



Integrated Project on Pervasive Gaming

FP6 - 004457

WorkPackage WP8: *Crossmedia*

Deliverable D8.1: Design Guidelines for Crossmedia Game Production

Sabiha Ghellal, SNS

Sönke Bullerdiek, SNS

Irma Lindt, FIT

Uta Pankoke-Babatz, FIT

Matt Adams, Blast Theory

Tom Söderlund, Daydream

Leif Oppermann, UNOTT

Release date: 21 March, 2005

Status: *public*



**Deliverable D8.1:
Design Guidelines for Crossmedia Game Production**



EXECUTIVE SUMMARY

The goal of the Crossmedia showcase is to untie the game experience both from geographical location and media channels, to provide a virtual story and game space which is accessible anytime, anywhere. These games have the potential of involving a large audience in the story and game play, as several media streams including interactive TV can be combined for content presentation and game participation.

These guidelines are developed and used in the course of the design of a first prototype of a crossmedia game. The focus of this prototype lies on providing a game area that is combined from a physical geographical area with a virtual representation. Thus players can have virtual experience through their physical presence. Challenges are posed by the seamless or seamful integration of a number of devices into such a trans-reality game environment. The form of participation of a player may depend on the devices available and used. Collaboration across devices and across physical and virtual game play should be facilitated in a crossmedia game.

This document introduces into the design of crossmedia games with special attention to trans-reality aspects. It outlines the challenges of crossmedia games and research themes to be explored. It outlines our crossmedia game under design and provides actual guidelines based on our crossmedia game design experiences. It concludes with a brief summary of guidelines.

Deliverable Identification Sheet

IST Project No.	<i>FP6 – 004457</i>
Acronym	IPerG
Full title	Integrated Project on Pervasive Gaming
Project URL	http://www.pervasive-gaming.org/
EU Project Officer	Albert GAUTHIER

Deliverable	D8.1 Design Guidelines for Crossmedia Game Production
Work package	WP8 Crossmedia

Date of delivery	Contractual	M 6	Actual	1-Mar-05
Status	Version 2.4		Final	
Nature	Prototype <input type="checkbox"/> Report <input checked="" type="checkbox"/> Dissemination <input type="checkbox"/>			
Dissemination Level	Public <input checked="" type="checkbox"/> Consortium <input type="checkbox"/>			

Authors (Partner)	Sabiha Ghellal, SNS Sönke Bullerdiek, SNS Irma Lindt, FIT Uta Pankoke-Babatz, FIT Leif Oppermann, UoN Tom Söderlund, Daydream Matt Adams, Blast Theory			
Responsible Author	Sabiha Ghellal		Email	sabiha.ghellal@eu.sony.com
	Partner	Sony NetServices GmbH	Phone	+49.30.2575.5533

Abstract (for dissemination)	This document introduces into the design of crossmedia games with special attention to trans-reality aspects. It outlines the challenges of crossmedia games and research themes to be explored. It outlines our crossmedia game under design and provides actual guidelines based on our crossmedia game design experiences. It concludes with a brief summary of guidelines.
Keywords	<p>Crossmedia Game Productions</p> <p>Virtual Game Space</p> <p>Virtual Equipment</p> <p>Physical Game Space</p> <p>Physical Equipment</p> <p>Individual Game Ideas</p> <p>Storyline</p> <p>Game Elements</p> <p>Game Genre</p> <p>Game Mechanics</p> <p>AR: Augmented Reality</p> <p>Ambient Devices</p> <p>Iterative Design</p> <p>Physical Presence and Virtual Experience (Combination of physical presence and virtual experience)</p> <p>Trans-Reality Game Mechanics (Combination of physicality and virtuality)</p> <p>Positioning Technologies</p>

Version Log			
Issue Date	Rev No.	Author	Change
12-01-05	1.0	Sönke Bullerdiel	First draft and structure
14-01-05	1.1	Sönke Bullerdiel	Changed 2.4 and 2.5
20-01-05	1.2	Sönke Bullerdiel	Changed 2.1
18-02-05	1.3	Sabiha Ghellal	<p>Added Executive summary</p> <p>Changed 2 and 3</p> <p>Added Conclusion</p>
21-02-05	1.4	Sabiha Ghellal	Changed 1.1 and 4.2.1
22-02-05	1.5	Sabiha Ghellal	Changed 2.4 and 4
23-02-05	1.6	Uta	Changed 4.2.5 and 4.2.6

