Introduction

Marko Turpeinen

marko.turpeinen@hiit.fi

1 Executive Summary

Key features of mobile devices are that they are primarily used for social purposes, i.e. for interpersonal communications, they are highly personal, they can be always connected to the network they can be increasingly used for media creation, and they are as mobile as the people who are carrying them. People are also gradually taking more active roles towards media content in seeking digital information and enter-tainment, participating in shared virtual environments, and becoming media producers themselves. New features of mobile devices, such as integrated cameras and open software platforms enable collaborative modes of group communication and multimedia content creation. The Mobile Content Communities (MC2) project has studied the role of mobile social media, especially in the domains of gaming and photography.

During the project's timeframe (2003-06) the core themes of MC2 have increased significantly in relevance and visibility. The reasons for this are three-fold. Firstly, there have rapidly growing interest and activity on the Web on participatory and social media, and user-generated media content, with well-known examples such as Wikipedia, MySpace, and YouTube. Secondly, the gaming industry has continued to grow, and there has been a significant shift towards social gaming on PCs and gaming consoles, with emerging game modding communities and complex systems of virtual economies. However, the mobile gaming industry, although growing, has still yet not lived up to the promises and there have been also significant commercial failures in this area. Thirdly, the mobile phones are changing people's behaviour of media creation and sharing. At the same time, phone manufacturers and telecom operators are frantically looking for content and service models that take into account the rapidly increasing capabilities of mobile devices.

We conducted a practice-oriented, multi-disciplinary, and international research with both operational and contextual dimensions. The contextual components consisted of gaining deep understanding of digital communities through modelling and reflecting on the social gaming and photo sharing community activity, as well as understanding the individual and social experience related to playing games, and creating and using mobile media. The operational components were building and nurturing communities inter-

ested in making content for and with mobile devices, and developing products, tools and processes that support people in their collaborative activities regarding mobile media.

The project studied the social meaning and impact of new communication technology for communities that are interested in social gaming and mobile photography. These communities were studied from the points of view of the users (community members), as well as reflecting the interests of different commercial actors (device manufacturers, media companies, operators, enabling software houses, and game developers).

The results of the project include evaluated and tested scenarios of mobile community gaming, new tools and services for mobile social media, new open source tools to empower the community activity, company-specific case studies to help the industry partners to benefit from community-created content, and academia/industry networks for future collaboration.

The results of the project are summarized in Table 1.

Table 1. Mobile Content Communities – Project results at a glance

1. Academic results

- 50 publications in international journals (4), conferences (29), seminars/workshops (6), books (3), internal reports (1), doctoral thesis (1), master's thesis (6)
- several co-written papers and co-hosted events across scientific boundaries
- international network of virtual economy researchers (VERN) started and hosted by HIIT
- game experience findings were ranked as the most relevant game research result of recent years at the Game Developer Conference 2006 in San Jose
- five continuation projects directly related to MC2 themes (COMSOA, MoMUPE, Immortalidad, FUGA, Gamespace)

2. Industry impact

- four product concepts implemented (Mobshare, Comic Story Creator, Mupeland Yard, Prediction League)
- two commercial products: Mobshare became PhotosToFriends/Kuvaboxi by Futurice, and Comic Story Creator was commercialized as Comeks by Bulbon; in addition a social game similar to Prediction League, i.e. Mobile League Sports Network (MLSN), was released by Digital Chocolate
- two start-up companies (Bulbon, Pixelgene)
- one of project's researchers was nominated as the CEO of a major mobile game studio at the end of the project
- in-depth analysis of community-centric design in Habbo Hotel
- mobile developer community hosted (Mupedev)
- ten MC2 special interest group (SIG) events with speakers from industry and academia
- international and domestic visibility in game industry-related events, such as Game Developer Conference talk and panel in 2005

3. Societal impact

- visibility in Finnish media and international media (example. Wired News)
- advancement of the use of Creative Commons licenses, especially in the context of games and photos

2 Background

This book results of research conducted in the Mobile Content Communities project (MC2, 2003-2006), which had the goal of understanding the roles of mobility, community and user experience in playing

games, and creating and sharing media. The insights obtained have been used in developing open source tools to support user created content production and documentation of shared experiences, models and frameworks for designing mobile media tools and services, and related business models and legal best practises.

The project was a collaborative research effort of by the following parties:

- Helsinki Institute for Information Technology (DCC: Digital Content Communities Group, UERG: User Experience Research Group, DE: Digital Economy Group)
- Helsinki University of Technology, SoberIT
- University of Tampere, Hypermedia Laboratory
- Helsinki School of Economics, Center for Knowledge and Innovation Research.

The project has also provided a forum for knowledge exchange and the identification of core business issues in the mobile gaming market, as different actors (game developers, media houses, operators, infrastructure and service providers, publishers, rights holders, and game platform manufacturers) all have their unique interests. The research themes of the project two media domains: *social gaming* and *snapshot photography*.

2.1 Social gaming

The rapid growth of digital gaming on PCs, game consoles and handheld devices (like the Nintendo DS and Sony PlayStation PSP) has spurred a range of activity to create new technology and game content for next generation of mobile devices. The promise of improved processing, storage and display capacity, combined with context-sensing and ubiquitous network connectivity, are making mobile devices an attractive platform for new kinds of gaming experiences. However, it is largely unclear what factors will make mobile gaming compelling for consumers.

During the timeframe of MC2 we have observed that the trend in commercial mobile game development has been to follow the path of games made for portable game decks rather than taking advantage of the special characteristics of a mobile phone (e.g., available context and social information, imaging technology, and network connectivity). Presumably, porting well-understood game concepts onto the mobile phone presents a smaller financial risk in the form of familiarity in marketing, development, and user adoption. Nevertheless, new games and new game genres are emerging, where the special characteristics of mobile devices, in contrast to other digital games, are taken more into account. This shift is also visible as some of the prominent players in the market, such as Digital Chocolate, have emphasized the role of social gaming and introduced new game concepts like Mobile League Sports Network (MLSN) to the market.

One lesson learned from PC gaming is that the role of community building around a gaming product is often crucial to achieve commercial success. People enjoy playing against real people instead of machine opponents. They invest their time and resources to master a game, to learn to know other gamers, and in many cases also to change and enhance the games themselves. Multiplayer online games (such as World of Warcraft) and game-like environments (such as Habbo Hotel) have proved the richness of emerging social behaviour, while also being commercially successful. The fundamentally social nature of mobile communications is also seen as a strong driver for community-oriented online mobile gaming.

