

Linköping Studies in Science and Technology

Thesis No. 1359

# Situated Play

by

Jana Rambusch




Submitted to Linköping Institute of Technology at Linköping University in partial fulfilment of the requirements for the degree of Licentiate of Philosophy

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Linköping 2008



 <b>Avdelning, Institution</b> Division, Department Institutionen för datavetenskap Department of Computer and Information Science		<b>Datum</b> Date 2008-04-11
<b>Språk</b> Language <input type="checkbox"/> Svenska/Swedish <input checked="" type="checkbox"/> Engelska/English  <input type="checkbox"/> _____	<b>Rapporttyp</b> Report category <input checked="" type="checkbox"/> Licentiatavhandling <input type="checkbox"/> Examensarbete <input type="checkbox"/> C-uppsats <input type="checkbox"/> D-uppsats <input type="checkbox"/> Övrig rapport <input type="checkbox"/> _____	<b>ISBN</b> 978-91-7393-930-0 <hr/> <b>ISRN</b> LiU-Tek-Lic-2008:17 <hr/> <b>Serietitel och serienummer ISSN</b> Title of series, numbering <u>0280-7971</u>
<b>URL för elektronisk version</b>		Linköping Studies in Science and Technology Thesis No. 1359
<b>Titel</b> Title Situated Play  <b>Författare</b> Author Jana Rambusch		
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April 2008

ISBN 978-91-7393-930-0

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ISSN 0280-7971

LiU–Tek–Lic–2008:17

## Abstract

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**Keywords:** computer game play, embodied and situated cognition, situatedness

*This work has been supported by the University of Skövde, Tillväxt Skaraborg and Skövde municipality.*

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## Acknowledgements

A sincere thank you goes out to my supervisor Tom Ziemke, for his continuous support and guidance over the years. A special thank you also goes out to Tarja Susi, for her inspiration, support and encouragement as a teacher, colleague and co-supervisor. I'm also indebted to Daniel Pargman and Peter Jakobsson for interesting and stimulating discussions, and fruitful collaborations. Further, this work would not have been possible without the participants in my case studies and the people who contributed to their success; here I want to thank Mikael Lebram especially, one of the technicians at the University of Skövde.

A heartfelt thank you also goes out to my colleagues and fellow graduate students at the University of Skövde, with special thanks to Jessica Lindblom, Henrik Svensson, and Maria Nilsson for the continuing interest in my work and all the discussions we have had.

Last but not least, a big, big thank you to my family and friends for being there for me.



## Publications included in this thesis

- I Rambusch, J. (2006) The embodied and situated nature of computer game play. *Workshop on the cognitive science of games and game play*. Vancouver (Canada), 26th July 2006. (8 pp.)
- II Rambusch, J. & Susi, T. (to appear) Situated play. In: B. Hardy-Vallé & N. Payette (Eds.). *Beyond the Brain: Embodied, Situated and Distributed Cognition*. Newcastle, U.K.: Cambridge Scholars Publishing. (12 pp.)
- III Susi, T. & Rambusch, J. (2007) Situated play – just a temporary blip? In B. Akira (Ed.), *Situated play* (pp. 730–735). Tokyo: The University of Tokyo.
- IV Rambusch, J. & Susi, T. (2007) The Challenge of Managing Real and Virtual Affordances in Computer Game Play. *Game in' Action, June 13-15, 2007*, Gothenburg University (Sweden). (13 pp.)
- V Rambusch, J. (2007) Riding a bike in Paperboy: A case study of embodied human-computer game interaction. In P. Hernwall (Ed.), *The Virtual - Designing Digital Experience, Nr 4:2007*. (pp. 144–151). Södertörn University (Sweden).
- VI Rambusch, J., Jakobsson, P., & Pargman, D. (2007). Exploring e-sports: A case study of gameplay in counter-strike. In B. Akira (Ed.), *Situated play* (pp. 157–164). Tokyo: The University of Tokyo.

## Other publications (work)

- I Rambusch, J. & Susi, T. (to appear) Serious learning while having fun. *Learntec 2007*, 13-15th February 2007, Karlsruhe (Germany).
- II Rambusch, J. (2007) Sikta, skjuta, samarbete. Om att utveckla kunskap i dataspel. [Aim, shoot, and cooperate - about skill development in computer games]. *Unga och nätverkskulturer: Mellan moralpanik och teknikromantik*. Ungdomsstyrelsen, 2007.
- III Rambusch, J. (2006) Situated learning and Galperin's notion of object-oriented activity. In: R. Sun (Ed.) *Proceedings of the 28th Annual Conference of the Cognitive Science Society, 1998-2003*. Mahwah, NJ: Lawrence Erlbaum.
- IV Rambusch, J. & Ziemke, T. (2005) Embodiment aspects in human computer-game interaction. *The European Conference on Computing and Philosophy, E-CAP 2005*. Västerås (Sweden).
- V Rambusch, J. & Ziemke, T. (2005) The role of embodiment in situated learning. In: B.G. Bara, L. Barsalou and M. Bucciarelli (Eds.) *Proceedings of the 27th Annual*

*Conference of the Cognitive Science Society, 1803-1808.* Mahwah, NJ: Lawrence Erlbaum.

- VI Rambusch, J., Susi, T. & Ziemke, T. (2004) Artefacts as Mediators of Distributed Social Cognition: A case study. In: K. Forbus, D. Gentner and T. Regier (Eds.) *Proceedings of the 26th Annual Conference of the Cognitive Science Society*, 1113-1118. Mahwah, NJ: Erlbaum.

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# 1 Introduction

People spend hours playing computer games without getting bored and often without even realising the time spent. The fact that people can get deeply involved, emotionally and intellectually, in such an activity raises questions regarding the nature and potentials of games. What makes computer games so incredibly engaging? What is happening in the minds of gamers? If we are to believe the media and the public opinion, not much. Very often, people's game play is simply portrayed as a fun and often too violent way to make time pass, with the underlying assumption that nothing productive or anything of value can be gained from it. Researchers can take some of the blame for this as one of the reasons has, without doubt, been the noticeable lack of

any naturalistic study of what game-playing experiences are like, how gaming fits into people's lives, and the kinds of practices people are engaged in while gaming. Few, if any researchers have studied how and why people play games, and what gaming environments are like (Squire, 2002).