		Pankoke-Babatz	
23-02-05	1.7	Irma Lindt	Changed 1.4
23-02-05	1.8	All	Conference Call small amendments
23-02-05	2.0	Sabiha Ghellal	Final Version
25-02-05	2.1	Uta Pankoke-Babatz	Typos and small changes
25-02-05	2.2	Sabiha Ghellal	Final Version
18-03-05	2.3	Uta Pankoke-Babatz	General revision after the review
1.4.05	2.4	Uta Pankoke-Babatz	Final Version

TABLE OF CONTENTS

EXECUTIVE SUMMARY	II
TABLE OF CONTENTS	VI
1 INTRODUCTION	1
2 CHALLENGES OF CROSSMEDIA GAMES	2
2.1 Game Design Aspects.....	2
2.2 Technical Aspects.....	3
2.3 Commercial and Ethical Aspects.....	3
3 RESEARCH THEMES FOR A CROSSMEDIA GAME	6
3.1 Physical Presence and Virtual Experience	6
3.2 Trans-Reality Game Mechanics	7
3.3 Social and Communal Aspects of Pervasive Gaming in Crossmedia	8
4 FUNDAMENTAL ELEMENTS OF CROSSMEDIA GAME DESIGN	9
4.1 Design Guidelines and Questions.....	9
4.1.1 Initial Collection of Game Ideas.....	9
4.1.2 Game Elements Definition	10
4.2 First Prototype of a Crossmedia Game.....	11
4.2.1 The Game	11
4.2.2 Initial Experiment with the Game	12
5 RESUME AND OUTLOOK	14
REFERENCES	15

1 INTRODUCTION

Design of pervasive trans-reality crossmedia games is a rather new field, and as such its boundaries have yet to be explored. Crossmedia game design lacks formal documented procedures for predictable and repeated success because design is not as predictable as artwork production or as tangible as programming and because there are not many sample projects available. The guidelines listed in this document have been written based on design experiences acquired during a design process of a crossmedia game. The methods described in this document are intended for research based game development.

Pervasive games focus on a game play that is embedded in our physical world. Elements of the physical world are inherent parts of the game. Their characteristics and states are sensed and influence the course of the game. Additionally, pervasive games allow for a game that can be potentially accessed at any time and from any location. A variety of pervasive games have already been implemented [Flintham, 2003; Thomas, et al., 2000]. Many of them rely on mobile and pervasive computing technology, such as cellular phones and location sensors and focus on location-based aspects.

Rather new forms of pervasive games are those kinds of crossmedia games that have a game area that consists of a physical geographical area and its virtual representation. These kinds of crossmedia games employ a wide variety of gaming devices and media channels in the game play, including state-of-the-art mobile and stationary computing devices as well as more traditional communication and information channels. They may also integrate broadcast media such as television or print media.

Such a crossmedia game can span real physical spaces, with real or virtual artefacts and a virtual representation. These games open the possibility to explore how human activity takes place in such trans-reality environments. This requires an extension of concepts for social presence [Short, et al., 1976] to suit the crossmedia trans-reality player interactions. Crossmedia game activities in the physical environment may interfere with everyday activities and thus may be considered within the schema games as cultural environments [Salen and Zimmermann, 2004].

This document is structured as follows. Chapter 2 highlights the challenges for designing and realizing crossmedia games. Research questions for crossmedia games are summarised in chapter 3. Chapter 4 gives a concrete example of a crossmedia game prototype and outlines the design guidelines used. It briefly describes this prototype and summarizes results of initial experiments with this game. The last chapter summarises this document and gives an outlook.

2 CHALLENGES OF CROSSMEDIA GAMES

This section describes the challenges for realizing crossmedia games with respect to game design, technical realization and ethical and commercial aspects.

2.1 Game Design Aspects

A crossmedia game conveys experiences to the player that cross physical and virtual spaces. Player interaction and game-play across the trans-reality boundary have to be supported. The trans-reality experience can be conveyed through usage of technical devices and physical artefacts. Therefore technical devices, their abilities, limitations as well intuitive operability and the interaction with physical artefacts are key issues in the game design. In addition, synchronisation between game play in physical areas and activities in the virtual is requested.