Community-centricity applies also to developing and enhancing games. Many computer game developers have already realised that allowing gamers to make expansions and modifications (i.e. mods) to existing games, even if these products are copyright-protected, is a good model for building community amongst gamers and thus increasing customer loyalty. Also, it is clear that these communities are not only consisting of "hackers" and "hard-core gamers". Thus, although gameplay is the binding activity for the communities, it is evident that there are many types of media content related to gaming. Collaboration happens in many forms of design, storytelling, development, coding, and socializing.

The "open APIs" and/or "open source" approach to media has produced high quality media content with booming enthusiasm, as demonstrated by blogs, wikis, RSS, music, PC game modding, but not yet in mobile gaming. While open content is increasing in quality and there is a growing public interest towards

this area, several issues remain unanswered regarding this form of content production. There are legal grey areas regarding licensing, lack of functional business models, open questions regarding how to combine open content with commercial content, and the general fact that open content could prove disruptive to the traditional media.

There exist many types of media content and enabling technology that may be associated with the gaming context. Communities need technology that allows on-going discussion and storytelling related to collaborative game design and shared gameplay experiences. For example, a community of gamers might want to create a short movie out of the multi-player gaming session. These formed repositories of game-related storytelling become tools for thinking about how to make better games (Figure 1).



Figure 1. Different forms of activities and media content related to playing games.

Mobile social gaming is still at an early stage of development and there were hardly any existing communities in Finland that are organized around multiplayer gaming with mobile technology. Therefore, it is important to look beyond the narrow definition of mobile gaming happening on portable handsets and small screens. We did not want to be too strict on the definition of "a game" and instead looked for clearly social game-like activities, which may influence the emerging genres of mobile games people will want to play and create. Probable genres are different types of role-playing, adventure and action games, and betting. Social party games and quizzes are also playable over mobile devices. Mobile technology also allows for completely new types of gaming experiences where virtual and real worlds are combined in context-dependent games, outdoor exercise and simulations.

According to parameters like market size, sociological impacts, future possibilities and share of media consumption, mobile gaming is an under-studied research domain. Finland can be considered one of the leading countries in this area illustrated by recent company acquisitions: Sumea by Digital Chocolate and Mr. Goodliving by Real Networks. In this context, project MC2 has addressed the need for an objective and critical view of the mobile gaming industry. Furthermore, through its international ties, MC2 has shed light on how well the findings related to the Finnish market apply to international markets.

The project results have clear and practical applications in the domain of mobile game development as they improve the understanding of 1) individual and shared gaming experiences, 2) the dynamics of communities in a gaming context and 3) the implications of open content. They can be used by the companies in developing future products, enhancing current ones and in forming and shaping the strategies for tackling the mobile gaming market.

2.2 Snapshot photography

Within the domain of digital photography our focus is on self-created photos and images, in other words, snapshot photography in the digital age. Snapshot photography is used often to distinguish between pro-

fessional photography, and especially, amateur photography, where the intentions are creative and artistic, and the technical skills of the photographer are emphasized.

As current consumer media creation devices include video cameras and other forms of media are being used similar way to the use of photographs, all these forms of media can be bundled under the term *snapshot media*. The definition of snapshot media includes video clips, text messages, multimedia shows, and so on, which is created by non-professionals for non-commercial purposes, and the intended audience for the media is themselves and/or their social network (i.e., family, friends, colleagues, etc.).

Mobile phone photography and picture sharing demonstrate the existing social activities that combine user-created media and mobile phones. Picture taking itself is often a social activity, and with networked cameras such as mobile phone cameras, picture taking becomes a collaborative activity where the created media can be immediately shared and combined over the network. Our studies indicate that the pictures and comments people share are very much like in traditional photography: events, people they know, and places and objects that are either aesthetically pleasing or symbolic. However, much of the interaction around mobile phone pictures is joking, storytelling or just playing. People comment and photograph themselves or their friends in a humorous manner, and create humorous meanings to pictures by the written captions.

We have also studied the production of digital memorabilia in groups, and what kind of groups people form when sharing media, and who are the actual people in those groups. The objective has been to approach the social interaction in the mobile domain from existing and smaller groups, such as friends and family, rather than larger groups or communities such as game and developer communities.

The results gained in this project on mobile pictures can also be applied to mobile gaming. We have observed how people are already socializing using the phone, and the socializing revolves around media content, which is created, viewed, and discussed collaboratively. This socializing has a play-like quality that, in a broad sense, could be seen as a social game among friends, relatives, and acquaintances. In other words, for mobile phone users, the step from existing media-related social activities to social mobile gaming is intuitive. From a gaming perspective it can be said that mobile photography is a non-immersed activity and playing that is different from computer games.

3 Research approach

We conducted a practice-oriented, multi-disciplinary, and international research project, which was organized in two dimensions: operational dimension consisting of participatory action, design research and technology development, and the contextual dimension, which acted as a reflective socio-technological "meta-layer" for the project.



Figure 2. An overview of the research methods used in the project.

The contextual components consisted of gaining deeper understanding of digital communities through modeling and reflecting on the (1) gaming community activity, (2) individual and social experience of playing games, and (3) theory and practice of game research. The operational components were (1) build-

ing and nurturing a community of people interested in making content for and with mobile devices, (2) developing tools and processes that will support mobile gaming communities in collaborative game design, documentation of shared experiences, and gaming-related storytelling, and (3) experimenting with hybrids of mobile and other forms of media.

3.1 Scenarios of mobile community gaming

We started the project by doing a background study to understand the state-of-the-art of mobile communities, open game development platforms and mobile gaming (based on literature and user studies). This starting phase was followed by the creation of story-based scenarios, which are related to mobile gaming.

We developed during first year of the project eight scenarios, which were used as an input for extensive concept development phase. The scenarios created using contextual enquiry methods and validated with the end-users served as a basis for the implementation of applications enabling collaborative content production and documentation of the gaming experience. The scenarios, through reflecting existing gaming communities, provided a framework for addressing business and legal issues associated with the creation, licensing, and utilization of open content.

All scenarios were combined with related discussion on the aspects relevant to MC2: technical requirements, player demographics, meta-gaming, business logic, legal issues, player motivation and community relations. The scenarios and these various viewpoints have been documented in length in other MC2related publications.

The following list summarizes the developed scenarios:

Scenario 1: Creating a story from a hockey betting night

Two friends spend their evening in a hockey game. They place bets for the game in a company facilitated betting community website. During the game they take pictures and send them. They also buy a new bet and combine it to their old ones. After the game they re-experience the winning goal from video, and in the end create a memorabilia artifact, i.e., a video, and share it with other people.