Research on this topic has significantly broadened and changed in the last couple of years, particularly in the field of game studies (cf., Aarseth, 2001), and recent more careful readings of people's everyday playing activities reveal a much more complex and differentiated picture of games (e. g., Gee, 2004; Prensky, 2004; Salen & Zimmerman, 2004; Bryce & Rutter, 2005). One important fact remains though; so far, surprisingly little attention has been paid to *the activity of playing computer games*, with the players and their actions in focus (cf., Ermi & Mäyrä, 2005). However, there are a few exceptions, such as explorations of creative playing actions (e. g., Wright, Boria, & Breidenbach, 2002), players' meaning-making activities (e. g., Tosca, 2003), and people's social behaviour in games. More recently, there have also been studies on player's skill development (Reeves, Brown, & Laurier, 2007) and their understanding of the game world (Linderoth & Bennerstedt, 2007). It does not erase the fact, though, that people's playing activities and the acquisition and maintenance of skills in game play has received very little attention in the scientific community.

Researchers in the social sciences and educational research would probably vehemently disagree though since a large deal of effort is devoted to the study of the impact of digital games on children's and adolescents' learning performances (cf., Mitchell & Savill-Smith, 2004). However, it is clearly not enough to simply say that games are engaging and that they can be effective, which is often the case in research on digital game-based learning (DGBL) (van Eck, 2006). What we need now is "research explaining *why* DGBL is engaging and effective" and "practical guidance for *how* (when, with whom, and under what conditions) games can be integrated into the learning process to maximise their learning potential" (ibid., p. 18). Moreover, the impact of games specifically designed to enhance learning often does not tell us much about the kinds of knowledge and skills achieved in people's everyday playing activities. Indeed, as Squire (2002) pointed out, "[t]he study of games and learning might begin with qualitative study of game players and game playing communities". Not experimental studies of

game players, not studies of people playing games designed for learning purposes, but studies of people who play games of their own choice, on their own terms, within contexts that are meaningful to both game and players.

## 1.1 Aim and objectives

The study of people who play games of their own choice, on their own terms, within meaningful contexts raises important methodological and theoretical questions. What are we supposed to study, which methods should we use, i. e., what is the *unit of analysis* in people's everyday play? The work presented here aims to contribute to a better understanding of people's everyday play from a cognitive science perspective. As it will become clear in the sections to follow, cognitive aspects of games and game play activities are still far from understood, and the area of cognitive science has a lot to offer in this respects since its theories and methods provide powerful tools for examining the dynamics, cognitive consequences and experiences of people's everyday play. On the basis of six publications included at the end of this thesis, it is shown why a cognitive perspective on games is important, which theories and methods are believed to be particularly well-suited for the study of game play activities, and what their implications are. Furthermore, two case studies are presented and discussed; these illustrate not only the empirical implications of the theoretical stance taken here, but also provide valuable insights into people's game play activities.

## 1.2 On a side note

A thesis about computer game play should probably start with a definition of what computer games are and what is meant by game play activities. It is my hope the latter will have become clear to you by the time you have finished reading the thesis and all the articles included. I do not see much sense in defining something in advance when it in fact has been *the research object* over the last two years. That is the whole point of this thesis, i. e., explaining and discussing how we can study game play activities from a cognitive science perspective. As far as computer games as such are concerned, there exists a number of articles and books discussing what (computer) games are (e. g., Crawford, 1982; Juul, 2003), taxonomies of them (e. g., Wolf, 2001), and how they differ from pre-digital games and other media like television and print (e. g., Crawford, 2005). I do not think I could add much to these discussions, not from a cognitive science perspective, which is why I take the easy way out and simply point you to some of the more well-known research on (computer) games and game play.<sup>1</sup> You will know what I consider a computer game when reading this thesis by the labeling of such games in capital letters, e. g., COUNTER-STRIKE. The label includes, among other things, games developed for

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<sup>1</sup>A few months ago, in November 2007, there was also an intensive discussion on the *Gamesnetwork mailing list* (<https://listserv.uta.fi/archives/gamesnetwork.html>) about what computer games are and what defines them. The people participating in the discussion were all in agreement about one thing only: we don't really know.

consoles, handheld systems, common personal computers, and online platforms. The common factor in all these games is that they require people to interact with computer-based interfaces, i. e., the input is usually provided through input devices such as mouse, keyboard, (console) buttons or joystick whereas the output is given through a computer screen and mobile speakers. This is not exactly any news, but worthwhile mentioning all the same. And in case you happen to stumble across *video* or *electronic games* in this thesis and want to know what I mean by that, go read “On a side note” again and replace the term *computer game(s)* with these terms. Now on with the thesis.

### 1.3 Overview and summary of the papers included

The thesis is structured as follows: firstly, we start with a theoretical and methodological discussion of game play activities, a discussion that to a large extent will be based on Papers I–IV. All papers are related (and to some extent overlapping), and instead of discussing each individually I will simply refer to each paper when it is deemed appropriate. The theoretical background discussion is followed by two empirical case studies where various cognitive aspects of game play activities have been explored more in detail. The focus will be on critical reflection rather than mere repetition of what can be found in paper V and VI. In the final chapter, future steps of theoretical and empirical research are outlined and discussed.

In *Paper I*, theoretical and methodological issues of embodied and situated cognition in relation to computer game play are discussed. *Paper II* is directed at cognitive scientists with an interest in computer games and people’s playing activities. In *Paper III* different levels of situatedness in game play are identified and discussed, whereas in *Paper IV* the emphasis is on the affordance concept and its relevance for the study of computer game play. In *Paper V*, the first case study is presented, with a focus on the actual activity of playing a computer game, which in this case was the game classic PAPERBOY. In the second case study, as presented in *Paper VI*, the focus has been on computer game play in a broader sense as an e-sport, thereby also including the surrounding material and social environment of professional COUNTER-STRIKE players.

