MIND GAMES EXTENDED
Understanding Gameplay as Situated Activity

by

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ABSTRACT

This thesis addresses computer gameplay activities in terms of the physical handling of a game, players’ meaning-making activities, and how these two processes are closely interrelated. It is examined in greater detail which role the body plays in gameplay, but also how gameplay is shaped by sociocultural factors outside the game, including different kind of tools and players’ participation in community practices. An important step towards an understanding of these key factors and their interaction is the consideration of gameplay as situated activity where players who actively engage with games are situated in both the physical world and the virtual in-game world. To analyse exactly how players interact with both worlds, two case studies on two different games have been carried out, and three different levels of situatedness are identified and discussed in detail in this thesis, on the basis of existing theories within situated cognition research.

Keywords: computer gameplay, situatedness, embodied cognition

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ACRONYMS

Acronyms, abbreviations and other common terms used throughout the thesis are enlisted below in alphabetical order.

AI  Artificial Intelligence
APM  Actions Per Minute
COIN  Cognition & Interaction Lab (research group at the University of Skövde, Sweden, with focus on embodied, situated, and distributed cognition in natural and artificial cognitive systems; www.his.se/coin)
CC BY-SA  Creative Commons Attribution Share Alike Licence (for more detailed information about what the licence covers, see http://creativecommons.org/licenses/by-sa/2.5/se/deed.en)
CPL  Cyberathlete Professional League (e-Sports event; www.thecpl.com)
CS  Counter-strike (Valve Software, 2000; FPS)
DDR  Dance Dance Revolution (Konami, 1998; rythm & dance game)
DiGRA  Digital Games Research Association
EEG  Electroencephalography
EfMI  Escape from Monkey Island (LucasArts, 2000; adventure game)
e-Sports  Electronic Sports
ESWC  Electronic Sports World Cup (e-Sports event; www.eswc.com)
FPS  First-Person Shooter
HCI  Human-Computer Interaction
HUD  Head-Up Display
InGaMe Lab  Interactable Game & Media Lab (research group at the University of Skövde, Sweden, interested in the fields of computer games and other interactable media; www.his.se/ingame)

LAN   Local Area Network

MMO   Massively Multiplayer Online Game

MMORPG  Massively Multiplayer Online Role Playing Game

NiP   Ninjas in Pyjamas (Swedish COUNTER-STRIKE clan)

NPC   Non-Player Character

PC   Personal Computer

PS2   Sony Playstation 2 (game console)

SK gaming Schroet Kommando gaming (German e-Sports club)

WCG   World Cyber Games (e-Sports event; www.wcg.com)

Wii   Nintendo Wii (game console)

WSVG   World Series of Video Games (e-Sports event; www.thewsvg.com)

WoW   World of Warcraft (Vivendi Universal, 2004; MMORPG)
Part I

THESIS OVERVIEW
INTRODUCTION

Ever played Tetris (1985)? Of course you have, the game is a classic! It is nearly impossible to win and yet it does not stop us from trying; the colourful and odd shaped blocks keep falling and falling and we keep pushing the game’s buttons in desperate attempts to make those blocks fit with each other. For as fun and simple as the game is, it really gets you to think about the workings and brilliance of the human mind. Kirsh and Maglio (1994) must have had similar thoughts when they set out to study Tetris players. So what did they find? It looks like most of us rotate the blocks directly on the game screen, instead of first doing it mentally, to minimise our cognitive workload. These were important findings back then; they were yet another indicator that there is more to human cognition than just the gray matter between our ears. However, their findings did not tell us much more about the game and the people who play it. How do we know, for instance, what to do with Tetris in the first place, and how do we figure out how the buttons on our gaming devices are connected to those falling blocks? Since then a lot has happened and research on computer games and gameplay has significantly broadened and changed, particularly in the field of game studies (cf. Aarseth, 2001). One important fact remains though; so far, surprisingly little attention has been paid to cognitive aspects of gameplay, with the players and their actions in focus. Surely there must be something more to be said about our playing activities than what Kirsh and Maglio found in 1994.

1.1 What This Thesis is About

The work presented here is about understanding the activity of playing computer games, its cognitive aspects and the many factors influencing it. This thesis addresses computer gameplay from the perspective of situated
cognition, with emphasis on the physical handling of a game and players’ understanding of it. Subsequently, this thesis is also about the integration of the research areas of cognitive science and game studies, two areas with quite different yet overlapping and complementary research interests.

1.1.1 Computer Games and Cognitive Science

Games have always played an important part in cognitive science, an interdisciplinary area with influences from fields as different as neuroscience, linguistics, computer science, psychology, philosophy, and anthropology. Many theories of human thinking are based on games like chess (e.g., Newell, Shaw, & Simon, 1958; DeGroot & Gobet, 1996), cognitive tests are repeatedly presented in the form of games (e.g., Simons & Chabris, 1999), and – starting most likely with Turing (1953) – different kinds of artificial intelligence (AI) can nowadays be found in almost every computer game available on the market. Oddly enough, though, cognitive scientists have been noticeably absent when it comes to studying computer games and people’s playing activities, apart from few exceptions such as the aforementioned study of Tetris players (Kirsh & Maglio, 1994), or R. A. Wilson’s discussion (2004) of the child game Rush Hour (1996). In recent years, however, an increasing number of researchers interested in games and gameplay has started to draw inspiration from research undertaken in cognitive science (e.g., Wilhelmsson, 2001; Gee, 2004b; Murray, 2006; Lindley, Nacke, & Sennersten, 2008). Even though the field of game studies, which the research on computer games is mostly associated with, has considerably broadened its scope in the last couple of years, cognitive aspects of games and gameplay activities are still far from understood. Cognitive science obviously has a lot to offer to research on games and people’s playing activities in this respect since its theories and methods provide powerful tools for examining the dynamics, cognitive consequences, and experiences of people’s everyday play.

Computer games are everywhere, becoming more and more embedded in our lives. The ongoing evolution of digital technology allows us to play games more or less whenever, wherever, and with whomever we want to; feature-rich mobile phones, Internet connected game consoles and finely tuned Personal Computers (PCs) at home are a testament to that. Gameplay activities are in many respects also highly social in nature, with people constantly escaping virtual confines and mingling with their physical and
social surroundings (cf. Clark, 1997). The study of gameplay from a situated cognition perspective, which also includes embodied cognition approaches to human cognition, allows us to consider this complexity in people’s playing activities. Gameplay is not just the result of internal, individual processes, but needs to be understood with respect to where it takes place, how it unfolds, and who and what is involved in the playing activity. Does gameplay, for instance, take place entirely within a bounded space (cf. Caillois, 1961), or is it enclosed within a magic circle, separating the player from ordinary life (cf. Huizinga, 1938)? Recent studies suggest otherwise (e.g., Consalvo, 2007; Pargman & Jakobsson, 2008; Zackariasson, 2009).

In the field of game studies it is increasingly being realised that computer gameplay evolves from and takes place within webs of social and cultural practices, which leaves researchers facing the immense challenge of dealing with this sociocultural ‘mess’. Recently, this has also been acknowledged by Ian Bogost (2009), one of the keynote speakers for the DiGRA conference 2009. The field of game studies, it seems, is faced with similar problems as the area of cognitive science since 20-25 years ago, which also might explain the growing appeal of situated approaches to human thinking in this field (e.g., Squire, 2002; Murray, 2006; Linderoth & Bennerstedt, 2007; Steinkuehler, 2008).

1.1.2 The Problem of Designating a Unit of Analysis

In the field of game studies, computer games are approached from a wide range of perspectives, but so far, little consensus exists on which research areas fall into this field, what to study, and which methods to use (e.g., Murray, 1997; Frasca, 1999; Aarseth, 2001; Bryce & Rutter, 2005; Bartle, 2009). A key difficulty also lies in defining computer games, that is, how computer games differ from pre-digital games and play as well as other media like television, print and radio (e.g., Crawford, 2005). The question is further complicated by the old and persistent problem of defining games and play as such (Huizinga, 1938; Wittgenstein, 1953; Caillois, 1961; Aarseth, 1997; Eskelinen, 2004; Juul, 2005). Still, despite differing views on their meaning, most of us interested in games have a general idea of computer games and gameplay. After all, we usually recognise a computer game when we see one – be it in a mobile phone, a game console or on the PC at home. Tetris? Yes; the ever so popular falling-block puzzle sure is a game. Word? No, not really; using the word editor writing a scientific article is anything
but a game, even though it can be fun on occasion. Pac-MAN? Yes sure, the navigation through a virtual maze that requires you to eat lots of Pac-dots while being chased by ghosts is definitely a computer game. Games especially designed for learning and training purposes, also commonly known as serious games, can make categorisation a bit more difficult since, for example, children do not always like them and usually only play them if they are told to (cf. Gee, 2004b; Egenfeldt-Nielsen, 2007). If we bring many game researchers’ dislike of the term ‘serious games’ into the discussion, the whole issue gets even more interesting (cf. Michael & Chen, 2006; Aldrich, 2009). This dislike is actually quite amusing considering that many game researchers have no problem at all with making a distinction between casual and hard-core games (cf. Juul, 2010).

From a cognitive science perspective, gameplay can naturally be described in terms of activity and cognition, but similar to researchers in the field of game studies we find ourselves asking what we should study and what methods to use. Focusing on the individual player and the skills acquired, without bothering too much about the physical and social surroundings in which everyday play takes place, would only provide a partial understanding of a gameplay, we would learn very little about what is going on cognitive-wise when people play computer games. Situated approaches to cognition maintain

*that intelligent human action has evolved within and is shaped by and adapted to the specific forms of activity in which it occurs, and that cognition must therefore be understood and studied as an aspect of embodied practical activity (O’Connor & Glenberg, 2003).*

That means gameplay cannot be studied by simply testing players’ performances experimentally on tasks that have really nothing to do with their regular playing activities, as often done in psychological research; it does not tell us much about the cognitive factors underlying computer play activities. This is not to say experimental studies cannot be meaningful, but they alone are not substantial enough to explain the many cognitive dimensions of gameplay. We need to take into account that gameplay is a *socially situated activity*, spanning brain, body, and (game) environment. But what is the game environment? Is it the game itself, that is, what is visible on the screen, the inherent rules, and the input and output devices used during the game? Or does the game environment also include other players? A game like COUNTER-STRIKE (CS, 2000) is a team-based game where
interaction with team members is crucial to the outcome of the game; in massive multiplayer online role playing games (MMORPGs) like World of Warcraft (WoW, 2004) you usually can only be successful if you cooperate with other players. To complicate things, in Counter-strike teams can play co-located, but they can also be distributed over time zones and continents, similar to people playing WoW. Not to mention the fact that people are very proficient in using and adapting the material environment for their purposes. Artefacts, tools – whichever term we use – are a fundamental part of human cognition (cf. Hutchins, 1995; Clark, 2003; Susi, 2006), and there is no reason to believe this is any different in computer gameplay; players can make use of both virtual tools, for instance, a compass and a clock in the game Escape from Monkey Island (EfMI), and material tools such as pen and paper to write down directions given in the aforementioned game. And some tools are not even virtual, or material objects, but instead appear, for instance, as cultural norms. Some of them may be implicit such as tacit strategies and turn taking in communication while others are explicit, such as agreed upon strategies. Also, some tools are present for shorter or longer time spans whereas others, such as requests or commands, are ephemeral and only exist for the time they are spoken.

All these aspects, taken together, pose somewhat of a problem, i.e., what is the proper unit of analysis in gameplay if we cannot really tell where the game environment begins and where it ends?

1.1.3 Aim & Contributions

In this thesis, computer gameplay is approached from a situated cognition perspective, with particular focus on (a) the physical activity of playing a game, (b) players’ meaning-making activities, and (c) how the two of them are closely interrelated. It is discussed why a situated cognition perspective on games is particularly well-suited for the study of gameplay activities, and what the theoretical and methodological implications are. A distinction between three different forms of situatedness is made since the term as such is very broad and often used in different ways, for different purposes (Chapter 4). In this context, James J. Gibson’s (1979) affordance concept is further explored as a possible aid in understanding the close, mutual relation between player and game environment (Chapter 5).
The theoretical and methodological stance taken here is illustrated through two case studies (Chapter 6-8). In the first case study, the focus has been on the body’s role in people's playing activities, with large emphasis on the actual activity of playing a game. More specifically, the study aimed to deepen our understanding of the way people and their gameplay are affected by different game interfaces. Two different input devices, a gamepad and a modified exercise bike, were used for the game PAPERBOY (1984), a fast-paced arcade game that challenges players to deliver newspapers along a suburban street without bumping into the many hazards that clutter the street. Results indicate that people played the game in similar ways, to large extent independent of which input device they used. However, the exercise bike seemed to have an influence on participant’s expectations about the kind of interactions it allowed.

In the second case study, a broader perspective was taken on computer gameplay, that is, when we chose the unit of analysis we not only included the actual playing activity, but also considered how gameplay is affected by factors outside the game itself, such as players’ relation to other players and their participation in game communities. The choice fell on COUNTERSTRIKE (CS, 2000), a highly popular first-person shooter (FPS) game, and most attention was given to COUNTER-STRIKE (CS) as an electronic sports (e-Sports) game, i.e., competitive gameplay which borrows from traditional sports. The analysis of the collected material not only provides an understanding of gameplay in CS, but also constitutes a qualitative description of how a variety of factors can influence playing activities on different levels. Furthermore, it illustrates how gameplay can be approached and studied methodologically and analysed theoretically without losing sight of the fact that gameplay is situated, and that it takes place in social contexts created and shaped by individuals as well as organisational practices.

The main purpose of this dissertation is to integrate research in the area of cognitive science and current research in the field of game studies; computer games have been approached from a variety of disciplinary and theoretical perspectives, but (cognitive) aspects of gameplay activities with the player in focus are still quite unexplored (cf. Goldstein, 2003; Ermi & Mäyrä, 2005). The integration of these two areas is not without its challenges though. It is simply not enough to take existing ideas and theories from one area and try to apply them to another area, whether they fit or not, and without any consideration for the research object at
Table 1: An overview of this thesis’s contributions to the areas of cognitive science and game studies.

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<th>Cognitive Science</th>
<th>Game Studies</th>
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<td>A systematic investigation of <em>game-play as a situated phenomenon</em>, that is, how players are situated in both the physical and the virtual world.</td>
<td>A discussion of different conceptions of situatedness, and their relevance and theoretical and methodological implications in relation to people's gameplay activities.</td>
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hand. However, the theoretical framework of situated cognition does not only provide valuable insights into the human mind as such, but it also deals with the kind of questions researchers in game studies increasingly become aware of. Moreover, many of the underlying assumptions can, to some extent, also be found in the field of game studies, making the ongoing research in these areas complementary rather than competitive. The latter is illustrated in Table 1, where it is shown how this thesis’ research questions and objectives are related and how they contribute to each of the two areas; a more detailed account of these contributions and the motivations behind is provided separately in the next two sections below.

A Cognitive Science Perspective

Today, there is an increasing awareness of the cultural, embodied, and situated nature of human cognition in different scientific fields of cognitive science (Robbins & Aydede, 2009). Theories of situated cognition, in a nutshell, are largely based on the idea that human thought and action are situated, in the sense that “what people *perceive*, how they *conceive of their activity*, and what they *physically do*, develop together” (Clancey, 1997, p. 1). Still, the term *situated* presents a fundamental dilemma and that is not only because of the blurry boundaries of human cognition and activity, as mentioned earlier. ‘Situated’ is often interpreted in the narrow sense that an action is grounded in the concrete situation or context in which it occurs (e.g., M. Wilson, 2002; Robbins & Aydede, 2009), which is evidently an oversimplification of the concept. The concept of situatedness refers not only to the ‘here and now’ of an activity, but also to the cultural and social knowledge we commonly share, the kind of knowledge that is incorporated in artefacts and tools (Norman, 1998; Preston, 1998; Rogoff,
and individuals’ memberships in various communities of practices (Lave & Wenger, 1991). People are also situated through their bodies; the body allows, for instance, only certain kinds of interaction with the equipment used during a game while, at the same time, the equipment also determines to some extent the kinds of skills developed in a game. The latter, a fundamental aspect of human activity and cognition, has been explored by many scholars using the concept of affordance (J. J. Gibson, 1979), which is not without its problems given the many and various uses of the concept (cf. Torenvliet, 2003; Oliver, 2005).

In this thesis, situated cognition is viewed and discussed in terms of three different conceptions of situatedness: (1) high-level cognition, (2) the here & now of a situation, and (3) low-level cognition. These three levels integrate theories of embodied and situated cognition, thereby exploring more in detail what the term situated means in relation to human activity. This is by no means a new framework; instead it is an attempt to put the different puzzle pieces together, similar to what has been done by, e.g., Ziemke, Zlatev, and Frank (2007). The difference here is that we go beyond various conceptions of situated and embodied cognition and instead focus on what they have in common as well as how they are interrelated. Moreover, the focus is on an activity that so far has not been the subject of extensive research within the area of cognitive science, or to put it differently, what has happened since Tetris?

A discussion of gameplay activities will bring an additional value to the research done in cognitive science; so far, the attention has been almost exclusively directed to work oriented activities and specific cognitive functions such as perception, memory, decision making, and reasoning, despite the fact that computer games have become commonplace in people’s lives. This readily prompts the question of what is so special about gameplay, compared to other kinds of activities. Given the increasing pervasiveness of computer games and the interaction styles they offer, it is a unique opportunity for us to deepen our understanding of how we manage to overcome the obstacles of being and acting in the game environment’s various physical and virtual manifestations. Also, the reading of current literature can easily give the impression that we are hard-working, rational and inherently dull beings. However, it is every bit as important to show and explore the less boring and creative aspects of human activity and cognition (that is not to say gameplay activities cannot be boring, or do not require hard work ...).
A Game Studies Perspective

The view of gameplay as a situated phenomenon is not exactly a novel idea. We have seen, for example, discussions on the sociocultural context in computer gameplay (Squire, 2002; Arnseth, 2006), which draw quite heavily on situated approaches to cognition. We have also seen discussions of gameplay and learning as a situated phenomenon, with focus on the interplay between the body, development, and cultural aspects, and the way they are integrated in learning and gameplay (Gee, 2004b). These and similar work of other researchers provide important insights on gameplay as a situated phenomenon. However, besides the sociocultural side of situatedness, there are many more aspects to it that have not been much considered in the context of computer gameplay. Firstly, it often remains unclear what researchers have in mind when referring to gameplay as being situated; as mentioned above, situatedness itself can have many different meanings. Secondly, a crucial aspect of situatedness that is often overlooked is the use of external resources in people’s playing activities in terms of artefacts and tools. This is somewhat surprising considering that computers and computer games themselves constitute cultural artefacts which involve complex cognitive activities.

This thesis discusses different conceptions of situatedness, as proposed within the theoretical frameworks of embodied and situated cognition, with regard to gameplay. The term ‘situated play’ seems to have reached somewhat of a buzzword status in the field of game studies (it was, for instance, the DiGRA conference’s theme in 2007), but its meaning is still quite vague. Some conceptual clarifications and distinctions on this issue are therefore needed.

In the chapters to come, different theoretical and methodological aspects of situated play are discussed and illustrated; we might not know exactly where the game environment begins and where it ends, but we sure need to find a way to define a valid unit of analysis. Also, as an important aspect of situatedness, the use of artefacts and tools is explored in more detail; the player’s actions need to be understood with regard to the game environment which not only holds and distributes information, but also invites players to take certain actions in relation to, for instance, the artefacts and tools used in the game. This also means that we need to consider affordances, for lack of a better word, in relation to players’ context-dependent actions, which include interactions with other players as well as objects.
1.2 What This Thesis is Not About

A dissertation about computer games and gameplay should probably provide readers with a detailed definition of what computer games are. Unfortunately, there is no unambiguous, universal answer to this question and as already mentioned in Section 1.1.2, the issue of defining computer games is complex, to say the least. This thesis is, in other words, not an attempt to formulate a refined definition of computer games. I do not think it would add much to these discussions, at least not from the perspective presented here, which is why I take the easy way out and simply point the reader to some of the more well-known research on (computer) games and gameplay (see the discussion on page 5).

Moreover, the focus will be on computer games as such, in contrast to serious games which is a research field in its own right (Aldrich, 2009). As has been hinted at earlier, many people in the game (research) community downright reject the idea of a distinction between ‘serious’ and ‘non-serious’ games since all computer games can be played in serious ways, if one puts one’s mind to it. I wholeheartedly agree with that, but then again, I do not really have a problem with the term serious games either. The intention is merely to point out that this dissertation is not about games specifically designed or used for learning and training purposes. That is not to say, though, that the research presented here is not of relevance for serious games research. On the contrary, people playing serious games also need to make sense of the game world and their interactions with it.

Other aspects that are not covered here in greater detail are related to the gaming experience such as people’s sense of flow, presence and/or immersion (e.g., Czikszentmihalyi, 1996; Douglas & Hargadon, 2000; Ermi & Mäyrä, 2005). Without a doubt, the gaming experience is an important and integral part of people’s gameplay, but there is not the space to go into these in detail here. The gaming experience is closely tied to people’s emotions which is an entire research area of its own, and it is still widely debated whether and to what extent human thinking and actions depend upon and are driven by emotions (cf. Damasio & Sutherland, 1995).

Last but not least, this dissertation does not provide readers with a methodological framework that lists steps necessary to determine the full scope and nature of people’s playing activities. As a consequence, researchers looking for research instruction guidelines might be misled
as the purpose of this dissertation is not to provide them with a methodological manual. What is discussed is methodological implications of the theoretical stance taken here, but this does not automatically result in practical guidelines and concrete examples.

1.3 A Few Clarifications

This section provides, as its name suggests, mostly clarifications. It is explained why a term such as computer games is used in the first place (not surprisingly, there exist different opinions on the subject), and how the thesis contents relate to my publications and conference presentations. A few words about the use of copyrighted images and screenshots in this thesis might also be in order since sometimes a picture does say more than a 1000 words, especially in discussions of computer games and gameplay. Also, the terms ‘embodied’ and ‘situated’ need a bit of explaining beforehand, considering how often they are used throughout the thesis.

Why Computer Games?

An increasing number of researchers argues in favour of using the term digital games instead of computer games or video games as the latter two terms carry mixed meanings in the English language (cf. Kerr, 2006). They can be confused with platform-specific games, for instance, computer games are often associated with games you play on your PC at home whereas digital games is a more neutral term that includes all kinds of games based on digital technologies. There is, in other words, a point in using the term digital games, which also has been acknowledged by DiGRA, an international association of academics and practitioners interested in digital games and associated phenomena.

Then why do I insist on using the term computer games? The answer is rather simple and really more about personal preferences than anything else. It feels weird to use terms such as video games or digital games, especially the term digital games feels more like an artificial construct to me than something I can relate to. I do not play digital games, I play computer games. Video games, on the other hand, is an everyday term that is widely used in English-speaking countries, but does not enjoy particularly widespread use in the rest of the world. Add to that the fact that my native language is German and I grew up playing ‘Computerspiele’
which translates to computer games. The last ten or so years I have lived in Sweden and here people play and talk about ‘datorspel’ which, again, translates to computer games and is the all-encompassing word for all kinds of digital games. Terms like computer and computer technology are pretty much synonyms for everything digital in these two countries. That said, it is certainly not my intention to use the term computer games exclusively, if only for variety’s sake. Therefore it is important to keep the following in mind while reading this dissertation: a game is a computer game is a digital game is a video game, unless specifically indicated otherwise.

*Thesis Contents & Copyright(ed Material)*

This thesis is the written result of research carried out in the *Interactable Game & Media Lab (InGaMe Lab)* and the *Cognition & Interaction Lab (COIN)* at the University of Skövde, in collaboration with the University of Linköping. A large part of it has already been presented and published at various national and international conferences, conventions and workshops. Also, this thesis comprises original work towards the PhD such as my research proposal and licentiate thesis (*Rambusch, 2008*). A complete list of publications and presentations can be found on page vii, sorted by (publication) type.

All material and images included in this thesis are licensed under a *Creative Commons Attribution Share Alike Licence (CC BY-SA)*, unless otherwise specified. An important portion of such a specification concerns screenshots from computer games as the CC BY-SA licence does not cover these. Game screenshots are included here under the *fair use copyright doctrine* which allows limited use of copyrighted material for research purposes. This means even though all screenshots were taken by myself, they are still the property of the games’ copyright owner(s), and acknowledged accordingly.

*Are You Still Embodied or Already Situated?*

As briefly mentioned before, the notion of situated cognition as used here also includes the notion of embodied cognition (cf. *Clancey, 1997; M. L. Anderson, 2003*). The relation between embodied and situated cognition is far from being clear or well-defined, but despite differing ways of attending the issues of embodied and situated cognition, there are a
number of features that are generally associated with both perspectives (cf. M. Wilson, 2002; Ziemke et al., 2007); more detailed accounts of the different views on embodied and situated cognition are provided in later chapters (cf. Chapter 3).
THESIS MAP

This dissertation consists of several parts of which parts i-iv represent the main body of it; a more detailed synopsis of the thesis content is given below, but for a schematic overview, see Figure 1. The supplementary parts consist of the bibliographical details and three appendices (graphically) illustrating certain aspects and results of the work presented here.

It is important to bear in mind that the thesis structure does not reflect the actual research process, for instance, both case studies had been carried out before larger parts of the theoretical discussion in Part ii were written. In other words, the theretical (background) discussion can be considered as much a contribution in this thesis as can the discussion and analysis of both case studies.

PART ii – Situated Play in Theory

This part consists of three chapters in which theoretical considerations of embodied and situated cognition in relation to computer gameplay are addressed.

CHAPTER 3 Here, the focus is on gameplay from a cognitive science perspective and various assumptions and trends regarding embodied and situated cognition. It is discussed why current research in the area of cognitive science can deepen our understanding of people’s everyday play as well as implicit and explicit assumptions underlying theories of embodied and situated cognition.

CHAPTER 4 Based on the previous chapter, three different levels of situatedness are identified and discussed in great detail with regard to gameplay in terms of the physical activity of playing a game and play-
In the first part, an overview is given on what to expect when reading this thesis.

**Aims, copyright, terminology, unit of analysis**

In the second part, it is discussed how gameplay can be approached from a cognitive science perspective, and what the theoretical implications of theories of situated and embodied cognition are. Three levels of situatedness are identified.

**Affordance, gameplay, situatedness**

In the third part, two case studies on two different games are presented, to discuss the relevance and methodological implications of situated and embodied cognition theories.

**Case studies, game controllers, e-Sports, methodology**

In the last part, main contributions are listed, and possible future work is discussed.

**Conclusions**

**Figure 1: Schematic overview of thesis structure and thesis content.**
ers’ meaning-making activities. The three levels identified are ‘low-level’ cognition, the ‘here-and-now’ of a situation, and ‘high-level’ cognition; they illustrate three commonly held and equally important conceptions regarding situated cognition.

CHAPTER 5 This chapter discusses the affordance concept with respect to computer games and gameplay activity as it addresses the close relationship between agent and world, which in this particular case refers to the player, and the physical and virtual environment. However, much of the discussion in this chapter suggests that what we have come to understand as affordances are not affordances in the Gibsonian sense (1979) but appear to be rooted in cultural values and practices, and the experience of having a body.