In a crossmedia game, the different gaming devices and media channels associate different forms of game play within the game. A desktop PC is more suitable to gain an overview of the game space whereas a mobile phone with a rather limited display size could be used to indicate interesting game artefacts in the player's proximity. The functionality of different devices in a crossmedia game should reflect the different affordances devices imply. E.g. a dog robot in a game may imply that you can pet it or that you can talk to it.

Pervasive games integrate aspects and characteristics of the physical world into the game play. By influencing aspects of the physical world, e.g. by turning on the electric heating in a room, a player could directly interact with a game and the turning knob of the heating becomes a kind of gaming device, so called physical gaming artefact. Physical gaming artefacts offer a new quality of interaction and should be considered when designing Crossmedia games.

From a game design perspective it is important that the gaming experiences players have with different devices should be somehow balanced. It is important to make a conscious decision about the benefits and pleasures afforded by the devices with respect to game play. Another interesting aspect is to design a game that encourages players to switch devices during a game session. Based on the current situation of a player, a certain functionality could be required that is only available on a special device.

To incorporate a wide variety of devices and media channels, devices attracting a mass audience need to be considered. The different devices and media channels imply different types of participation in the game. Some devices and media channels don't offer a back channel and are therefore more suitable for observing the game. Some devices could be used as voting tools, whereas others allow for realizing a broad functionality and a rather immersive game experience. Some basic forms of participation that can be derived from the different types of devices and media channels are: observing the game, influencing the course of the game, occasionally participating in the game and actually playing the game. A crossmedia game should support at least some of these participation types.

As a pervasive game, a crossmedia game does neither take place purely in the physical world nor purely in the virtual world. Based on the gaming devices, different combinations of physical presence and virtual experience are supported within a

crossmedia game. Devices that are rather stationary such as public displays or game consoles imply a game experience that is more focused on the virtual aspects of the game, whereas mobile devices such as mobile phones stress the physical presence of the player. The game design of a crossmedia game needs to make conscious decisions on the different types of game experiences it delivers.

2.2 Technical Aspects

Apart from the roles different gaming devices imply, there are some technical aspects that should be considered.

In order to communicate between the different devices at least some kind of common platform protocol has to be used or a platform independent framework or game engine, which reduces the implementation time of the different parts of the game. However, this is of course true for all games that have to run on different platforms.

For the technical realization of crossmedia games two different device-related aspects need to be considered: Platform-independent development on the one hand and abstraction of interaction devices on the other hand. Platform-independent development allows a straightforward porting of an application to a different computing platform (e.g. Windows Mobile). Abstraction models for interaction devices classify devices by their functionality to make similar devices exchangeable while still providing a specific interface for each device. E.g. a GPS tracker provides different values than a 3-DOF position tracker, namely two angles, a height and a velocity, while the 3-DOF position tracker provides x, y and z coordinates. Although some applications might want to use the different values of the GPS tracker, other applications would like to use the GPS and the 3-DOF tracker, e.g. for indoor and outdoor tracking. In order to prevent additional code within the application for both tracker types, the device abstraction model handles the differences between these trackers and provides both through the same interface.

In addition, due to the mobility aspect of pervasive games, one cannot rely on constant communication between the devices and the game server. Regardless of the network protocol being used, whether it is GPRS, 3G or WiFi, none has a perfect coverage of a larger area. When designing a pervasive game in general and a crossmedia game in particular, it is important to consider disconnectivity and other technical limitations and to incorporate them into the design. Some games, e.g. *Can You See Me Now?* [blast_theory and MRL, 2005], even exploit the fact that players can be disconnected.

2.3 Commercial and Ethical Aspects

When designing a crossmedia game, designers should be aware of a number of ethical and commercial aspects to be able to make conscious decisions on the game design. Since being aware does not mean avoiding such aspects, these aspects still can play a very significant role in the game design. This section lists some ethical and commercial aspects. The authors are aware of the fact that some of the commercial aspects are in contrast to ethical aspects of crossmedia games, but none of the aspects are judged in this document.

Due to the focus of crossmedia games on rather technical aspects such games are well suited to promote new devices. If the game can only be played on proprietary devices users have to buy them to play the game. This concept is not new to crossmedia games,

but has been exploited by almost all game console manufacturers. The unique chance of this type of games is the possibility to promote several devices, e.g. a smart phone, a mobile game console and a PDA. Thus crossmedia games are attractive under a commercial perspective. However, under an ethical perspective the costs of the equipment may disadvantage players that have limited financial resources (see below).