## 2 A cognitive science perspective on computer games

Computer games can be approached from many different research directions, but according to Aarseth (2003), there are three dimensions that characterise every (computer) game. *Game play perspectives*, with focus on the player's actions, strategies and motives, are primarily studied with theories and methods from sociology, anthropology, psychology, i. e., the social sciences. *Game-world perspectives*, e. g., the fictional content of the game, are primarily studied with theories and methods from art, history, media studies, cultural studies, i.e. the humanities. *Game-rules perspectives*, finally, are studied with theories and methods from game design, business, law, computer science and other "applied" areas that are all of use in the industrial practice of computer game development.

My interest is foremost aimed at understanding the dimension of *game play*, but as acknowledged also by Aarseth (ibid.) the three levels are interdependent. Game play is the natural starting point for me, given my main interest in the cognitive aspects of game play involving people and computers. It is first in the process of playing, as the player navigates through the game environment, that the game comes to life, and it is only by studying people playing games, or possibly by playing them yourself, that one can begin to understand the game. From a methodological standpoint then game play activities can be divided into

- (1) the physical activity of playing a game, i. e., the handling of the game, and
- (2) 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 game play. 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 also be an essential part of game play activities, because the participation in player circles gives access to other player's knowledge and information, which have an impact on how a game is played (Rambusch, 2006a; Susi & Rambusch, 2007).

To think of game play as consisting of these two elements provides different openings for the study of game play 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 good manual dexterity and eye-hand coordination means players know *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 game play, 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 the game in wider terms, e. g., as a “cultural object”. Tosca’s ideas seem to be very similar to current research in the area of cognitive science which provides us, as we will see in the next section, with a complementary account on the relation between handling the game and players’ understanding of it.

## 2.1 Situated cognition

Given the history of cognitive science (e. g., Boden, 2007) – an interdisciplinary area with influences from fields as different as neuroscience, linguistics, computer science, psychology, philosophy, and anthropology – the connection to computer games and their (psychological) impact on people is quite obvious. And yet, cognitive scientists have shown a remarkable lack of interest in addressing this issue in the past. We just have to take a look at the proceedings of the annual meeting of the Cognitive Science Society, the research world’s largest cognitive science conference. Computer games don’t really exist as an object of study, except for those studies in which self-designed “computer games” are used to administer various kinds of cognitive tests (e. g., Jones, 2007). 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), but research on computer games as such, research that not just uses them as examples to illustrate a theoretical point concerning something else, is basically non-existing. However, a cognitive science perspective on computer games is necessary since cognitive processes lie at the core of (computer) game play activities, and if we do not address those, a large piece will be missing in our understanding of people’s game play. (Rambusch & Susi, to appear; Rambusch, Jakobsson, & Pargman, 2007).

With a background in *embodied and situated cognition* (Rambusch, Susi, & Ziemke, 2004; Rambusch & Ziemke, 2005b; Rambusch, 2006b) it does not require much to recognise and acknowledge the embodied and situated nature of game play activities. This is clearly reflected in my research on computer games; it started out with an extended abstract on “Embodiment aspects in human computer-game interaction” (Rambusch & Ziemke, 2005a) and has been further developed and explored in subsequent papers, of which six are included in this thesis. I have not only addressed why and how the frameworks of embodied and situated cognition might help us gain a deeper understanding of people’s everyday play, but also discussed empirical issues arising from such a perspective. Moreover, an introduction to the areas of embodied and situated cognition has been given (Rambusch, 2006a). The notion of situated cognition as used here includes also the notion of embodied cognition, and I discuss how we can look at game play with a situated perspective in mind. The main purpose, however, has been 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 game play activities with the player in focus are still largely unexplored (cf., Goldstein, 2003).

Without doubt, the field of cognitive science has a lot to offer to game studies since its theories and methods provide powerful tools for examining the dynamics, cognitive consequences and experiences of people's everyday play. This is increasingly also acknowledged by researchers in the field of game studies given the problems they face: game play activities evolve from and take place within webs of social and cultural practices and the question is how we can study game play without sidestepping central aspects of it. The activity of playing a computer game is in many respects a very social activity that includes more than just the individual player and the game itself. People, when playing computer games, make use of the game environment such as the game interface, but also of their surrounding environment, e. g. when they use pen and paper to write down directions given in an adventure game, or when they go and ask other people for help. People also have bodies which to a considerable extent constitute part of their playing activities even if, for an outside observer, it often can seem that the only body parts involved are the fingers moving on the keyboard.

However, before we can discuss game play activities from such a perspective it is necessary to take a closer look at the underlying assumptions in theories of embodied and situated cognition. A large part of the discussion can be found in paper I, but for people who are unfamiliar with those theories, some aspects are discussed here more in detail.

### 2.1.1 *Central assumptions*

For quite a long time, cognition has been believed to be the product of internal (individual) processes, comparable to the symbol-manipulating processes of a computer (e. g., Pylyshyn, 1990). Accordingly, the focus in cognitive science has largely been on information and its mental representation and processing, thereby often reducing an agent's interaction with the surrounding environment to nothing but a set of interactions between external stimuli, mediating internal (symbolic) knowledge, and behavioural responses. In recent 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; Clancey, 1997; Clark, 1997). 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; Clark, 1997).

Today, there is an increasing awareness of the cultural, embodied and situated nature of human cognition in different scientific fields of cognitive science. Theories of embodied and 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). The sharp distinction between different kinds of knowledge (explicit vs. tacit) is being questioned and the boundaries between “in here” and “out there” have become blurred. As Thelen, Schönér, Scheier, and Smith (2001, p. 1) put it, cognition. . .

. . . 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.

### 2.1.2 Definition(s) and trends

The relation between embodied and situated cognition, though, 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). 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. 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:

[C]ognition 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 background in Artificial Intelligence (AI), 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.