PART III – Situated Play in Practice

The theoretical background discussion in Part ii is followed by an introduction to the two case studies underlying this dissertation, and a thorough discussion and analysis of said case studies.

CHAPTER 6 This chapter provides an introduction to the two case studies, with particular focus on the identification of suitable methodology, and the main ideas behind them.

CHAPTER 7 The first case study was undertaken to gain a better understanding of the way people and their gameplay are affected by different kinds of game control devices. Two different control devices, a gamepad and a modified exercise bike, were used for the game PAPERBOY (1984), a game where players take on the role of a paperboy on a bike. The results are, for the most part, inconclusive, however, it does not mean there are no valuable points to be drawn from this case study.

CHAPTER 8 The second case study illustrates how cognitive, cultural, economical, and technological aspects shape the way a game is played and players’ understanding of the game. Particularly, focus was placed on COUNTER-STRIKE (2000) and its development into an e-Sports, that is, competitive gameplay which borrows forms from traditional sports.
Part IV – Conclusions

The third part contains a summary of the main contributions and implications of this thesis, as well as reflections on the work presented in the preceding chapters. In addition, it points to open questions as well as possible directions for further research.
Part II

SITUATED PLAY IN THEORY
A COGNITIVE SCIENCE PERSPECTIVE

Computer games can be approached from many different research directions, but on closer inspection there are three dimensions that characterise nearly every game species (cf. Aarseth, 2003). The first and most obvious dimension is the dimension of gameplay; it refers to players’ actions, strategies and motives, and is primarily studied with theories and methods from sociology, anthropology, and psychology, i.e., the social sciences. The focus has been, among many other things, on some of the following topics: people’s motivations to play games (e.g., Crawford, 1982; Bryce & Rutter, 2005), the gaming experience (e.g., Douglas & Hargadon, 2000), moral issues in gameplay (e.g., Consalvo, 2007), the potential negative influence of games on people (e.g., Gentile, Lynch, Linder, & Walsh, 2004), the impact of games on people’s learning performance and social behaviour (e.g., Holmes & Pellegrini, 2005), and online game culture (e.g., Taylor, 2006). The second dimension is represented by the game world, that is, the fictional content, narrative structure and design of a game; it is primarily studied with theories and methods from art, history, media, and cultural studies, i.e., the humanities (e.g., Murray, 1997; Atkins, 2003; Juul, 2005). The third and last dimension is about the game structure and refers to the rules of a game; it is frequently studied with theories and methods from game design, business, law, computer science, AI, and other applied areas that are of use in the industrial practice of computer game development (e.g., E. Adams, 2002; Salen & Zimmerman, 2004).

This thesis is foremost aimed at understanding the dimension of gameplay, but as acknowledged also by Aarseth, the three levels are interdependent. Gameplay is the natural starting point for me, given my main interest in the cognitive aspects of gameplay involving people and games. It is first in the process of playing, as the player navigates through the game.
Figure 2: Gameplay can be divided into the physical activity of playing a game, such as the use of keyboard and mouse, and players’ meaning-making activities, which also involve interactions with other players. The picture above was taken during the WCG 2006 in Monza, Italy; it shows a COUNTER-STRIKE clan practising for upcoming matches.

environment, that the game comes to life, and it is only by studying people playing games, or possibly by playing them oneself, that one can begin to understand gameplay. From a methodological standpoint then, and as seen in Figure 2, gameplay activities can be divided into essentially two categories:

(a) the physical activity of playing a game, i.e., the handling of the game, and

(b) players meaning-making activities, i.e., people’s understanding of the game and their interactions within and outside the game.

The distinction between these two elements is for discussion purposes only; both processes are closely interrelated and reflect an important aspect of the situated nature of gameplay. The handling of the game alone does not tell us much about player’s mental processes during a game and
yet it is a central part of player’s understanding of a game. It is also necessary to understand that players’ interactions outside a game can be an essential part of gameplay activities, because the participation in player circles and communities gives access to other player’s knowledge, ideas and experiences, which have an impact on how a game is played.

To think of gameplay as consisting of these two elements provides different openings for the study of gameplay activities. We can, for instance, observe people handling a game or we can ask them in interviews or questionnaires of their understanding and the meaning of a game. In this sense, and at the most basic level, we could say that the handling of a game involves knowing which buttons to press, and peoples’ understanding of the game in terms of possible actions and the game’s inherent rules means knowing when to press the buttons. However, knowing which buttons to press and when to press them does not explain why people bother pressing any buttons at all. Players’ understanding of a game includes, in other words, more than what is implied in the distinction above. Tosca (2003) argues that, in order to understand gameplay, we have to look at which buttons are pressed (the action level), how these are interpreted in relation to the game context (the plot level) and we also need to consider games in wider terms as, for instance, cultural objects. Tosca’s ideas are very similar to current research in the area of cognitive science which provides us, as we will see in the sections to come, with a complementary account on the relation between handling a game and players’ understanding of it.

3.1 Historical Background & Current Trends

Given the history of cognitive science (e.g., Boden, 2007), the connection to computer games and their (cognitive) impact on people is quite obvious. And yet, as already hinted at in the introduction, cognitive scientists have shown a remarkable lack of interest in addressing this issue in the past. A good indicator for this is the proceedings of the annual meetings of the Cognitive Science Society, the research world’s largest cognitive science conference. Computer games rarely exist as an object of study, except for studies in which self-designed computer games are used to administer various kinds of cognitive tests (e.g., Jones, 2007; Coen et al., 2009). There is also applied research being carried out from a cognitive perspective, mainly research on perception and decision making in virtual environments (e.g., Jang, Jyung, & Black, 2007; Coen & Gao, 2009), and
AI models of games and gameplay (e.g., Destefano & Gray, 2008; Crick & Scassellati, 2009). Still, research on computer games as such, research that not just uses them as examples to illustrate a theoretical point concerning something else, is scanty compared to traditional research topics in this area. Your guess is as good as mine as to why that is, but one plausible explanation is that gameplay is seen as just another activity, among many others. Computer games have not changed the way we think or perceive the world, after all our brain is pretty much the same brain our ancestors possessed when they came up with the clever idea of decorating caves with colorful paintings. So unless we have proof of computer game players having larger/heavier/more evolved brains than anyone else, or them using techniques never observed before, many cognitive scientists will probably continue paying attention to other research agendas. With that being said, it does not mean that there has not been any research at all on games and cognition.

One of the earliest attempts to analyse games and gameplay from a cognitive science perspective was made by Grodal (1994) in the area of film and media studies, which at first glance has very little to do with the study of the human mind and its underlying processes. However, Grodal does not explicitly talk about games and gameplay; the focus in his dissertation is on the subjective experience of viewing visual fiction, a term that includes everything between cartoons, films, television series, and computer games. A few years later, Wilhelmsson (2001) took Grodal’s ideas several steps further and explicitly addressed the connection between cognitive film theory and computer games. Important sources of inspiration for his work were also Lakoff and Johnson (1980, 1999) and J. D. Anderson (1996) who discussed various aspects of embodied cognition, albeit with different foci and terminology. According to Wilhelmsson (2001), gameplay and the identification with a game character are fundamentally related to the physicality of having a body, which most noticeably is influenced by the perception of affordances (cf. J. J. Gibson, 1979) and the human capacity to use cognitive metaphors and image schemas, and which manifests itself in a player’s Game Ego. Wilhelmsson also calls attention to the fact that a player’s ability to identify with a game character in form of a Game Ego is not a purely visual process as also sound and movement affect its formation. This is also the reason why he discards the concept of point of view as it ignores the tight link between perception and action; instead he prefers to talk about players’ point of being as it better captures the
close relationship between how players perceive the game environment and their actions within it.

If we then fast forward four years, we will find the work of Gander (2005) who expanded upon the research of Grodal and Wilhelmsson. Gander has a background in cognitive science and his claim is that “the difference between traditional, non-participatory stories (such as books and films), and participatory stories (such as story-based computer games) is one of cognition” (p. 5), seeing that people who use participatory stories construct spatial mental representations of the story world. The participant’s speech in Gander’s study also suggested that the use of participatory stories leads to a more close and personal perspective on the story events. It is worth noting that Gander draws a clear line between story based and non-story based games as well as participatory and non-participatory stories, whereas neither Grodal nor Wilhelmsson seemed to care much about these distinctions. Unsurprisingly, other game researchers do care about these things, which is most evident in the now infamous and still ongoing debate between narratologists and ludologists (e.g., Murray, 1997; Frasca, 1999). Also, more recent research has shown that even films and books can be considered to be participatory in some sense (e.g., Jenkins, 2006a, 2006b), and that non-story based games like Tetris do not stop players from telling compelling stories about them (Rambusch, Susi, Ekman, & Wilhelmsson, 2009).

Around the same time, the first sociocultural approaches to games and gameplay arrived on the scene, approaches that to some extent were inspired by recent research in cognitive science. Squire (2002) was among the first who criticised the lack of any naturalistic studies of what gameplay experiences are like and the kinds of practices people are engaged in while playing computer games. His discussion of gameplay as cultural practice focused much on issues of learning and knowledge transfer in response to the heated debate between researchers who attack the evils of (violent) games and those who praise their learning and communicative potential. Murray (2006), for her part, discussed the strong link between media, mind, and culture, thereby linking games and gameplay to embodied social processes such as mimicry and imitation. Players’ perception and understanding of the game world as well as their interactions with it have been explored more in detail by, e.g., Linderoth and Bennerstedt (2007) who further elaborated the concepts of affordance (J. J. Gibson, 1979) and professional vision (Goodwin, 1994) in relation to gameplay. More
recently, there have also been studies on the situated nature of players’ skill development such as S. Reeves, Brown, and Laurier’s exploration of professional COUNTER-STRIKE players (2009) which is closely related to the work presented here (cf. Chapter 8 and Rambusch, Jakobsson, & Pargman, 2007). In the social sciences and educational research, a large deal of effort is devoted to the study of the impact of digital games on children’s and adolescents’ learning performances (e.g., Buckingham & Sefton-Green, 2003; Gee, 2004a, 2004b), which is accompanied by critical voices on occasion (e.g., van Eck, 2006; Kirriemuir, 2007).

The research outlined above highlights important cognitive aspects of people’s everyday play and it becomes apparent that much of current research on games and gameplay is driven by researchers’ desire to go beyond traditional notions of human activity, and that for good reasons. The activity of playing a computer game, although seemingly detached from the real world and usually not involving much actual physical movement, is in many respects a highly social activity, spanning brain, body, and game environment. Gameplay is by no means an activity that takes place inside a virtual cyber-vacuum, rather it is shaped by players’ bodily experiences and their interactions with and use of the game environment, including both game interface (e.g., input & output devices) and the surrounding environment such as objects and other people. People also have bodies which to a considerable extent constitute part of their playing activities even if, for an outside observer, it often may seem that the only body parts involved are the fingers moving on the keyboard. This complexity in gameplay makes theories of embodied and situated cognition a valuable aid in mapping out the relationship between people’s physical playing activities and their understanding of it (cf. page 24). However, before we can continue discussing gameplay activities from such a perspective in more detail it is necessary to take a closer look at the underlying assumptions and beliefs embedded in those theories.

3.2 Embodied and Situated Cognition

For quite a long time, cognition was considered the product of internal (individual) processes, comparable to the symbol-manipulating processes in a computer (e.g., Pylyshyn, 1990). Accordingly, the focus in cognitive science traditionally has largely been on information and its mental representation and processing, thereby often reducing an agent’s interaction
with the physical and social environment to nothing but a set of interactions between external stimuli, mediating internal (symbolic) knowledge, and behavioural responses. In the last 15 to 20 years, however, there has been a shift within parts of the cognitive science community, leading to approaches and perspectives where in particular the interaction between agents and their environment is in focus (Hutchins, 1995; Clark, 1997; M. Wilson, 2002).

3.2.1 Definition(s) and trends

Drawing attention from the individual, to individuals acting in a socio-cultural context, much research indicates that the cognitive processes of human beings cannot be understood without taking into consideration the social and situated nature of human cognition. But not only the individualistic perspective has been questioned; many researchers are also opposed to dualistic and functionalist viewpoints, which in different ways presuppose the separation (non-relatedness) of mind and body. Going beyond this perspective, it has been argued that body and mind cannot be separated, since they strongly affect and depend on each other (e.g., Varela, Thompson, & Rosch, 1991; Clancey, 1997; Clark, 1997; Ziemke et al., 2007).

Still, as already mentioned in the introduction, the relation between embodied and situated cognition is far from being clear or well-defined. Embodiment approaches bear many similarities to situated approaches to cognition and activity as many of the underlying assumptions in situated cognition and embodied cognition are closely related and to a considerable extent also have the same historical roots (e.g., von Uexküll, 1928; Vygotsky, 1932; Dewey, 1938; Mills, 1940; Piaget, 1969). Moreover, the notions of situated cognition and embodied cognition are often used in an interchangeable way while at other times they are used to express different ideas and views. M. L. Anderson (2003), for instance, considers sociocultural situatedness to be one of the most complex aspects of embodied cognition, which according to him has led to a point at which the division between embodied and situated cognition does not really make sense anymore. Clancey (1997), for his part, does not distinguish at all between situated and embodied cognition. In his concept of situated cognition, Clancey has acknowledged and taken into consideration both the embodied and sociocultural nature of human cognition:
Cognition is situated, on the one hand, by the way conceptualizing relates to sensorimotor coordination and, on the other hand, by the way conceptualization, in conscious beings, is about the agent’s role, place, and values in society. Thus, situated cognition is both a theory about mechanism (intellectual skills are also perceptual-motor skills) and a theory about content (human activity is, first and foremost, organized by conceptualizing the self as a participant-actor, and this is always with respect to communities of practice) (pp. 27–28).

Mataric (2002), on the other hand, describes situatedness as “existing in, and having one’s behavior strongly affected by […] an environment” and embodiment, in contrast, as “a type of situatedness”. Embodiment, she argues, “refers to having a physical body and thus interacting with the environment through the constraints of that body” (p. 82). At first glance Mataric’s approach seems to have some similarities to Clancey’s idea of situated cognition as both have integrated embodiment cognition in the concept of situatedness, but it is nonetheless very obvious that Mataric and Clancey have a different perspective on situated cognition, which also is related to their different backgrounds and foci. For Mataric (2002), with her AI background, there is still a clear distinction between agent and world; here, we have the agent being affected by the environment, there, we have the objective and independent world outside. Clancey (1997), on the other hand, questions this well-defined distinction by making the agent an active part of its social, cultural and physical environment.

In response to all those different views, Robbins and Aydede (2009) provide yet another picture of the landscape that is situated cognition. According to them, situated cognition should be viewed as a genus of which particular forms such as embodied, embedded, enactive, and distributed cognition are species. They are aware that such a categorisation is not standard, nor adopted by anyone else, but to them it is “as good as any” (p. 3). Clearly, the focus here is more on bringing together the different views and terminologies under one roof, rather than on exploring the situated nature of human thinking in general.

3.2.2 Central Assumptions

Despite differing ways of attending the issues of embodied and situated cognition, however, there exist a number of features that generally are associated with both perspectives (cf. M. Wilson, 2002; Ziemke et al.,
M. Wilson (2002), in an attempt to distinguish and evaluate central views on embodied cognition, identified six different claims that in one way or another run through the literature on embodied and situated cognition: (1) Cognition is situated, (2) Cognition is time-pressured, (3) We off-load cognitive work onto the environment, (4) The environment is part of the cognitive system, (5) Cognition is for action, and (6) Off-line cognition is body-based. The six claims illustrate important issues in embodied and situated cognition theories, even though Wilson herself, as we will see, is somewhat opposed to some of these claims.

**Cognition is situated**

The first claim is one of the cornerstones in the theoretical frameworks of embodied and situated cognition (e.g., Lave & Wenger, 1991; Hutchins, 1995; Clancey, 1997; Clark, 1997; Kirshner & Whitson, 1997; Ziemke, 2002; Rogoff, 2003; Smith & Semin, 2004; Susi, 2006; Lindblom, 2007; Robbins & Aydede, 2009). Cognitive activity is situated as it takes place “in the context of a real-world environment”, “in the context of task-relevant inputs and outputs”, thereby inherently involving perception and action (M. Wilson, 2002, p. 626). Wilson, nonetheless, criticises that some authors have gone so far as to claim that there is no activity that is not situated (cf. e.g., Lave & Wenger, 1991; Clancey, 1997). By viewing cognition as being situation bound, she argues, “large portions of human cognitive processing are excluded” (p. 626). According to her, cognitive activity is sometimes unaffected by the ongoing interaction with the environment (e.g., day-dreaming, remembering) and, hence, is not situated but takes place “off-line”.

Wilson’s interpretation of the term ‘situated’ illustrates a widespread problem in the field of cognitive science. Admittedly, the term is rather vague and thus subject to differing interpretations, but most of the time it is interpreted in the limited sense that human activity is grounded in the concrete situation or context in which it takes place. One possible reason might be the term’s literal meaning. However, rather than viewing a person as being in an environment – “like a cherry in a bowl”, as Dewey once put it – situated cognition views the activities of person and environment as “parts of a mutually-constructed whole” (Bredo, 1994). In order to understand human cognition we cannot just look at separated, isolated parts such as the individual brain, but we have to view cognition as a dynamic
process that emerges over time and in interaction with people and artefacts (Thelen & Smith, 1994; Hutchins, 1995; Clark, 1997; Shanker & King, 2002). Broadly speaking then, individual actions (even those taking place ‘off-line’) cannot be explained without taking into consideration what other people are doing and people’s shared, over generations developed knowledge and understanding of the world. For instance, when a person leaves a message on the desk for her co-workers, the information becomes part of a social activity and individual knowledge becomes shared knowledge. The concept of situated cognition consists, in other words, also of a strong social dimension, which can be the social interaction with others, the cultural and social knowledge incorporated in artefacts and tools (Preston, 1998), but also an individual’s membership and participation in various communities of practices (Lave & Wenger, 1991; Rogoff, 2003).

**Cognition is time-pressured**

According to Clark (1997), the human mind needs to be understood in terms of how it works under the pressure of real-time interaction with the environment. All of us usually have to deal with many different things at the same time, which seldom gives us the time to come up with a smart plan or action. It is now argued that humans, instead of relying on some mental (objective) representations of the world, simply use the “world as its own best model” (Brooks, 1991, p. 139). This way of argumentation is rooted in the research field of artificial intelligence where traditionally artificial intelligence models are given the opportunity to build and manipulate complex internal representations. In the real world, it is argued, there is no time for such a time-consuming behaviour; instead, an agent has to cope with a constantly changing environment as fast as it perceives its surroundings. For example, a person playing Tetris (1985) mostly rotates the bricks directly on the screen instead of doing it mentally (Kirsh & Maglio, 1994), as it is faster and easier.

M. Wilson (2002) is somewhat opposed to the second claim as there are sometimes situations in which we are not at all under time-pressure, for instance, when we make us a sandwich. The concept of time-pressure, however, is here closely related to how an observer perceives this particular sandwich-making situation, which also has been recognised by Wilson to a certain degree. The person who in fact makes herself a sandwich is still under (indirect) time-pressure, in the sense that she is under the pressure...
of real-time interaction, because as soon as she would start thinking about how to make this sandwich she would ‘fall apart’ – and would presumably still be hungry. Perceptuomotor coordination of any kind is always and in every situation an activity under time-pressure, and the increasing awareness of this aspect of human cognition has led to a heated debate in which the existence and nature of mental representations is being questioned (cf. Brooks, 1991; Hesslow, 2002; Svensson & Ziemke, 2005; Gallagher, 2008).

We off-load cognitive work onto the environment

The idea of using the world as its own model is closely related to the third claim, according to which people off-load cognitive work onto the environment. People constantly off-load cognitive work onto the environment as a consequence of limited cognitive capacities, and by taking advantage of the environment people relieve their cognitive workload by letting the environment hold information for them (e.g., Clark, 1997; Kirsh, 1995, 1996). For instance, I wrote down directions given in the game EfMI (2000) simply because I had a hard time remembering them. As Clark (1997) pointed out, we can allow ourselves to be “stupid” because we know how to arrange and use the surrounding world to our advantage. That is, the “mind is a leaky organ, forever escaping its ‘natural’ confines and mingling shamelessly with body and with world” (p. 53). Norman (1993) defined those tools storing and manipulating information as “cognitive artefacts”. Neither the term artefact nor tool, or tool use, are particularly well defined, despite numerous definitions in different research areas, which mainly is the result of differing interests and foci (cf. Susi, 2006). In the following years and in response to this situation, researchers have shown increased interest in how artefacts and other kinds of tools affect human cognition. Artefacts play, for instance, an important role as organisers as they make information available and visible (e.g., a post-it on the desk), but they also contribute to coordination, cooperation, and structure on a social level (e.g., Rambusch, Susi, & Ziemke, 2004; Susi, 2006; Rambusch et al., 2007).

M. Wilson’s perspective (2002) on this aspect of human cognition is somewhat controversial. Off-loading parts of the task onto the environment is, according to Wilson, a process that only occurs when the stimuli and the task are new, that is, when we are forced to function on-line and cannot rely on our previous experiences and memories. When functioning
on-line, Wilson argues, we off-load parts of the new task onto the environment to minimise the cognitive workload in our short-term memory. The use of storing devices such as floppy-discs or books, on the other hand, has also been acknowledged by Wilson as some kind of off-loading, but in her view they are not involved in the process of on-line thinking. Doing math with pencil and paper, accordingly, is also considered to be an off-line process as the physical activities involved in the process of calculating are not situated in terms of Wilson's interpretation of a situated (on-line) process. These activities are, according to Wilson, performed “in the service of cognitive activity about something else, something not present in the immediate environment” (p. 629). Yet, Wilson argues, the manipulation of objects (e.g., the use of pencil and paper) is also a situated process because it involves “the manipulation of spatial relationships among elements in the environment” (p. 629). In other words, based on Wilson’s definitions, doing math with pencil and paper is an off-line process (not situated) because it is about something not present in the environment, but at the same time it is an on-line process (situated), because it involves the manipulation of objects in the environment. Clearly, the distinction between off-line and on-line cognition is somewhat problematic because neither we nor Wilson can really tell where exactly the line goes between on-line and off-line cognition. Instead of trying to find a line that might not even exist, as cognition appears to be a process with changing boundaries, an increasing number of researchers has begun to study and analyse how the use of artefacts and other external structures in the environment is involved in cognitive activity (e.g., Preston, 1998; Susi, 2006). It is also questionable whether the terms ‘off-line’ and ‘on-line’ cognition in themselves really provide much help in our understanding of human cognition as the underlying assumption, once again, is the dualism of body and mind. The human mind is not a computer that can be turned off and on, and that functions independently and is unaffected by an agent’s interactions with the physical and social environment.

The environment is part of the cognitive system

The observation that both the body and the environment have an assisting role in cognitive activity has led some researchers to claim that cognition is not the activity of the mind alone, but is instead distributed across mind, body, and environment (e.g., Hutchins, 1995; Clark & Chalmers, 1998;
Accordingly, it has been argued that in order to understand cognition scientists must study the situation and the situated cognizer together as a unified system. This way of thinking has, for instance, found its way into the field of human-computer interaction (HCI) (e.g., Robertson, 1997; Dourish, 2004; Suchman, 2007). The idea of individual and environment together being the main unit of analysis, however, has been heavily under attack ever since this idea was formulated (e.g., Neuman & Bekerman, 2000; F. Adams & Aizawa, 2001, 2008). Although most researchers do agree on the first part of the claim, according to which external structures such as artefacts have a considerable effect on a person’s cognitive processes, it seems clear to M. Wilson (2002) “that a strong view of distributed cognition – that a cognitive system cannot in principle be taken to comprise only an individual mind – will not hold up” (p. 631). Susi, Lindblom, and Ziemke (2003), in contrast, argued that the main issue is not where to draw the boundary of cognition, but that it is more important to attend the role of artefacts themselves in cognition as they play a considerable role in human thinking.

Cognition is for action

Both embodied and (most) situated approaches to cognition and activity consider cognitive mechanisms in terms of their function, which is “to produce the next action” (Franklin, 1995, p. 412). The mind, accordingly, is the control structure of individuals and all cognitive processes and senses “must be understood in terms of their ultimate contribution to situation-appropriate behaviour” (M. Wilson, 2002, p. 626). Unlike the information-processing mind in traditional paradigms, which takes in and processes ready-made pieces of information and knowledge from the objective world, the embodied mind “operates on sensations to create information for its own use” (Franklin, 1995, p. 413, original emphasis). Information and knowledge, thus, are not the result of mere symbolic thinking but of structurally coupled sensorimotor activity, or to say it in the words of Maturana and Varela (1987), “all doing is knowing and all knowing is doing” (p. 26). Action and manipulation seem, for example, to be fundamental for acquiring knowledge about objects and their use as the identification and naming of objects activates premotor areas typically associated with visuomotor transformations for grasping and manipulating objects (Grafton, Fadiga, Arbib, & Rizzolatti, 1997), which indicates a close
relation between action and thought. This perspective is strongly related to ecological viewpoints on cognition and object manipulation (J. J. Gibson, 1979). From an ecological point of view, perception is an active process and all information necessary can be found in the environment, that is, we know how to use a chair because the chair in relation to our body’s movements affords a particular behaviour, and not because we make use of mental categorisations that tell us what a chair is and how it can be used. In essence this means there is no perception without action and there is no action without perception, only through perceiving and acting knowledge evolves.

However, the use of the affordance concept is not without its problems as scientists use the term in many different ways (cf. Torenvliet, 2003). Some scientists, for instance, claim that the affordances of an object depend on the context, that is, if we need to change light bulbs the chair does not only afford sitting but also standing (Rookes & Willson, 2000). In other cases, for instance in J. J. Gibson’s original theory (1979), affordances appear to be independent of contextual aspects as only the physical appearance of objects in relation to an agent’s movements seems to matter, in the sense that a flat surface affords standing and walking whereas a graspable object affords throwing. The perception of affordances in relation to an agent’s movements was, however, only acknowledged to some extent by Gibson and the issue was not further elaborated. Hirose (2002), for his part, described affordances in terms of “opportunities for action that objects, events, or places provide for an animal” (p. 290) to clearly show the close and mutual relationship between agent and environment, that is, an affordance is, from this point of view, context-dependent as the actions taken by the agent determine how a certain object is perceived. Hirose’s concept of affordance differs from other perspectives on affordance in that it also accounts for properties of the agent, called effectivities. Effectivities are defined by Hirose as “means for acting that an animal can use to realise a specific affordance” (p. 290), i. e., a graspable object only affords throwing if the agent has the arm to throw with.

The discussion above is only a sampling of existing definitions as there is a wide range of interpretations of the affordance concept and we will look further into them in the upcoming chapters. The perception of affordances is an essential component of human thinking and acting, and needs to be taken into consideration when studying gameplay activities. The grounding of gameplay activities in the affordance concept provides
not only valuable insights on how players perceive the game world but also addresses the close relation between player and her choice of actions in the game environment. Studying the perception of affordances is a bit tricky, though, since the game environment consists of two worlds – a physical one and a virtual one. As players are engaged in gameplay, they face the challenge of perceiving and acting upon affordances in both worlds and we, as researchers, face the challenge of capturing and explaining them. To make things even more difficult, we also need to consider the fact that objects/artefacts/tools constitute part of a community's intellectual history, which turns the widely assumed individual activity of perceiving affordances into a social process.