Many pervasive games and especially crossmedia games make heavy use of the location of players. For a technician or a game designer this is a very interesting feature, which should be exploited, but a lot of people possibly do not want to expose their positions all the time. They may feel scared about the fact that the game always follows their steps. Some games even drag their players into the game when they are at a certain location, e.g. a device of a player could recognize other players within its proximity to start a competition. Of course, such functionality can be very exciting for players, but on the other hand, the game must provide mechanisms to let the players decide at what times they are willing to play the game.

If players are able to decide how much time they want to commit to the game, the design usually rewards longer playing times to keep players in the game. In contrast to this, the disadvantage for not spending a large amount of time should not be too big in order to maximise participation. The difficulty hereby is to find a good balance so that the game does not get boring. This balance is recommended both from an ethical and from a commercial perspective. This balance requires not disadvantaging players with a low temporal budget and makes thus the game attractive to a wide audience of players.

The location of players and the use of media streams within the game can also be used for commercial reasons, e.g. for advertisement. A player who has to watch e.g. a television show for a clue in the game would not switch to another channel during the commercial break, or if a store or a restaurant is part of the game, players can be directed to go there to proceed in the game.

Especially in crossmedia games, a monetary investment might give a player an advantage over others, since they are able to buy more sophisticated devices. Therefore the roles and the functionality of the devices within the game have to be again fine balanced. Although one of the commercial aspects is to launch a new device by making the game impossible to play without it, this aspect is in contrast to the ethical aspect of letting players participate in the game independently of their financial situation.

Apart from the devices within the game, the financial situation might also be important when travelling is part of the game play. A game taking place in a number of cities, e.g., has to expose the meaning of the different cities and what can be achieved in any of them. Such a game scenario can allow and reward players who form groups to solve the game; otherwise players who cannot afford to travel are overly handicapped.

If a game uses a range of expensive equipment, which most of the players will not be able to afford like in the following gaming scenario, where wearable computers, robots and head-worn AR displays are part of the game, the devices can be handed out to the players for an event. Such an event could be to solve a mystery during a cruise and the devices are provided by the cruising company. Another event could be a history game within a museum or an archaeological site, where students use the devices to learn the history in the context of the game play.

In means of billing the players, crossmedia games do not differ from any other pervasive or massive multi-player online game. Anything from monthly-fees, single

game licenses, or advertising is possible and depends on the focused consumer group and the game design.

3 RESEARCH THEMES FOR A CROSSMEDIA GAME

Based on the general constraints for crossmedia games and on the experiences made during the first game design process, we derived more detailed research themes and guidelines as outlined below. The research themes are based on those raised in the first internal deliverable from the IPerG work package on evaluation and design [Montola et.al., 2005] and elaborates how these themes can be addressed in a crossmedia game.

The research themes below address the trans-reality aspect of crossmedia games that can be played on a game space that is combined from a physical game space and a virtual space. The combination of these two spaces may address the following research themes.

3.1 Physical Presence and Virtual Experience

Choose between explicit or hinting at the overlay and between friction and perfect overlay: The overall game area of a crossmedia game may consist of an explicit overlay of both – physical and virtual – game worlds. The game design should address the fact how and when a player would be able to perceive the virtual world, whether the player can perceive everything from anywhere and anytime or whether there are game relevant limitations. When an explicit overlay of the virtual world onto the physical game space is chosen – as is the case in our first crossmedia prototype developed in IPerG (see below) –, then there is no ambiguity. However this choice is a matter of explicit design decision in a crossmedia game.

Choose if the boundaries of the magic circle are explicit or fuzzy: The boundaries of the magic circle could be explicit to the players, as both the physical and the virtual parts of the game may have explicit boundaries. However, when the physical parts of the game space are not dedicated to gaming only, fuzziness of the magic circle occurs with respect to non-playing people in the physical space. The magic circle spans across physical and virtual space. Although there are explicit boundaries of the physical game space, it may be possible to a player to switch between a so-called physical play-mode (player is walking around in his/her physical environment) and a so-called virtual play-mode (player is using a device without location tracking, such as a web interface). The rules and impacts of a switch between both modes are a matter of suitable game rules. The virtual play-mode enables a player to play the game potentially everywhere which means implicitly that a player is interacting with non-players and that he or she does also non-gaming activities.