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. Wilson (2003), 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., Clancey, 1997; Clark, 1997; Kirshner & Whitson, 1997; Ziemke, 2002). 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 (Wilson, 2003, p. 626). Wilson (ibid.), nonetheless, criticised 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). By viewing cognition as being situation bound, she argued, a “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 fundamental dilemma in the field of cognitive science. Situated is often interpreted in the sense that an action is grounded in the concrete situation (context) in which it occurs, which evidently is an oversimplification of the concept. 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 (Hutchins, 1995; Clark, 1997). Broadly speaking then, individual actions cannot be explained without taking into consideration what other people are doing and their 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” 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 now, there is no time for such a time-consuming behaviour; instead, an agent has to cope with the environment constantly and 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).

Wilson (2003) 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.<sup>2</sup>

***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). People use, for instance, to write down telephone numbers simply because they have 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, “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”<sup>3</sup>, and in the following years there has been a growing interest in how artefacts (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

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<sup>2</sup>The increasing awareness that cognition most of the time is time-pressured has also led to a heated debate in which the existence of mental representations is being seriously questioned (e. g., Brooks, 1991).

<sup>3</sup>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 focuses (cf., Susi, 2006)

on the desk, but they also contribute to coordination, cooperation and structure on a social level (e.g., Rambusch et al., 2004; Susi, 2006)

Wilson's perspective (2003) on this aspect of human cognition is somewhat controversial. Offloading 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 (ibid.) 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 diskettes or books, on the other hand, has also been acknowledged by her as some kind of off-loading, but it is according to Wilson (ibid.) 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 (2003) performed "in the service of cognitive activity about something else, something not present in the immediate environment" (p. 629). This is also the case when someone is gesturing while speaking to others as it helps the speaker, according to Wilson (2003), "to grease the wheels of the thought process that the speaker is trying to express" (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 maths with pencil and paper is an off-line process (not situated) because it is about something not present in the environment and 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 unaffected from its 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., Adams & Aizawa, 2001; Neuman & Bekerman, 2000). Although most researchers do agree on the first part of the claim, that is, that external structures such as artefacts have a considerable effect on a person’s cognitive processes, it seems clear to Wilson (2003) “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” (Wilson, 2003, p. 626). Unlike the information-processing mind in traditional paradigms which takes in and processes ready-made pieces of information (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 (knowledge), thus, is not the result of mere symbolic thinking but structurally coupled sensorimotor activity, or to say it with 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 and the use of objects as the identification (naming) of objects activates premotor areas typically associated with visuomotor transformations for grasping and manipulating objects (Grafton, Fadiga, Arbib, & Rizzolatti, 1997), which clearly shows the mutual, close relation of action and thought.

This perspective is closely related to ecological viewpoints on cognition and object manipulation (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, one knows how to use a chair because the chair affords a particular behaviour, not because s/he makes use of a mental categorisation that tells her what a chair is and how it can be used. In other words, there is no perception without an action, and there is no action without perception, only through perceiving and acting knowledge evolves. Scientists use the term affordances often in different ways. 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, e. g., in Gibson’s original theory, 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 while a graspable object affords throwing (Hirose, 2002).<sup>4</sup> Hirose, for his part, described

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<sup>4</sup>The perception of affordances in relation to an agent’s movements was acknowledged to some extent by Gibson, but the issue was not further elaborated.

affordances in terms of “opportunities for action that objects, events, or places provide for an animal” (ibid., p. 290) to clearly show the close and mutual relation of agent and environment, that is, affordance is even 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 (ibid.) 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.

***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. According to Wilson (2003), 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” (Wilson, 2003, p. 633). However, in contrast to Wilson (ibid.) 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 as to what extent 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; Lindblom, 2007) and serves as an important tool in developing and understanding abstract concepts and knowledge (Lakoff & Johnson, 1980; Roth, 2002).

## 2.2 A situated cognition perspective on game play

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 computer game play activities (Rambusch, 2006a; Rambusch et al., 2007; Susi & Rambusch, 2007).

However, before we can go on with the discussion of game play activities, some clarifications are in order here. Even though the different views on human cognition as described above lie at the core of situated cognition theories, they also implicitly point out different forms of situatedness (Susi & Rambusch, 2007). Firstly, we find “*high-level*” *situatedness*, which commonly refers to the socio-cultural setting or context of an activity, meaning that the activities in which we engage are guided by cultural and social norms and values. Much interest here lies on learning/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 and 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 the individual and the interactions in which s/he is involved. Focus lies on the distribution of cognition between individuals and their material surroundings, e. g. when people use calendars to aid their memory, or when people cooperate to solve a task. A third sense of situatedness is what might be called “*low-level*” *situatedness* (sometimes termed *embodiment*), where much focus is placed on the agent having a physical body, through which the individual, or agent, is sensori-motorically 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. This is also the case in the area of game studies where “situated play” seems to have become somewhat of a buzzword even though its meaning is often left vague and general. Moreover, as discussed in Susi and Rambusch (2007) and Rambusch and Susi (to appear), “situated play” or “situatedness” often refer to high-level situatedness, thereby downplaying and/or ignoring the other two forms of situatedness. It is important to note, however, that these three forms 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).

### 2.2.1 *Situated play*

Having discussed different notions of situated cognition and identified three different forms of situatedness, we may ask at this point what the concept of situatedness can tell us about games and game play, that is, *what does “situated play” actually mean?*

The activity of playing a computer game is in many respects a very social activity, an activity that extends beyond the interface of the game. People playing games meet in both virtual and off-line places, they discuss their games with their friends, they engage in discussions with others, be it in an online forum, web log, café or a magazine, they meet online to practice their skills and to learn from each other, they establish relations with other people online, they get to know other people without ever having met them offline. For instance, an interview with a COUNTER-STRIKE player revealed that many players are able to recognize their online-peers by means of how their avatars move, how they play, what strategies they use (in a preliminary study to Rambusch et al., 2007). Computer game play is, in other words, a social activity that is distributed across player(s), game characters, game environment (on- and offline), and input/output devices. The common view of computer game play as an activity that takes place inside a virtual cyber-vacuum is shortsighted and limited as it refuses to acknowledge the very essence of computer game play. By ignoring large parts of the distributed and social aspects of computer game play, scientists miss out on opportunities to study how people, inspite of on the surface limited interaction techniques, communicate with each other, how they establish relations with others, how they help each other, how they learn from each other, how they solve problems in and make sense of the virtual environments provided to them.