**Off-line cognition is body-based**

The claim that cognition is for action is, along with the third claim, also directly related to the claim according to which all off-line cognition is body-based. The last claim is largely based on the idea that all kinds of cognitive activity, even activity that might be decoupled from the environment, is grounded in bodily activity that has evolved in interactions with the environment. Counting on one's fingers, for instance, is an activity in which the body is used to solve a certain problem. This activity can also be done in a more subtle manner, that is, in a way in that only the one who is counting can keep track of the fingers. It seems, however, that this kind of activity also can be performed successfully without really moving the fingers at all. According to M. Wilson (2002), many cognitive activities make use of this kind of strategy, i.e., the priming of motor programs without triggering any overt bodily activity. In other words, it appears that mental structures that originally evolved in perception-action-loops at times also run ‘off-line’ and decoupled from the environmental inputs and outputs. Generally spoken, “the function of these sensorimotor resources is to run a simulation of some aspect of the physical world, as a means of representing information or drawing inferences” (M. Wilson, 2002, p. 633). However, in contrast to Wilson who views sensorimotor simulation merely as one form of cognitive (‘off-line’) activity (e.g., mental imagery, episodic memory), there are other scientists according to whom cognition in general is the result of internal simulations of perception and action (e.g., Hesslow, 2002). In terms of this point of view, there is no difference between cognition on the one hand, and perception and action on the other, since
cognition is viewed as being “inherently perceptual, sharing systems with perception at both the cognitive and the neural levels” (Barsalou, 1999). This is also in line with Glenberg (1997), who argued that the traditional view of memory as a storage device for abstract representations needs to be replaced by a view of memory “as the encoding of patterns of possible physical interaction with a three-dimensional world” (p. 1).

Even though no consensus exists regarding the extent to which human thinking is the result of perception-action simulations, there is a growing number of studies providing solid evidence that human cognition is inextricably intertwined with perception and action. A number of studies indicates, for instance, that our language is deeply affected by and rooted in everyday bodily experiences (e.g., Lakoff & Johnson, 1980; Rizzolatti & Arbib, 1998; Roth, 2005). Recent findings in neuroscience also suggest that a shared understanding between individuals is grounded in the human ability to recognise and simulate the actions of conspecifics (Rizzolatti, Fadiga, Fogassi, & Gallese, 2002). The body is also frequently used in human communication and social interactions (Goldin-Meadow, 2003; McNeill, 2005; Lindblom, 2007) and serves as an important tool in developing and understanding abstract concepts and knowledge (Lakoff & Johnson, 1980; Lakoff & Nunez, 2000; Roth, 2002; Prinz, 2005).

3.3 Concluding Thoughts

As we have seen, cognition is a continuous process with changing boundaries and is consequently much more than what takes place within the individual mind. Cognition, thus, cannot be understood without taking contextual aspects such as the use of environmental resources into consideration. We have also seen increasing evidence to suggest that cognition is deeply rooted in and inextricably intertwined with bodily activity. This has, of course, implications for the study of gameplay activities; it is not enough to study the player and the game (environment) separately since neither can be fully understood without the other. The game environment alone, even though it plays an important part in the game, would not tell us much about the ongoing gaming activity, because without a human being or a device that can provide feedback there would not be any interaction at all. The player’s actions, on the other hand, also need to be studied with regard to the game environment which not only has a direct effect on what actions are taken, but also holds and distributes useful information. This
presents something of a challenge for people since both the virtual and the physical game world need to be combined for a game to be played successfully.
SITUATEDNESS – A COMPLEX CONCEPT

Having discussed different notions of embodied and situated cognition, we may ask at this point what they can tell us about the physical activity of playing a game and players’ meaning-making activities (cf. discussion on page 24). So far, we have only touched on the surface of things, making a more detailed discussion necessary. However, before we can go on with the discussion of gameplay activities from a situated cognition perspective, some clarifications are in order here. Even though the different views on human cognition, as described in the previous chapter, lie at the core of embodied and situated cognition theories, they also implicitly point out different forms of situatedness.

Firstly, we find ‘high-level’ situatedness which refers to the sociocultural setting or context of an activity, meaning that the activities in which we engage are guided by cultural and social norms and practices. Much interest here lies on learning and teaching processes, as in guided participation (cf. Rogoff, 2003) or legitimate peripheral participation (cf. Lave & Wenger, 1991). Importantly, this view on situatedness suggests that all activities are social in nature, even those carried out individually. Another aspect of situatedness is the contextual ‘here & now’ of a scene, or setting; the common emphasis is that in order to understand peoples’ cognitive processes, we need to consider what is taking place around individuals and the interactions in which they are involved. Focus lies on the distribution of cognition between individuals and their material surroundings, for instance, when people use pen and paper to aid their memory, or when people cooperate to solve a task (cf. Hutchins, 1995; Susi, 2006). A third sense of situatedness is concerned with ‘low-level’ aspects where much focus is placed on the agent having a physical body through which (s)he is
Figure 3: The equilateral triangle illustrates three commonly held and equally important conceptions regarding situated cognition. The triangle is a dynamic one where each change on one of its sides inevitably will lead to changes on the other two sides. If we remove any side of this triangle we will find ourselves limited in explaining human activity and human agency.

directly coupled to the world and perceives constant feedback on actions (e.g., Clark, 1997; Clancey, 1997).

The distinction between these different forms of situatedness is necessary since the term ‘situated’ as such is very broad and often used in different contexts, for different purposes, and usually much emphasis is put on the sociocultural nature of human thinking, or the way people are affected by and interact with their surroundings. While this approach is not necessarily wrong, it provides only part of the picture that is human cognition. The body’s role is often overlooked, if not ignored, and it does not always become clear that sociocultural aspects and people’s interactions with the physical and social environment are, in fact, two sides of the same coin. The three forms identified above are not independent of each other, and neither is one form more important than the others. Making such an assumption would be “as pointless as asking whether people rely more on their right leg or their left leg for walking” (Rogoff, 2003, p. 65, on the interplay between biological and cultural factors). Admittedly, the terms chosen here are far from being clear and unambiguous in meaning either. For instance, both ‘low-level’ and ‘high-level’ carry implicit meanings about their influence and importance, but as just mentioned, low-level aspects of human activity are by no means meant to be taken as ‘the least important part of human cognition’. For these reasons it is appropriate to describe the situated nature of human activity as an equilateral triangle, as illustrated in Figure 3, where each side represents each form equally and
each side is connected to one another. Importantly, the triangle should be viewed as a dynamic structure since changes at one point inevitably alter other points, and the triangle as a whole. Also, the second we remove any side of the triangle, it will break down, leaving us unable to explain certain aspects of human activity and human agency.

The different forms of situatedness are manifest in players’ everyday play in various ways; gameplay is a culturally evolved system of activity in which actions are affected and guided by sociocultural norms and practices, and what players do, which actions they take, are very much affected by the circumstances of the playing activity. Furthermore, the body plays an essential part in gameplay even though it often can seem, on the surface, like not much corporeal action is involved, except for the hands moving across the keyboard. To discuss and illustrate how the different concepts of situatedness apply to computer gameplay, particularly in terms of handling the game and players’ meaning-making activities, I will use examples from various kinds of games. The examples are mixed examples, partly based on narrations of players, and partly based on own experiences. The intention is to explore in more detail what characterises gameplay on each level and how the three of them affect each other. For the sake of convenience, I will primarily focus on one level at a time, however, as mentioned before the three forms of situatedness go into each other, which will also become apparent in the discussion below. More specifically, Section 4.1 discusses in greater detail low-level aspects in human thinking, whereas the discussion in Section 4.2 focuses more on the here-and-now of a situation and high-level processes, including social interactions with other individuals, tool use behaviours, and learning processes.

4.1 It’s Not Just Hands

In the last 15–20 years, the body and its impact on human thinking has been reconsidered by an increasing number of researchers in various research areas such as developmental psychology (Thelen & Smith, 1994), biology (Maturana & Varela, 1987), linguistics (Lakoff & Johnson, 1980), neuroscience (Chiel & Beer, 1997; Rizzolatti & Arbib, 1998), and philosophy (Varela et al., 1991; Clark, 1997, 1999). The boundaries between ‘in here’ and ‘out there’ have become blurred, or as Thelen, Schöner, Scheier, and Smith (2001) put it, cognition is embodied because
it arises from bodily interactions with the world. From this point of view, cognition depends on the kinds of experiences that come from having a body with particular perceptual and motor capabilities that are inseparably linked and that together form the matrix within which reasoning, memory, emotion, language and all other aspects of mental life are meshed (p. 1).

The idea of human cognition being inextricably intertwined with corporeal experiences needs be taken into consideration when studying gameplay activities; important aspects include, but are not limited to, body movements such as grasping, pointing, jumping, facial expressions, and other types of motor behaviour. Research undertaken by Newman (2002), for instance, indicates that behaviours such as reeling, swerving, and ducking considerably increase people’s gaming experience even though these movements are not registered by a games’ control devices. The experience of having a body can sometimes cause considerable confusion, though, since
you as a player can have two bodies – a physical one and a virtual one. Which arrow key would you, being Guybrush Threepwood in EriMI, press to move to the right (see Figure 4)? The question is not as easily answered as you might think as you cannot base your decision on what your eyes tell you; if you want go to the right from your point of view you need to picture the scene from Guybrush’s perspective and press the left arrow key. I got it wrong all the time and ended up running in circles far more often than I would have liked.

Obviously, controlling a game character with the arrow keys on a keyboard is not that easy, something that also might explain the success of the more intuitive, graspable game pad. Controlling a character with an analogue thumb stick is often experienced as being more authentic since the movement of the hand to some extent mirrors the body’s (and in extension the game character’s) movement. And yet the outcome of a game might be affected in negative ways if players would have to pull the thumb stick towards them in response to, say, an enemy attack. Chen and Bargh (1999) have illustrated how people’s reaction times are slower if their bodily activity (i.e., pulling a lever towards them) does not correspond to their cognitive activity (i.e., responding to words with a negative meaning); apparently, we do not want anything near our bodies that might entail negative consequences – be it words with a negative meaning, or the ghost monsters in Pac-Man (1980).

The physical world is reflected in computer games also in many other ways; for example, people playing a game understand that objects can be hidden from view by other objects and game characters. However, as pointed out by Dourish (2004) there is a substantial difference between using the physical world as a metaphor and using it as a medium for interaction:

> Real-world metaphors can be used to suggest and guide action, and to help us understand information systems and how to use them. Even in an immersive virtual-reality environment, users are disconnected observers of a world they do not inhabit directly. They peer out at it, figure out what is going on, decide on some course of action, and enact it through the narrow interface of the keyboard or the data glove, carefully monitoring the result to see if it turns out the way they expected. Our experience in the everyday world is not of that sort. There is no homunculus sitting inside our heads, staring out at the world through our eyes, enacting some plan of action by manipulating
our hands, and checking carefully to make sure we do not overshoot when reaching for the coffee cup. We inhabit our bodies and they in turn inhabit the world, with seamless connections back and forth (pp. 101–102).

The distinction between interaction in the physical world and virtual environments, however, suggests that people’s interactions with the game world is only to a limited extent embodied and thus interfaces are necessary to support a seamless connection between body and virtual world. Yet, looking at people playing games it seems that, in many cases, a seamless connection between body and virtual world already exists. The interaction might be limited in the beginning, as people try to figure out what is going on, but after a while the virtual world becomes part of the physical world, which makes it impossible for an observer to draw a line between the two. Take the example of an expert player performing an average of 300 actions per minute (APM), an example based on a log from a Starcraft (1998) match where one expert player took on another player (Starcraft Replay: ToSsGirL vs. Legend, 2010). One measure of expertise in this kind of game is manual dexterity and different kinds of tools are used in game communities to log, for instance, keyboard activity and events during a game; this information is often displayed in EEG-like curves (cf. Figure 23, Appendix C). The expert player in question performed an average of 300 APM in a 20 minutes long game; the maximum APM was even higher and reached over 386 APM. The accuracy and precision of the data may be debatable, however, it is probably safe to say that 300 APMs display a lot of keyboard activity, which can be considered a good indicator for skilled human-game interaction. In fact it almost seems that mouse and keyboard become an extension of the player’s body through which the game world is perceived directly. This example is very similar to the much discussed example of a blind man and his stick, where the stick is no longer sensed for itself as the agent gets accustomed to using it (cf. Bateson, 1972).

This process shows similarities to what Hirose (2002) defined as an act of embodying, a process where objects cease to be objects and instead become part of the body, thereby extending players’ physical body structure as well as their action and perception space (cf. Maravita & Iriki, 2004; Witt, Proffitt, & Epstein, 2005). A person’s actions in a computer game thus reflect in many respects processes of embodied interaction which are more related to the act of embodying, and less to the state of being embodied, something scientists advocating embodied theories of cognition mainly
seek to emphasise. And yet the two processes are closely related. It explains, for instance, why we can navigate through virtual game worlds without looking at our hands to operate mouse and keyboard. The body’s sense of its own physical position in the world, something researchers refer to as proprioception (Graziano & Botvinick, 2002), tells us where our hands and fingers are located and what they are doing. Many games do not create any sustainable sense of proprioception, though. A good example is games using a first-person view. We usually look through the eyes of the game character without much sense of our virtual body; we do not know what our legs look like, or how far we can reach with our arms, and more often than not we are limited in what movements we can do. Usually, we cannot jump on objects or over obstacles, or control the speed at which we run with our virtual bodies, which inevitably breaks the illusion of ownership of our virtual body. A rare exception is MIRROR’S EDGE (2008), a first person action-adventure game. The game allows for a wider range of actions and many visual cues are provided to create a strong sense of proprioception, for instance, when running you see your hands going up and down, just like they do when you go for a run. This commitment to realism seems to have its downsides, though, as MIRROR’S EDGE has also become known as the game that makes you feel nauseous; it is well established that many people experience motion sickness because of what appears to be a sensory conflict between perceived movement and the body’s actual movement (Oman, 1990).

The physical activity of playing a game is in many respects also a highly cultural process where, for instance, newcomers participating in a group of community members’ activities gradually advance from being unskilled to higher levels of expertise. This is, for instance, very much the case in MMORPGs like WORLD OF WARCRAFT and team based games such as COUNTER-STRIKE where gameplay is largely created through social interactions with other players. These examples seem to be most representative of the other two forms of situatedness, yet research in recent years has shown that low-level processes in many ways are deeply social processes. Embodied phenomena such as mimicry and imitation are significant for social relations as they help people connect, making it possible for them to communicate and to understand each other (e.g., Barsalou, Niedenthal, Barbey, & Ruppert, 2003; Tomasello, 2003; Lindblom, 2007). It is probably not surprising that these research findings have piqued the interest of researchers in the area of game studies. Murray (2006) is one of them
and according to her gameplay, and the enjoyment that comes with it, are rooted in our ability to understand con-specifics, because these processes bring cultural knowledge into being.

4.2 Interactions with the World

We are social beings and the interactions and relations with other individuals are an essential part of our lives. Through social interactions with others we share information and contacts and, to use the words of Lave and Wenger (1991), become part of communities of practice. Social interaction is a rather complex process and full of meaning, requiring us to find ways to communicate and to understand each other. In social psychology, scientists

investigate the ways people perceive, interact with, and influence each other, studying specific topics such as person perception, group prejudice and stereotyping, diverse personal relationships, group processes, persuasion, and social influence (Semin & Smith, 2002, p. 385).

Through the years, social psychologists have well-documented many instances of social interactive phenomena such as mimicry and action imitation. Strangely enough though, embodiment aspects of social cognition have never played an important role in social psychology, and social aspects of embodied cognition have not received much attention in embodied cognition research either. Both research areas are, however, closely related. The claim according to which cognition is for action (cf. page 35), for instance, clearly reveals its social dimension as our cognitive processes continuously and effectively are shaped by social goals and action requirements.

The neglect of the body in social cognition research has, according to Farnell (1999), mainly been a consequence of widespread Cartesian assumptions; it explains why researchers within the social sciences have preferred to refer to the mind as the centre of rational thought, language, and knowledge, while the body mostly has been disregarded as “the locus of corrupting appetite, sinful desire, and private irrationality” (p. 346). The continuous absence of the body in the social sciences, Farnell argued, also had good political reasons as biological aspects of human cognition in the past often were misused to justify sexist and racist assumptions about human nature. The conception of the mind as being superior to and
independent of the body was, in other words, also an attempt to promote ‘politically correct’ research within the social sciences.

However, as pointed out by Lindblom and Ziemke (2006), reconsidering and investigating the body and its role in human cognition does not automatically result in (socio)biological reductionism. Ingold (2000), for instance, argued that learning to walk is not an innate human capability, but rather should be seen as an acquired skill in the context of its social and cultural environment. Learning to walk, of course, has its biological components as the skill to walk is an essential part of the human organism, but it is also influenced by toddlers’ social and physical environment (cf. also Rogoff, 2003). Interestingly, this seems to be the case with regard to people’s emotional responses as well. Tracy and Matsumoto (2008) have found that blind athletes show pride in victory like sighted athletes, but that sighted athletes’ expressions of shame also appear to be affected by cultural norms and values. Their findings suggest that displays of pride and shame are innate, yet to some extent they can also be socially constructed. To be correct, though, Tracy and Matsumoto found only evidence for shame to be affected by cultural norms, but it is not far stretched to assume that even expressions of pride reflect sociocultural attitudes and perceptions. For instance, a Warcraft III (2002) player mentioned during an interview for a workshop on e-Sports that professional players prefer to show only subdued signs of pride after a won match; it seems to be, above all, a way of embracing the culture and traditions of the Warcraft scene in China and South Korea. The game is hugely popular in these two countries, which have also come to play a dominant role in the global e-Sports scene. In Counter-Strike (2000), on the other hand, it is very common for professional players to shout, yell, and otherwise cheer after a won round; it is intended to intimidate the opposing team, but also helps keeping up the team spirit.

The close relation of embodied cognition and social cognition has also been established by Barsalou et al. (2003). By reviewing and discussing a larger number of experiments in social psychology, Barsalou et al. clearly illustrate the role of social embodiment in human thinking, a concept that includes body states such as postures, arm movements, and facial expressions. These body states arise during social interactions and play an important part in social information processing. Social psychologists have repeatedly illustrated, for instance, that social stimuli not only produce cognitive states but bodily responses as well. A good example is that of
students who adopt a more erect posture upon receiving good grades compared to students who receive bad grades; apparently, students with good grades do not just feel good but their feelings are also expressed through body posture (Weisfeld & Beresford, 1982). And, as we have seen, similar behaviour can be observed in players who have just won a game as they often express their joy by jumping up, clapping their hands, or pumping their fists in the air. The findings regarding the compatibility of motor activity and cognitive activity provide yet another example of a social embodiment effect; there is evidence to suggest that another person’s actions have an impact on our own ongoing actions, as observing a person’s action, if being different from our own action, can interfere with our body posture and movements (Blakemore, Winston, & Frith, 2004). These findings bear some similarities in results to Chen and Bargh’s study (1999), as discussed on page 45. Moreover, studies repeatedly show that we tend to mimic the behaviours and facial expressions of other people, for instance, we often smile in response to other people’s smiling (Dimberg, 1982; Dimberg, Thunberg, & Grunedal, 2002). And, yes, this applies also to virtual people like game characters; it is not exactly news that we form emotional bonds with virtual agents including the electronic devices that brought them to life (B. Reeves & Nass, 1996). Important aspects of embodied social interaction are often also very gestural in their character and help the speaker to express ideas and thoughts (Goldin-Meadow, 2003). Gestures are considered an essential part of human cognition as there has not been discovered a culture yet in which people do not use gestures while talking. This suggests that the function of gestures goes far beyond the basic purpose of communication, and recent studies have provided additional evidence on the matter (Roth, 2002; Goldin-Meadow, 2003; Lindblom, 2007). It explains, for instance, why we sometimes use the mouse, and in extension our game character, as a pointer to direct other players’ attention while talking into the headset, but it also explains why we can find ourselves waving our arms around and talking out loud in our attempts to solve a game’s mysteries and puzzles.

Opinions differ on what the underlying neural mechanisms are for the phenomena described above (cf. Svensson, Lindblom, & Ziemke, 2007). However, the accumulated evidence is strong to suggest a tight link between sensorimotor activity and human thinking, and its role in emphatic and cooperative behaviour. These assumptions are supported by an increasing number of neuro-chemical and neuro-psychological studies which
indicate the existence of a motor-resonant mechanism in humans (cf. Rizzolatti et al., 2002; Mukamel, Ekstrom, Kaplan, Iacoboni, & Fried, 2010). Studies of this kind have shown that thinking about an action activates the same areas of the brain as if we are performing the action ourselves, an ability that is commonly referred to as motor imagery or simulation of actions (e.g., Jeannerod & Frak, 1999). It has also been illustrated that thinking about an object activates the same areas of the brain, as when one is seeing the object in real life, something researchers have come to refer to as visual imagery or simulation of perception. Moreover, there is increasing evidence to suggest a close relationship between perceiving an object and its physical manipulation, which is ascribed to a certain class of visuomotor neurons (Kellenbach, Brett, & Patterson, 2003). The ability to simulate actions and objects is believed to provide the basis for simulations of future behaviour and the behaviour of others (Hesslow, 2002). Furthermore, our tendency to mimic the behaviour and facial expressions of other people are believed to arise from brain circuits specialised for mimicry and imitation (e.g., Rizzolatti et al., 2002). These brain circuits appear not only to provide fast learning mechanisms where new actions are learned through imitation, but they may also constitute a possible underlying mechanism for the development of social competencies such as cooperation, negotiation, and empathy (cf. Meltzoff, 2002; Tomasello, 2003; Gallese, Eagle, & Migone, 2007).

In the end, it is important to understand that low-level processes in human thinking are much more complex than what we can observe from the outside, but it is easy to be drawn into false assumptions about the term's meaning and scope. The body's role in human activity and human agency entails more than what we do with our joints, bones, and muscles since, as we have seen, all activities we engage in are grounded in perception, action, and sensorimotor activity, which necessarily includes the human brain. The discussion above also clearly illustrates how low-level processes, the here-and-now of a situation, and high-level processes are tightly interlinked. Without a functioning motor-resonant mechanism we would not be able to recognise objects and the actions of others, and we would have difficulties establishing a shared understanding with other individuals. It would therefore be impossible for us to grasp the rules and structure of a game and its copious cultural references, in fact we would not even know what to do with a game case in the first place, except maybe chew on it for a little while.
4.2.1 Tooling Up

Another important consideration of the social and cultural practices in which players are embedded is the different tools people use when playing, in particular, how and under what circumstances players use resources in a game as cognitive aids, and to what extent such off-loading extends into the physical world (cf. discussion on page 33). Situated cognition approaches generally emphasise the role of tools in cognition and it has been argued that they are part and parcel of our cognition, and that it is a mistake

\[ \text{[\ldots] to posit a biologically fixed “human nature” with a simple “wrap-around” of tools and culture. For the tools and culture are indeed as much determiners of our nature as products of it (Clark, 2002).} \]

Nevertheless, tools and tool use have not attracted due attention neither in cognitive science, nor in other sciences, although there are notable exceptions (Hutchins, 1995; Clark, 1997; Baber, 2003; R. A. Wilson, 2004). Russian psychology has also since long emphasised tools as inherent to cognition, and their role as mediators in human activity (Vygotsky, 1932; Galperin, 1978; Leontiev, 1978), and today, these ideas are increasingly finding their way into current research on embodied and situated cognition. The term, as used here, refers to the use of different kinds of tools for the purpose of achieving some end. What exactly constitutes a tool, or what end a user wants to achieve depends on the activity under consideration. When considering artefacts and tools, there are some important distinctions between the two (cf. Susi, 2006), but in this thesis the term ‘tools’ is used rather than ‘artefact’ since an artefact could be any object, even one not used for achieving some purpose (e.g., a vase placed on the window sill simply because we happen to like its appearance). What is important about tools is that they allow us to extend our cognition beyond skin and skull; tools are external resources that we may employ to off-load our cognitive workload (Clark, 1997; R. A. Wilson, 2004). An example is the use of a to-do-list; instead of having to remember the separate items we only need to know how to read the list. As for computer games, cognitive scientists have not paid much interest to the issue, apart from a few exceptions (e.g., Kirsh & Maglio, 1994; R. A. Wilson, 2004). In the field of game studies, in contrast, the use of tools as discussed here seems to be largely as transparent to researchers as it is to the players when they play a
game; as previous research has shown, we usually do not reflect on what kind of tools we use and why we use them, instead they are transparent and tend to disappear from our view (Suchman, 1987; Gauvain, 2001).

It has become common for researchers to distinguish between two categories of tools: material (physical) tools and psychological (mental) tools (Susi, 2006). Material tools include all the things we may use in an activity, for instance, a hammer, pen and paper, calendars, diagrams, written instructions, laws and regulations. In the case of computer games, we use tools such as game controllers, manuals inside game cases, and post-it notes with game hotkeys stuck onto the computer screen. Psychological tools, on the other hand, refer to language, heuristics, mnemonic aids, strategies, conceptualisations, implicit sociocultural norms and rules, among many other things. Cooperation and coordination in competitive games such as Counter-Strike hinges, among other factors, on good communication which is why it is important that each team member knows and masters specific CS-related terms (cf. Wright, Boria, & Breidenbach, 2002). Most research on tool use in cognitive science has been individual-oriented and focused on, among other things, the way different forms of external representations affect human reasoning. However, tools are important not only for individual cognition, but also for inter-individual cognitive processes. For instance, World of Warcraft (WoW) players have the option to synchronise their characters’ calendar with their own personal calendar so that they, for example, will not miss out on their guild’s next raiding party.

Recent work on distributed cognition (Hutchins, 1995; Salomon, 1997) has in some sense rediscovered the integral role that artefacts play in both individual and collaborative cognitive processes that are distributed across people and the material resources they use. This approach takes an interest in the way information is represented, transformed, and propagated in the material and social environment. That way, cognitive processes can be described in terms of functional relationships between brains, other people, and external objects. Still, the role of artefacts as mediators of social cognition, is far from being fully understood (Rambusch et al., 2004; Susi, 2006).

Importantly, there is not always a clear line between one or the other kind of tool, and they may be used for different purposes. For instance, we may place an empty game case on the couch as a reminder that it is gaming night and that we need to stock up on party snacks. While the empty game case serves as a reminder for us, it may also provide feedback
to our flatmate who takes the hint and goes grocery shopping. When we use an empty game case, or any other object in such a way, we modify our environment so as to reduce our cognitive workload. In other words, we off-load some of the cognitive burden onto the environment. At the same time, such an adaptation of the environment may serve as a signal or message to others, to which they may or may not respond, because even though we remind ourselves to do something, other people may as well ignore it. Thus, what takes place is an indirect interaction. This kind of indirect interaction is quite common, and at day’s end, it leads to coordinated, cooperative collective behaviour (Susi, 2006). In the world of social insect behaviour, this kind of indirect interaction has been explained through the principle of stigmergy. The basic principle in stigmergy states that traces left and modifications made by individuals in their environment may feed back on themselves and others, i.e., activities are to some extent recorded in the physical environment, and that record is used to organise collective behaviour. An example of stigmergic behaviour in computer games is the exploration of instance zones in Wow (2004), which requires groups of players to work together as a team to defeat attacking monsters. As the players defeat a monster, they also make an alteration to the environment which allows players to benefit from the dungeon experience instead of having to take turns for the same monster.