Scenario 2: Player-created mobile games

A player wants to make a mod but needs help from other players in technical issues. How can one contribute to the community by creating a mod, if one does not have all the necessary skills? What are the motives behind making own content for others to see?

Scenario 3: A visit to a mobile online roleplaying game

A player has communication problems in mobile gameplay. What types of interaction problems are present in mobile games: features in player's physical context, network connectivity problems etc.

Scenario 4: Local super-distributed game and social acceptability

Shopping has become a common hobby for many people. Stores put huge efforts in marketing, campaigns and product placements in order to make shopping a memorable customer experience. Combining the shopping location (i.e. a mall) and Geocaching-style mobile hide-and-seek game could possibly bundle up as an interesting activity. Such a game could offer more impulsive, social and adventurous shopping for customers, and more efficient marketing and data gathering opportunity for stores and the mall.

Scenario 5: Social pressure and conflicting moral codes in virtual worlds

In open-ended socialization-based game worlds there is a potential for formation of groups with different conceptions of correct way of gameplay. This story tells how a newbie learns the rules through encounters with different groups. As he learns to know the game better, his moral code changes depending on with whom he is playing. Beside getting and learning new technical skills, a teenager is growing also mentally when climbing to upper levels in this gameworld in which morally different social groups and internal social pressure are influencing his gameplay end existence in the gameworld.

Scenario 6: Challenges in managing player presence and context in a persistent mixed-reality game

Franck has forgotten that he is a member of a conspiracy game. He receives an up-setting call in the middle of the night, and is forced to ponder whether he should quit his participation in the game. The community tries to keep him as a member by showing him simple voting results of his popularity among other members of the community.

Scenario 7: Context-sensitive advert gaming

On a visit to a movie theater two girls play a mobile game that has been released as part of a cross-media promotional campaign. How can the gradual progression from a more personal media to a more public one (e.g. print, mobile to television) be used to deliver a cohesive cross-media gaming experience? How will users receive advertisement-centric gaming?

Scenario 8: Company-community relations in controlling user-created content

When an online gameplay community matures, there may be changes in power relations between different player groups with different gameplay practices, like player created extensions and customisations. What's suitable and right for some isn't for others, and one may ask: "Whose game is this anyway?". The boundaries between fandom and corporate culture change, and there are increasing difficulties in considering different player groups when developing future versions of the game.

3.2 Enabling technology development

We have created open source tools that support content creation for mobile games and documentation of shared gaming experiences. The project has designed and built software prototypes and tools for (and with) the communities. These tools are also be useable outside the project's immediate scope of mobile gaming, as the tools will help to create any communities organized around mobile content, to support their collaborative activities, and to help the development of related business activities.

Based on a systematic approach of concept creation, refinement and selection, seven product concepts were chosen for actual implementation, namely:

Mobile Augmented Reality (MAR) toolkit

Toolset for creating mobile multiplayer games using visual markers, maps, public displays.

• Mupedev.org

Online community for the developers of MUPE platform.

• Prediction League Engine

Community toolkit for prediction-based games and its mobile extension.

• Comic Story Creator (in co-operation with Bulbon)

Tool for creating comic strips on a mobile phone.

• Mobshare, or PhotosToFriends (in co-operation with Futurice)

Platform for sharing and digital photos within known groups of users.

• Fansite Starter Kit (designed, but not implemented)

Toolset for making fansites for Habbo Hotel.

Mobile Player Search Tool (not implemented)

Mobile tool for finding other players in the vicinity.

Design and development of product prototypes have enabled testing of the concepts with the communities. The underlying goal in the development of these tools, services and applications was that they were to be used and further developed by the communities participating in the study in a self-sustaining fashion. The ultimate target, in terms of industrial impact, was to go beyond prototyping and to proceed to the level of real commercial pilot applications and possibly even to a commercial launch of products based on the pilots. This goal was achieved with Mobshare/PhotosToFriends, Comic Story Creator and Prediction League.

One of the goals in technology development was to build and sustain attractive community nodes for mobile game developers and players. This included building Web sites for community members for discussion and collaborative design regarding mobile games. The role of these sites was to provide information and tools that allow people to make their own games and game extensions. Project gave support and guidance to the community members in questions regarding game design and game development platforms, such as Multi-User Publishing Environment (MUPE).

3.3 Sociology and participative action in communities

The goal of observing, documenting and analysing the community activity was to contribute sociologically to the views and practices in supporting digital communities. There is a grey gradient from individual, to circle of acquaintances / intimates, to groups where everyone knows one another, to a community of people, to the public which might be limited by language or geography, to the whole global population. The emphasis has been on the social practices that emerge in communities, and rich variety of symbolic connections between members.

The community modelling also included researching computer-accessible models of community activity including analysing, profiling and networking communities using social network analysis (SNA) methods.

The main methods for data gathering have been literary studies in sociological community literature and in digital community supporting area, web material, and user-studies. We have also conducted qualitative research into the social gaming experience. The communities that we selected for research are summarised in Table 2.

Table 2. Summary of the selected communities / groups for user study

Community/ group activity

Neverwinter Nights

Multiplayer game with community-created content

• ethnographic observations using the methods of contextual inquiry of open-ended IRC-based interviews

LARP

Live-action roleplaying communities

- ethnographic observations using the methods of contextual inquiry of open-ended face-to-face interviews
- thematic, narrative-based interview study with LARP players (N=23)

Geocaching

Mobile location-dependent augmented reality game

- interviews and observations of Geocachers
- Geocaching.com site information, collected by a specifically implemented web crawler
- Geocaching fan site analysis, concentrating on the Finnish geocaching.fi -community
- Social Network Analysis (SNA) of Geocaching in the Bay Area, USA

Habbo Hotel

Strong and well-established virtual community with game-like characteristics

- semi-structured questionnaire on Habbo Hotel (country) managers dealing with their ideas on community
- interview of the Habbo Hotel's (global) community manager
- web questionnaire for Habbo Hotel visitors handling the room decoration theme (helping also to define criteria of focus group gathering)
- focus groups of Habbo Hotel visitors based on questionnaire results
- focus group of Hobbas (trusted visitors volunteering as moderators in the hotel)
- Sulake developer interviews (focus on the interplay between design and users)
- Habbo community fan websites, especially the Finnish community

Sulake has provided MC2 researchers access to some of their data and we produce interpretations of community aspects to the company. For example, the "Hotel manager" study helps the company to evaluate their internal guidance. Furthermore, the student project designing "Fan Site Starter Kit" that is

separate from Sulake will anyhow support the fandom culture around and in commercially oriented online communities.

Field studies on the developed product concepts (Comic Story Creator, MAR Toolkit and MobShare) were made in real community settings, with autonomous use of the, and both long-term studies (diaries, questionnaires, interviews) and short-term observations (participant observation in the real context) of their usage.