Human interaction with computer games is also shaped by the human mind’s limitations and makes it, strictly speaking, necessary that the users of a computer game have the opportunity to off-load parts of their cognitive work onto the computer screen. For instance, Kirsh and Maglio (1994) have shown that people playing TETRIS (1985) use the video game’s screen to decide whether or not an L-shaped brick fits in between other bricks by rotating the brick directly on the screen. They argued that the physical rotation reduces the cognitive workload considerably more than if the rotation would have to be performed mentally. Many computer games, however, do not always offer many opportunities for offloading activities. That is, how do users of a game off-load parts of their cognitive work onto the game environment when they cannot re-organize, remove or leave any clues inside the virtual environment? How do they know where they left off? Most researchers interested in usability aspects would probably argue that, because of limited cognitive capacities, computer games need to be designed in a way that does not require extensive structuring of the virtual environment. It might not be as simple as it sounds, though. Game developers, for instance, use their experience and intuition rather than scientific principles, which of course also is related to the limited interest that has been taken into games within areas such as HCI, where cognitive theories are applied to computer (game) technology. Moreover, computer games that do not require people to off-load parts of their cognitive workload may not always be as successful as one might expect. The constant and active adaptation of our environment is part of what

we are, who we are and is subsequently also a very important part of our interaction with computer games because it allows us to be active rather than just reactive.

Unfortunately, we do not know much about how, why and under what circumstances people off-load parts of their mental workload onto the game environment. The interesting question thus is how people deal with at times static virtual environments, to what extent and how the off-loading of cognitive workload extends into the “real world” and whether it differs between different game genres (Rambusch, 2006a). The extension of cognitive workload into the “real world” includes also other people and people are part of communities of practices (Lave & Wenger, 1991). Many of them are, of course, related to computer game play. A closer look at some of those game communities can also help us furthering the understanding of the distributed, embodied and social nature of computer game play. Take the example of COUNTER-STRIKE (2000). It is one of the most popular games around and a team effort, where teams (called “clans”) can develop complicated strategies and advanced divisions of labor. Viewing such clans in terms of communities of practice can provide an insight into how an on the surface individual game play in front of a computer is socially distributed across different places and persons, that is, how a clan develops and plans its strategies and thereby affects the game play, and how clan members practice and learn from each other (Rambusch et al., 2007).

The body also plays an essential part in game play activities. Wilhelmsson (2006), for instance, argues that the identification with a game character is fundamentally related to the physicality of having a body which manifests itself in a player’s *Game Ego*. It has also been argued that the traditional view of memory as a storage device for abstract representations needs to be replaced by a more embodied view of memory (Glenberg, 1997, cf. section 2.1.2, p. 12), an assumption that could help us understand how computer game players navigate through and remember landmarks in virtual environments that allow very little or no adaptation at all. In the “real world”, humans are very proficient in adapting their surroundings through the use of environmental properties as cognitive aids, which has resulted in a growing interest in how artifacts and tools affect human thinking in the field of situated cognition (cf. section 2.1.2, p. 9). The use of artefacts and/or tools also clearly shows the close interrelationship between sensori-motor processes and socio-cultural knowledge. Tools are material objects which afford certain actions (Gibson, 1979), but at the same time also incorporate cultural knowledge about their various uses. But we also have another dimension here, the virtual dimension, which raises the question whether and to what extent virtual objects afford actions in the same sense as material objects; it is reasonably possible that other factors are at work when players try to make sense of the game world in terms of possible actions (cf., Rambusch & Susi, 2007)

### 2.2.2 *An integrative framework for game play*

A framework for understanding game play as described above should consider playing activities as integrated in everyday life and part of popular culture (cf., Jenkins, 2006), and needs to account for both the phenomenon of handling the game and players’ meaning-making activities. It requires subsequently a framework that not only addresses these

two phenomena, but also views them in terms of mutually interdependent parts. The approach to game play in this thesis is based on theories that are widely discussed in the fields of cognitive science (embodied and situated cognition) and game studies (e.g. film theory, leisure theory, ludology), because a thorough understanding of the complexities of the human interaction with computer games requires an interdisciplinary approach in which the distributed, interactive and multi-dimensional nature of computer game play is taken into consideration. The different research lines in the areas of cognitive science and game studies are complementary to each other, despite all their differences, allowing us to address computer games in terms of handling and meaning construction from a broader, interdisciplinary perspective.

Game studies has so far mostly been concerned with the meaning of games, in a very wide sense of the word. The focus has been on the games themselves, not the practice of playing them (cf., Ermi & Mäyrä, 2005), and even though configurative (Eskelinen, 2001) or tangible (Grodal, 2003) aspects of games have been recognised and discussed, this is still an area where researchers would benefit from borrowing and incorporating theories and methods from the area of cognitive science. Importantly, the borrowing and incorporating of theories, should not be a one-way street. Aside from substantial discussions of the meaning and content of games as such, researchers in the field of game studies have also frequently analysed particular games. This is very helpful in our study of players' meaning-making activities as it has been explored what games mean to people playing them and their cultural consequences and relevance, thereby not only including but also surpassing the ever so popular discussion of violent content in games. Such a close examination of games, their genres, meaning, and content, is a research topic that, at first sight, does not have much to do with cognitive science and yet research would greatly benefit from this kind of interdisciplinary exchange. Bryce and Rutter (2006) wrote in the introduction to *“Understanding digital games”* that the usefulness and necessity of the establishment of a field “computer games studies” is yet to be shown. In my opinion, the colonisation attempts from different fields which Aarseth (2001) heavily criticised is not really the problem; the problem is that many researchers from other research fields and disciplines often are not interested in computer games as such. Psychologists and educators, to mention only a few, often have only a quite vague idea of what computer games actually are and how they are used. Somewhat polemically speaking, it almost seems that just because they have played (or seen) a game or two in the past they think they know everything there is to know about computer games. This is definitely something we need to keep in mind when we want to study people's playing activities from a cognitive perspective.