Experiment with the various modes of play: Two play-modes – the virtual play-mode and the physical play-mode – could be made available in a crossmedia game. These play-modes rely on the devices used. The gaming devices imply different types of participation in the game. Some devices and media channels don't offer a back channel and are therefore more suitable for observing the game. Some devices could be used as voting tools, whereas others allow for realizing a broad functionality and a rather immersive game experience. Some devices enable to perceive and play with virtual game objects also in the real physical realm. Crossmedia games can allow for investigating different forms of participation in the game.

There are always seams between different media and in addition between different devices. It is important to make the best out of these seams. (See the work of Matthew

Chalmers on “seamful design” [Chalmers and MacColl, 2003]). Investigating those seams is one of the most important research themes of Crossmedia. Seams between the virtual play-mode and the physical play-mode have to be designed as an inherent part of the game.

Crossmedia gaming implies that players can use different devices and media channels and that they can switch their devices during a gaming session. Our first Crossmedia prototype will allow for investigating how players can be encouraged to actually switch their devices during a game session and how the seams from one device to another can be designed. The seams between devices and media as well as the technical limitations and dependencies can be exploited in a crossmedia game.

3.2 Trans-Reality Game Mechanics

Make conscious decisions on how the real world and the virtual realm will be used in the game: In a crossmedia game the real world, respectively a physical space could define the actual game space whereas the virtual world could contain the gaming artefacts and a virtual representation of the physical world. The game design has to address the relevance of the affordances and the connotations of the physical world [Barker, 1968; Gibson, 1986]. This has to acknowledge the intuitive understanding of the players.

Make conscious decision on the possible role of spatial player movement: Spatial player movement can be used to explore the game space. E.g. a player may perceive and interact with a virtual object at a certain physical location only, i.e. virtual objects may be bound to fixed physical locations.

Make an informed decision on how physical game play is enhanced by virtual content/gameplay: The physical game play would not work without the virtual content, i.e. by means of the devices used; virtual artefacts may also be perceived in the real physical space and may even have a physical location. Furthermore, the virtual gameplay should only work if the physical game space is somehow represented in the virtual world (e.g. for the virtual play-mode the physical world could be represented as some kind of map).

Encourage emergent player behaviour: Emergent behaviour can be studied in order to find out how the players cope with the devices and the trans-reality game environment. Crossmedia games employ a wide variety of gaming devices and media channels in the game play that imply different roles, different affordances, different types of player participation and different combinations of physical presence and virtual experience. A crossmedia game should allow for investigating how these different aspects can be incorporated into the game. It could be an important research result of a crossmedia game to find out unexpected use of devices.

Making the Game Interruptible: Interruptibility is a major issue in a crossmedia game. Players may be enabled to individually interrupt their game session for different reasons, e.g. to switch play-mode but also to take a break as is necessary in long term game play. The time delays that occur after an interrupt challenge the game mechanics, the time management and the synchronicity [Dennis and Valacich, 1999]. Furthermore, players may change their play-mode when they continue, e.g. continue physical play-mode although they were in virtual mode before.

3.3 Social and Communal Aspects of Pervasive Gaming in Crossmedia

Consider making use of players interacting with each other or non-players: The goals of the game could be set up such that players need to interact with each other to achieve the goal. This interaction should also be encouraged across media. If the players do not cooperate it should be rather unlikely that they will win the game. In order to provide for long term game play, it must be possible to players to play the game even when there are just a few players available (see also interruptability). Furthermore this requires to support social presence [Short, et al., 1976] across media and devices. Collaboration should be motivated across different devices. We will investigate how collaboration, awareness and community formation can work across different gaming devices and media channels. Crossmedia games attract a mass audience since certain devices such as television or web are typically aiming at a broad audience.

Enable spectatorship: A crossmedia game that is played out in public environments has to acknowledge non-players and spectators. This also relates to ethical questions, as spectators may not be aware of the game and players may not be aware of spectators. Thus a game that is played out in public places has to ensure that passengers or other people are not affected by the game play. Furthermore, when broadcast media are involved, designing for spectators is requested. Different degrees of immersion with respect to intention (player versus spectator) and to technical limitations have to be designed for.

4 FUNDAMENTAL ELEMENTS OF CROSSMEDIA GAME DESIGN

In the following sections we present some of the guidelines that were used in the design process of our first cross media game. Subsequently we will report results from the first experiments with the first mock-up of this game.