3.4 Psychology

Qualitative and psychophysiological studies have been the core of our analysis of the gameplay experience. We have researched the role of transient emotional responses (and response patterns), attentional engagement, cognitive appraisals, and the sense of presence during the activity of game playing. The emotional responses can result from (1) an individual's responses to primitive-level elements of the game (colours, shapes, movement etc.), (2) social interactions with other players in the game and (3) cognitive primary and secondary appraisal of the events of the game (interpretation of the meaning of the events to the self). Emotions during game playing can result in mood states during and after the game.

The experiments focused on the following five research themes:

- the influence of selected low-level elements of the game on an individual's emotions
- the influence of social interaction on an individual's and group-level emotions
- the influence of game's events/microcontexts/tasks on an individual's emotions
- the influence of individual differences on emotional responses
- other immediate and transient psychological effects of gameplaying

This research has produced unique results because (1) psychophysiological continuous measures during game play have not been widely used and (2) combinations of task- and user experience-based analysis and psychophysiological methods have not previously been applied in the context of game playing. Overall, the underlying assumption is that emotion may be the possible key explanatory factor in good gaming experiences. The results has also suggested preliminary design rules and best practices for game developers interested in facilitating or avoiding desirable/undesirable emotions.

3.5 Media research

Media research part of the project had the focus on user-created game content and game-related fan production. The objective is to understand the collaborative creative practices of the so-called "modding" communities, i.e. game fan communities that modify and extend officially released titles. Additionally, the correlation between game design, gameplay experience and fan production was explored.

Focus on game content and can be seen as a bridge between the community-oriented and gamer-oriented research approaches of MC2 project. The principles of player-centred game design have to be informed by research into several dimensions: the practises, experiences and significances created by the players as individuals as well as communities, in their interactions with, through and around games.

These questions were approached by investigating several computer games that have spawned particularly productive creative communities. Analysed games included Grand Theft Auto (Rockstar Games 2002/2003), The Sims (EA/Maxis 2000) and Half-Life (Valve Software 1998). Official and unofficial game authoring tools, community models, collaborative practices and game design solutions discovered have been evaluated in terms of how suitable they are in the field of mobile gaming. Research methods have combined observation and community interviews.

We have also studied the relationship between game design and the gameplay experience. This research has sought to find further conceptual tools that were useful when researching the relation between the game and the experience of the player, and when designing mobile games that are to entice users to create content for or tell stories with the game.

3.6 Business

We have studied the business impact and underlying business models for open game development platforms, and the underlying dynamics and future value configuration of the mobile gaming industry. This analysis has examined novel opportunities for increasing user involvement, beneficial to both industry and the user community, in social mobile gaming.

The ability for an author to benefit from community-created content can be considered to be proportional to the community-created contents dependence on the core product. The more dependent the user-created content is on the core product the higher the ability to directly benefit for the original author. The case of video games poses a prime example. Modifications to a video game cannot be experienced with out the user buying the core product. That is the user created content has little or no value for the user if the user does not possess the core product. The more user created content becomes a substitute, i.e. eats into the sales of the core item, community-created content might prove damaging to the profits of the author. In this sense, an optimal strategy for content creators might strive not for restricting user rights in the use of their material for the creation of complementary offerings, but to restrict users rights with regards to the creation of substitute offerings. An example of this would be a licensing scheme that allows the experiencing of community-created content only when the core offering provided by the original author has been already purchased.

User- or community-created content presents significant issues both in business models and legal issues such as liability and intellectual property. For example, what kind of new revenue models are possible in having users create part of the content. Also, the problem of liability in user-created content or game modifications has been an uncharted area of research (*e.g.*, is the game developer or publisher liable for defects caused by user-created content or modifications). Another unsolved issue is intellectual property in user-created content (*e.g.*, licensing and rights in distributing and publishing content which is partly user-created and partly proprietary, and also, the problem of verifying that the user-created content does not infringe on any third party rights.). Thirdly, the issue of community as a legal person becomes relevant in user-created content where there are several people contributing (*e.g.*, who has the rights to sell, distribute, and modify content which has been created by a community, who can make decisions on behalf of the community). Finally, to make matters more complex there are significant differences in legal regimes in different countries, which have to be taken into account although the game business and gaming itself is global.

One of our goals was to use MC2 as a testbed for new forms of incorporating open content licensing (such as "creative commons" licences) with commercial services. The project has also explored the key benefits and potential pitfalls of such models, as well as the fit of existing open source/open content licenses with such mixed open/close development models. The impact of community-based innovation on product development/business model, where need-based product development is "outsourced" to the user community, was also studied.

We have also studied the role of users in value creation in virtual environments, and its business impact. The virtual worlds of today's massively multiplayer online games and social environments have gradually become centers of commercial activity: users buy and sell virtual assets for real money. In this way, users indicate that they perceive some virtual assets as possessing actual value. In most cases this is an emergent phenomenon: it not part of the developer's design. Thus even though virtual worlds seem to be effective at creating value, the process of value creation is not fully understood.

3.7 Academia/industry collaboration

The project had the goal of generating a mobile gaming industry-academia network to foster the emerging Finnish mobile gaming industry cluster. MC2 industry-academia relationship has been fostered with seven Special Interest Group (SIG) workshops and meetings, and projects industry-academia website (http://pong.hiit.fi/) has been in active use throughout the project.

Active work in fostering game developer (professional and amateur) communities helps to better understand their needs. By combining the academic links with the insights gained from the developers gives MC2 a good position to contribute in standards definition and standards creation, both in game components, tools and design level. This interaction between academia, industry and developers also allows the projects to create best practices that can be leveraged both in industry and in future academic work.

In addition, MC2 has also contributed to building, strengthening and broadening the current academic game and photography research community in Finland and abroad. Through these networks, Finnish research institutes have strengthen their ties to MC2 international academic partners.

Game research is clearly an emerging branch of science. In the future, both the business and social impacts of gaming will become more visible and significant, which will further boost also the interest in the academic frontier. As MC2 was a large, networked, multidisciplinary and internationally well-connected research project, it created a solid basis for future Finnish academic game and community research and projects. Lessons learned from the project's multidisciplinary work environment also generate academic best practices, beneficial to other research fields as well.

From the scientific point of view, the research has fed onto computer science, sociological, psychological, legal and business- and media-related understanding of mobile gaming communities. This understanding will be apparent at various levels, ranging from simple models to wider theoretical advances, and it will feed back to the commercial and social levels apparent in the project. For example the psychophysiological research has already generated new findings and results, which appears to have significant impact on understanding the psychology of gameplay.