### 3 Situated play in practice

Theories of embodied cognition, situated cognition, and game studies appear at this moment to be one of the most promising lines of theoretical thinking for an adequate understanding of computer game play; not only have the three of them their own unique way of addressing the handling of games and the attribution of meaning in games, but they also consider these two components of game play processes that are closely interwoven and interrelated. The two case studies presented in this chapter, and papers V and IV, illustrate not only the situated nature of people's playing activities, but also provide some practical implications for the approach favoured here.

In the first case study (Rambusch, 2007), 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. In the second case study (Rambusch et al., 2007), a broader perspective has been taken on computer game play, that is, when we chose the unit of analysis we not only included the actual playing activity, but also considered how game play is affected by factors outside the game itself, such as players' relation to other players and their participation in game communities.

The game used in the first study is a "classic", a game many grown-ups recognise even though they played the game quite some time ago, when they still were 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. 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 seven years after its release. It belongs to the often looked-down-upon category of First-person-shooter games (FPS), games where the "shooting" of other players is a central element. The violent content in the game, however, has not been of interest here; instead the focus has been on people's interactions with the game and their understanding of it.

The methodological approach was not exactly the same in these 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), i. e., at the *World Cyber Games 2006* in Monza, Italy. Ethnographic methods were used in both cases, though, such as interviews and observation, but in the PAPERBOY study also quantitative methods were used.

#### 3.1 Playing Paperboy

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, when they sit 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, Nintendo's *Wii*<sup>TM</sup> and games such as DANCEDANCEREVOLUTION (1998) and EYETOY (2003) are based on similar ideas. In these cases, the player's motions are captured by colour- and motion sensitive camera and handheld devices, and their popularity speaks for themselves. Current, applied research in the area of human-computer interaction (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). 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. Moreover, games such as EYETOY and DANCEDANCEREVOLUTION belong also 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.

### 3.1.1 Results and analysis revisited

To summarize the first case study, the 20 participants were divided into two groups; one group played the game with a common hand control device whereas the other group controlled the game character with an exercise bike. The bike was expected to afford actions somewhat different from actions afforded by the handheld device, thereby affecting the outcome in terms of performance (e. g., higher number of delivered newspapers) and gaming experience (e. g., higher experience of fun). *Preliminary results*, as discussed in paper V, indicated that there in fact is not such a difference, but it seemed that the exercise bike had an influence on people's expectations about the kind of interaction it allowed. But what do the *final results* tell us?

The final results in table 1 and 2 (see page 19) indicate that there is a difference between the groups in terms of how often players tried to deliver the newspaper (Paper delivery), how often they managed to hit a customer's mail box (Mail box) and non-customers' windows (Non-cust.'s window), and how often they had to pick up new newspapers (New newspapers). This result seems to be consistent with the expected outcome where the subjects in the game-pad group were expected to focus more on delivering newspapers and vandalising non-subscribers' home. Subjects 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, an expectation that is not supported by the final data; both groups were equally good, or bad, at avoiding hazards (Crash) and reaching the bonus round (Bonus round). Moreover, both groups were also equally good at annoying subscribers by crashing their windows with newspapers (Customer’s window).

Table 1: Performance – **Game pad group**: *bolded mean values* indicate a difference to the other group, *underlined mean values* indicate no difference to the other group.

Activity	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	$\sum$	$\bar{x}$
Paper delivery	300	270	405	385	427	543	347	781	99	420	3977	<b>398</b>
Mail box	63	67	0	63	131	148	75	88	18	95	748	<b>75</b>
Non-cust.’s window	0	31	7	24	2	117	6	55	4	37	283	<b>28</b>
Customer’s window	7	16	8	20	17	18	16	10	8	15	135	<u>14</u>
New newspapers	1	35	19	3	133	80	40	74	2	86	473	<b>47</b>
Crash	41	79	97	64	106	108	70	56	28	83	732	<u>73</u>
Bonus round	17	4	3	0	21	9	4	13	6	17	94	<u>9</u>

Table 2: Performance – **Bike group**: *bolded mean values* indicate a difference to the other group, *underlined mean values* indicate no difference to the other group.

Activity	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	$\sum$	$\bar{x}$
Paper delivery	132	268	252	154	149	129	174	185	280	328	2051	<b>205</b>
Mail box	53	33	37	23	28	53	12	18	19	55	331	<b>33</b>
Non-cust.’s window	0	22	13	0	1	0	2	4	17	8	67	<b>7</b>
Customer’s window	13	28	9	5	16	13	20	15	21	13	153	<u>15</u>
New newspapers	11	3	5	6	6	11	2	4	10	2	60	<b>6</b>
Crash	41	89	78	61	49	41	96	68	110	95	728	<u>73</u>
Bonus round	9	12	9	7	7	9	12	16	8	2	91	<u>9</u>

What do the final result tell us, what conclusions can we draw? Not many conclusions, unfortunately, since it can be questioned whether or not the difference between the two groups in fact is a result of different affordances. As already discussed in Paper V, subjects participating in this study were people who frequently play computer games, which suggests they are familiar with a game pad and its functionality. A bike, on the other hand, is a control device the subjects had not encountered in a playing situation before, which most likely had a huge impact on the final results. Moreover, there were also other (unexpected) aspects and events influencing the final results, making a more detailed statistical analysis of the results unnecessary. These unexpected events taught me a number of valuable lessons though.

### 3.1.2 Lessons learned

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 mail box with a newspaper and yet they didn't 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 result even though it happened quite often. Secondly, *do not trust your subjects to not tell their friends about the game*. Gamers love competition, which can affect your results in a bad way (and yet it shows us how much even a single player game is affected by socio-cultural factors). If you look at the results in the game pad group you might notice an increase of players' performance in delivering newspapers and crashing non-customers' windows. Even though the subjects were asked *not* to talk about the study with their peers, the results tell us a somewhat different story. It seems some of the subjects spent a little time practicing 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. Subjects complained repeatedly about a gap between what they saw on the screen and what the bike actually did. The game's age also forced players to start over the game 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*, resulting 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. It could be a bug in the recording software, or I need to go the optometrist pretty soon again.