The principle of stigmergic behaviour also leads us to a third category of tools, namely social tools. The concept itself originates from the area of non-human primate tool use (Hayashi, Mizuno, & Matsuzawa, 2005; Morris, 2005) and is not commonly used in the context of human activities. Susi (2006) argues, however, that the concept applies to humans as well which is not too surprising considering that interactions and collaborations with other people play an substantial role in human thinking. Social tool use generally refers to individuals’ ability to use other individuals as tools, that is, to take help from others in order to achieve a desired outcome. A good example would be me asking a friend for tips on getting my game character out of a room in a single-player adventure game where I got stuck, because I could not get past the NPCs in the room without being seen. Another example is when people ask their team members to cover them as they shift position in a game. All of these can help explain different forms of not just individual but collaborative behaviour, for instance, in team-based games where cooperation is required for success. Also, as in the case of the previous two categories of tools, we rarely (if at all) think of such cases
Figure 5: Head-up display in Open Transport Tycoon (2010), a business simulation game. The design often varies, but there exist a number of features which players can recognise across games and platforms. Most games give players also the option to hide parts or all of the HUD.

as tool use, and social tools are also often highly transparent in that we just use them without giving them much thought.

Importantly, the discussion above illustrates yet another dimension of situatedness and tool use. Players do not only use different kinds of material, psychological, and social tools, but also many of the virtual tools available in the game. For example, while trying to find a way through a marsh in Escape from Monkey Island (2000), players have access to a virtual compass and a virtual clock which make navigation, and subsequently playing the game, much easier. Many games also tend to convey important game state information on a head-up display (HUD, Figure 5), which is intended to guide players through the game by highlighting key parameters such as health status, mini maps, and ammunition counters. Still, many computer games do not offer many opportunities for the
off-loading of mental workload onto the game environment, and people playing computer games are often also distributed over several locations and time zones. Take the example of FPS games such as Counter-Strike and real-time strategy games like StarCraft. These kinds of games are played under extreme time pressure, require constant, focused attention on the computer screen and they do not provide many opportunities for players to manipulate the game world, other than their own position in it. An interesting and relevant question accordingly is how people deal with, at times, static virtual environments that allow very little or no adaptation at all, how and under what circumstances they use environmental (virtual) resources as cognitive aids and to what extent off-loading extends into the physical world outside, which in many cases also includes other people. Playing Counter-Strike, for instance, is a team effort and teams can develop complicated strategies and advanced divisions of labour.

It should not have escaped the reader’s attention that our ability to make use of the material and social environment clearly reflects the strong link that exists between the here-and-now in gameplay and the other two forms of situatedness. As we have seen earlier, the manipulation of material tools is rooted in sensorimotor processes and so are our interactions with each other, even if low-level aspects in tool use often have been neglected in the past (Rambusch & Ziemke, 2005). Players have to cope with the game environment constantly and as fast as they perceive its surroundings, both virtually and physically. This can require the knowledge of strategies and moves by heart, but also shared perception of possible actions. All players in a CS team need, for example, to be able to see which walls provide protection from the opposing team’s firearms. At the same time, they also need to have physical control of the mouse, i.e., the bends and shifts of their hands have to match both the actions in the game and their hands’ physiological constraints. How fast players have to cope with the game world is also a matter of the kind of game played. In Tetris, players do not have much time to think about their actions which is why they off-load parts of their cognitive work onto the game environment by rotating the bricks directly on the screen instead of doing it mentally. In a game such as World of Warcraft, on the other hand, players can often sit back and think about their next move, but at the same time they are also under time-pressure (cf. page 32), because as soon as they would have to think about how to bend and shift their hands when using the mouse, they would have trouble fighting an attacking enemy.
The different kinds of tools also constitute part of a community’s intellectual history, and the appropriation of knowledge about them and their skillful and competent usage is therefore in many respects a product of high-level processes. This explains, for instance, why game controllers such as gamepad and joystick usually are associated with gameplay activities and why PC games, or games developed for gaming consoles, can be expected to work in similar ways. Most importantly perhaps, many tools used to improve and elevate a game are not built-in features and interfaces, but can be found on various websites and online community spaces; for instance, players who get stuck in a game can find hints and tips in game walkthroughs. In addition, players who are not satisfied with a game as it is, or who simply want to enhance their character’s abilities and equipment, have the option to download add-ons and modifications, which are available through numerous online resources. Characteristic for these tools is that the majority of them are created, modified, and maintained by players for players, that is, they are a product of collective intelligence, a form of distributed intelligence that emerges from the collaboration and interaction among individuals in a community (cf. Levy, 1997; Jenkins, 2006a). This is one of the reasons why it has been argued that the contextualisation of games, in particular the embedding of gameplay in collaborative activities, is probably more important to understanding gameplay, than specific features of games (Arnseth, 2006).

4.2.2 The Social Mind

Collaborative and participatory aspects of games and gameplay have attracted avid and widespread interest in the field of game studies, of which the number of studies on massively multiplayer online games (MMOs) is an indication (Ducheneaut, Yee, Nickell, & Moore, 2006; Taylor, 2006). It is being increasingly understood that gameplay takes place within a web of social and cultural practices, which accords well with situated perspectives on learning (Lave & Wenger, 1991; Clancey, 1995; Rogoff, 2003), as learning and the appropriation of knowledge are viewed as processes that emerge from activity in a subjective and socially constructed world (cf. Gee, 2004b, 2004a; Steinkuehler, 2008). Much emphasis is put on the sociocultural nature of learning and knowledge, i.e., learning is viewed as a process in which the social interaction with other individuals and the use of different kinds of tools are pivotal. As Packer and Goicoechea (2000) pointed out:
A community of practice transforms nature into culture; it posits circumscribed practices for its members, possible ways of being human, possible ways to grasp the world – apprehended first with the body, then with tools and symbols – through participation in social practices and in relationship with other people (p. 234).

Drawing heavily on historical ways of learning and teaching (Vygotsky, 1932; Dewey, 1938), scientists in the research area of situated learning frequently use different kinds of apprenticeship concepts to describe and explain situated and sociocultural aspects of learning and knowledge appropriation. According to Lave (1988), one of the main reasons to use these conceptions is to emphasise the indivisible character of learning and work practice and to reveal, in addition, the social, distributed nature of learning and knowledge. The conceptions of apprenticeship and participation are largely based on ethnographic (anthropological) studies of learning and everyday activity, and those studies have been instrumental in revealing how different schooling is from activities in the domain of daily life, where the activities themselves and culture usually give meaning and purpose to what is learned.

Lave and Wenger (1991), for their part, approached the issue of situated learning from a more general angle to emphasise the social, distributed character of the human mind in general. The central principle in Lave and Wenger’s theory of learning is legitimate peripheral participation, which is intended to capture how “learners inevitably participate in communities of practitioners and that the mastery of knowledge and skill requires newcomers to move toward full participation” (p. 29). According to this principle, participation for an unskilled person is, at first, legitimate in a community of practice; a newcomer (novice) in, for instance, World of Warcraft is allowed to participate in the WoW community by acquiring the game and logging in on one of the game’s many servers. In the beginning, due to limited knowledge and skills, the person is located at the periphery of the community, but her participation then gradually increases in engagement and complexity until she, the former newcomer, has become a full part (member) of the community.

Rogoff (2003), on the other hand, was mainly concerned with the cognitive development of children, and emphasised tacit forms of communication to show that in the process of learning not only language aspects needs to be taken into account. For instance, a father playing a game with his kids directs their attention to various aspects in the game by pointing at
the screen, and by raising or lowering his voice. Learning, in other words, is not just a process in which exclusively verbal communication is used. This is also in line with Wright et al. (2002) who argue that games like Counter-strike are about much more than the graphics or violence, and need to be understood in terms of the social mediations and interactions between players, through their talk with each other, and by their cooperative performance within the game. Players actively and interactively create the game’s meaning through their virtual talk and behaviour, borrowing heavily from popular and youth culture representations.

However, while strongly emphasising the interpersonal and tool-mediated nature of cognition and activity, researchers interested in collaborative and distributed aspects of cognition and learning have been less concerned with low-level processes and their role in human thinking. Very often, the body is just another factor, briefly acknowledged and mentioned, but in fact understood and analysed very little (Rambusch & Ziemke, 2005). But as repeatedly shown throughout this chapter, high-level processes and the here-and-now are tightly interlinked with low-level processes, making possible learning and a shared understanding between individuals.

4.3 Concluding Thoughts

Gameplay is a sociocultural practice that takes place within a complex web of embodied sensorimotoric processes, individual and collaborative tool use (material, psychological, and social), guided by participation in a social community in which interactions on many different levels facilitate learning and skill development. Subsequently, any sharp distinction between the content of a game and the activity of playing it – or between the physical and the virtual world for that matter – does not really make sense. To consider either one in the absence of the other would be to take in only part of the picture.

And yet, when it comes to computer games and the virtual worlds they offer, we find ourselves confronted with the problem of explaining how players make sense of such virtual worlds, which can be quite different from the physical world. For instance, most virtual objects and tools do not provide the same functionality as their physical equivalents, and the virtual nature of these objects and tools begs the question: to what extent do theories on object manipulation and tool use apply to virtual worlds? This question is particularly interesting with respect to players’ perception
of possible actions in a game, which, as we have seen earlier in this chapter, is rooted in sensorimotor activity.
MAKING SENSE OF THE WORLD

The game environment with its complex and multiple action opportunities presents a challenge for players as it consists of two worlds, a virtual and a physical one, and for games to be played successfully, both worlds need to be integrated and acted upon. In Tetris, for instance, we need to figure out that the buttons on our mobile phone or Nintendo DS are connected to the falling blocks in the game, otherwise it would be difficult to maneuver and rotate them into the right position. Only, how do we know that pressing a button on our gaming devices will have an immediate effect on the falling Tetris block? Researchers familiar with (usability) design will most likely reply, “It’s because of the game’s affordances”.

Affordance has become a well-known term in the design world, and it is mostly used when researchers seek to explain how people discover the functionality of features in computer applications and other everyday products. It is probably not an exaggeration to say there are as many definitions of the term as there are researchers defining it. Only one researcher can claim original ownership of it though, namely James J. (1979), who introduced the concept of affordance in his by now famous book “The Ecological Approach to Visual Perception” (1979). The affordance concept became quite popular among scholars and researchers outside the world of ecological psychology when it was included by Norman in “The Psychology of Everyday Things” (1988), especially in HCI and AI robotics (Clancey, 1997; Duchon, Warren, & Kaelbling, 1998), but it also spread from the scientific realm to more general and popular uses. At the same time, however, the terms popularity has also lead to a devaluation of conceptual currency, as Torenvliet (2003, p. 13) phrases it, because
somewhere on the way from academia to Starbucks […] something happened. The meaning of affordance became distorted and confused. At first it was subtle, but by now its meaning has bifurcated wildly.

Much of the current confusion surrounding the affordance concept can be attributed to an incautious use of terminology in Norman’s (1988) book, and nowadays the affordance label is put on pretty much everything that has a physical appearance, hoping it will explain how users perceive the world they interact with. This is a problem since the affordance label alone does not tell us much about how people perceive the world and act upon it.

The perception of affordances is, nonetheless, an essential aspect of human cognition and it needs to be taken into consideration also when studying gameplay activities. When used in its original sense, in the context of gameplay, affordance addresses the close, mutual relation between player and game environment. It is a relation in which players constantly shift between the virtual and the physical world (cf. Chapter 4) which, as earlier mentioned, presents a challenge in the sense that players are faced with affordances in two different worlds that need to be integrated for successful play (cf. Section 3.2.2). Even though players themselves are unlikely to ever consciously reflect upon ‘affordances’ in their gameplay activities, the issue is an interesting one; a good integration of different kinds of affordances is also a good integration of the player’s virtual and physical worlds (cf. Gee, 2005). The challenge manifests itself in situations where the very same object that affords a certain action in the physical world, like grasping a stone, does not afford the same action in the virtual world. A perhaps even greater challenge lies in understanding how actions in the physical world affect actions in the virtual world, that is, how we as players make the connection between our actions outside the game, and what we see and do in the virtual game world.

Before going deeper into the relation between physical and virtual affordances, however, we need to take a look at the concept of affordance itself, and (some of) its different uses. Most researchers familiar with Gibson’s work (1979) have a general understanding of the term, but its widely varying meaning across disciplines has lead to a number of misunderstandings and confusions. Affordance is a useful concept, to a limited extent I may add right from the start, but if it is to be of any real analytical value in computer game research, we need to be aware of how we use it and when it is time to look into alternative explanations.
5.1 What Affordances Afford Us

Let us start with J. J. Gibson’ own description of affordance (1979). His ecological psychology turned against the traditional psychological mind-body dualism, with its ideas of psychological processes operating upon incoming bodily sensations. Instead, he saw perception as something direct, with no intermediary processes, i.e., an activity in which agent and environment form a reciprocal relationship. What we perceive are affordances and they are what they provide or offer an animal in terms of possible actions, for good or for ill. An affordance is neither objective nor subjective in a narrow sense, instead it “points both ways, to the environment and to the observer” (p. 129). And yet, an affordance is objective in the sense that it is invariant and

\[\text{does not change as the need of the observer changes [...] an affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because it is what it is (p. 138f).}\]

That an affordance is invariant means that it is always there to be perceived, regardless of whether or not we perceive it. At the same time, an affordance is also subjective in that it is relative to an agent's bodily capabilities, locomotion, and orientation. According to J. J. Gibson, “different layouts afford different behaviours for different animals, and different mechanical encounters” (p. 128). A surface, for instance, that is (more or less) horizontal and flat, and sufficiently extended and rigid, relative to the size and weight of the agent, affords support for that agent – it is, as J. J. Gibson says, “stand-on-able” and “run-overable” (p. 127). As J. J. Gibson further states, if such a surface of support is also knee-high above the ground it affords sitting on, but knee-high for a child is not the same as knee-high for an adult, so, again, the affordance is relative to the size of the agent. The affordance itself is specified through information in the environment, that is, the pattern of light reflected from surfaces, which reaches the observer’s eyes.

Sometimes, however, we do not perceive an affordance, or we pick up, as J. J. Gibson phrased it, “misinformation” about it. For instance, we might not notice that a door made of glass is actually closed and we walk right into it, which means the perceptual information we pick up (that is, air, which affords passing through an open doorway) is not the same as the door's
affordance when we notice it. Of course, the door also affords bumping into, but that is not what we want to do. When it comes to objects, J. J. Gibson distinguished between attached and detached objects, and considered tools a special kind of detached objects that are graspable, portable, and manipulable. J. J. Gibson pointed out that we are constantly grasping objects and that they are perceived in relation to the hands, and also that “the perception is constrained by manipulation, and the manipulation is constrained by perception” (p. 224). As we (temporarily) attach a tool to our body, we extend our capacity of perceiving and acting (cf. Chapter 4.1). The capacity to attach something to the body suggests, in J. J. Gibson’s view, that the boundary between us and our environment is not fixed at the surface of our bodies. Considering that affordances are invariant, it implies they are also independent of cultural and social conventions. J. J. Gibson did, however, recognise that our use of objects is affected by “second-hand knowledge” (or mediated or indirect knowledge). As J. J. Gibson says, “wisdom is handed down [...] this knowledge is communicated to the child” (p. 260). A well-known example is the postbox that invites letter-mailing, an object that everyone “above the age of six knows what it is for” (p. 139). However, despite mentioning second-hand knowledge, it seems he left sociocultural aspects largely unattended. We will return to this issue later.

To see how the affordance concept could apply to computer games, I use a scene from Escape from Monkey Island (EfMI, 2000), an adventure game that I have played myself. It is important to remember here that the game example is meant as an illustration of the various theoretical points I make throughout the discussion of the affordance concept, and not meant as a precise empirical description.

In Figure 6, we see how the player, in the form of the avatar Guybrush Threepwood, has entered a room through a window (at the far end of the room, to the avatar’s right) to pick up things she needs. She is now about to leave the room and checks whether she can use the entrance door instead of climbing back out through the same window from which she came. When she gets to the door, however, she soon finds out that she cannot pass through. What takes place in this scene, in J. J. Gibson’s sense of affordance, is the following:

*The player now wants to leave the room and she perceives information about possible actions, possibilities relative to her/Guybrush’s action capabilities and the situation at hand. She sees the door with a plate*
However, the possible passing through, in terms of affordance, actually stops short here (unless we invoke second-hand knowledge or something similar). The player must do something to make Guybrush pass through. She knows that doors in the game are not actually opened in the same manner as in the physical world; instead they are passed through by just walking into them (if it is a door that can be passed through), and she also knows that in order to do so, she needs to keep pressing the button that makes Guybrush move (in this case the avatar is controlled through a keyboard). However, the button (in fact, all buttons) affords pressing at any time, and there is nothing, no perceptible information on the door or any other part of the virtual game environment, that affords to press, or keep pressing, a button outside of the virtual game environment; neither when she wants to approach the door, nor at any other specific point in time. To explain how she actually knows she needs to press a button requires a
conception other than affordance, but for now let us just go with the fact that she keeps pressing a button to pass through the door. We will return to this issue later, and in the meanwhile, we denote this ‘affordance-action gap’ with a little star (★), also when it occurs in the following examples. What we do know, however, is that while the player plays the game, she temporarily attaches an object (the keyboard) to her body, and thereby extends her action capabilities. In other words, the attachment of this specific object allows her to ‘reach’ into the virtual world – but it still does not explain why, or what affords the pressing of the button.

(★) She walks towards the door, and ‘bumps’ into it because she cannot pass through. The door looks ‘approach-able’, but it is not ‘pass-through-able’. However, the information that the player perceives is ‘the door can be passed through’, otherwise she would not have opted for that action. The ‘pass-through-ability’ of the door was simply the result of misperception.

An elaboration of affordance that perhaps is the closest to J. J. Gibson’s meaning of the concept, is found in Gaver (1991). In his view, affordances are the fundamental objects of perception, and he makes a distinction between ‘real affordances’ and ‘perceptible affordances’ (i.e., perceptual information that specifies the affordance). However, he also includes the notion of ‘false affordance’ (when information suggests a non-existent affordance), which is unfortunate and contradicts his own account since either an affordance exists or it does not, and therefore it cannot be false. Gaver further notes that affordances can be made perceptible by making attributes relevant for action available for perception. Since perception is direct, he says “perceiving that a door handle affords pulling does not require a mediating concept because the attributes relevant to pulling are available for perception”. However, Gaver also recognises the role of socio-cultural settings, as he says “[k]nowing that a key should be turned inside a lock does require mediation because the relevant attributes are not available” (p. 2f). In his view, the observer’s culture, social setting, experience, and intentions partly determine the perception of affordances, but such factors are not central to affordances, they only “highlight” certain affordances.

Gaver also addresses complex affordances and includes exploration as a means to perceive sequential and nested affordances (the latter was implicit in J. J. Gibson’s work (1979), even though he did not use the term).
Sequential affordances refer to “situations in which acting on a perceptible affordance leads to information indicating new affordances” (p. 4). Passive observation alone does not reveal all possible operations of an object – instead they are revealed over time. A door handle, for instance, may afford grasping, but the affordances of turning it, or using the handle to open the door, are not indicated. Instead, it is only after the handle has been grasped and exploratory pushed downwards that the affordance of turning it is revealed (through tactile information). Once the handle is fully pressed down, it is natural to pull (or push) it, and the result of pulling it reveals whether or not the door affords opening.

The player looks for a way out of the room and she sees the brown object that separates itself from the wall, and it has a plate on one side of it. In her culture such objects are doors. But merely observing the door does not reveal all its possible actions. But she perceives information that the door affords approaching and possibly passing through, so she walks towards it...

The player now needs to keep pressing a button outside the virtual world to pass through the door. Since no relevant attributes for such an action are available (there is no such perceptible information in the virtual world), it requires mediation – the player’s cultural setting partly determines her perception of affordances, and highlights the affordance of pressing the button.

… and ‘bumps’ into the door. This exploration reveals no further affordance, and the result of the action is that she cannot pass through the door. The perceptible affordance in this case did not lead to information indicating new affordances.

The second concept, nested affordances, refers to affordances that are grouped in space. While a part of an object may afford some kind of handling, separate parts in themselves do not reveal the possibilities of the whole object as such. In the case of a door, as Gaver (1991) points out, a door handle alone suggests different affordances, but it is only when we see the affordance of pulling the door handle, as nested within the affordance of pulling the door that we perceive the affordance of opening the door.

The player is looking at the door, but the door itself does not reveal all its possible actions. It is only when she ‘sees’ the affordance of pressing the button as nested within the affordance of approaching the door that she perceives the affordance of (possibly) passing through the door.
Now, let us turn to Norman’s view on affordance (1988). When he wrote of affordances (as presented in his book), it included both real and perceived affordances, although not clearly distinguished as such. It is this initial description that has caused much of today’s misuse of the term (cf McGrenere & Ho, 2000; Oliver, 2005). In Norman’s use of the concept, affordances focus on the objects, which leaves out the agent of the original mutual agent-environment relationship. For Norman, affordance refers to “the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used” (1988, p. 9). Also, in Norman’s view, perceived properties may or may not equal the real ones, but they are nevertheless affordances. Since perceived affordances are the same as real ones, it seems the agent comes to ‘decide’ which properties of an object are relevant. Norman also emphasises the role of social conventions and interpretation, and says the way affordances are perceived depends very much on those.

The player looks at the door and sees its large flat surface. There is no handle or knob on the door that can be grasped or turned, but there is a plate on the right side of the door. She knows that such a plate on a door usually means one should push to open the door because that is how people do. But in the game, doors are not opened in the conventional way (i.e., as in the physical world), instead they are passed through by walking right into them. She perceives the door as ‘approach-able’ and possibly ‘pass-throughable’, so she walks towards it. As she reaches the door, she ‘bumps’ into it because she cannot pass through. So, both the door’s real and perceived affordances are the same, that the door is ‘approach-able’. It is also perceived as possibly ‘pass-through-able’.

If real and perceived affordances are indeed considered one and the same, the player decides which properties the door has, and in this case the door’s affordances are that it is ‘approach-able’ and ‘pass-throughable’. But in reality (the virtual one…) the door does not have any of these affordances in relation to the player as she still has to press a button outside the game to make her game character move towards the door. To be fair, Norman (1999) has clarified that it was a mistake to write of affordances when what he really meant was perceived affordances. On that account, the door’s affordances are only perceived affordances.

While Norman’s use of the affordance concept placed focus on the object, others have instead focused on the agent and its cognitive operations,
At the expense of the object which is left out of the original mutual agent-environment relationship. Just to mention a couple of examples along this line of thinking, there are Cooper’s (1995) and Kirsh’s views (1996) on affordance. Cooper prefers Norman’s definition of affordance (“the perceived and actual properties of a thing”) to be read as “the perceived properties of things”, which would refer to what we think objects can do instead of what we can do with them. This detaches affordance from the environment and makes it all about subjective perception; it becomes purely cognitive. Kirsh (1996), on the other hand, talks of strategies, or actions, that are undertaken because they affect the way a task is perceived and understood, and because they create cognitive affordances. For instance, when counting coins, a person can keep track of the ones already counted by pointing, which off-loads her cognitive processes and leads to more efficient performance of the task.

As the player entered the room through the window she had not planned how to get out, but now that she is done in there, she is trying to figure a way out. Does she have to climb out the window again or is there another way out? Instead of planning ahead, she uses cues in the environment which help her choose a strategy. She sees the door, which she thinks is a possible way out, so the strategy she chooses is to try the door instead of the window. (★) She approaches the door and ‘bumps’ into it, not able to pass through. She thought of the object as ‘a way out’, only this time, her strategy actually did not lead to a more efficient performance.

Yet another perspective on affordances is one that actually throws the concept right back into the very dualistic information processing view of cognition that J. J. Gibson wanted to avoid in the first place. A good example is “honesty of affordances”, which means that “a tool tells the truth, the whole truth, and nothing but the truth about the capabilities it has” (Fitzgerald & Goldstein, 1999, p. 179). With reference to the original theory, Fitzgerald and Goldstein argue that the use of an object is determined by its properties, and that a mapping between actual and perceived affordances is not enough. Instead, they emphasise the role of the designer who chooses which affordances a tool conveys. Affordances are seen as a means of communication between designer and user, and the underlying idea is that the possible uses of a designed tool can be intentionally communicated through its affordances. The general idea, then, is straightforward: design things so people can see what they are for. It is also recognised in
this view that objects afford some capabilities due to social histories and conventions. Nevertheless, this approach resorts to a de-contextualised information-processing view; it is assumed that ready-made knowledge can be 'transferred' from designer to user, and it boils down to 'adding' the right affordances to a physical design. This line of thinking does not leave much room for the mutual agent-environment relationship that is one of the key ideas in J. J. Gibson’s theory (1979).

The player sees the door, and perceives it as 'approach-able' and a way out, so (★) she walks towards it and 'bumps' into it because she cannot pass through. There is not a good mapping between the perceived affordance and the door’s real affordance – the door is not telling “the truth, the whole truth, and nothing but the truth about its capabilities”. The designer who chose which affordances to convey did a bad job; the design does not communicate the door’s possible uses to the player because it does not have the right affordances.

In the case of designing interfaces for use in, say, work environments, it certainly makes sense to ‘design things so people can see what they are for’ (albeit it cannot be done by ‘adding’ the right affordances). But, when it comes to games and gameplay, ‘honesty’ presents an interesting twist – do we always want affordances to be ‘honest’? Would we like to ‘see’ the whole truth? Is not the exploration itself an essential part of gameplay? Probably neither game designers nor players would want everything to be made obvious.

There are several other interesting interpretations and formulations of the affordance concept, but they cannot all be discussed here. Just to mention a few, though, there are the affordances identified by Zhang and Patel (2006): biological (based on biological processes), physical (for tasks constrained by physical structures), perceptual (provided by spatial mappings), cognitive (provided by cultural conventions), and mixed affordances (provided by combinations of more than one module). Further, in Hartson (2003), we find: cognitive affordance (a design feature that helps thinking about something), physical affordance (a design feature that helps physically doing something), sensory affordance (a design feature that helps the user in sensing), and functional affordance (a higher-level user enablement, a function that helps the user do something in the work domain). Yet another angle is provided by McGrenere and Ho (2000), who argue that it is too simplistic to say that affordances either exist or not. Instead,
they claim it is more useful to think in terms of the degree of perceptual information, and the degree of affordances.

Of the perspectives discussed here, Gaver’s view sticks perhaps closest to the original concept as described by J. J. Gibson (1979), and also provides an elaboration of the concept by accounting for complex affordances. The others largely deviate from the original concept. Norman (1988), for instance, only takes ‘half the system’ into account, focusing on the objects and their properties. However, in J. J. Gibson’s perspective, there is affordance (which either exists or not) and information that specifies the affordance (which sometimes can be misperceived), and they are always relative to an agent’s embodied actions and action capabilities.