Academia is a neutral instance for nurturing a game developer community. Neutrality and financial independence helps developers gain trust on the site. Open-minded collaboration is especially important in games domain, while currently most of the game development projects have out-grown from the resources and capabilities of most of individual parties. Fluent sharing of knowledge, components and other game development resources enable that smaller groups of people can still finalize a game, which will further be beneficial for customers who get more varied and available gaming opportunities.

From a social standpoint, one of the main aims of MC2 is to promote the livelihood of communities centered around content production for mobile games and on the consumption of the mobile games. Through promoting the collaborative aspects of various processes related to mobile gaming, the social ties within these groups might be strengthened and enhanced. Furthermore, by developing open source tools that make it easier for users to expand existing content and to generate their own content. Through these means, we are promoting the diversity of ideas and social expression.

4 **Publications**

The following list includes all of the publications of the project, with the following categorization:

- o International journal article (4)
- Conference paper (30)
- Book chapter (3)
- Seminar / workshop paper (6)
- Internal report (1)
- \Rightarrow Doctoral thesis (1)
- \checkmark Master's thesis (6)

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Research Framework

One of the original goals of the MC2 project was to bring researchers with very different backgrounds together to study mobile social media. We can also claim that the project was very multi-disciplinary: we combined technical research and development with in-depth community studies, added with knowledge from fields like mobile content business, game design research, psychophysiology of media experience, and legal expertise. This also meant we have also used a plethora of research methods and practises within the project.

This chapter introduces three viewpoints on our research framework. We want to illustrate how we have combined the elements of the operational research dimension consisting of participatory action, scenario and concept development, and designscience research, with the elements of the contextual research dimension, which has consisted of gaining deeper understanding of digital communities.

In the first paper *Scenario and concept development process*, Antti Salovaara explains how we have arrived with novel mobile application and service scenarios and concepts in practise. The process consisted of two phases: scenario development and concept design, which both resulted in from a collaborative analysis of the field. The method used was an adaptation of affinity diagram construction technique. We believe that in a large and uncharted problem space, where many different viewpoints need to be considered, the methodological process can be highly useful. The process used in MC2 can provide a fruitful approach for coming up with a large collection of novel and relevant concept ideas, but also means for selecting the the best of the crop suitable for actual technical implementation.

Design-Science Research in Mobile Photography by Risto Sarvas provides a methodological framework for constructing new mobile services in an iterative fashion and evaluating the constructed work in actual use. This method effectively and practically combines the "problem-solving by construction" or "technology push" approach familiar in engineering and the behavioral studies approach of understanding people from more humanistic research background. In his paper, Sarvas illustrates how design-science research method was used in designing, implementing, and evaluation three

consecutive mobile photo sharing systems. This work describes the methodological core of the doctoral thesis work conducted by Sarvas within the framework of the MC2 project.

In the third paper, entitled *Community Modeling and Community-Centric Design* by Mikael Johnson and Kalle Toiskallio, the authors attempt to do the impossible and condense the various viewpoints behind the concept "community" in roughly ten pages of text. They have gone though a herculean job of summarizing and exposing different literature discussions on different community perspectives – sociology, engineering, virtual worlds, e-commerce. The main conclusion is that these viewpoints are quite different, and the contribution of this article is in explaining the differences and potential incompabilities. The authors illustrate how this "community confusion" was sorted out for the purposes of MC2 project and outline social design strategies based on Strauss' social world perspective. The paper also makes a significant and novel contribution to the field by introducing the concept of "community-centric design". This is research work that was started in the MC2 project and has continued in several follow-up research efforts.

Scenario and concept development process

Antti Salovaara

HIIT, Ubiquitous Interaction Research Group antti.salovaara@hiit.fi

Abstract

Part of the MC2 activity was to develop concepts of new services, with an emphasis on mobile applications. The concept development was carried in two stages, preceded with case studies on gaming communities: scenario development and concept design. This chapter concentrates especially on describing the process deployed in the latter stage. The starting point was very multidisciplinary: we had data on four gaming communities, added with knowledge from fields like game business, game design research, modding, and psychophysiology of gaming. We started by setting up expert lectures to collect information from many sources in an interdisciplinary manner. While listening, people wrote 873 PostIt notes in order to gather as much information from the lectures as possible. The lectures were followed with PostIt note based data analysis. The method used was an adaptation of affinity diagram construction technique, which is a technique quite often used in concept design projects. This chapter explains how the traditional method was adapted and discusses its potential benefits. The argument is that the adaptation may be useful in concept design when the starting point is multidisciplinary and it is difficult to balance the importance of different sources of data.

1 Introduction

Tasks 2 and 4 in the project aimed at reflection and analysis of the Task 1's ethnographic findings of the four case communities selected. The purpose was to jointly create scenarios of future practices in game communities and develop product concepts of devices and services that could be needed in such activities. In the field of User-Centered Design, these tasks are traditionally been understood as design activities that *precede* the traditional product development process. The Figure 1 below, adapted from [2], aims to clarify the purpose of these preparatory stages in relation to other tasks in the project. The tasks are de-



Figure 1. The relation of MC2 project's Tasks 1 (establishing common ground), 2 (scenario building), 4 (conceptualization and design of enabling tools) and 5 (building and maintaining the enabling tools) in the framework of traditional stages of a user-centered design process. In MC2, Task 4 did not include building and evaluating prototypes, so they are greyed in the figure. scribed below in the two following chapters.

2 Scenario development

The goal of scenario development was to gather and bind together the information that was collected in the first half-year of the project. This was essential from the point of view of developing interdisciplinary practices across partners, but also to sketch the *design space* of the project: achieve understanding on the field of mobile social gaming, in order to be able to develop applications, systems and services in the later project's stages.

The scenario development process was started as a distributed activity, in which project partners developed scenarios around the topics that they found the most relevant from their particular theoretical standpoint. That is, the aim was to develop stories of possible future mobile gaming activities that would the project to analyse important theoretically motivated questions in a manner that would be understandable to all project partners. Each scenario consisted of a small summary of its contents (2-3 sentences), definition of the underlying theoretical question, a storyboard of the scenario's main contents, and the full story.

The scenarios were collected to MC2 wiki pages, to be accessible to all project partners. The initial scenario development was followed with workshops where the contents were edited and discussed, especially from the viewpoints of

- Prerequisites (what needs to happen in technology and in the market before the scenario is realizable),
- Player demographics (who are the people playing this game),
- Meta-gaming (what might be the related activities that touch gameplay in this scenario),
- Business perspective (from the point of view of primary and secondary stakeholders separately),
- Legal issues,
- Player motivation (why might the players play the described game),
- Community relations (what is the relation between the individual and the community in this scenario), and
- Potential extensions to this scenario.