Without doubt, a few things in this study should not have happened, however, it does not mean the study has been a waste of energy and time. The results have shown how difficult it is to achieve a perfect match between a game's content and its control device. and how much people's game play also is affected by socio-cultural aspects such as other people and previous experiences. Moreover, the study has illustrated how difficult it is to study people's playing activities in action, that is, how many factors actually need to be taken into consideration. Last but not least, the fact that the game-pad group was almost twice as good at delivering newspapers as the bike group suggests that it might be worth to repeat the study with the lessons learned in mind.

## 3.2 Playing Counter-strike

In the second case study, three different researchers were involved, each of them with their own research perspective(s). In addition to my cognitive perspective, my colleagues had a background in media technology and communication, respectively. Our different backgrounds allowed us to study game play activities from different viewpoints, and COUNTER-STRIKE (2000) was considered a particularly interesting research object here, given the game's widespread popularity and its change into an e-sport, and the requirements such a change impose on people's playing activities in the game. Accordingly, the emphasis in our study was on

- (1) CS as an e-sport and its effects on players, game and game play,
- (2) CS and its increasing professionalisation, and
- (3) players' skills and development

Only, how does one approach such questions empirically? Should one study the actual activity of playing the game, the ongoing activities on the screen, players' feelings and subjective experience, and/or their participation in various game forums? The "three-circuits-of -interactivity model" (cf., Kline, Dyer-Witthoford, & Peuter, 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 into account (see figure 1).

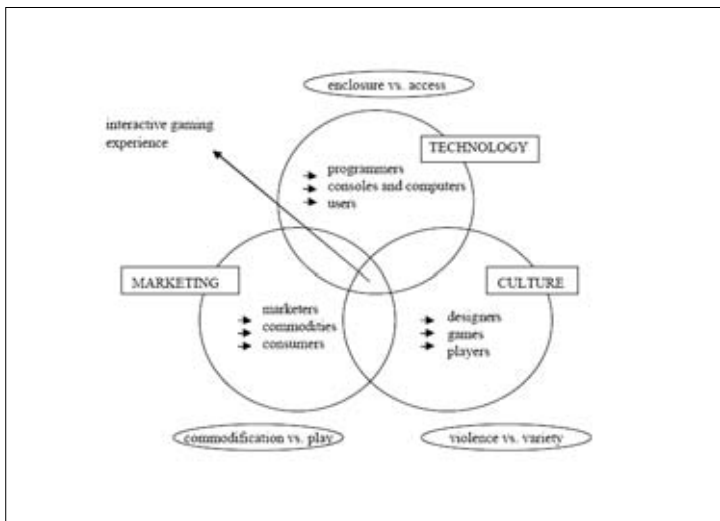


Figure 1: Three circuits of interactivity

What we did was to try to capture the interplay between these three circuits, but with a different take on the interactive gaming experience, which was not primarily understood in terms of players interactions with the game. As we have seen in the previous chapter, 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 the individual player, the interactions between players and teams, e-sports organisations and leagues, the media as well as the fans and players discussing the game in online forums and other virtual community spaces.

The most part of our material was collected at the *World Cyber Games* in Monza 2006, and on the Swedish CS online forum *Fragbite*. We talked to 34 clan members from nine different countries on three continents, and also videorecorded one of the matches. We used an interview guide, but whenever something interesting caught our attention, we asked follow-up questions, and in our analysis of the interviews we used a variety of affinity diagrams (cf., Beyer & Holtzblatt, 1998), which is quite a fancy name for

post-it notes on which you write down interesting sound-bites and facts. This resulted in about one post-it per minute of interview. At the end we had to analyse over 500 post-its, which we put on walls and colleagues' office doors to off-load some of our mental workload. The material collected at the online forum was analysed by means of critical discourse analysis (Barker, 2001). The analysis of the videorecordings is still ongoing, but some of the results are already included here.

The analysis revealed elements shaping gameplay on four analytical levels: (1) player actions during the play, (2) interactions within and between teams, (3) players and fans on the Internet, and (4) the COUNTER-STRIKE gaming scene. Team play serves an important role in CS, resulting in higher levels of strategic thinking and communication skills and providing the base for a close learning-teaching relationship within and between teams. Meaning and understanding of the game is negotiated on several levels, including the players themselves, their fans, and e-sports organisations. Professionalism and athleticism are two prominent discourses here, where players and other interest groups try to paint a picture of dedicated and mature players who take their playing activities seriously, strive towards excellence, and work hard to build up their physical fitness and endurance. The CS gaming scene looks different in different countries, but teams (or clans) is the most typical form of player organisation worldwide, which has been able to resist even the wishes of sponsors and tournament officials.

Taken together, all these aspects provide a qualitative description of how a variety of factors can influence game play activities, i. e., how technology, marketing, and culture are related and affect game play activities in terms of handling the game and players' meaning-making activities. The story, however, certainly does not end here, as also outlined in the end of papers V and VI. More research is needed and from a cognitive perspective, which the focus is on here, it is particularly interesting to take a closer look at how the handling of a game and players' meaning-making activities are interrelated. PAPERBOY and COUNTER-STRIKE could not be any more different and yet both phenomena can be found in these games, and an interesting question is what they share, what the common factors are.

## 4 Conclusions and future research

From a cognitive science perspective, *embodied* and *situated cognition* appear at this moment to be two of the most promising theoretical frameworks for the study of game play activities and the communities in which they take place. Not only do they provide valuable insights into the human mind as such, but they also deal 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.

Figure 2 illustrates<sup>5</sup> how game play activities are approached both methodologically and theoretically here; the handling of the game and the player's meaning-making activities are closely interrelated, but to a large extent also affected by factors outside the game, including material tools and other people. This requires an integrative framework of theories that takes these factors into consideration.