The question now is: if we are to keep the affordance concept as a valuable concept that addresses the reciprocal agent-environment relationship, would we not be better off finding and using other concepts for phenomena that are difficult to reconcile with the affordance concept as proposed by J. J. Gibson? At the beginning of this chapter, I mentioned that J. J. Gibson did acknowledge mediated or second-hand knowledge, which suggests that previous conventional knowledge about objects has a considerable impact on how we use them. We have also seen, in the first case where the player tries to pass through the door, that she somehow knows she needs to press a button, even though there is no affordance for such an action within the virtual environment. To explain such knowledge, we need additional conceptions, besides the affordance concept.

5.2 Beyond Affordances

As repeatedly pointed out in this thesis, gameplay is an activity in which players perceive and act upon objects and events in both the physical and the virtual world. This ‘being in two worlds’, however, is at odds with how players often experience their playing activities. Terms like flow or immersion come to mind here (Douglas & Hargadon, 2000; Ermi & Mäyrä, 2005); players can be so engrossed in their playing activities that they actually feel like they are in the game, while everything around them is ‘tuned out’, and, subsequently, is not part of the game. But just because players experience themselves as being in one world, the game world, it does not mean that they actually are. Research on tools and artefacts has shown that objects, particularly those that we use frequently, tend to disappear because they have become transparent to us; we are not
consciously aware that we are using the objects, which is also what happens when people play computer games (cf. Chapter 4.2.1).

Beginners are quite aware of what they do both in the virtual world and in the physical world since they need to get used to the game equipment; they need to learn how actions that involve objects like mouse or keyboard are related to actions in the game world. In EfMI, for instance, as players we have to learn that pressing the arrow keys has an effect on Guybrush’s movements in the game. We have to learn that those arrow keys are connected to Guybrush in the game since the guy does not have an affordance such as ‘movable with arrow keys’ or ‘controllable with arrow keys’; what we have to learn is that a game character can be moved in a game and we also have to learn how to do this. The keys themselves, of course, have an affordance, such as ‘press-able’, but the arrows on those keys reflect a cultural convention. We have learned that an arrow pointing in a certain direction has a specific meaning, which in this case means ‘going forward’, ‘going backwards’, ‘going to the left’, and ‘going to the right’. This also clearly demonstrates how our perception is affected by the here-and-now (cf. Chapter 4), which is closely related to our actions. Those same arrow keys have somewhat different meanings in, say, a text editor; while I wrote this thesis those arrows meant, among other things, ‘one line up’, ‘one line down’, ‘one letter to the left’, and ‘one letter to the right’. And even in EfMI, the meaning of those arrows can change; every time we look at the objects we have collected during the game, the arrows mean ‘one object to the left’ or ‘one object to the right’. Obviously, we cannot talk about affordances here. ‘Press-able’, on the other hand, is an affordance and it remains the same in all computer applications, be it a text editor or a game like EfMI. This seems to be what J. J. Gibson (1979) meant by “invariant affordances”: the affordances of an object are always there to be perceived, no matter what we do, but depending on what we do, we may or we may not pick up on them.

Experienced players, on the other hand, have already gained the knowledge discussed above. They no longer have to think that much about how keyboard or game controller are related to a game, and this usually enhances the playing experience considerably. It has been suggested such knowledge constitutes a development of professional vision for affordances, as discussed by Linderoth and Bennerstedt (2007) in the context of the first-person shooter game TimeSplitters 2 (2002). An alternative explanation, however, is that such knowledge has less to do with professional
vision than with the equipment becoming an extension of a player’s body, which affects her perception of the game. An experienced player perceives a door in Timesplitters 2 as something that ‘can be opened through a click on the gamepad’, because she has learned that a door can be opened by a click on the gamepad button, and such an action has become an automatic action. A beginner, on the other hand, probably perceives the same door simply as ‘could be opened’. None of these perceptions, though, are real affordances of the door, since no matter how skilled a player becomes at controlling her gamepad, no matter how much of a professional vision she develops, she will never pick up the affordance ‘open-able by pressing a button on the control’. There is nothing in the game or in the game environment that tells the player, ‘you can open the door by clicking button x’ for the simple reason that there is no such affordance – not on the screen, not in the virtual room, not on the virtual door itself, and neither anywhere else in the game equipment. The action of opening a door has to be learned by means other than the pattern of light on the screen or game controller that reaches the player’s eyes. And it is here that professional vision may come into play.

Professional vision is, as Goodwin (1994) says, “socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group” (p. 606, emphasis added). Goodwin’s findings are based on studies of archaeologists and their practice of coding schemes to categorise events relevant to their work, their practice of highlighting specific phenomena in their environment for better visibility, as well as their production and articulation of material representations, such as archaeological maps. These practices are, according to Goodwin, embedded within webs of socially articulated discourses, i.e., the ability to see relevant objects or events is not the result of the individual mind alone, but arises within a “community of competent practitioners” (p. 626). Following this line of reasoning, the development of professional vision in gameplay is, in other words, a social process in which players learn through “socially articulated discourse”, within the community of (competent) gameplay practitioners, what a game controller is for, how it can be used, and what information is relevant in different kinds of game genres. It can be as simple as reading the instruction manual. Professional vision has subsequently very little to do with the differentiation of “the information for a specific set of affordances which is relevant to a certain group in a certain situation” (Linderoth & Bennerstedt, 2007, p. 4). Rather, affordances
relevant to a certain group in a certain situation entail from socially articulated discourses, i.e., they have been socially negotiated or agreed upon, or emerged implicitly among the group members (as social norms often do). This is clearly at odds with J. J. Gibson’s view on affordance (1979) – after all, an affordance is relative to an individual animal, not to groups of animals. On the other hand, it points to the importance of mediated or second-hand knowledge, and that the use of objects can be affected by social norms. That, in turn, may be taken to indicate that J. J. Gibson was aware that perhaps not all aspects of the animal-environment relationship can be explained in terms of affordances.

However, one could also interpret Linderoth and Bennerstedt’s argument in the sense that the development of professional vision is not about the negotiation of affordances, but something that instead leads to new ways of perceiving the game environment, i.e., the development of professional vision leads to the perception of different kinds of affordances in the game. But again, in J. J. Gibson’s view, affordances are directly perceived by an agent in relation to its motion and not in relation to negotiated, agreed upon, or implicitly emerged knowledge.

Linderoth and Bennerstedt have a valid point in discussing how players try to grasp the properties of a game world and how they learn to discriminate between ‘relevant features’ and ‘decorations’ in it, but this process is not so much about learning right and false affordances, but more about learning to recognise which parts of the game one can and cannot interact with. Affordances, according to J. J. Gibson, afford actions, not non-actions; a picture on a wall in a game does not afford ‘ignore me’, but an experienced player has learned, through interaction with her social surroundings and through exploration of the game world, that pictures in, for example, a shooter game, rarely are related to the game; players know they are simply there for the purpose of creating some sense of realism in the game. This means it is not a matter of learning affordances, but rather a matter of learning to recognise the interactive parts of the game. Such knowledge, then, affects players’ perception of the game environment, a conclusion supported also by other researchers who suggest that sociocultural practices to a considerable extent shape people’s perception of the environment. Kranjec, Lehet, Bromberger, Chatterjee, and Gilbert (2010) claim, for instance, to have found evidence that cultures that read from left to right have a bias for rightward motion, which apparently also film directors exploit by having villains arrive from the right; the intention is
to transfer our discomfort with leftward motion onto the villain (Van Sijll, 2005).

The idea of having to learn to recognise the interactive parts of the game seems to be consistent with Neisser (1992), who argued that we need to distinguish two kinds of perceptual processes, namely direct perception and recognition. According to this view, direct perception provides us with information for locomotion and orientation in space, whereas recognition provides us with information about the identification and classification of objects and events, and recognition is more effective if we are able to accumulate information about the features of an object or arrangement. Neisser’s idea comes, on the one hand, close to E. Gibson’s theory of perceptual learning (1963), which is described as “responding to variables of physical stimulation not previously responded to” (see also E. Gibson, 1994; E. Gibson & Pick, 2000). Perceptual learning, in other words, is about learning differentiating qualities of stimuli in the environment, such as a person’s ability to identify different types of sherry or red wine. She pointed out, however, that the theory of perceptual learning does not account for misperception, as it does not tell us anything about how imagination, fantasy, or wishful thinking might affect our perception of objects and events in the environment, aspects that are arguably integral parts of gameplay activities. Lockman’s theory (2000), on the other hand, can be seen as a complementary approach to Neisser’s view on direct perception. According to Lockman, the origins of complex tool-use behaviour are mainly manifested in perception-action routines while small children explore and inspect their surroundings. Tool use behaviour, in these terms, is a stepwise learning process in which tool use and insight emerge gradually over time and arises from small children’s attempts to relate objects to other objects and surfaces, while detecting affordances based on the perceptual information available. This means tool use behaviour is not simply the result of innate structures that in time will lead to sudden insight, but is rather a process of continuous embodied activity, a perspective that is consistent with ecological viewpoints on cognition and object manipulation.

The latter approach is obviously heavily influenced by theories of embodied and situated cognition. It has already been mentioned that as we attach an object to the body, we extend ourselves and our action capabilities in an act of embodying, and that a large number of studies has shown that knowledge about objects and their use are inextricably intertwined with people’s actions with and upon them (cf. Chapter 4.2.1). The identification
of objects and actions appear, for instance, to activate areas in the brain that typically are not associated with recognition or semantic access (Johnson-Frey, 2004). Regions responsible for grasping and manipulating actions, for example, are active during tool naming and viewing (e.g., Chao & Martin, 2000) and during identification of actions which are related to certain tools (Grabowski, Damasio, & Damasio, 1998). Grafton et al. (1997), in addition, demonstrated that tool observation and silent tool-naming activated motor areas in the brain. These findings indicate that even in the absence of any subsequent movement, motor areas in the brain process objects that “have a motor valence” (p. 231). The presence of an activation in those areas, it is furthermore argued, implies that motor areas play an important role in understanding object semantics. This would mean, in the EfMI example, that the player perceives the door as a door and as ‘open-able’, because she associates the picture of it with previous bodily experiences of opening and passing through doors.

5.3 Concluding Thoughts

Undoubtedly, opinions on what constitutes an affordance are mixed, resulting in confusion and misunderstandings among researchers and designers. So far, when trying to explain the relevance of affordances in people’s interaction with virtual worlds, most researchers focus almost entirely on what is visible on the screen whereas low-level and high-level aspects are routinely downplayed. The discussion of how we perceive and act upon the game environment, however, requires us to think more than screen deep (Torenvliet, 2003), seeing biology and culture as equally important, and that they go hand in hand (cf. Chapter 4). This puts us into a difficult spot: a discussion of the affordance concept in terms of low-level processes, the here-and-now, and high-level processes is completely at odds with the affordance concept as described by J. J. Gibson (1979), as his view on direct perception does not resonate well with mediated and second-hand knowledge. Much of the material presented in this chapter suggests that ‘virtual affordances’ (for lack of a better term) are not affordances in the Gibsonian sense, but rather are rooted in cultural values and practices and the experience of having a body, which includes more than visual perception, which J. J. Gibson mainly focused on.

Another major issue with the affordance concept is that it has become an all-encompassing term that we use to explain a variety of cognitive phe-
nomena without realising that we risk loss of its denotation and meaning. But perhaps most important to realise is that we limit ourselves in our quest to understand these phenomena if we use the affordance concept whenever and wherever the opportunity arrives, without considering alternative explanations. As valuable as the affordance concept is for our understanding of our interactions with the (physical) world, we need to be careful in our use of it, and avoid overusing it.
Part III

SITUATED PLAY IN PRACTICE
TWO GAMES, TWO CASE STUDIES

The concept of situatedness, as discussed in the previous chapters, seems at present to be one of the most promising lines to follow in understanding computer gameplay; not only does it address the handling of games and the attribution of meaning in games, but it also considers these two components of gameplay processes that are closely interwoven and interrelated. The two case studies presented in the chapters to come address not only the situated nature of people’s playing activities, but also provide practical implications for the theoretical approach favoured here.

6.1 Methodological Questions

In the first case study, the focus has been on the body’s role in people’s playing activities, with a large emphasis on the actual activity of playing a game. The game used in this study is a ‘classic’, a game many grown-ups recognise even though they played the game quite some time ago, when they were still just kids. The name of the game is PAPERBOY (1984), a single player game in which you take on the role of a paperboy, delivering newspapers in a suburban neighbourhood while trying to avoid several hazards along the street.

In the second case study, a broader perspective has been taken on computer gameplay, that is, when we chose the unit of analysis we not only included the actual playing activity, but also considered how gameplay is affected by factors outside the game itself, such as players’ relations to other players and their participation in game communities. The game used in the second case study is also a ‘classic’, but a classic that is still very much alive: COUNTER-STRIKE (2000), one of the most popular multi-player games around, even several years after its release. It belongs to the category of
**FPS** games, a game genre where the shooting of other players is a central element.

The methodological approach was not exactly the same in the two case studies; whereas the former was conducted in a more controlled manner, i.e., in a laboratory, the latter took, to a large extent, place in the wild (cf. Hutchins, 1995), more specifically at the *World Cyber Games (WCG)* 2006 in Monza, Italy. Ethnographic methods were used in both cases, though, such as interviews and observation (cf. DeWalt & DeWalt, 2002), but in the *Paperboy* study also quantitative methods were used. The question is, of course, whether it is really necessary to make a distinction between ‘qualitative’ and ‘quantitative’ research, and the answer would have to be yes. Whether we like it or not, game research is a methodological battlefield where the stronger use of quantitative research methods is more often than not at odds with the more qualitative research traditions (Williams, 2005). The ever so popular debate of violent/aggressive/sexual content in games is living proof of that (cf. C. Anderson & Dill, 2000; Sherry, 2001). Moreover, the discussion is not so much different from what takes place in the area of cognitive science, which has always shown a strong preference for controlled, quantitative research approaches (cf. Shaughnessy, Zechmeister, & Zechmeister, 2000). That has changed to some extent, however, after the arrival of more situated approaches to human thinking in the field (e.g., Lave, 1988; Lave & Wenger, 1991; Hutchins, 1995; Hollan et al., 2000; Lindblom, 2007), but on the grand scale it has not changed *that* much, despite various attempts to obtain some balance between the two methodological camps (e.g., Lincoln & Guba, 1985; Breakwell, Hammond, & Fife-Schaw, 2007).

But leaving the controversies aside, I have to agree with Williams (2005) who is all in favour of not limiting our research to discussions about whose methods are better. As he points out, “[u]ltimately, the ends matter more than the means” (p. 448). This is very similar to Bateson’s (1972) line of thinking, who argued that “the way to delineate the [cognitive] system is to draw the limiting line in such a way that you do not cut any of these pathways in ways which leave things inexplicable” (p. 465). This means the proper unit of analysis and the methodological approach that comes along with it depend very much on *what we want to explain*. Also, the discussion in the preceding chapters has addressed various aspects of gameplay in terms of situated activity and it is doubtful whether we can approach all aspects in similar ways. Off-loading activities in gameplay, for instance,
are often highly visible whereas the identification with a game character probably only to a small extent can be observed from the outside. And yet, both of these processes constitute an important part of situatedness in gameplay. This means, rather than to try to figure out which parts to include or not, we need to reverse the issue and ask ourselves what we want to explain. Such a reversal provides a guide for which aspect(s) of situatedness to focus on, since no matter how much we want to understand gameplay as situated activity, it would be very hard to include all aspects at the same time.

6.2 Ideas and Underlying Premises

The main idea to the first case study was born in the minds of two cognitive scientists who did not know much about computer games, but a lot about human cognition. Suffice to say, I was one of them, and was pretty sure we would get results that were to our liking. However, as it turned out, our subjects had a mind of their own. The underlying assumption was that the pushing of buttons on a keyboard or a game console is a rather unnatural way to move in an environment, which is why it was very tempting to argue that people who are given the opportunity to, for example, walk through the game environment, might experience it as a more intuitive way to interact with the game’s interface. People participating in the case study did not have the opportunity to walk though. Instead, they played the game with an exercise bike since the game character in the game delivers the newspapers to his subscribers on a bike. The participants should have found it an even more natural way than walking to play the game, since the game character on the bike should have made it easier for players to identify with it, sitting on a bike themselves. But again, it did not turn out quite as we expected.

The assumptions underlying the first case study did not come out of the blue though; there is both research and current developments on the game market that support these assumptions. For instance, the Wii gaming console, and games that come with different kinds of control devices such as Dance Dance Revolution (DDR) (1998) and EyeToy: Play (2003) are based on similar ideas. In all those cases, the player’s movements are captured by motion-sensitive devices such as dance pad, cameras, or wireless handheld devices, and their popularity speaks for themselves (see Figures 24–27 in Appendix C for examples). Current
applied research in the area of HCI is also of relevance here. In areas such as haptic interaction and pervasive/ubiquitous computing, for example, researchers try to develop more intuitive user interfaces, and some of the ongoing research in these areas is inspired by embodied cognition theories (cf. Dourish, 2004), and has found a creative outlet in the design and research of pervasive games (e.g., Jegers, 2009).

I should probably also mention that I have not really been as naive as the introduction to this section suggests. I was pretty aware of some of the pitfalls here, one of them being the more than 30 years long popularity of computer games, which is a strong indicator that successful and natural interaction with computer games is not only a matter of awe-inspiring input devices. I also like to play computer games myself every now and then, so I think it is fair to say that I am not totally ignorant when it comes to computer games and gameplay. But then again, playing computer games oneself is not really the same as having a profound understanding of them (there are researchers who like to think otherwise, but that is subject for a different kind of discussion). Last but not least, games such as EyeToy: Play and DDR belong to a specific kind of game genre, suggesting that the kind of interaction provided in these games might not always be suitable for other genres. The latter point warrants some caution, though, since the establishment of criteria used to classify computer games (and other media) into different categories or genres is almost as difficult as finding a widely accepted definition of them (cf. Altman, 1989; Wolf, 2001; Apperley, 2006; Arsenault, 2009). For instance, well-established game genres are an important marketing tool for game developers and publishers, whereas those who play the games can maintain their own genre conventions.

By the time the second case study came around I had developed a much better understanding of the meaning and content of games as well as their cultural consequences and relevance. Together with Daniel Pargman and Peter Jakobsson, who have a background in media technology and communication respectively, I set out to address gameplay activities in a more encompassing manner. Our different backgrounds allowed us to study gameplay activities from different viewpoints, and COUNTER-STRIKE (2000) was considered a particularly interesting research object here, for a number of reasons. COUNTER-STRIKE (CS) is one of the most popular and successful games in the world, even several years after its release in 2000. This is a very long time for a computer game, and yet it still captures and holds the interest of players throughout the world.
According to steamcommunity.com, there are over 158 000 CS servers on the Internet, and over 280 000 players were simultaneously playing CS when this part of the dissertation was written. In the wake of its success, Counter-strike has created a distinct and unique culture surrounding it, including the players themselves, professional clans and their fans, e-Sports organizations and leagues, as well as enthusiastic spectators. A handful of clans and individual players have also gained widespread international fame and recognition, and make a living off of playing CS.

Motivated by the game’s widespread popularity and its change into an e-Sports game, and the requirements such a change imposes on people’s playing activities in the game, the focus in the second case study was on (1) CS as part of the e-Sports scene and its effects on players, game and gameplay, (2) the game’s increasing professionalisation, and (3) players’ skill development and their growth as both individual and team players. A key question was how to approach these aspects empirically; should we study the actual activity of playing the game, the ongoing activities on the screen, players’ feelings and subjective experience, their participation in various forums and communities, or all of these together? A model developed by Kline et al. (2003) served as an initial, methodological inspiration for the case study since it goes beyond the classic player/designer dichotomy, and also takes cultural forces and commercial constraints into account (see discussion on page 103). We offered a different take on players’ gameplay experience, though, which was not primarily understood in terms of players’ direct interactions with the game. As we have seen in the previous part, game play is shaped by cultural contexts and tools, and takes place within webs of social and cultural practices, which in the case of Counter-strike includes individual players, interactions between players and clans, e-Sports organisations and leagues, the media as well as fans and players discussing the game in online forums and other virtual community spaces.

6.3 Closing Remarks

Both case studies provide in their own way qualitative descriptions of how a variety of factors can influence gameplay activities, for instance, how the different levels of situatedness are related and affect gameplay in terms of handling the game and players’ meaning-making activities. However, hindsight is a wonderful thing and what seemed like a good set up a few
years ago is not necessarily as good now, given past experiences and the resulting knowledge. This is particularly true when it comes to J. J. Gibson’s affordance concept (1979) and its potential to explain people’s gameplay activities (cf. discussion in Chapter 5). The reader is advised to keep this in mind when reading the next chapter since the first case study was very much based on the assumption that the affordance concept can help us understand the relation between players’ handling of the game and their meaning-making activities.

As far as the second case study is concerned, the study was part of a research project involving three people with shared, but to some extent varying interests (cf. Section 6.2). Naturally this affected how the case study was carried out and which aspects we chose to focus on. In May 2010, I also had the chance to attend a workshop on e-Sports and cyberathleticism organised by the IT University, Copenhagen, which brought together members of the community, including players, team managers and website organisers; the material collected at the workshop provided additional breadth and insights to the COUNTER-STRIKE case study.
PLAYING PAPERBOY

The human use of, and interaction with, computer-based interfaces has been a continuous issue in various fields of HCI, but only in recent years computer games have become an issue on the agenda of scientists in this area. However, even if computer games as such so far only have been of minor importance for researchers in the area of HCI, there is a lot of ongoing research in this area which is directly or indirectly connected to, and of high relevance to computer game research. In many sub-areas new technology is being tested and developed, and behind the technology is the conviction of researchers that bodily experience is a factor not to be underestimated. The underlying intention in areas such as haptic interaction (e.g., Ruspini, Kolarov, & Khatib, 1997) and pervasive, or ubiquitous computing (e.g., Headon & Curwen, 2002) is to develop technology that makes it possible for users to interact with a computer based interface in a way that feels more natural to them – a development that recently also has reached the computer-game society. EYE TOY: PLAY (2003), for instance, is a collection of games which allows people to interact with its interface in a more natural manner since the interface is rather intuitive and does not require extensive learning or technical skills to be used successfully; in the game the player’s motions are captured by a color- and motion sensitive digital camera device.

The embodied interaction approach to HCI put forward by Dourish (2004) can be considered a theoretical foundation for such ideas as it emphasises the embodied nature of human cognition and its impact on people’s interaction with software systems. Dourish has very much drawn his inspiration from research in the area of cognitive science. Within the framework of embodied cognition researchers strongly emphasise the role of bodily activity in human cognition (cf. discussion in Section 3.2).
Traditionally, though, human-computer game interaction is mostly limited to pushing selected buttons on a keyboard or a console in order to control a virtual agent’s movements. From a pure cognitive point of view, this is a rather unnatural way to move in and through an environment. It takes some time for people to learn, for instance, the mapping between ‘pressing the left arrow key’ and ‘turning left’. Most people would probably say that it feels quite ‘natural’ after some time of practice, but being able to control the movements of a virtual agent is not quite the same as being able to play a game successfully. Giving people, on the other hand, the opportunity to use and feel more parts of their bodies than just the tips of their fingers when playing games, might substantially increase the performance of gamers. It is thus tempting to argue that people who are given the opportunity to actually walk through the game environment might find it a more intuitive way to interact with computer games. As already Weiser (1988) pointed out,

*people live through their practices and tacit knowledge so that the most powerful things are those that are effectively in use […] so embedded, so fitting, so natural, that we use [them] without even thinking about it.*

We cannot ignore one important fact, though. Computer games have been spectacularly successful for more than three decades now, despite apparently limited interaction opportunities. Many people playing games display, for instance, a remarkably skilled use of keyboard and mouse. Apparently, successful interactions between player and game take place whenever people get caught up in their gaming activity, regardless of the interaction mode. Furthermore, many games with more intuitive input devices such as DDR (1998) or EyeToy: Play (2003) are often directed at what Juul (2010) would refer to as casual players, i.e., people who often have little or no gaming experience at all, and in web forums and alike critical voices are heard about that kind of input devices.

This raises a number of questions about the potential of such kinds of input devices and the quality of interaction they provide. That is, how natural is the interaction with a game interface through input devices such as dance pad and movement-sensitive cameras, and to what extent can the technology be implemented in other game genres? There is only a small number of games with more intuitive input devices on the market, and all of them are quite similar in their design and their target audience.
Also, there exists very little empirical material providing new insights into how people’s play of computer games is affected by different kinds of interaction technology, aside from notable exceptions in the fields of ubiquitous and wearable computing (e.g., Cheok, Yang, Ying, Billinghurst, & Kato, 2002), and in an area which very much has drawn its inspiration from these fields, pervasive gaming (e.g., Warn et al., 2004; Schrader, Jung, & Carlson, 2005; Jegers, 2009). Further research is therefore necessary to understand what different game interfaces afford to a person in terms of action opportunities and how this affects the player’s gameplay. As Hirose (2002) pointed out in his discussion of J. J. Gibson’s ideas (1979) in relation to embodied cognition,

*the body may change with tools [and these] changes in the body may alter the observer’s action capabilities, and thus the observer must adjust perception of affordances to this changes in order to fit the environment* (p. 292).

It is important to keep in mind here that the game environment consists of two worlds – a virtual one and a physical one. As players are engaged in gameplay, they face the challenge of perceiving and acting upon affordances in both worlds, and we as researchers subsequently face the challenge to capture and explain them.

With the discussion thus far in mind, a case study has been undertaken to investigate the impact of different input devices on people’s gameplay in terms of performance, action frequency, and gaming experience.

### 7.1 Method & Setting

In this case study, a modified exercise bike and a common gamepad were used as input devices for the single player game Paperboy (1984); one group played the game with the gamepad (Figure 13, Appendix A), while another group controlled the game character with the exercise bike (Figure 14, Appendix A). The object of the game is to control a paperboy delivering newspapers on a bike along his route in a suburban neighbourhood (cf. Figure 7). While delivering newspapers to subscribers, vandalising non-subscribers’ homes and picking up new newspapers, the player has to avoid various hazards along the street to make it to the next level.

Participants in this study were 20 (10/10) male undergraduate students between 18 to 30 years. Their selection was to some extent a matter of
Figure removed due to copyright reasons.

Figure 7: Paperboy (1984), the game that was used in the first case study. The game objective is to deliver newspapers along a suburban neighbourhood while trying to avoid various obstacles along the street. ©Atari Games (1984)

convenience (cf. Patton, 2002) as they were enrolled in the computer game development programs at the University of Skövde (Sweden), but much more important was that they met the criteria for avid computer game players. There were several reasons why we recruited avid game players as participants, and not people with little or no gameplay experience at all. For one, we wanted to avoid that participants would have to spend a considerable amount of time to get comfortable with the idea of playing computer games, and to gain the kind of tacit and cultural knowledge that comes along with it. For another, their knowledge about games gave them the necessary skills to get a hang of things fast, for instance, of the game mechanics and rules. This study was after all about the impact of different control devices on people’s gameplay, and not so much about the ability and desire of people to learn to play a (new) game. It is also worth noting that it was by no means a conscious decision to ignore female computer game players, it was just the way it was and happened; the game devel-
development programs at the University of Skövde are known for their strong male-to-female student ratio. All participants played computer games on a regular basis, even though the time spent on games per week varied considerably. Games played by the participants include, among other games, FPS, adventure games, puzzle games, racing games, and strategy games. They usually prefer certain game genres, but all of them are familiar with most game genres on the market. Almost all of the participants had played Paperboy in the past, when they were still kids, but most of them could not really remember what the game was about. All participants could therefore be considered to be 'new to the game'.