All the scenarios have been included in the MC2 Intermediate Report (Spring 2004) and the describe the following activities:

- 1. Creating a story from a hockey betting night
- 2. Player-created mobile games
- 3. A visit to a mobile online role-playing game
- 4. Local super-distributed game and social acceptability (parts of this scenario are visualized in Figure 2)
- 5. Social pressure and conflicting moral codes in virtual worlds
- 6. Challenges in managing player presence and context in a persistent mixed-reality game
- 7. Context-sensitive advert gaming
- 8. Company-community relations in controlling user-created content

Scenario 4: Local super-distributed game and social acceptability

Summary: Some people get interested and some get annoyed when people play a location-based mobile game in a shopping mall.

Theoretical questions:

- 1) How to distribute a game easily and effectively to players, who are located in the same physical space?
- 2) What is a sustainable business model for user-to-user distribution?
- 3) How will the social norms evolve around mobile gameplay in public places?





Mary gets a crippled copy and tries it with John and Mark. She likes it a lot and buys the full version.



Mary forwards a crippled

copy of the game to her

friend Susan.



Mark, John and Mary make noise while playing and an angry lady from a nearby cafe tries to stop them. Mark gets angry since he loses the top score

Figure 2. An example visualization of Scenario no. 4.

3 Product concept development

The scenario development was followed with more detailed conceptualization of the design space and the potential product concepts. As can be noticed from the list of issues explored in the scenario development, the design space for the product concepts was very large, and efforts were needed to narrow it down. In addition, the relevant fields of research were very different in nature, ranging from ethnographic first-hand observations of community practices to business models of mobile gaming industry. This raised the following challenges for concept design:

- 1. How should we make an analysis of information that is described in so many different ways?
- 2. How should the design space be narrowed so that it would be possible to come up with viable and believable product concepts?

One of the methods used in user-centered design of product concepts (or user-centered product concept design, UCPCD) is *affinity diagram technique* [1]. In that method, information about the topic of interest is first written onto PostIt notes, each piece of information onto a single note. This creates a large number of notes that then can be sorted to create natural categories. Rationale behind this is that by working with the information, the designer-researchers have a possibility to learn new insights about the phenomenon. The technique consists of creation of PostIt notes (e.g. during data sessions where different user research findings are discussed), sorting the notes, and concretization of the key ideas into concept scenarios. Because our research group had already gained positive experience on using this method in the past projects, this method was selected.

However, the technique was not familiar to all the project partners whose participation was needed. Therefore, a one-day tutorial on this method was organized for everyone. Including this tutorial, the whole product concept development process consisted of the following steps:

- 1. Tutorial workshop of UCPCD and affinity diagram construction technique (March 2004)
- 2. Data sessions: 8 lectures of different topics by domain experts (April 2004)
- 3. Data analysis: Affinity diagram construction (May-July 2004)
- 4. Creating concept scenarios (July-August 2004)

We will describe these steps in more detail in the following sub-chapters. The emphasis is on the use of a modification of the traditional affinity diagram technique.

Session	Domain expert	# of notes
Live-action role-playing	Antti Salovaara (HIIT/UERG)	77
NeverWinter Nights	Sauli Tiitta, HIIT/UERG)	186
GeoCaching	Kalle Toiskallio (HUT//IERG)	94
Habbo Hotel	Mikael Johnson (HUT/IERG)	200
Modding communities	Tero Laukkanen (UTa/HyperML)	150
Game design research	Satu Heliö (UTa/HyperML)	92
Game industry and business	Fernando Herrera (HIIT/DCC)	74
Psychophysiological responses to gaming	Niklas Ravaja (CKIR)	56
	SUM	873

Table 1.The topics of the case lectures held in the data sessions, the presenters of
each session, and the numbers of PostIt notes collected.

3.1 Tutorial workshop

The purpose of the one-day tutorial workshop was to teach the involved research partners into the idea of PostIt note based data analysis. The participants of the workshop consisted of the people who would be also present in the next step: giving, and listening to, expert lectures. It was important to provide an idea what to write on the PostIt notes while listening to other people giving a speech, and what is the post-processing like after that.

What was stressed in the tutorial was that:

- The text written does not need to contain any insights or product ideas that is too far-reaching at this point. Simply trying to faithfully write down the speech content is enough.
- Only full sentences should be written. This is because it is often difficult for other people to understand ideas expressed with a few keywords only.
- Notes should be written continuously without a pause, aiming for dozens of notes in each data session. The more there are notes, the better the basis for post-processing.

3.2 Data sessions: the case lectures by domain experts

In the data sessions, the procedures were put into practice. Lectures were organized about the eight different topics, with an average of 5.7 listeners (13 different people in the sessions) in each lecture writing PostIt notes. Notes of different colours were used in different lectures. This was done to make it easier in data analysis to track were each piece of information actually originated from. The number of notes collected in different sessions is summarized in Table 1. Here are three randomly selected notes from the case lectures, to provide a feeling of the type of data:

- Modding note #46: Multiple software tools might be needed to create a "simple" game modification.
- Habbo Hotel note #122: Bying only furniture might be too simple for an economy. People are buying experiences when using Habbo. There is great room for improvement.
- Live-action role-playing note #10: LARPs are usually organized in teams.

The total number of notes provided a fairly good basis for the data analysis. After the sessions, all the notes were numbered so that in the later stages of the process it would be easy to create links between individual notes just by writing down the unique numbers.

This process of PostIt note creation exemplifies one benefit of affinity diagrams: with the notes, all the knowledge from different topics is can be represented in a unified way. When later analyzing the notes to create interpretations of the phenomenon of gaming, having all the information in the notes facilitated the multidisciplinary analysis of data.

3.3 Data analysis: affinity diagram construction

The process of organizing the notes was planned as follows. Three researchers¹ spent time analyzing the data. All the notes were collected in piles on a side table, from which they were picked up and sorted on a big table. The following instructions were used to unify the working practices between researchers:

- 1. Pick a set of notes with different colours from the side table.
- 2. Place notes into categories on the table. Categories should describe people's current practices. When creating categories, label them with suitable names, and put the name on a PostIt not that you stick on top of the category.
- 3. If notes do not seem to forma meaningful category, you may reorganize the categories, not only making new categories but also creating hierarchies. Categories that are related to each other should be placed next to each other on the table.
- 4. Impossible-to-categorize notes can be put into a "recycle bin" to be used later.
- 5. When working at the table, try to identify gaps, people's problems and links between and within categories and how technology can support them (i.e., important insights). Use special-colour PostIt notes to record these ideas. Write down the numbers of the notes from which the idea originated. This enables back-tracking later when notes are again separated from each other.
- 6. If you have a idea of a product concept, draw a scenario about it, and make also a PostIt note with a special colour to explicate your underlying hypothesis.