4.1 Design Guidelines and Questions

Design guidelines for games in general [Salen and Zimmermann, 2004] and for computer and videogames [Crawford, 1997; Lewinsky, 2000] can be used as a basic. The aim of the first prototype is to craft a game that provides its players with a combination of challenge, competition, and interaction. However, the challenge in the design of a crossmedia game is to find the balance between the constraints given by the technology to be used in the game, by the physical game area to be used for play and by the target group. Our first crossmedia prototype focus on research issues related to the creation of a combined game setting which spans across a real physical space with augmented reality and virtual reality spaces, i.e. a trans-reality game area. Different media and devices will be used to create such a game setting. The emerging behaviour with respect to devices is subject of study. We will investigate how such a game setting can facilitate meaningful play across the boundaries, among the devices and among real physical and virtual game space representation.

For the first prototype of a crossmedia game we defined the following high level crossmedia objectives:

- Support several devices/interfaces/media and provide the possibility to choose devices. Differences in the handling and functionalities of the devices should be acknowledged through e.g. corresponding player immersion, roles, and action abilities.
- Explore behavior patterns/evaluation and encourage emergent behavior. Give the players a chance to explore the potential of a device and find their own way of using it.
- Facilitate trans-media collaboration. This comprises symmetric and asymmetric game play (Symmetric gaming means that players have equal roles and equal devices. Asymmetric gaming on the other side means that players involved in the same gaming session have different roles, action abilities, or devices.)
- Enable active and passive participation as well as different temporal involvement and synchronous and asynchronous gaming. Players should be enabled to individually interrupt the game and to continue later on.

4.1.1 Initial Collection of Game Ideas

Early in the design process a target group is to be identified which is assumed to be interested in particular in crossmedia games. This group should be selected by means of psychographic characteristics Psychographics, or as is it sometimes called sociographics is an important way of understanding target groups. The point is to look at how people behave, emotions, values, lifestyles, etc and to build your models from true behavioural data, and not just demographic factors such as age, sex, income, geography etc.

After selecting the target group, the design process should begin with a creative phase of idea creation and evaluation. Brainstorming can be suitable to generate a large number of ideas. Since the number of ideas generated will grow considerably, ways have to be found to rate and select the promising ones. A procedure is required to rate and evaluate the ideas to prepare them for the use in the further process. The template below can be used for collecting and rating ideas. It can help to present ideas logically and sequentially. The ideas can then be rated sorted and the suitable ones selected.

Nr.	Name	Idea Category	Idea	Inserted by	Pros & Cons	Comments
	Name for the game idea	-Storyline -Game mechanics -Game genre -Game element	Description			

Table 1: Template for collecting and rating game ideas

4.1.2 Game Elements Definition

In the course of the design process, a number of questions were compiled which helped to improve the game design. These questions combine general aspects of game design with specific crossmedia aspects. Although this list of questions is not comprehensive and may grow in the future, we recommend answering them for each crossmedia game under design. Although some of the questions that are general to game designs such as the first ones (see also [Crawford, 1997]) and others are particular to crossmedia, the answers will be crossmedia and game specific.

Game Goal

- What is the goal of the crossmedia game and what story line suits with the goal? How does it relate to the physical/geographic game location?
- What is the main feature of the game and how does it acknowledge crossmedia game particularities?

Game area

- How does the game fit to the physical game area and its connotations? How does it add game meaning to the space?
- Where is the game played? What are the physical locations for the game? Does the game span several geographic locations? What is the virtual representation of the physical game area? What boundaries exist? How will actors and activities in the real game space be made perceivable in the virtual space and vice versa?
- What are the properties and what is the behaviour of the game space, respectively what interaction possibilities does the space provide? How are these represented in the physical and in the virtual game space? What kind of map exists between the two? How is the game space conveyed across the media and across devices, how is it visualised and made perceivable?

People and actors

- What is the target group of the crossmedia game? What are their psychographic characteristics?
- How many players? What is a team? Are the teams formed by media or are they formed across physical or virtual boundaries? Is collaboration or competition among and between teams requested?
- What virtual features or artefacts are parts of the game? How do they appear and behave? How can players perceive them and interact with them?