A combination of survey questionnaires, interviews, and video recordings was used to collect complementary types of data; the overall aim with these three methodological building blocks was to find both quantitative and qualitative indicators for how the players’ experience and performance were affected by the gamepad and the bike, respectively. The survey questionnaire included for the most part ranking questions with eight scale response options, asking subjects about strategies used in the game, their opinion about the game in terms of difficulty and experience of fun, and their willingness to participate in follow-ups. Participants were also invited to leave free-text comments at the end of the survey questionnaire (cf. Appendix A.2). During the taped interviews participants had the opportunity to talk more freely about the game and their gaming experience, such as their first impression of the game and how they thought their 30-45 minutes long playing session went for them. The idea was to counterbalance the survey questionnaire where most questions were presented in forced-choice format, something that could have limited the participant’s responses. The video recordings of participant’s playing session, for their part, allowed to obtain further information of the participant’s actions and progress in the game, and the difficulties encountered while playing.

The setting used in this study was an apartment-like room in the university’s game research lab that roughly corresponds to a common student’s living and working environment, and that is equipped with video surveillance cameras to monitor and record user activities (Figure 15, Appendix A). For the bike-group, the sofa and the small tables in front of the TV had been removed to give them some space during the game. The participants were divided into two groups with 10 members each, and simply informed that the purpose of this study was to investigate human interaction with computer games and that the playing session would be videotaped. The
information was kept vague on purpose so as not to affect their expectations and playing activities too much. A description of the game, as can be found on Wikipedia, was available both before and during each participant’s playing session; some of the participants made use of it, but most of them preferred to follow the classic learning-by-doing strategy. Also, after each session, an interview took place and the participants were asked to fill out the survey questionnaire.

With Hirose’s quote (2002) in mind (p. 89), the exercise bike was expected to afford action opportunities somewhat different from action opportunities afforded by the gamepad. It seemed likely that players riding the bike would pay more attention to bike-related actions such as avoiding obstacles along the street. The delivery of newspapers, on the other hand, was expected to play a less significant role compared to players who controlled the paperboy with the gamepad; those in the gamepad group were expected to focus more on delivering the newspaper and vandalising non-subscribers homes because of the placement of the newspaper button (Figure 16, Appendix A). In order to deliver a newspaper they simply had to push a single button on the gamepad with their left thumb; they did not need their left thumb for anything else which means they never had to remove their thumb far from the button. Moreover, the game character was easily controlled with the thumb stick, which people used their right hands for. In the case of the bike, on the other hand, people constantly had to move their hand between the steering axis and the newspaper button (Figure 17, Appendix A). Things did not turn out quite as expected though, for reasons I will come back to later in this chapter.

7.2 Analysis & Results

The data extracted from the survey questionnaires was entered and analysed in a spreadsheet in order to compare the answers of both groups (cf. Appendix A, Tables 5-10). The participants’ free-text comments were entered in a separate text-document, without enforcing categorisation; four participants made comments in the gamepads group, five participants in the bike group (cf. Appendix A, p. 175). The interviews were listened to and read, in order to identify elements that participants shared similar views on, or expressed different opinions about, particularly with respect to elements such as the game’s difficulty and participants’ playing experience. In the absence of log files, the video recordings were analysed.
manually with the built-in viewer of the surveillance software that was used to videotape the participant’s playing sessions. This approach is very time consuming and extremely prone to human error. For these reasons, two student assistants, not involved in the actual case study, analysed the video data which considerably lessened the workload as they analysed one group each. The main focus in the video data analysis was placed on the participants’ on-screen activities, which were divided into seven categories:

- **Paper delivery** – how often players pressed the newspaper button, resulting in a flying newspaper
- **Hit mail box** – how often players managed to hit a customer’s mail box with a newspaper, gaining them a higher score
- **Hit non-customer’s window** – how often players managed to break a non-customer’s window with a newspaper, resulting in a new customer
- **Hit customer’s window** – how often players broke a customer’s window with a newspaper, resulting in a lost customer
- **New newspapers** – how often players picked up new newspapers
- **Crash with object** – how often players collided with one of the many objects thrown against them, resulting in a lost life
- **Bonus round** – how often players managed to reach the bonus round, gaining them additional score points

The results of the video analysis were entered into a spreadsheet as well (cf. Appendix A, Tables 11-12) and a comparison was made based on the mean values in both groups (cf. Table 4 in Section 7.2.2). A thorough statistical analysis was deemed inappropriate since the sample size was too small (n=20) to yield valid conclusions and, as noted before, a manual analysis of quantitative video data leaves the door wide open to mistakes and transcription errors.

### 7.2.1 Survey Questionnaires and Interviews

A preliminary analysis of the survey questionnaires indicated early on that there is in fact no difference between the groups in terms of performance (strategy ranking) and gaming experience (experienced difficulty...
The table shows a summary of how the participants in the gamepad and the bike group ranked their gameplay activities. The ranking scale ranged from 1 to 8, with 1 corresponding to ‘very important’ and 8 to ‘not important at all’. A detailed list with the participants’ individual responses can be found in Tables 7 and 8 (Appendix A.3, pp. 171-172).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Gamepad</th>
<th>Bike</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Σ</td>
<td></td>
</tr>
<tr>
<td>Getting as many scores as possible</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Avoiding hazards along the street</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Delivering as many newspapers as possible</td>
<td>34</td>
<td>37</td>
</tr>
<tr>
<td>Getting as many new customers as possible</td>
<td>64</td>
<td>59</td>
</tr>
<tr>
<td>Bonus scores</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Exploring the game world</td>
<td>70</td>
<td>63</td>
</tr>
<tr>
<td>Winning the game</td>
<td>48</td>
<td>54</td>
</tr>
<tr>
<td>New newspapers</td>
<td>49</td>
<td>54</td>
</tr>
</tbody>
</table>

The findings from the interviews and the free-text comments, however, indicated that the input devices had had an influence on people’s expectations about what kind of interaction they allowed. It was difficult to control the game character for both groups, but the bike group blamed the bike rather than the game whereas the gamepad group, although experiencing similar problems, had a more negative attitude towards the game itself. This suggests that more intuitive input devices for computer games can lead to high user expectations that are difficult to match with the tech-
Table 3: Experienced difficulty. The table shows a summary of how the participants in the gamepad group and the bike group ranked the game’s difficulty; considerable differences are marked with the ✓ symbol. The ranking scale ranged from 1 to 8, with 1 corresponding to ‘very difficult’ and 8 to ‘not difficult at all’. A detailed list with the participants’ individual responses can be found in Tables 9 and 10 (Appendix A.3, pp. 173-174).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Gamepad</th>
<th>Bike</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Σ</td>
<td>x</td>
</tr>
<tr>
<td>A1 Getting as many scores as possible</td>
<td>46</td>
<td>4.6</td>
</tr>
<tr>
<td>A2 Avoiding hazards along the street</td>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>A3 Delivering as many newspapers as possible</td>
<td>50</td>
<td>5.0</td>
</tr>
<tr>
<td>A4 Getting as many new customers as possible</td>
<td>70</td>
<td>7.0</td>
</tr>
<tr>
<td>A5 Exploring the game world</td>
<td>48</td>
<td>4.8</td>
</tr>
<tr>
<td>A6 Bonus scores</td>
<td>57</td>
<td>5.7</td>
</tr>
<tr>
<td>A7 Winning the game</td>
<td>21</td>
<td>2.1</td>
</tr>
<tr>
<td>A8 New newspapers</td>
<td>41</td>
<td>4.1</td>
</tr>
</tbody>
</table>

nology available (today). The participants in the study were no novices, all of them have plenty of gameplay experience and are familiar with a gamepad. Riding a bike when playing a computer game might thus have been experienced as being somewhat odd, even though riding a bike in other, ‘real-life circumstances’, feels natural to most of them. The familiarity with the gamepad and its inherent limitations may thus have been a reason why the gamepad group did not complain so much about the input device used, because they knew how it works and how to use it. The bike, on the other hand, was an input device never encountered before in a gaming situation, and all people could rely on was their knowledge about bike riding in the physical world. This may have lead to disappointment and a certain degree of scepticism among the bike group since a modified exercise bike connected to a computer, so far, simply does not work like a real bike.

It has also become apparent that most of the participants did not like the game very much, which is clearly reflected in their answers on the survey questionnaires (cf. Figure 8 and 9) as well as in their opinions expressed in the free-text comments and during the interviews. The reason for this is probably largely due to the nature of the computer game used in this study.
How often both groups would play the game in the future

Figure 8: The figure shows to what extent the participants in both groups would like to play Paperboy even in the future. The ranking scale ranged from 1 to 8, with 1 corresponding to ‘never again’ and 8 to ‘very often’. A detailed list with each participant’s response can be found in Table 6 (Appendix A.3, p. 170).

and less related to the different input devices. Paperboy was developed in the 1980s, a time when it was not possible to save the game status after each successful round. This meant that participants had to start the game all over every couple of turns, a game aspect that quickly became annoying for most of them because they did not really feel like they were making any substantial progress in the game.

7.2.2 Video Recordings

The analysis of the video recordings (Table 4 on page 98) indicates that there is a difference between the two groups in terms of how often players tried to deliver a newspaper (B1), how often they managed to hit a customer’s mail box (B2) and non-customers’ windows (B3), and how often they had to pick up new newspapers (B5). This result seems to be consistent with the expected outcome where subjects in the gamepad
How much both groups enjoyed playing the game

![Bar chart showing enjoyment levels for Gamepad group and Bike group.]

**Figure 9:** *The figure shows how much (or how little) both groups enjoyed playing Paperboy. The ranking scale ranged from 1 to 8, with 1 corresponding to 'not at all' and 8 to 'very much'. A detailed list with each participant’s response can be found in Table 5 (Appendix A.3, p. 169).*

Group were expected to focus more on delivering newspapers (B1) and vandalising non-subscribers’ homes (B3). Participants in the bike group, on the other hand, were expected to pay more attention to bike-related actions such as avoiding hazards along the street (A2), an expectation that is not supported by the final data; both groups were equally good, or bad, at avoiding hazards (B6) and reaching the bonus round (B7). Moreover, both groups were also equally good at annoying subscribers by crashing their windows with newspapers (B4).

What do these results tell us, what conclusions can be drawn? Not many conclusions, unfortunately, since it can be questioned whether the difference between the two groups in fact can be ascribed to the gamepad’s and bike’s different affordances. As already discussed in the previous section, subjects participating in this study were people who frequently play computer games, which suggests they are familiar with a gamepad and its functionality. A bike, on the other hand, is a control device the participants had not encountered in a playing situation before, which most
likely had a huge impact on the final results. As one of the participants pointed out, “Fun but difficult. You had to pay so much attention to the game controller that other game aspects took a back seat”. Comments from participants also suggest that successful gameplay in Paperboy has more to do with players’ ability to memorise the different routes than with the control device used in the game. The issue becomes even more interesting if we consider the affordance concept’s analytical limitations in explaining how players perceive and respond to the game environment (cf. discussion in Chapter 5). There were also other (unexpected) aspects and events influencing the participants’ actions during the game, thus making the final results less impressive than they actually might be. These unexpected events taught me a number of valuable lessons though.

First of all, pick a game with as few bugs as possible. The game used in this study had a couple of bugs, for instance, players managed sometimes to hit a mailbox with a newspaper and yet they did not get any scores for it. Instead the newspaper often made its way over to the customer’s window, resulting in a lost customer. Those cases were not included in the results, for obvious reasons. Secondly, do not trust your subjects to not tell their friends about the game. Many gamers enjoy competitions and like to show off, which can affect your results in unpredictable ways, but at the same time it illustrates how much even a single player game is affected by sociocultural factors. If you look at the results in the gamepad group

Table 4: Performance. The table shows how often the participants in both groups performed one of the activities listed below; considerable differences are marked with the ✓ symbol. A detailed list with the participants’ individual results can be found in Table 11 and 12 (Appendix A.3, pp. 176-177).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Gamepad</th>
<th>Bike</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Σ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper delivery</td>
<td>3977</td>
<td>205.1</td>
<td>2051</td>
</tr>
<tr>
<td>Hit mail box</td>
<td>748</td>
<td>✓</td>
<td>33.1</td>
</tr>
<tr>
<td>Hit non-customer’s window</td>
<td>283</td>
<td>✓</td>
<td>6.7</td>
</tr>
<tr>
<td>Hit customer’s window</td>
<td>135</td>
<td></td>
<td>15.3</td>
</tr>
<tr>
<td>New newspapers</td>
<td>473</td>
<td>✓</td>
<td>6.0</td>
</tr>
<tr>
<td>Crash with object</td>
<td>732</td>
<td></td>
<td>72.8</td>
</tr>
<tr>
<td>Bonus round</td>
<td>94</td>
<td>9.1</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>397.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>74.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.3</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>47.3</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>73.2</td>
<td></td>
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<tr>
<td></td>
<td>9.4</td>
<td></td>
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</tr>
</tbody>
</table>
you might notice an increasement of players’ performance in delivering newspapers and crashing non-customers’ windows. Even though participants were asked not to talk about the study with their peers, the results tell us a somewhat different story; it seems some of the participants spent a little time practising beforehand. Thirdly, a 20 year old game works fine with 20 year old control devices, not with fancy new technology. The game, as mentioned earlier, has a few years on the back, which did not always go along well with the exercise bike. Participants complained repeatedly about a gap between what they saw on the screen, and what the bike actually did. Also, the game did not allow participants to save their current game status which forced them to start the game all over every couple of turns, leading to frustration and annoyance; some players simply stopped playing after a while. And finally, what you see is not always what you get, which became apparent in an occasional black screen during the analysis of the data material. Even though my eyes never left the computer screen during the video recordings, it happened that only a black screen was visible during the analysis, which is likely the result of a bug in the recording software.

7.3 Analysis Revisited

Without doubt, a few things in this study should not have happened. However, it does not mean there are no valuable points to be drawn from it. The results have shown that there is more to understanding gameplay than a game’s content and its control devices, as gameplay activities also are shaped by elements such as other people, prior experiences, and one’s own expectations. Moreover, terms like ‘natural’, ‘intuitive’, or ‘authentic’ can be called into question here; the fact that certain game controllers feel natural to you or me is not enough evidence on which to base a claim of truth or generality. For instance, one of the participants in the gamepad group almost immediately took off his shoes and lay down on the sofa, then moved the candy bowl I put on the sofa table earlier, within an arm’s reach and started playing. Contrary to my earlier assumptions and expectations, this looked more ‘natural’ and ‘authentic’ than any of the bike group’s playing sessions. And this brings me to two other points. For one, the focus in this case study was almost entirely on participant’s on-screen activities and experiences, except for the general sweeping assumption that what you do in a game essentially boils down to what a game controller
affords you in terms of possible actions, which was doomed to failure from the start. As discussed in Chapter 5, the affordance concept alone cannot explain how we perceive the game environment, which is clearly illustrated by the fact that I had to explain to the participants how the bike worked, and when and where they had to press a button. For another, there was the underlying assumption that more ‘natural’ interactions with games are somehow better. I have not been alone in thinking this, though, as other researchers buy into the same fallacy, as vividly illustrated by the following quote:

Articulating dance with game play similarly explodes discourse of video gaming as a disembodied activity; the stereotypical image of the video gamer slouching sedentary on a sofa is completely undone by the notion of a video game that instead requires players to engage it with a locomotive, kinaesthetic, rhythmic, and wholly corporeal whirlwind of movement (Behrenshausen, 2007, p. 342, about the dance and rhythm game DDR).

Embodied gameplay is reduced here to visible body movements, with the unspoken implication that only this kind of corporeal gameplay is the ‘real thing’. However, as discussed earlier, in Section 4.2, embodied gameplay entails more than what we can observe from the outside, that is, someone slouching on a sofa while playing is not less embodied than someone who is moving in more energy-intensive ways. The question that arises now regarding future investigations is how we can capture and explore low-level phenomena in gameplay, if we do not want to limit ourselves to its most obvious, visible aspects, as important and influential they may be.
PLAYING COUNTER-STRIKE

In recent years, a growing number of scholars in the field of game studies has acknowledged the need for player-centred approaches (e.g., Ermi & Mäyrä, 2005; Linderoth & Bennerstedt, 2007). Considering the almost exclusive focus on formalistic approaches in earlier years, this development represents a critical step towards understanding players’ actual gameplay activities. Nevertheless, a fruitful player-centred approach remains elusive and presents a formidable challenge for anyone interested in studying people’s everyday play. Should we concern ourselves with the actual activity of playing a game, with the ongoing activities visible on the screen, with people’s feelings and subjective experiences as they play, or with questions about why many people are active in communities discussing their favourite games? Many researchers’ take on people’s gameplay activities focus on the relationship between game design and player experience (e.g., Newman, 2002; Lazarro, 2004; Ermi & Mäyrä, 2005), and they therefore risk loosing sight of the fact that gameplay in many cases takes place in a context created and shaped by many actors and interest groups.

The latter is particularly true in the case of Counter-Strike (2000), one of the most popular FPS games around. The game’s popularity and success, and the culture that formed around it, has made Counter-Strike (CS) an interesting if challenging research object (e.g., Manninen, 2001; Wright et al., 2002; Hahsler & Koch, 2004; S. Reeves et al., 2009). It leads to questions such as: What are the factors that make playing CS such an engaging and meaningful activity for the players and their fans? How has the CS scene evolved and what drives its development? These questions are particularly interesting given the option for CS players to turn a mostly individual leisure activity, something that is done for fun and amusement, into semi-professional work with an emphasis on team play. Along with
Figure removed due to copyright reasons.

**Figure 10:** Three circuits of interactivity and the contradictions within them, as described by Kline et al. (2003, p. 54). According to this model, the interactive gaming experience is the result of three, interrelated circuits of interactivity – marketing, technology, and culture. In each circuit, three positions relating to production, commodity, and consumption are presented as important objects of study. The same position in different circuits can sometimes refer to the same actor, for instance, players as consumers and users.

The increasing popularity and professionalism of e-Sports, gameplay in CS has also undergone changes that impose new requirements on players. The cooperative nature of playing CS and the cultural complexes of the CS scene make the game a particularly inviting setting for questions that go beyond game design and the performance of individual players; few if any other computer games attract similar levels of interest from players, e-Sports organizations, and sponsors.

The theoretical framework developed by Kline et al. (2003) provided the initial inspiration for our discussion of gameplay in COUNTER-STRIKE (cf. Figure 10) since it goes beyond the common designer-player dichotomy and also includes a description of how cultural forces influence the meaning and perception of games. According to Kline et al., the interactive gaming experience is the result of three connected circuits of interactivity: marketing, technology, and culture. In each circuit, three positions relating
to production, commodity, and consumption are presented as important units of analysis; the same position in different circuits can sometimes refer to the same actor, for instance, players as consumers and users. The aim in this case study was to capture the overlap and interplay between these three circuits of interactivity in COUNTER-STRIKE, and to focus on the players’ gameplay without sidestepping technological, economical, and cultural aspects of their playing activities. However, even though Kline et al.’s model was used as an inspiration, and to some extent also as an analytical tool, it is not necessarily a good example of the sought after player-centred approach. In their model, the emphasis is on production and commodity, and not so much on consumption. Also, gameplay in this model corresponds to the interactive gaming experience which is not primarily understood as players’ interactions with the game. Rather, it is viewed as a relationship between players’ actions in the game and cultural, economical and technological forces underlying game design, people’s perceptions of the game, and many other factors.

8.1 Method & Setting

From a methodological standpoint there are at least two ways of studying and understanding gameplay. On the one hand, there is the handling of the game, i.e., the actual physical activity of playing the game. On the other hand, we have players’ meaning-making activities, i.e., their understanding of the game in terms of how the game is to be played, their role in the game, and the culture which has developed around the game (cf. discussion in Chapter 3). This is an analytical distinction since in practice both elements are closely related; the handling of the game has an impact on players’ understanding of the game and vice versa. For instance, our study has shown that players who become better at handling COUNTER-STRIKE start taking playing activities more seriously which ultimately leads to more practice and higher levels of proficiency. Moreover, computer gameplay is not only the result of players’ immediate actions in the game, but is also affected by many other factors since it takes place within webs of social and cultural practices (cf. Part ii and Kline et al.’ model 2003). In the case of e-Sports, for example, gameplay is strongly shaped by fans, and e-Sports organizations and leagues in a process of increasing professionalisation, similar to processes that can be observed in other sports such as the Olympic Games and World Championships. It
Figure 11: Gameplay in COUNTER-STRIKE can be viewed as a mosaic of interdependent patches that derive from different stakeholders’ practices. There is the individual player and his actions in the game (1), but to understand his actions we also need to consider the interactions within his clan and the clan’s interactions with the opposing team (2), the game itself (3), the discussions taking place on various community websites (4) as well as direct and indirect influences of fans, e-Sports organisations, and the media (5).

is a sometimes painful process where broadcast companies and remote audiences can make demands on a game or sport that are at odds with the wishes of the athletes themselves.

To think of gameplay as a sociocultural practice has significant implications for how to approach it empirically. This study has largely been inspired by distributed cognition and cognitive ethnography (Hutchins, 1995, 2003) as well as critical discourse analysis (Barker, 2001), which allowed us to capture much of the dynamics and complexities of gameplay in COUNTER-STRIKE. To understand gameplay it is necessary to pay attention to more aspects than those implied in the gameplay, game world, and game
structure categorisation (cf. discussion in Chapter 3, p. 23). In the case of CS, these include community sites, e-Sports leagues and organizations, as well as players’ cultural backgrounds, i.e., gameplay in CS is the result of and builds upon different stakeholders’ multi-layered practices. This is graphically illustrated in Figure 11 where gameplay in CS is depicted as a mosaic of interdependent patches which derive from different stakeholders’ knowledge, attitudes, and cultural practices.

Setting the Scene

Counter-strike is a FPS game in which a team of counter-terrorists is pitted against a team of terrorists (cf. Figure 12), where each team typically consists of five to eight players (teams in CS are usually called clans by the players themselves; I will use these two terms interchangeably). Each round of competition is won by completing an objective (e.g., placing or defusing a bomb), or by eliminating the opposing force. CS may be played via LAN or Internet. Each player generally starts with a certain amount of money and ammunition, a knife, and a pistol. Before a round begins, both teams are usually given a few moments to buy ammunition and weapons. During this interval, neither team can attack the other, or make any other moves. Once a round has ended, surviving players can keep their remaining ammunition and weapons, while those who died have to start over. Communication is usually facilitated by Voice over IP software where players wear head-sets and integrated microphones.

The material for this case study was primarily collected at the World Cyber Games (WCG) 2006 in Monza, Italy. WCG represents one of the world’s largest e-Sports events and has frequently promoted itself as the virtual equivalent of the Olympic Games, with the caveat that everything works on a much smaller scale (for impressions from the event, see Figure 18, Appendix B.1). The 700 participants at WCG’06 competed in eleven different games, of which Counter-strike was the only team-based game. A large part of the collected material is based on interviews with 34 semi-professional and elite level clan members between 19 and 25 years of age; to interview both elite and non-elite CS players is a good way to get an overview not just of the game, but also the wider CS scene. The players we interviewed were all male since e-Sports at present is an overwhelmingly male domain (cf. Bertozzi, 2008), and WCG’06 was no exception. The players came from nine countries on three continents (Australia, Asia,
Figure removed due to copyright reasons.

**Figure 12:** *Counter-Strike* is a popular *FPS* game in which a team of counter-terrorists is pitted against a team of terrorists, where each team typically consists of five to eight players. Each round of competition is won by completing an objective (e.g., placing or defusing a bomb), or by eliminating the opposing force. ©Valve Software

and Europe) and were among the very best in their respective countries. However, since the quality of the *CS* scenes in the different countries varies a lot, the players had varying hopes and expectations regarding their participation in the tournament and their overall future in gaming. The interviews were carried out in a semi-structured manner where an interview guide was used, but we also took the chance to pose follow-up questions whenever something especially interesting caught our attention.

The *video recording of a match* took place during the semi-final between the Swedish team *NiP* and the Finnish team *hoorai*. Synchronising the video with what was happening on the computer screens was not possible since access to the computers was restricted to officials working for *WCG*. Consequently, the on-screen activities could not be included. Furthermore, only one of the teams could be videotaped as the teams played on opposite
ends of the room. Naturally we chose to videotape the Swedish team since it allowed us to follow their in-game chat.

We have furthermore talked to CS players in Internet cafés in Germany and Sweden as part of a pre-study to this project, and visited national and international fan and community sites. The main focus, however, was on one particular site, fragbite.se, a Swedish news and community site that reports from the national and international CS scene. Fragbite hosts a lively community and is generally considered to be the best CS site in Sweden. As part of this case study we have performed a critical discourse analysis (Barker, 2001) of how the professional organizations and the multi-national companies’ interest in the scene is valued and used by the community members in their understanding of what the game means to them, a detailed account of which can be found in Peter Jakobsson’s discussion (2007). We also happened to meet the four writers Fragbite sent to Monza to cover the WCG competition, which gave us a chance to get more insight into the community site’s targeted audience. Last but not least, we also played COUNTER-STRIKE ourselves since first-hand experiences are helpful, or perhaps necessary, to understand and interpret players’ experiences (cf. Aarseth, 2001).

8.2 Analysis & Results

The interviews were transcribed, then categorised using affinity diagrams (Beyer & Holtzblatt, 1998), in which interesting sound-bites and details are recorded on cards or notes (or, in our case, post-it notes), related items are grouped, and the cards continue to be sorted until all of them are in one or another group. The analysis of the transcriptions resulted in approximately one post-it note per minute of interview, or 500 post-it notes overall, which were hung on walls and on colleagues’ office doors until they finally came together into a set of categories (Figure 21, Appendix B.1). During the analysis, items were clustered according to similarities in the given answers which resulted in a number of categories that were formed so as to preserve and reflect the views and opinions of the players. In addition to expected categories, according to the questions asked, we also found several other categories that emerged from the analysis of the transcribed interviews. Not all of the categories can be listed here, but a non-exhaustive list of category examples is provided in Appendix B.3.
The 28-minute video recording has been of limited relevance for the analysis, however, as the quality of it was quite poor because of bad light and sound conditions during the recording. It was very crowded at the time the match was videotaped (after all, it was the semi-finals) and, as mentioned earlier, access to the playing area was restricted with the result that mostly only the in-game chat of the player closest to the camera could be deciphered. This players’ colourful way with words almost made up for the disappointing quality of the video recording, though...

The empirical material was analysed with regard to the respective roles of players, users, and consumers (cf. Kline et al., 2003), in an attempt to develop a player-centred approach to digital games. The analysis revealed elements shaping gameplay on four analytical levels: (1) player actions during play, (2) interactions within and between teams, (3) players and fans on the Internet, and (4) the CS scene as a whole.