While working, also incomplete ideas were written down bearing in mind that another researcher would be able to improve them. Because there could be individual differences in perceiving what clusters of notes could form neat categories, we were talking about our actions to the others while working, this way making the others aware if some reorganizations were being done that others would not agree with. In addition, if a poor categorization was noticed, the discrepancy was solved through constructive critique. Figure 3 shows pictures from these data analysis sessions.

Two variations of diagram construction were used in this step of product concept creation. The first one – free categorization – is the traditional way of working with the notes. The second – *structured affinity diagrams* – was originally experimented with in a previous project [2] and was applied here in a larger scale.

¹ Antti Salovaara, Marko Turpeinen, Sauli Tiitta

3.3.1 Free categorization

Free categorization is the method proposed e.g. by Beyer and Holtzblatt [1]. In free categorization, the idea is to approach data without preconceptions, and letting the data organize itself in the sorting process. This allows the researcher learn about interrelationships between different findings, and this way gain novel insights. In MC2, the first half of the analysis was carried out this way. After 5 full days of clustering the notes, approximately half of the notes had been organized, and the following big categories were found:

- What are the game-related discussions like, both outside the gaming situations (off-game) and during the gameplay (in-game). The in-game communication was smaller of these categories and could not be divided into further sub-categories, but the off-game discussions were further divided to issues related to pre-game and post-game discussions and the importance of memorabilia from the game.
- What are the issues that make people "hooked" into the gameplay. This category contained findings about 1) the pleasure of seeing one's character become stronger in the role-playing gameworld, 2) learning to master the game better, 3) getting satisfaction from small incidents in the game, and 4) cheating the others.
- Game development as a teamwork. There were categories about 1) ways to maintain the motivation to keep on working with the game project, 2) organizing team communication, 3) team management and its risks, and 4) solutions to make a multi-disciplinary team to work together.
- What is the practice like when designers are designing gameplay for players. The subcategories were: 1) maintaining a role-playing gameworld by creating new interesting features and delights, 2) control mechanisms that designers may set up into the game world to keep it balanced and fair, and 3) allowing for many different ways to play the game.

Although these categories "made sense" to the researchers, the remaining notes (constituting more than half of the notes on the table) were so disorganized that the free categorization was terminated at this stage, and it was decided that this was the suitable moment for the adaptation of the method.

However, as a result from free categorization, 30 ideas of products and 10 insights were gained. Here is a random selection of product concepts and insights. It is easy to notice that some of them are hard to understand by other people than their inventors, and that their quality varies a lot as well:

- Product concept: Game business profit calculator for developers
- Product concept: An in-game tutorial system in a multi-player game that introduces the game world and its norms to a newbie.



Figure 3. A picture from affinity diagram construction sessions, and a close-up photo of one unfinished category and its sub-categories.

- Insight: Playing in a persistent game world brings reality to the game world: you don't want to do that many risky things because that is harmful to your later game sessions.
- Insight: We should investigate whether the reason for creating fan sites lies in vanity factor or in the desire to share one's experience.

To make the connection to empirical data explicit in the innovation of concepts and insights, we always wrote what PostIt notes had provided inspiration to the innovation. At this point of the process, it was clear that the concepts and insights could not always be very polished – it was more important to write down all the potentially useful ideas while working, and postpone refining them to a later stage.

3.3.2 Structured affinity diagram creation

During the free categorization, we had become increasingly aware of the fact that the relationships of the different *actors* in the gameplay activities seemed to play an important role in understanding the phenomenon of gaming. The different actors were e.g. the players, the game masters, and the designers. This finding provided a basis for a role diagram of different actors that is shown in Figure 4. The diagram consisted of a sociogram of players, game masters, designers, developers, modders, and game industry, surrounded with two spheres: game community and the society in general.

Using a sociogram was only one possibility from many options that could be used as an underlying structuring principle. Also temporal organization structures were considered, such as game development and game session lifecycles. However, because of the presentations in the data sessions, the PostIt notes were better suited for analyzing the social relationships between different actors.

Making a conscious choice on how to structure the notes can be beneficial in three ways. Based on our previous experience, it is possible to become trapped in the following pitfalls in affinity diagram creation:

- 1. *Clustering together notes from all too different use contexts.* It is easy to group together PostIt notes that in the word level seemingly handle the same topic but that actually map into different use contexts. This statement can be clarified with an example: Our task was to create concepts that facilitate social gaming. Therefore, when creating the affinity diagram, we may inadvertently group together all the notes that mention "social" in a way or another, to create a cluster of notes that define different kinds of "social phenomena". As a result, findings about player-player relationships and designer-game industry relationships are put together, forming a cluster that does not anymore represent a natural social group of people. We then lose the idea of users' context by short-sightedly concentrating on words written on notes.
- 2. *Identifying too high-level phenomena.* Grouping the sticker notes is a generalization process: individual observations are combined together, and their headings emerge to describe groups of notes. It is sometimes difficult to tell when this generalization has gone too far and we have lost the connection to concrete observations. For instance, when trying to formulate underlying characteristics of players we might conclude with a statement that "these people enjoy playful interaction". This conclusion is a rather plausible inference, but it applies almost universally to any people and is not related to the activity social gaming concretely enough and cannot probably be useful in finding really important needs that would raise ideas for groundbreaking concepts.



Figure 4. A sociogram that represents relationships between actors in a game community. This structure was used to categorize PostIt notes during the structured affinity diagram construction.

3. Inability to realize that the affinity diagram construction can be guided by false intuition. It is rather easy to understand that sociologists probably arrange a set of sticker notes in a different way than industrial designers. Likewise, taking the perspective of the players' or game industry's intentions only results in different emerging phenomena. Therefore there is no single, objective way to cluster the notes together and one should understand that our assumptions always guide our analysis. This happens sub-consciously if we are not aware of it.

The structure shown in Figure 4 was used to resist being trapped in these pitfalls. The diagram made us aware of our underlying assumptions (pitfall 3), allowed only socially related notes be clustered together (pitfall 1) and forced us to come up with categories that were plausible to particular social groups, not any people who are involved in game-related activities (pitfall 2).

As result of structured affinity diagram creation, 178 early-stage concepts and 66 insights were gained. These were similar to the ones presented as examples in the previous subchapter. In the evaluation of the method, provided at end of this chapter, we will make an indicative comparison between the concepts and insights that were gained with this approach versus with the free categorization.