Game activities

- What is the dramatic arc of the crossmedia game? How does the game end? Will there be game levels/stages (main structure, start and end of the game, levels, dramatic arc)?
- Which play-modes will be supported across the media? Can a player switch between play-modes?
- How can the players learn the game? And in particular how can they learn the use of the devices? Is this learning part of the game?
- On which devices will the game be played upon? How can the devices be used within the game play? What game meaning is associated to the devices?
- What relationship exists between the degree of involvement of a person and the devices and media she is using? Can the degree of involvement be changed when devices are changed? Is spectatorship enabled? If yes by which media?

4.2 First Prototype of a Crossmedia Game

4.2.1 The Game

The crossmedia game prototype, which we are currently designing, consists of a storyline, sets of rules for the different play-modes, game spaces and devices. The game allows for several competing teams (min of 3 teams, max of 5 teams), each team holding a minimum of 3 players. The game could last for several days. Players can change devices or play-modes (physical play or virtual play) anytime and can play on their own if they wish but have clear advantages through collaboration. For this prototype we selected a wide variety of devices (see figure 1) with different capabilities for displaying aspects of the virtual game world, for supporting player communication and integration of real-world aspects via sensors. The virtual play-mode requires the use of PCs. Further selection criteria were the degree of innovation. To this end we selected smart phone, portable play station, webcam, Augmented Reality systems, and sensor technology. Finally we also integrated a small robot, the AIBO, into the game play.

The smart phone is mainly used for communication and implements a rudimentary access to the game play. It is a rather small and inexpensive device and can be used anytime in the virtual and the physical game mode. The portable play station is a mobile version of a classical game console. We found it quite attractive to integrate a typical gaming device into a Crossmedia game to attract hard-core players. The webcam allows a broad group of spectators to watch the game play. The Augmented Reality systems

(e.g. Head-up display) allow players to see the direct overlay of the virtual game world onto the physical world. The AIBO offers interesting game mechanisms. E.g. a player in the virtual play mode could control the AIBO in the physical game world. The game under design should allow us to explore adequate usefulness of these technologies and heterogeneous devices. We also expect the players will enjoy exploring these innovative technologies.



Figure 1: choice of devices

The game is designed to be played in a physical and a virtual game space and teams have to play in both spaces in order to achieve the goal of the game. The virtual game space will be a model of the physical game space and game appearance and game mechanics will be adapted in the physical and the virtual game space. The game play will be balanced across the devices and the play-modes.

4.2.2 Initial Experiment with the Game

The complexity of the design constraints for a crossmedia game make it necessary to set up an interactive design process where playability is evaluated in all phases of the design process, as recommended for social technical design [O'Day, et al., 1996]. The setup of paper mock-up [Ehn, 1988] of a crossmedia game under design and an evaluation with players can help to evaluate a game idea. Although a paper mock-up cannot test crossmedia specific technical issues, it may well help to test game concept, goal and particular mechanics. For example, the aim of the first play test of our prototype was to get player feedback on the game concept and features and on the two play-modes (virtual and physical play-mode).

The goal of the game was to defeat virtual viruses that appear both in the physical and in the virtual space. A background story was created to introduce into the game.

As game board, a paper map was created from an intended physical location for the game (see Figure 2). The game rules were simplified and a small program was developed to calculate the virus behaviour. Both play-modes were played out on the

paper map but in separate rooms. Game masters synchronized the two game boards to show the calculated number of viruses on the respective fields.

The game began by telling the background story to all players. The rules for the respective play-modes were written on public paper boards and read out to the players. The virtual players could perceive all viruses across the game board but had rather weak virus attack power. The players in the physical world could “scan” viruses in adjacent fields only, but they could carry devices with different scan and attack power, i.e. they had paper descriptions of the game facilitation of a smart phone, a Portable PlayStation or an Augmented Reality system. During the game, players could communicate with team mates in the other room by sending SMS.