8.2.1 Player Actions During Play

The interviews revealed that playing style in Counter-strike evolves over time; what generally began as an individual leisure activity – something done just for fun – has for these players gradually turned into (semi)professional work with a clear emphasis on team play. In the beginning, most play is “learning by doing”, focusing on individual skills like aiming a weapon and shooting. By playing on public servers, players new to the game get in contact with more experienced players, thereby getting to participate in some of the CS community’s activities (cf. Section 4.2.2). Over time, the players gradually advance from newbies to increasingly expert players. A prerequisite for the transformation from leisure activity to (semi) professional play is also the design of the game. It affords competitive play by rewarding fast reflexes, good manual dexterity, and excellent hand-eye coordination. As one player said, “CS is the first game I played and the competitiveness kept me in it”.

The development of more complex team-related skills is closely related to players’ identities as (semi) professional players and usually coincides with joining a particular CS team, or creating one. New players are randomly assigned to any team on the public servers that host CS, which makes any kind of serious team play more or less non-existent. Under such conditions, communication is understandably sparse and strategies and tactics fairly simple. Playing in a clan, on the other hand, requires new
levels of skills and understanding from players, and the better they become at handling the game the more seriously they take their playing activities. The emphasis thus changes from individual to team play, and skills such as good communication, and the ability to adapt to changes in the clan's line-up and opposing clans’ strategies and moves, become increasingly important. Players come to view themselves not only as individual players but also as team players who know that everything they do most likely will have an impact on the other team members. Competing in local tournaments starts to shift the activity from leisure to (semi) professional work and once players have won their first tournament they want more. As one player pointed out, “when we won we thought that we could achieve more and we started to play more”.

When players join a clan their individual playing style has to match the clan’s style as a whole. Players take on different roles with respect to the clan’s line-up, and the agreed-upon strategies and tactics. Players’ individual styles are nonetheless also a result of their style and activities from before they joined the clan, and a player who has played a lot on public servers will probably have a more aggressive playing style. The reason for this is that players on public servers usually play alone and focus is therefore much more on individual skills such as aiming and shooting. Another factor shaping gameplay in CS is the equipment, for instance, good headsets allow players to locate the direction of explosions in the game. Choice of equipment is also a matter of personal preferences where players need to feel comfortable with their equipment. Some players go further and develop emotions for their equipment, perhaps also with a hint of magic thinking; one player had used the same mouse pad for three years, bringing it with him to every match, and it shows (Figure 22, Appendix B.3). Most professional players, however, do not put too much faith into the connection between equipment and performance. They instead believe that good individual skills and skill sets required for successful team play are much more important than equipment. Some hinted that part of what it means to be a professional player is to be able to perform well with any type of equipment.

However, as video recordings and interviews revealed, configuration of the equipment does have an important impact on gameplay in CS. This has little to do with players’ beliefs or feelings. Instead, it has to do with the isomorphism between how the physical environment is configured in relation to the in-game environment. The typical line-up at a tournament
consists of five players sitting in a row next to each other. Players can thus make use of the screens of the players sitting next to them as well as their own; instead of asking for others’ in-game locations and actions, they can simply glance sideways and see what is going on at that very moment. The team’s virtual line-up in the game is mirrored in its physical line-up, which in all teams is pre-determined both for practice and for matches. This is a good example of how players escape their virtual confines and take cognitive advantage of the physical and social game environment (cf. Section 3.2.2 on page 33, and Section 4.2.1). However, both the interviews and the video recordings revealed also the importance of knowing the CS specific language and speech (cf. Wright et al., 2002). That is, as in many other subcultures, CS has a language all of its own, and it is essential that every team member masters it. For instance, strategic requests such as “flash against B” and “smok’em” need to be followed immediately without time for conscious reflection. The analysis of the in-game chat during the match between Ninjas in Pyjamas (NiP) and hoorai clearly shows the importance of this. COUNTER-STRIKE is a game played under extreme time pressure, requiring the computer screen to be kept under constant focused attention. The players within a team do not have time to communicate with each other except through direct speech. It is not always practical, for example, to glance over at the contents of neighbours’ computer screens, and good communication becomes even more critical when team members are distributed over multiple locations and time zones. As one player remarked, “when you play together on-line, you talk more to each other, because when you play co-located you can look at each others’ screens”.

Importantly, the organisation of tournaments can also have an effect on ongoing matches. As excited and passionate as players might be, if the hardware does not work as supposed to, no regulations for breaks exist, and players often are expected to travel from tournament to tournament without any rest and recovery time between them, it is hardly surprising that players can end up feeling exhausted and frustrated.

8.2.2 Interactions Within and Between Teams

The content and inherent rules in COUNTER-STRIKE might seem to suggest that the most important skills players need to develop are fast reflexes, good manual dexterity, and excellent hand-eye coordination. The interviews revealed a different picture, however, showing that the handling of the
game and players’ meaning-making activities are closely interrelated. As a player joins a team, new levels of communication and strategic thinking are required, skills that to some extent develop through the interaction with more experienced players in the team, and also as teams play against other teams. As one of the players expressed, “The strategies you use depend on which team you play against”, which indicates a close, mutual learning-teaching relationship between players (teams) and their opponents. This can also indicate that the choice of strategy is a matter of adaptation, but adapting to another team is also a matter of learning – teams learn how other teams play and thus acquire new strategies. The interviews also showed that advanced players find individual skills, such as fast reflexes and excellent hand-eye coordination, quite overrated in comparison to other skills they need: the ability to communicate well as members of a team, to grasp the finest details of the game, and to adapt to the opposing team’s strategies and moves. As two players pointed out, “understanding of the game is more important than a good aim” and “a smart team wins over a team that aims better”.

Grasping the finest details of the game means, among other things, knowing all about the financial system in CS, the different kinds of weapons, and the different types of maps, all of which are clearly shown by the transcripts. Most important, however, is knowing which strategies to use depending on the situation. Decisions must be made nearly instantaneously under constantly changing conditions, requiring players to know strategies and moves by heart. The only way to achieve this is for players to constantly be simulating different strategies and their possible consequences – a good example of a highly dynamic perception-action cycle (cf. Sections 3.2.2 and 4.2). In team situations, knowledge of strategy is useless without joint understanding; the ability to play as a member of a team is more important than individual ability. Players need to understand how the consequences of their actions will affect their team members at least as much as how they will affect their individual contribution to the game. Good CS players have developed skills to deal with the rapid pace of change as, for instance, changes in a team’s line up will, in most cases, lead to modifications in strategy and communications.

In CS, advanced players are the most important source of information for inexperienced players (even though these players are not always good at communicating their experience and lessons), i.e., learning takes place in a community of practice (Lave & Wenger, 1991) where new players grad-
ually advance from newbie status to greater levels of expertise and more central positions in the scene (cf. Section 4.2.2). In addition to playing with and learning from better players on public servers, inexperienced players also watch matches of more experienced and successful teams (cf. S. Reeves et al., 2009), and use various forums to discuss the game with other (more experienced) players. Events like WCG are considered an excellent opportunity for players to learn from more experienced players. Of course, in games like COUNTER-STRIKE, we must consider the terms ‘learning’ and ‘teaching’ carefully since the relationship between players is not the sort commonly observed between teacher and student in traditional educational environments. For starters, the role of teacher or learner is never taken on explicitly, and players constantly switch between the two roles, often playing both roles at the same time. In formal learning situations, on the other hand, the different roles of teacher and learner are always explicit and generally quite stable, with many predefined assumptions and expectations. Teachers and learners in such situations typically have different learning goals (cf. Gee, 2004a), whereas in CS, players are all striving towards the same goal which, of course, can change from time to time (e.g., becoming better players or reaching the finals in a tournament). Such informal learning methods as one finds in CS facilitates players’ development both on individual and team level, and can eventually lead to top-level play. The players themselves seem to prefer the term ‘mentorship’ though, most likely to emphasise the fact that top-level play in CS is not only about learning the right strategies and moves. As mentioned at the e-Sports workshop, new players tend to shoot their mouth off and like to challenge the better players. That is why more experienced players deem it necessary to “put them into place”; it is easy to beat a good player once, but the real challenge lies in staying on top for a very long time and learning to deal with disappointments and failures. As pointed out by a manager, e-Sports organisations face a similar challenge as “young [CS] players are hungry to get on top” and usually do not understand what it entails which, in the worst case, can result in the loss of substantial amounts of money.

A CS team is not one big social mesh though; social interaction within and between teams are crucial for the development of players’ skills but players also need to achieve a level of proficiency and independence as individual players. As one player pointed out, “you must be able to play independently, you cannot ask the others all the time”. This seems to be attained the longer a person plays CS, i.e., interaction and exchanges with
other players are necessary to develop a greater level of independence as a player. The close (learning-teaching) relationship between players in a clan can nonetheless also become a source of potential emotional conflict; players who want to become successful in the CS scene must at some point leave their friends and old team behind to join a better team. It is unusual that the whole team and each player become better at the same pace, and the conflict between friendship and career could be seen as part of the prize to be paid for the professionalisation of the CS scene.

With the increasing professionalisation of the CS scene, one would think that teams spend a lot of time practising. Surprisingly, this is not the case – apart from the teams who think they have a reasonable chance of winning the prize money. Practice usually consists of playing against other teams and discussing strategies and tactics within the team. Most teams we talked to practice just enough to qualify for different events – and might not practice at all if there are not any serious opponents in their country. However, the latter might have changed a bit in recent years since it was pointed out at the e-Sports workshop that “everyone just practices their hearts out, unlike just a few years ago”. When they practice, most teams prefer to meet physically and play matches against other teams over the Internet. Only teams whose members live far from each other, or cannot afford to travel, practice online. Practice is also related to the infrastructure in a country. Ping-rate or network lag is a crucial factor in CS and teams that do not have access to fast interoperable Internet connections (e.g., India) are practically barred from playing against other teams online and are thus severely limited in their choices of sparring partners. A team that has limited opportunities to practice against other teams, or limited opportunities to meet physically and practice together will tend to develop more slowly no matter how good the team might be theoretically. This suggests a kind of network effect in terms of a close learning-teaching relationship within and between teams, as well as the importance of factors such as broadband penetration and telecommunications infrastructure.

8.2.3 Players and Fans on the Internet

As with many other popular computer games, there are countless community sites dedicated to COUNTER-STRIKE. The game’s connection to the e-Sports scene does, however, make a noticeable difference; many CS clan sites can best be described as fan sites whereas other sites are dedicated to
presenting results and interviews with players, and still others offer commercial gambling activities. Characteristic for most of these sites is that they are maintained and supported by people who play(ed) CS themselves, which can be considered a textbook example of collective intelligence in a game community (cf. Section 4.2.1).

Fragbite is the most popular Swedish news and community site and it reaches a large part of the Swedish CS scene. It started in 2002 and its archives tell the story of both the Swedish and the global CS scene. In our analysis we focused on

- discussions about how CS should be played, and how the activity of playing is valued and understood by community members, and
- how these ideas, opinions and values form discursive identities which players can draw upon in their attempts to make sense of their own playing activities.

Two dominant discourses of identity on Fragbite are couched in terms of professionalism and athleticism. A professional identity is very important to community members as the community wants to establish itself as serious, dedicated, and mature with a clear goal and purpose in mind; the conversion of leisure activity into an accepted sport with chances for practitioners to make a living off of playing the game. Appeal to excellence, physical fitness, endurance, practice, and hard work constitutes the basis for a discourse of athleticism.

The two discourses of professionalism and athleticism might, or might not, be dominant in the CS scene as a whole, but they are nevertheless important to the overall evolution and professionalisation of CS. Discourses of professionalism and athleticism also constitute powerful counter-discourses to prevailing opinions about the dangers and consequences of computer games. A good example of the latter is an article about the computer festival Dreamhack (dreamhack.se) in one of Sweden's biggest newspapers, where the event is described as a “computer game convent but also a ghost fair, for the image here offered is a horrifying vision of humanity's future: cybernetic and withered, rushing and snorting across an artificial savannah” (Spjut, 2006). The discourses of professionalism and sport transform the activity of playing a computer game into work rather than play. This connection has been noted also by others (Fromme, 2003; Taylor, 2006; Yee, 2006), but rarely in the highly positive manner offered by these player-created discourses. The connection between work and
play is here used to invert the image of the “horrifying vision” above, into something that borrows both from the bureaucrat and the entrepreneur; planned and diligent work combined with expansive visions for the future. The common image of the couch potato “wearing thick, unflattering spectacles, overweight, pale, pimply skin, poor fashion sense [bodies] soft, not hard, from too much physical inactivity and junk food” (Lupton, 1995, p. 102), is countered by creating a connection between traditional sports, health, physical fitness, and e-Sports.

There is resonance between these discourses (from the Swedish CS scene) and the WCG. As apart from most other tournaments, WCG invites only one team from every nation – mimicking the Olympics. This is the reason why some teams practice little and settle for qualifying to the event (see above). Something all are well aware off is that the skills, experiences, economical conditions, and opportunities for practising vary widely between teams. Every team knows how far their country has come in the process of professionalising e-Sports and steps needed to be taken by players, sponsors, organizations, broadcasters, and even governments. Some realise that they will never be able to play professionally in their home country and dream about moving abroad to pursue a carrier as a professional player. Players also recognize the need to sell themselves as players and their teams to sponsors, and to work hard to show off their professionalism. While most players claim that recognition from other players is the most valued form of recognition (e.g., by winning tournaments), having a professional web page and cultivating a public image for your team is also recognised as important means to reach out to fans and potential sponsors. One informant even suggested that keeping a strict diet is important as sponsors want their teams to look good and to be in good physical shape.

8.2.4 The Counter-strike Scene

Having discussed individual players, interactions within and between teams, and the role of fan and community websites in CS, it is now time to take a step back and look at the CS scene as such. The usage of the term ‘scene’ is somewhat problematic, though, since it is difficult to know where such a scene is located and who is part of it (cf. Hesmondhalgh, 2005). Whilst acknowledging the problem, we used the term in this case study to refer to those people who are actively involved in activities centred
around the game and the places where these activities occur. In this regard, a distinction is made between 'national scenes' and 'the global scene'.

There are several competing organisations that would like to call their tournament 'the world championship of computer games'; for instance, the Electronic Sports World Cup (ESWC) which is hosted by a French company; the Cyberathlete Professional League (CPL) and the World Series of Video Games (WSVG) with presence and operations in North America, and the WCG that is run by a South Korean company. While these are the biggest actors on the scene, there are several other organisers of international tournaments and many more that organise national or local tournaments. Top teams on the global scene often practice against teams from other countries so as to get the best opponents. It is rare with national scenes that can support several teams competing on the highest international levels. The best players in a country often get recruited into the two or three top teams in that country. Since low ping-rate is crucial when playing against other teams over the Internet, teams tend to practice within the same region, for instance, the Nordic countries and the Baltic States, eastern and middle Europe, South-East Asia etc. Players reported that this leads to the adoption of different playing styles in different regions and the Australian team claimed that there were even distinct playing styles in different parts of Australia. The teams with the most experience from the international scene instead claimed that there were no discernible differences any longer. It seems that among the teams that constantly play against each other in successive tournaments around the world, such differences disappear, whereas the teams that rarely play in international tournaments retain a 'local colour'.

To get recognition on the global (and national) scene it is not enough to be a top CS player, you also have to play in a good team that wins tournaments. Top players ignore online play on public servers and this attitude is found also in Fragbite's discussion forum. The proliferation of LAN tournaments has made them an established way of separating the wheat from the chaff. During the workshop on e-Sports and cyberathleticism, it was mentioned in this regard that experience is the key to successful play since it can take up to over a year for players to find their way around the e-Sports scene. This makes it all the more important that team mates are “on the same page” when playing in public tournaments. It was also mentioned that there are players who do not recognise the chance they get with just being at a tournament, which most likely can be attributed to the
fact that the various CS scenes can look very different; without any serious competition in a country, a team can end up playing at public tournaments even though its members do not play at the same level as the other top teams (cf. Section 8.2.2).

While clans is the most typical form of player organisation and usually consist of five or six players, with no support in terms of administrative personnel or management, the number of e-Sports organisations is steadily increasing. As in other sports, these are run as professional, for-profit organisations, even though they are few in comparison to the number of amateur teams; the proliferation of these organisations is restricted by the number of potential sponsors and the amount of money in circulation. Common to all e-Sports organisations is that teams/players are put under contract, and the need for employees or volunteers who can assist with general logistics such as website maintenance, press contacts, and the organisation, preparation, and coordination of tournaments (see also Görling (2007) for interesting parallels between the professionalisation of computer gaming and the open source movement). At present, sponsors are first and foremost hardware companies such as Intel, Samsung, Microsoft, AMD and ATI. These companies have extensive knowledge about the e-Sports scene as they sell the equipment used in the different tournaments. It is also an effective way to reach out to potential customers, which is not very different in traditional sports. In order to be of interest to sponsors, the e-Sports scene has had to adopt new technologies as well as maintain a ‘business-friendly’ attitude. Finding life-style sponsors, as in traditional sports, can be quite a challenge though as they are often not aware of the e-Sports scene and the money that is in it. Most e-Sports organisations also have little desire to get associated with certain brands and companies (e.g., cigarette and alcohol brands). This is also the case with regard to military sponsorship as the e-Sports scene attempts to get away from the violent picture people have about games, which does not fit well with military operations.

The formation of an audience is another interesting aspect of the CS scene. While the majority are players or ex-players, there are those who follow the scene without first-hand knowledge of playing CS. While small in numbers, the emergence of games broadcasting and coverage of games in traditional media, might eventually attract larger audiences, which the e-Sports scene hopes would gain wider acceptance and credibility in mainstream society. It is the proverbial chicken and egg problem, though. In
order to reach a larger audience, they need more money, but to get more money from sponsors and the like, they need a larger audience. However, live-streaming remains the most important tool in reaching a broader audience, even though there does not yet seem to exist a universally accepted format for broadcasting and commentating on matches. This makes it quite difficult for the uninitiated to understand what is happening on the screen. Another difficulty that arises is the limited access to broadcast licenses which is why usually only the most important games and matches are shown, and CS is no exception. It also costs money to keep many of the amateur commentators in the e-Sports scene; many organisations cannot afford to pay competitive wages.

Also, let us not forget Valve, the company that owns and manages the intellectual property rights to the game. After COUNTER-STRIKE was independently developed as a mod(ification) for the game HALF-LIFE (1998), it was picked up by Valve and released as an official expansion in 2000. The 2003 release of CS 1.6 is the version that is played in most tournaments, even though CS: SOURCE was supposed to replace it after its release in 2004. That would have enabled Valve to resell the same product, only with an updated graphics engine and to a premium retail price. It is not unreasonable to assume that the (hardware) sponsors did welcome the decision as CS: SOURCE required three to four times the computing power compared to the original game. We can, however, deem CS: SOURCE a failure since it is not nearly as popular as the game it was meant to replace. This may change at some point in the future, but the players’ refusal to play upgraded versions of the game has been successful so far, leaving Valve with basically no option but to generate revenue through advertisements in the game (CS-Nation, 2007).

8.3 Closing the Circuit

So far, the results have been presented with regard to the three circuits of interactivity (cf. page 102) with focus on the respective roles of players, users, and consumers and, to some extent, programmers, marketers, and designers. What remains is to bring the different circuits together and to tell a feasible story of how technology, marketing, and culture relate to each other. In this context it is also exemplified where the three levels of situatedness fit in here seeing as gameplay activities cannot be fully understood without them (cf. Chapter 4).
As the metaphor of a circuit suggests, the increasing organisation and professionalisation of the CS scene is not a top-down process but rather the result of constant and complex interactions between the positions in each circuit (production, commodity, and consumption). The content and the inherent rules of the game as well as the player base and various e-Sports organisations and sponsors make these transformations possible. For instance, the game software has been developed taking into account the transformation of Counter-strike into an e-Sports game, a process where different tournament formats and business models have been tried and rejected, and the style of playing has changed over the years. This was also confirmed by one of the players we interviewed, saying that “if you’re away from the game for a couple of months, the way of playing will have changed completely. People come up with new ways of playing all the time.” This example clearly illustrates the importance of low-level and high-level aspects in CS. In order to stay competitive at a top level, players have to remain in a team and keep playing the game, but at the same time they also need to be aware of and know how to successfully manage the tensions between themselves and other actors in the scene (cf. Sections 4.2.1 and 4.2.2).

An example of a positive feedback loop between the positions within the three circuits is the successful attempt to turn CS into an accepted sport. A central discourse at Fragbite is, for example, about how playing CS can be linked to discussions of athleticism in traditional sports, suggesting that the players consider themselves part of a larger community, a community that extends beyond the CS scene. These sentiments are directly mirrored on several e-Sports websites. The WCG proclaim a “healthy cyber culture” as their aim and define the event as “a global tournament in which sport is conducted within the medium of cyberspace, also known as e-Sports”. On another website, a promotion film for Intels’ sponsored clan SK gaming was said to show “the pure sportsmanship and a highly professional attitude of the SK gaming clan” (Game-on.intel, 2007). The different actors here do not exactly match the model’s various positions, however; as always, abstract models need to be adapted when applied to concrete empirical material. For example, most participants in the Fragbite forum best fit the player (consumption) position in the culture circuit whereas those playing for sponsored e-Sports organisations may as well be viewed as marketers who have been recruited to improve the e-Sports movement’s reputation and to act as public representatives for the various e-Sports organisations.
and clubs (marketing circuit; production position). Intel and WCG, on the other hand, do not fit easily into any of the circuits’ positions as they are actors that could be placed in all three circuits, in various positions.

However, the attempts to establish CS:Source as the follow-up to CS 1.6 cannot be considered a positive feedback loop since the circuits’ different positions are pulling in different directions. The production side (marketers, designers, and programmers) is here in conflict with the consumption side (consumers, players, and users), to the extent that there is a latent conflict between marketers and professional players who prefer the older version of the game. And yet it is also an example of how the players’ professional identity has developed in the cultural circuit, following the CS scene’s growth and the higher demands on practice and skills. Players have become much more aware of their ability to affect events such as the WCG since it is the players themselves who insist on playing CS 1.6 at the various tournaments, even though it goes much against the wishes of sponsors and e-Sports organisations. The players prefer the way CS 1.6 feels and operates, and are unwilling to make a switch to something they regard as inferior. The resistance has so far been successful in contrast to how such conflicts usually play out. In MMOs, for instance, players have little choice but to accept an update. However, the negotiations may have to start all over again, as sponsors and e-Sports organisations are trying to reach a larger audience outside established player communities. One of the biggest challenges is to get non-player spectators to understand the emotions and skills displayed in a game, which may have unwelcome consequences for the design and rules of the game. In order to reach larger audiences, it requires games that are ‘easy to watch’ and Counter-Strike is not one of them, unless you have enough experience from playing it.

Interestingly, traditional sports does not seem to have the same problem and it may not only be because of its decades-long head start (make that a centuries-long head start if we want to count the early Olympic games in ancient Rome as well). In traditional sports, even if you do not know much about a sport and its rules, you usually can come to some understanding and appreciation for the athletes’ actions. For instance, in football you do not have to play it to understand what running for 90 minutes, or getting tackled by an opponent, would feel like. That is, when watching a football game, or any other sport, you might be able to simulate prior experiences that to some extent mirror the sports movements and locomotion types you can see on the screen (cf. Sections 3.2.2 and 4.2). In the case of com-
puter games, on the other hand, it is very difficult to simulate such prior experiences if you do not play computer games and cannot see much of the players, with the exception of their virtual counterparts. And even if you see the players, there is not really much to see for you, except for their fingers moving across the keyboard. Their hands alone, however, might not be enough for you to understand the skills displayed on the screen, i.e., mouse and keyboard might have become an extension of the players’ body, but for you, as a spectator, it is quite difficult to establish a connection between physical and virtual game world (cf. Section 4.1).

Concluding Thoughts

In this chapter we have moved between the three circuits of interactivity while discussing some of the cognitive, technological, economic, and cultural dimensions of Counter-Strike. The discussion does not only provide an understanding of gameplay in CS, but also constitutes a qualitative description of how a variety of factors can influence gameplay activities on different levels. Moreover, it illustrates how gameplay can be approached and studied methodologically, and analysed theoretically without losing sight of the fact that gameplay is situated and takes place in social contexts created and shaped by individuals as well as organizational and community building practices (cf. Chapter 4). The situatedness of gameplay becomes evident in all instances of the three circuits of interactivity, including players’ actions during the game, their technology usage, and their interactions, negotiations, and conflicts with the various actors in the scene.
Part IV

CONCLUSIONS
CONTRIBUTIONS & IMPLICATIONS

Without any doubt, the study of computer gameplay activities is of great academic interest and importance, even though we all have diverse ideas on how to approach them. In this thesis, gameplay has been approached from a situated cognition perspective, exploring in more detail how the activity of playing a computer game in many respects is a situated activity, an activity that extends beyond the game interface.

9.1 Main Findings & Contributions

The main contribution in this thesis is a systematic investigation of the actual activity of playing a game in terms of the physical handling of the game, players’ meaning-making activities, and how these two processes are closely interrelated (cf. Chapter 3). This is a unique approach in that it not only addresses the body’s role in gameplay but also examines in greater detail how gameplay is shaped by other factors outside the game, including different kind of tools and players’ participation in community practices. An important step towards an understanding of these key factors has been the consideration of gameplay as a situated phenomenon, which is characterised by the fact that players who actively engage with games are situated in both the physical world and the virtual in-game world (cf. Chapters 3-4). To get a better idea of exactly how players are situated in both worlds, three different levels of situatedness have been identified and described on the basis of existing theories within situated cognition research (cf. Chapters 4-5), and two case studies on two different games have been carried out (cf. Chapters 6-8). To summarise the main findings and contributions in this thesis:
• The detailed examination of the situatedness concept in terms of low-level processes, the here-and-now of a situation, and high-level processes clearly illustrates how the experience of having a body, our interactions with the social and material environment, and the sociocultural knowledge we commonly share, are interlinked in gameplay activities (cf. Chapter 4-5). This view on situated cognition provides us with an analytical tool in the study of human activity and human agency as it highlights the different aspects that need to be taken into account, which in turn allows us to be clearer about our unit of analysis, since no matter how much we want to understand gameplay as situated activity, it would be very hard to include all aspects at the same time (cf. Section 1.1.2).

• The consideration of gameplay as a situated phenomenon strengthens the importance and necessity of taking into account low-level processes in people’s playing activities, i.e., the experience of having a body through which we are directly coupled to the world and perceive constant feedback on actions. Research on games and gameplay is at the moment quite unbalanced in that emphasis, to a large extent, is placed on sociocultural aspects of gameplay activities with little or no attention devoted to low-level processes. The perhaps most important message to take away from this, however, is that low-level processes are not, by any means, limited to visible body movements. As thoroughly discussed in Chapter 4 (and to some extent also in Chapter 5 and 7), the body’s role in human activity and human agency entails much more than what we do with our joints, bones, and muscles.