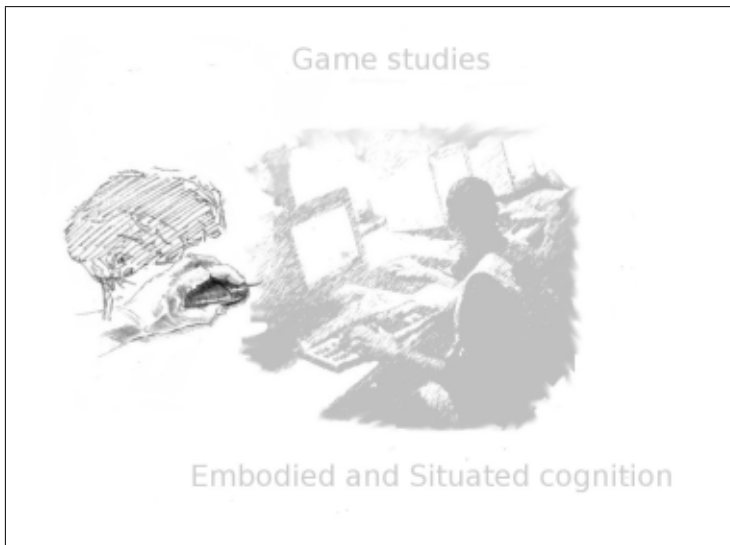


Figure 2: Game play in terms of *handling the game* and *the player's understanding* of it, approached from three complementary perspectives.

Six different papers are included in this thesis, each of them addressing the implications of an embodied and situated cognition perspective on people's game play activities. In *Paper I* (Rambusch, 2006a), theoretical and methodological issues have been discussed, and it is mainly directed at researchers in the field of game studies who are not very familiar with cognitive theories and how they could be applied to computer games and

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<sup>5</sup>The illustration is based on drawings made by Margareta Borg and a picture that was taken by me at the World Cyber Games 2006.

people’s playing activities. *Paper II* (Rambusch & Susi, to appear), in contrast, can be considered a wake-up call for the area of cognitive science with its continued lack of interest in (computer) games. In *Paper III* (Susi & Rambusch, 2007), three different levels of situatedness have been identified and explored in relation to computer game play; researchers – and not only in the field of game studies – need to be aware of the term’s various meanings if they want it to be of any use. *Paper IV* (Rambusch & Susi, 2007) deals with another term researchers love to use, which also has reached the field of game studies now; it is the *affordance concept*, which similar to “situated” and “situatedness”, often is mentioned without researchers being fully aware of its original meaning. In *Paper V* (Rambusch, 2007), the PAPERBOY case study is presented, where embodiment aspects of game play activities have been explored more in detail. Finally, in *Paper VI* (Rambusch et al., 2007), the complementary nature of theories within game studies and cognitive science has been discussed and explored, using the example of professional COUNTER-STRIKE players.

#### 4.1 Where to go from here?

Having established and discussed the situated nature of computer game play, where does this leave us? So far, we have only touched on the surface of things, even though we occasionally went a little deeper than that. But what is the next step? As we have seen in chapters 2 and 3, the term “situated” can mean many different things, depending on what kind of research questions one has and how familiar one is with the various meanings of these terms. What is required now is a more detailed discussion of situatedness in game play activities and an in-depth analysis of how we can bring together the different levels. Research on people’s game play activities is at the moment quite unbalanced in that emphasis is mostly on socio-cultural aspects of game play whereas research with the sensorimotor level in focus is quite rare. This is not particularly surprising though since even in the area of cognitive science (bodily) activity usually is viewed as the product of (superior) mental activity – a view fundamentally opposed to situated conceptions of activity. Future steps will need to involve a more thorough analysis of theories that particularly presuppose the interrelatedness of high-level processes of human cognition and its underlying low-level processes.

A scientist whose ideas come to (my) mind here is Pjotr Galperin (e.g., 1992), a Russian psychologist who further developed the ideas of Vygotsky (1932), and whose work I have discussed to a larger extent elsewhere (Rambusch & Ziemke, 2005b; Rambusch, 2006b). In Galperin’s view, the body is an essential part of mental activity as materialised action, i. e., an action performed upon material objects, is considered a necessary precursor condition for all forms of mental activity. Most importantly, his ideas integrate socio-cultural lines of thinking with embodiment perspectives on human cognition, and he appears to have been one of the first scientists to recognise and explicitly point out the close relationship between the manipulation of objects and mental activity. Additionally, supporting material might be found in current research on embodied cognition where it is suggested that social-cultural processes such as communication,

social understanding of others, and tool use are deeply rooted in sensorimotor activity (cf., Svensson, Lindblom, & Ziemke, 2007).

Accordingly, the aim for the remainder of my PhD research is to explore in more detail the different levels of situatedness . . .

- (1) . . . by discussing *specific* theories of embodied and situated cognition and their (possible) relevance for the study and understanding of people's game play activities, and
- (2) . . . by describing the different levels of situatedness in relation to game play, and how they are interrelated

So far, I have mostly talked about theories of embodied and situated cognition *in general*, but in the future it is necessary to take a closer look at specific theories and what they can tell us about the different levels of situatedness. The description of the different levels in relation to game play has also been rather superficial, which is why it requires further, detailed study of what characterises game play on each of these levels and how they affect each other.

The research outlined above is theoretical rather than empirical in character, but an important step will nonetheless be the exploration of alternative methodologies to empirically study computer game play activities with the three, interrelated levels of situatedness in mind. At the present time, no specific empirical studies are planned, but I do not want to exclude the possibility of future empirical research.

## 4.2 Closing words

The theories mentioned in the previous section belong without doubt to the area of cognitive science, where computer game play activities are hardly ever mentioned. That is why it is all the more important to pay close attention also to ongoing research in the field of game studies, and not to forget what the unit of analysis is. The worst mistake one can make is to just take existing 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 hand. I consider myself first and foremost a game researcher, someone who is interested in computer games and people's interactions with them, which is also why my research predominantly is aimed at the field of game studies. However, the complex, socially situated, and increasingly body-focused nature of computer games might also provide valuable insights into the embodied and situated nature of human cognition in general. This makes computer games without doubt an interesting and valuable field of application for current research in the area of cognitive science. After all, it is about time for cognitive scientists to arrive in the 21<sup>st</sup> century.

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