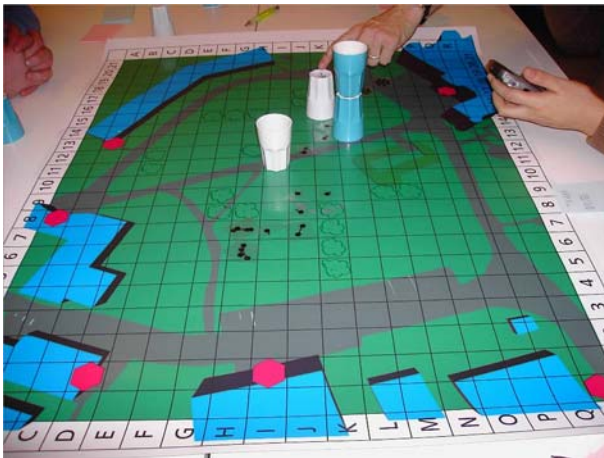


Figure 2: Paper mock-up of the prototype

The differences between virtual and physical play-mode encouraged collaboration and communication – as intended. Via SMS the teams communicated and coordinated their actions; e.g. players told their team mates where they should go, where viruses were, and where they should extinguish viruses. A particular focus of the collaboration between players in the two realms was to make joint attacks on the virus and thus multiply the effectiveness of their weapons.

After a period of play, the pure extinction of the virus appeared to be a too simple as the only goal. The fun in the game increased when the players detected that another player was infected and left infected traces. Other and more complex interaction possibilities with the virus have been identified as game design goals for the next iteration of the game.

This experience with the paper mock-up gave a large number of valuable hints for the further design process. In the further design process more experiments will be performed. Thus in each stage of the design process we can gain input and feedback from players which will influence the further design. This procedure provides player participation in the design process.

5 RESUME AND OUTLOOK

This document has shown that crossmedia games pose specific challenges and that different aspects need to be considered regarding game design and technical realization as well as commercial exploitation and ethical issues. An example of a crossmedia game has been explained and results of early paper-based experiments based on this example have been presented. This example outlines how the guidelines presented in this document may be used in a design process.

We are currently pursuing the design of this game and start its technical realisation. The staging a first prototype which is planned towards the end of this year, we will evaluate the game play and enter a new design cycle to consider more of the aspects mentioned in this document. This will give us important insights into the relative importance of the different game design aspects. These design guidelines will be enhanced and refined in the future.

REFERENCES

- [1] Barker, R. G., (1968): *Ecological psychology*. Stanford: Stanford University Press.
- [2] blast_theory and MRL, (2005): "Can you see me now?." <http://www.canyouseemenow.co.uk/sheffield/index.html>
- [3] Chalmers, M. and MacColl, I., (2003): "Seamful and Seamless Design in Ubiquitous Computing," vol. 2005. www.equator.ac.uk/PublicationStore/2003-chalmers.pdf
- [4] Crawford, C., (1997): "The art of computer game design," vol. 2005. Berkeley, CA: Osborne/McGraw-Hill. <http://www.vancouver.wsu.edu/fac/peabody/game-book/Coverpage.html>
- [5] Dennis, A. R. and Valacich, J. S., (1999): "Rethinking Media Richness: Towards a Theory of Media Synchronicity.," presented at 32nd Annual Hawaii International Conference on System Sciences (HICCS-32), Los Alamitos, California.
- [6] Ehn, P., (1988): *Work-Oriented Design of Computer Artifacts*. Stockholm: Arbetslivscentrum.
- [7] Flintham, M., Anastasi, R., Benford, S., (2003): "Where on-line meets on-the-streets: experiences with mobile mixed reality games," CHI 2003.
- [8] Gibson, J. J., (1986): *The Ecological Approach to Visual Perception*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Publishers.
- [9] Lewinsky, J. S., (2000): *Developer's guide to computer game design*. Plano, Texas: Wordware Publishing.
- [10] Montola, M. and et.al., (2005): "Deliverable D5.1: Initial Design and Evaluation Guidelines." internal deliverable <http://iperg.sics.se/>
- [11] O'Day, V. L., Bobroe, D. G., and Shirley, M., (1996): "The Social-Technical Design Circle," presented at Conference on Computer Supported Cooperative Work (CSCW'96), Boston, MA.
- [12] Salen, K. and Zimmermann, E., (2004): *Rules of Play*. Cambridge, MA: The MIT Press.
- [13] Short, J., Williams, E., and Bruce, C., (1976): *The social psychology of telecommunications*. London: John Wiley & Sons, Ltd.
- [14] Thomas, B., Close, B., Donoghue, J., Squires, J., P., D. B., M., M., and Piekarski, W., (2000): " ARQuake: An Outdoor/Indoor Augmented Reality First Person Application," presented at 4th Int'l Symposium on Wearable Computers, Atlanta, Ga.