• The investigation of professional COUNTER-STRIKE players in Chapter 8 enhances our understanding of the e-Sports scene in general, and gameplay in COUNTER-STRIKE (2000) in particular, especially in terms of the physical handling of the game and players’ meaning-making activities. The case study presented here does not only provide insight into how gameplay in CS develops and changes over time, but also how a variety of elements that are not part of the game environment shape players’ understanding of it and their interactions with it.
What implications and conclusions can we draw from all of this? For one, the findings described above are yet another indicator that Huizinga’s *magic circle* (1938), which is supposed to separate the player from ordinary life, in fact does not exist (cf. Section 1.1.1). And neither does gameplay take place within a *bounded space*, as suggested by Caillouïs (1961). On the contrary, when we play games we seamlessly shift between the virtual in-game world and the physical world we live and act in, and our experiences of the physical world make it possible for us to make sense of the virtual world provided to us. It can be a game as simple as Tetris where our experiences of rotating objects in the physical world, and our cultural knowledge of boxes, cartons and such, allow us to understand the inherent rules of the game. Paperboy, on the other hand, only makes sense if we know, for instance, what newspapers are and what the job as a paperboy entails, not to mention that our experiences of navigating through physical spaces (sometimes by means of a map) allows us to find our way around the game’s map-like world. It is important to understand that games are not ‘just games’ as they are always reflections – sometimes accurate, sometimes distorted or simplified – of our cultural background and our (sensorimotoric) experiences of the physical world.

For another, many researchers seem to be at loss when it comes to studying everyday playing activities, gameplay ‘in the wild’ so to speak, with players’ cognitive processes in focus. This is why cognitive scientists are needed here; we might not have all the answers yet, but we are familiar with those issues and can fall back on a large body of theoretical and empirical work that addresses them. For instance, research on games and gameplay deals to some extent also with similar issues as the area of HCI. In recent years, this area has shifted towards considering the situated nature of human computer interactions to a greater extent, and there are theories that are highly relevant, the work of Dourish (2004) being a good example (cf. Section 4.2.1 and Chapter 7). In fact, computer games can be considered good representatives of virtual worlds in general, which have become widely popular in recent years. I would not go as far as to say that virtual worlds is a *new* phenomenon considering the history of games like Pong (1972), Space Invaders (1978), and Pac-Man (1980), however, more and more of these virtual worlds are becoming an important and integral part of our lives, which makes it necessary to understand how they fit in there – cognitively speaking. Furthermore, games in general are considered a driving force of cognitive and cultural evolution (cf. e.g.,
Tomasello, 2003; Murray, 2006) and they are often used in cognitive science to explore diverse cognitive phenomena, as mentioned in the beginning of this thesis, which only leads to one conclusion: computer games are a valuable field of application for current research in cognitive science, or to put it differently, it seems to be time to make them a research object in their own right.

9.2 Reflections & Looking Ahead

As necessary and useful as it is to understand human activity in terms of ‘the situatedness triangle’, as discussed in Chapter 4, it causes us a few problems: how do we exclude something without sidestepping central aspects of the phenomenon we seek to explain? Unsurprisingly, I had encountered this kind of problem in my two case studies, which is why it is impossible for me to make a claim of completeness here. Although both case studies clearly illustrate theoretical and methodological points made throughout this thesis, there are nonetheless important elements missing. For instance, in the CS study it was not possible to analyse the players’ actions in the virtual in-game world in greater detail since access to the computers was restricted. However, since it is impossible to capture all aspects that have an impact on people’s playing activities, it is vital that we maintain our awareness of the elements that are missing, instead of downplaying their importance.

Moreover, a balanced, thorough understanding of gameplay requires more than the mere application of existing methods and theories in the computer game domain. If we are to understand people’s everyday play from a cognitive science perspective we need more intimate knowledge about games than that they are played ‘for fun’, which is quite a limited view to begin with. Of course, this cannot be sufficiently captured by cognitive scientists as such. The field of game studies, on the other hand, with its many descriptive and detailed accounts of computer games, provides us with complementary perspectives for seeing computer games in a variety of ways, and is thus a necessary and valuable complement to the study of gameplay in terms of activity and cognition.

However, the e-Sports scene has not received much attention within game studies and the second case study will hopefully contribute to increased knowledge and greater interest in competitive gameplay from an academic point of view (cf. Chapter 8). Traditional sports is an established
research area, and many similarities exist with e-Sports, but e-Sports faces challenges that are unique to the scene. For instance, issues related to gender need to be highlighted in future work since e-Sports, at present, is an overwhelmingly male domain (Bertozzi, 2008). The players themselves seem to be largely against the idea of female teams and leagues, if the workshop on e-Sports and cyberathleticism is any indication, since cyberathleticism allows players, regardless of gender, to meet on equal conditions. So, at least, in theory. In practice, not so much. Only few female players compete at professional levels, and female players in general are often treated fairly badly in game communities; it can be a reaction to something as simple as asking if other female gamers would have an interest in starting a women-only clan (e.g., Kesler, 2010). Another interesting question related to the e-Sports scene is what makes a game a good ‘tournament game’. COUNTER-STRIKE is an old game, compared to others, yet it is one of the most popular games out there, with a strong culture around it; some players would even go so far as to call it “the ultimate (e-Sports) game”. What does CS have that other games do not?

The players themselves tend to emphasise team play above anything else, and the way they learn from each other and mentor each other (cf. Section 8.2.2). Some players even believe the knowledge and skills they develop will help them get a job in fields where their CS skills are seen as a major bonus (Jakobsson, 2007). No doubt, learning processes play a critical role in gameplay activities, but to what extent learning and knowledge transfer takes place is still open to question. Situated theories to cognition are most prominent in fields such as serious games or digital game-based learning, where the emphasis is on games designed for training and learning purposes; the shift from cognitivism to situated cognition holds important implications for educational practice and research, and cognitive aspects of game play have naturally caught researchers’ attention in this particular area (Gee, 2004b; van Eck, 2006; Steinkuehler, 2008). And yet, something is missing. Kirriemuir (2007) talks about “Groundhog day for games in learning” since many researchers in these areas go on and on about the potential of games in learning without delivering representative, empirical data material. Why is that? Situated theories to learning and knowledge appropriation have been subject to heavy critique, and one of the main critique points has been that these theories sidestep the issues of generality and transfer (Rambusch, 2006). It is argued that the emphasis on the social and tool-mediated nature of learning processes alone does not explain
how, why, and what people learn, and as shown in this thesis, research on gameplay is dealing with similar issues at the moment (cf. Section 1.1.3 and Chapter 4).

Another interesting direction for future work would be recent developments in game technology. Most games discussed in thesis are quite traditional in that our interaction with them is realised via cable connections, which naturally limits our range of motion and perception. This leads to an interesting question: how do recent developments in game technology affect the way we perceive and interact with virtual worlds? As more and more game developers cut the direct physical connection between game and player, we need ways to study and understand such gameplay activities, with the ‘situatedness triangle’ in mind (cf. Chapter 4). A major challenge will be how to capture low-level processes without destroying people's gameplay and gaming experience as not everything can be observed from the outside (cf. Sections 4.1 and 7.3). The latter is closely related to the topic of emotions in gameplay (e.g., Nacke, 2009), which has only been mentioned in passing. As noted earlier, it is still widely debated whether and to what extent human activity depends upon and is driven by emotions (cf. Section 1.2), however, recent research suggests that high-level and low-level processes are important factors regarding emotions (e.g., Niedenthal, 2007; Tracy & Matsumoto, 2008; Ziemke & Lowe, 2009).

Last but not least, the discussion throughout the thesis has shown the importance of a cognitive science perspective on games and gameplay, and one of the major question (for cognitive scientists) is how to proceed from here. Computer games and gameplay can greatly enhance our understanding of the situated nature of human cognition and activity, because when we play games we are situated in two worlds and shift rapidly and seamlessly between them.
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APPENDICES
A.1 Images & Screenshots

Figure 13: Gamepads come in various shapes and sizes. The one shown here is from the Nintendo GameCube (Source: Wikimedia commons).
Figure 14: The bike used in the second case study was a common exercise bike which was modified by one of our technicians. He happens also to be the one on the picture.
Figure 15: The setting in which the first case study took place, with parts of the surveillance system visible in the upper left corner. For the bike group, the sofa had been moved a bit away from the television, and the small table set in front of it had been moved to another room. The apartment-like room is part of the InGaMe Lab Lab at the University of Skövde, Sweden.
Figure 16: Controlling the game with the gamepad. Newspapers are controlled with the right thumb (the red button as indicated by the white circle), the game character’s bike is controlled with the left thumb.
Figure 17: Controlling the game with the bike by switching between the steering axis’ left handle and the newspaper button (the small red button as indicated by the white circle).
A.2 Questionnaire Template

The questionnaire’s original language was Swedish; English translations in italics were added later for non-Swedish speaking readers of this thesis.

**Hur roligt tyckte du att det var att spela Paperboy?** *How much fun was it to play the game?*

1[ ] 2[ ] 3[ ] 4[ ] 5[ ] 6[ ] 7[ ] 8[ ]
Inte alls
Ok
Jätte skoj!

No fun at all
Ok
Great fun!

**Hur ofta skulle du spela Paperboy om du skulle få spelet?** *Would you play the game again if you would have it?*

1[ ] 2[ ] 3[ ] 4[ ] 5[ ] 6[ ] 7[ ] 8[ ]
Aldrig mer
Då & då
Väldigt ofta!

Never again
Now & then
Very often!

**När du spelade spelet, vad var din strategi?** *Ranka nedanstående alternativ: 1 Mycket viktigt – 8 Obetydligt.* *What was your strategy in the game? Please rank the listed alternatives below: 1 Very important – 8 Not important.*

[ ] Få så många poäng som möjligt *(Getting as many scores as possible)*
[ ] Undvika krockar *(Avoiding crashes)*
[ ] Levera tidningen till så många kunder som möjligt *(Delivering as many newspapers as possible)*
[ ] Få så många nya kunder som möjligt *(Getting as many customers as possible)*
[ ] Få bonuspoäng *(Getting bonus points)*
[ ] Utforska spelvärlden *(Exploring the game world)*
[ ] Vinna spelet *(Winning the game)*
[ ] Hämta nya tidningar *(Getting new newspapers)*
Vad upplevde du som svårast i spelet? Ranka nedanstående alternativ: 

I Mycket svårt – 8 Lätt. What was most difficult in the game? Please rank the listed alternatives below: 1 Very difficult – 8 Very easy.

[ ] få så många poäng som möjligt (Getting as many scores as possible)
[ ] undvika krockar (Avoiding crashes)
[ ] levera tidningen till så många kunder som möjligt (Delivering as many newspapers as possible)
[ ] få så många nya kunder som möjligt (Getting as many customers as possible)
[ ] få bonuspoäng (Getting bonus points)
[ ] utforska spelvärlden (Exploring the game world)
[ ] vinna spelet (Winning the game)
[ ] hämta nya tidningar (Getting new newspapers)

Den här studien skall genomföras under en längre tid för att också ta hänsyn till tidsaspekter i spelandet. Är du beredd att delta på fler uppföljningar? This case study is a long term study to take time aspects in game play into account. Would you be willing to participate in follow-ups?

Ja (Yes) [ ] Nej (No) [ ]

Är det något som du vill tillägga? Would you like to add something?
A.3 Collected Data

In this section, the detailed responses and results of all participants are presented. For a full discussion and analysis of the collected data, see Section 7.2 on page 92.

Questionnaire

Table 5 – How much both groups enjoyed playing the game (p. 169)

Table 6 – How often both groups would play the game in the future (p. 170)

Table 7 – Strategy ranking in the gamepad group (p. 171)

Table 8 – Strategy ranking in the bike group (172)

Table 9 – Experienced difficulty in the gamepad group (p. 173)

Table 10 – Experienced difficulty in the bike group (p. 174)

Free-text comments in both groups (p. 175)

Video recordings

Table 11 – Performance in the gamepad group (p. 176)

Table 12 – Performance in the bike group (p. 177)
Table 5: The table shows how much the participants in the gamepad group and the bike group enjoyed playing PAPERBOY. The ranking scale (S) ranged from 1 to 8, with 1 corresponding to ‘not at all’ and 8 to ‘very much’. For a detailed discussion of the results, see Section 7.2 on page 92.

<table>
<thead>
<tr>
<th>S</th>
<th>P1</th>
<th>P2</th>
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<td></td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>
The table shows to what extent the participants in the gamepad group and the bike group would like to play the game even in the future.

The ranking scale (S) ranged from 1 to 8, with 1 corresponding to 'never again' and 8 to 'very often'. For a detailed discussion of the results, see Section 7.2 on page 92.

Table 6: The table shows to what extent the participants in the gamepad group and the bike group would like to play the game even in the future.
Table 7: Strategy ranking in the gamepad group. The table shows how the participants in the gamepad group ranked their gameplay activities. The ranking scale ranged from 1 to 8, with 1 corresponding to ‘very important’ and 8 to ‘not important at all’. For a detailed discussion of the results, see Section 7.2 on page 92.

<table>
<thead>
<tr>
<th>Activity</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
<th>P8</th>
<th>P9</th>
<th>P10</th>
<th>Σ</th>
<th>x̄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting as many scores as possible</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>24</td>
<td>2.4</td>
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<tr>
<td>Avoiding hazards along the street</td>
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<td>1</td>
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<td>2</td>
<td>5</td>
<td>1</td>
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<td>6</td>
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<tr>
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<td>5</td>
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<td>2</td>
<td>34</td>
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<td>Getting as many new customers as possible</td>
<td>6</td>
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<td>8</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>7</td>
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<td>5</td>
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<tr>
<td>Bonus scores</td>
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<td>5</td>
<td>7</td>
<td>4</td>
<td>7</td>
<td>5</td>
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<td>3</td>
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<td>3</td>
<td>46</td>
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<tr>
<td>Exploring the game world</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>8</td>
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<td>7</td>
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<td>5</td>
<td>8</td>
<td>2</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>48</td>
<td>4.8</td>
</tr>
<tr>
<td>Getting new newspapers</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>49</td>
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</tr>
</tbody>
</table>
The table shows how the participants in the bike group ranked their game play activities. The ranking scale ranged from 1 to 8, with 1 corresponding to 'very important' and 8 to 'not important at all'. For a detailed discussion of the results, see Section 7 on page 92.

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting as many scores as possible</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Avoiding hazards along the street</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Delivering as many newspapers as possible</td>
<td>4</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Getting as many new customers as possible</td>
<td>8</td>
<td>4</td>
<td>6</td>
<td>8</td>
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<td>6</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Exploring the game world</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Winning the game</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
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<td>7</td>
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<td>7</td>
</tr>
<tr>
<td>Bonuses scores</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 8: Strategy rankings in the bike group. The table shows how the participants in the bike group ranked their game play activities. For a detailed discussion of the results, see Section 7 on page 92.
Table 9: Experienced difficulty in the gamepad group. The table shows how the participants in the gamepad group ranked the game's difficulty. The ranking scale ranged from 1 to 8, with 1 corresponding to 'very difficult' and 8 to 'not difficult at all'. For a detailed discussion of the results, see Section 7.2 on page 92.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Participants</th>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
</table>
| Getting as many scores as possible       | 3            | 4 | 2 | 7 | 5 | 4 | 4 | 7 | 6 | 46
| Avoiding hazards along the street        | 1            | 2 | 1 | 1 | 1 | 1 | 2 | 4 | 1 | 15
| Delivering as many newspapers as possible | 5            | 3 | 7 | 5 | 2 | 6 | 6 | 3 | 8 | 50
| Getting as many new customers as possible | 6            | 3 | 5 | 4 | 3 | 8 | 7 | 6 | 3 | 48
| Bonus scores                            | 4            | 3 | 6 | 6 | 7 | 5 | 5 | 3 | 6 | 7
| Exploring the game world                | 7            | 4 | 8 | 8 | 8 | 7 | 8 | 7 | 5 | 70
| Winning the game                        | 2            | 1 | 3 | 3 | 4 | 3 | 3 | 1 | 1 | 2
| Getting new newspapers                  | 8            | 4 | 4 | 2 | 6 | 2 | 2 | 5 | 2 | 41

\[ \sum \text{Activity} \]

\[ \bar{x} \]
Table 10: Experienced difficulty in the bike group. The table shows how the participants in the bike group ranked the game’s difficulty. The ranking scale ranged from 1 to 8, with 1 corresponding to very difficult and 8 to not difficult at all. For a detailed discussion of the results, see Section 72 on page 92.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Activity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Getting as many scores as possible</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Avoiding hazards along the street</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Delivering as many newspapers as possible</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Bonuses scores</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Exploring the game world</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Winning the game</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Getting new newspapers</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Delivering as many newspapers as possible</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Getting new customers as possible</td>
<td>5</td>
</tr>
</tbody>
</table>

The ranking scale ranged from 1 to 8, with 1 corresponding to very difficult and 8 to not difficult at all. For a detailed discussion of the results, see Section 72 on page 92.
Free-Text Comments – Gamepad group

Det var kul att få highscore förstå gången, och att lära sig hur spelet fungerar. Jag kände mig mer säker när jag började memorera banorna.

Såg att vinna spelet som något ouppnåligt, därav det höga svårighetsranken och den låga prioriteringen.

Jag är retro-spelare, dvs. jag spelar ofta gamla spel på min fritid. Jag har spelat Paperboy förr.

Tur att musiken är så bra. Spelet är lite buggigt och/eller otydligt. Undrar om spelet är så här svårt i originalutförande.

Free-Text Comments – Bike Group

Roligt men svårt. Man var tvungen att tänka så mycket på kontrollen så att andra spelmoment kom i skymnden (få nya kunder, bonuspoäng). Man vinner mycket på att lära sig banornas mönster och anpassa sig därefter.

Ett väldigt dåligt spel.

Har någon klarat en hel vecka, någonsin? Styret på cykeln lite snett ibland, relativt spelkaraktären.

Med en bättre kontroll är jag beredd att spela mer, annars för svårt och frustrerande.

Jag vill inte spela Paperboy igen dock.
Table II: Performance in the Gamepad Group

<table>
<thead>
<tr>
<th>Activity</th>
<th>Participants</th>
<th>Activity</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper delivery</td>
<td>300</td>
<td>Hit mail box</td>
<td>0</td>
</tr>
<tr>
<td>Hit customer's window</td>
<td>7 3 5</td>
<td>Hit non-customer's window</td>
<td>0 0 4</td>
</tr>
<tr>
<td>Hit mailbox</td>
<td>6 3 5 7</td>
<td>Crash with object</td>
<td>8 7 3 1</td>
</tr>
<tr>
<td>New newspapers</td>
<td>5 7 4</td>
<td>Bonus round</td>
<td>4 1 7 9</td>
</tr>
<tr>
<td>Crash with object</td>
<td>8 3 4</td>
<td>Paper delivery</td>
<td>3 9 7 2</td>
</tr>
</tbody>
</table>

The table shows how often the participants in the gamepad group performed one of the activities listed below. For a detailed discussion of the results, see Section 7.2 on page 92.
Table 12: **Performance in the bike group.** The table shows how often the participants in the bike group performed one of the activities listed below. For a detailed discussion of the results, see Section 7.2 on page 92.

<table>
<thead>
<tr>
<th>Activity</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
<th>P8</th>
<th>P9</th>
<th>P10</th>
<th>∑</th>
<th>̄x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper delivery</td>
<td>132</td>
<td>268</td>
<td>252</td>
<td>154</td>
<td>149</td>
<td>129</td>
<td>174</td>
<td>185</td>
<td>280</td>
<td>328</td>
<td>2051</td>
<td>205.1</td>
</tr>
<tr>
<td>Hit mail box</td>
<td>53</td>
<td>33</td>
<td>37</td>
<td>23</td>
<td>28</td>
<td>53</td>
<td>12</td>
<td>18</td>
<td>19</td>
<td>55</td>
<td>331</td>
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</tr>
<tr>
<td>Hit non-cust's window</td>
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<td>22</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>17</td>
<td>8</td>
<td>67</td>
<td>6.7</td>
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<tr>
<td>Hit customer's window</td>
<td>13</td>
<td>28</td>
<td>9</td>
<td>5</td>
<td>16</td>
<td>13</td>
<td>20</td>
<td>15</td>
<td>21</td>
<td>13</td>
<td>153</td>
<td>15.3</td>
</tr>
<tr>
<td>New newspapers</td>
<td>11</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>11</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>60</td>
<td>6.0</td>
</tr>
<tr>
<td>Crash with object</td>
<td>41</td>
<td>89</td>
<td>78</td>
<td>61</td>
<td>49</td>
<td>41</td>
<td>96</td>
<td>68</td>
<td>110</td>
<td>95</td>
<td>728</td>
<td>72.8</td>
</tr>
<tr>
<td>Bonus round</td>
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<td>12</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>12</td>
<td>16</td>
<td>8</td>
<td>2</td>
<td>91</td>
<td>9.1</td>
</tr>
</tbody>
</table>
COUNTER-STRIKE CASE STUDY

b.1 Images & Screenshots

Figure 18: Impressions from the World Cyber Games (WCG) 2006. WCG represents one of world’s largest e-Sports events and has frequently promoted itself as the virtual equivalent of the Olympic Games, with the caveat that everything works on a much smaller scale. The 700 participants at WCG’06 competed in eleven different games of which COUNTER-STRIKE was the only team-based game.
Figure 19: A COUNTER-STRIKE clan in action. It is the Swedish clan Ninjas in Pyjamas (NiP), playing the finals against Pentagram (Poland) at WCG'06. The clan stopped playing in 2007; by then it was considered to be one of the top teams in the world. It was also a member of the G7 teams, an association of professional e-Sports teams.
Figure 20: Video screenshot from the semi-finals at WCG’06 between the Swedish team NiP and the Finish team hoorai. Only one of the teams could be videotaped as the teams played on opposite ends of the room. Naturally we chose to videotape the Swedish team since it allowed us to follow their in-game chat.
Figure two.fitted/one.fitted: Working with affinity diagrams, as suggested by Beyer and Holtzblatt (1998). Affinity diagrams are interesting sound-bites and details that are recorded on cards or notes (or, in our case, post-it notes). Related items are grouped and the cards continue to be sorted until all of them are in one or another group. The analysis of the transcriptions resulted in approximately one post-it note per minute of interview, or 500 post-it notes overall, which were hung on walls and colleagues’ office doors until they finally came together into a set of categories. For more details about the analysis of the collected material, see Section 8.1 on page 103; for category examples, see Appendix B.3 on page 187.
Figure 22: Equipment matters in COUNTER-STRIKE, even though the opinions held by the players differed on the subject. Some players develop emotions for their equipment, perhaps also with a hint of magic thinking; one player had used the same mouse pad for three years, bringing it with him to every match, and it shows (cf. discussion in Section 8.2.1).
b.2 Interview Guide

The interviews in the second case study were carried out in a semistructured manner. Me and my colleagues used the interview guide shown below, but we also took the chance to pose follow-up questions whenever something interesting or relevant caught our attention. For more details about the case study’s design, see Section 8.1 on page 103.

General questions

Why do you play CS? What made you start playing CS?

How has your development as a CS player looked like until today?

What makes a good CS-player? What does he have to know? What kind of skills does he need to develop? (Follow-up question: what is most important in terms of handling the game and understanding it?)

Can you identify stages (milestones) in your development as a CS-player?

- Which skills did you develop by joining a CS-clan?
- How has it changed your way of playing CS?

Do players in different countries have different kinds of knowledge (skills)? How you play CS – does it depend on which country you from?

What are the differences between a newbie and a professional player?

Has your development come as far as it can get, or is there still something you need to learn, you could be better at?

How has your way of playing CS changed during the years?

How does you future look like as a CS-player?
‘Zen of Unreal’

Which movements are very difficult to learn? Why?

Which movements is common knowledge, which movements can be considered professional (takes some time before one realizes which movements are possible beyond the most basic movements and which can gain you a “bonus”)?

Has there been a situation where you chose a strategy, movement depending on your knowledge about your opponent’s (other clan member’s) constraints related to the use of the keyboard (mouse)?

Would you recognize your friends or opponents in a game even if they use a different name? What exactly is it you recognize?

Virtual Reality vs. Real Life

A problem arises in the VR – how do you solve this problem in the game/outside the game?

What dimensions of a game take place in the real world?

Does your clan prefer a certain way of playing? Online, in the same room?

When you all are in the same room – do you prefer a certain “sitting arrangement”?

Practice

How often do you and the other clan members meet/play to practice?

What is the difference between a practice game and a real game? (in terms of knowledge and skill(s) development)

Does it happen often that you have to practice even though you don’t really feel like it?
How do you motivate yourself even though a practice session might be boring?

**Team play**

Why did you join a CS-clan in the first place?

What is the difference between playing yourself and in a clan?

How many different clans have you joined during the years?

What are the common reasons for one to stay in a clan or to join another clan?

How has your clan’s development looked like?

Can you name/identify stages in the clan’s development?

Has the joining of a CS-clan changed you on a personal level, has it changed the way you look at the world?

What makes a good CS-clan?

Are there still things you could be better at, as a clan?

How does your clan’s future look like?

**Culture**

How does the CS-scene look like in your country?

Are there differences in how people play CS?

Do players in different countries have developed different kinds of knowledge or skills?
B.3 Category Examples

Please note that the categories listed below are not direct quotes from the interviews, but are written as such to better reflect the players’ views and opinions. Furthermore, the categories shown here are intended only as examples, they do not represent a comprehensive or exhaustive list. For a full discussion and analysis of the various categories, see Section 8.2 on page 107.

Playing CS takes time

“You need to attain a good balance between CS and Real Life”

“CS takes too much time”

“There is a conflict between playing CS and other activities”

Recognition

“The only way to get recognition is to win tournaments”

“Image and webpages help to get recognition”

“Online doesn’t count”

Infrastructure matters

“Their infrastructure is better than ours.”

“You need good ping to practice against other countries.”

“Our infrastructure sucks.”
People accept it as long as it “leads somewhere”

“People are curious and think it’s cool.”

“My family is supportive. Now.”

“My parents support me because I get to travel and meet other people.”

This is how we practice

“We don’t practice enough to win international tournaments but to win national qualifiers”

“We only practice before tournaments”

“We arrange our own tournaments to get practice”

Milestones

“Getting introduced to the game by a friend”

“Playing in tournaments”

“Getting recruited to a clan”

Team issues

“The good teams can pick the players they want.”

“It’s stressful to play and can cause conflicts.”

“We have played together for a long time.”
Equipment is important

“You need really good headsets.”

“The use of equipment is also about personal preferences.”

“This is cool equipment.”
Figure 23: Starcraft replay: ToSsGirL vs. Legend (2010). One measure of expertise in this game is manual dexterity and different kinds of tools are used in game communities to log, for instance, keyboard activity and events during a game; this information is often displayed in EEG-like curves. The expert player in question performed an average of 300 APM in a 20 minutes long game; the maximum APM was even higher and reached over 386 APM.
Figure 24: Controlling the game DANCE DANCE REVOLUTION (DDR) (1998) with my feet. Is it a more natural way to interact with a game? The jury is still out on that one.
Figure 25: Example of a motion-sensitive camera device; this particular piece of technology comes with the Sony Playstation 2 (Source: Wikimedia commons).

Figure 26: The *EyeToy: Play* (2003) game collection is controlled with a motion-sensitive camera device by using gestures and other silly movements (Source: flickr.com/photos/libraryman/8244018/).
Figure 27: Boxing tournament in the living room with the Wii Remote and the Wii Nunchuk (Source: flickr.com/photos/vanhuisen/395645803/).