3.4 Concept and hypothesis refinement

After having analyzed and categorized all the notes (except the 43 notes in the recycle bin category), the task was now to cut down the number of concept ideas, from the total of 30+178 to a manageable number, while at the same time improving the quality. To do this, all the original PostIt notes from the case lecture sessions were removed from the table, and only the 15 top-level categories (see Figure 4), insights and concept ideas were kept. Then these notes were categorized thematically together, making new categories. Whenever possible, product ideas were merged together. The insights were also placed next to the relevant product ideas whenever possible. If the insight applied to multiple places, the PostIt note was duplicated. As a result, the number of ideas was compressed to 68. Figure 5 shows a picture from the table at this stage.



Figure 5. A close-up of the affinity diagram during the concept and hypothesis refinement. New, merged product concepts were denoted with orange notes, next to which original product ideas (yellow notes) and insights (green notes) were placed. Magenta notes were used to describe categories of new product concepts. On the bottom of each yellow and green note there is a list that tells case lecture PostIt notes gave rise to the idea in the note.

The new 68 product concepts were converted into use scenarios, to make them more concrete and comparable with each other. The scenarios were textual, and always contained 3 parts: the first part described a situation that was in some way problematic to a certain group in the community. The second part presented the product concept and how it can be used to solve the problematic situation. The third part described the outcome of using the product concept in this hypothetical situation. This way, the product concepts were made more understandable also to outsiders who had not participated in the PostIt note clustering process.

At this point, the affinity diagram was left aside, and the future steps concentrated on analyzing the 3-part scenarios and selecting the best of them. The selection process was carried out in two phases of voting: early concept selection that within the two research teams at HIIT² and late concept selection in a meeting together with the MC2 project partners³.

3.5 Early concept selection

In the early concept selection session, the researchers ranked the 68 scenarios based on three criteria: 1) what was the researcher's personal "gut feeling" of the quality of the product described in the scenario; 2) how interesting the product is research-wise (for instance, does it express a new idea that has not been analyzed before); and 3) can the described product be implemented as a prototype within the MC2 project's two remaining years. Every researcher was allowed to distribute 30 points among the product concepts, giving a maximum of 3 points to a single concept.

When analyzing the outcomes of this voting process, 16 winners were found, and the rest of the scenarios were dropped from later development. In addition to the 16 product concepts that originated from this process, the list was appended with 6 additional concepts. These were ones that were already in "product line" within the project.

3.6 Late concept selection

For a new voting process among the MC2 partners, the 22 remaining product concepts were visualized with hand-drawn pictures, and then presented to the representatives of the partners in the MC2 special

² User Experience Research Group (UERG) and Digital Content Communities (DCC)

³ Special Interest Group meeting SIG5, held August 26, 2004, at HIIT.

The Mole Modders gaming group wants to make stories out of their gaming sessions, and chooses to use comics as the media for storytelling.

The comic story creator has ready-made templates for molerelated storytelling. Using the toolkit the players are guided through a simple process of creating a comic.

Comic stories are shared between players by sending them to the group's website.



Figure 6. The Comic Story Creator product concept, as presented in the MC2 special interest group meeting. Other product concepts were visualized in the same way.

interest group (SIG) meeting no. 5 in August 26, 2004. Figure 6 shows how the Comic Story Creator was visualized and what was its use scenario.

The voting in the meeting narrowed the selection of product concepts down to 7:

- *MAR (mobile augmented reality) toolkit*: a set of software tools that help people construct their own mobile multiplayer games, and a combination of two concepts (Physical object tagger and Tool for quiet communication in games).
- *MAR structure visualizer*: a software for PC that allows game masters to plan different outcomes for their game session, and analyze the balance of the game
- MobShare for gamers: a lightweight tool to capture mobile game sessions
- Fansite starter kit: a toolkit for setting up a fansite and a meeting place for a community of gamers
- *Comic story creator*: a lightweight memorabilia tool for gamers, allowing recording narratives from the gameplay experience
- *Social network virtual mirror*: a tool for active community members and maintainers to analyze how is their community developing
- *Mobile player search tool*: a mobile short-range communication software for advertising your game sessions and getting new players into it

In addition, the SIG chose two additional concepts (Mupedev.org and Prediction League Engine) for later development outside the product concept design process. In different ways, all of these concepts were put to implementation within Task 5. More about the product concepts can be found in chapter "Toolkit for user-created augmented reality games" in this report.

4 Discussion

In the end of the day, the ultimate test for the viability of the product concept design process is the success of the resulting concepts. In the case described in this chapter, the outcomes from the process resulted in two implemented prototypes (MAR Toolkit, Comic story creator), an academic paper about the importance of recognizing the "playmakers" in game communities (i.e., the people who maintain and nurture the community activities [3]), and a spinoff company (Bulbon Ltd.) that commercialized the Comic story creator with a name Comeks. In this sense, the concepts proved successful.

Another way to evaluate the quality of the ideas is to compare the outcomes of this method against some baseline condition. This is obviously a lot more difficult task, since creative brainstorming processes are not deterministic and therefore it is impossible to claim if a certain outcomes was a result of a certain factor in the process or not. Qualitatively, however, the structured affinity diagram technique has some advantages. By forcing the designer to draw a map like in Figure 4 about the underlying links in the data, it makes the designer better aware of the premises of the creative process. For instance, when drawing the map, the designer may notice that without drawing the map, he/she would have not thought about the idea of game masters in other games than role-playing games. This might lead to a new finding that might have not occurred otherwise. In our case, by allocating a separate space for game masters in our map, and sorting notes onto it, we found out that in any game community, there are active members who arrange game-playing situations for others or otherwise provide resources for engaging gameplay (e.g. by running the servers). These are not game masters in traditional sense, but serve the same purpose. We dubbed these people as "playmakers" are started developing concepts that would facilitate the gameplay of these particular community will benefit from it. The outcome of this thinking is visible in many of the concepts that were presented to the project partners – many of the concepts are tools for these game masters.

That is, using structured affinity diagrams may increase reflection during the concept design process, and this helps in identifying gaps and other opportunities in the design space. Starting from nine different game-related topics, as presented in the case lectures in the beginning of the process, the structured approach enabled us to analyze the data in a balanced way and notice novel ideas.

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Design-Science Research in Mobile Photography

Risto Sarvas

risto.sarvas@hiit.fi

Abstract

Design-science research provides a methodological framework for constructing and evaluating the constructed work in actual use. It is a combination of the problem solving by construction approach familiar in engineering and the behavioral studies approach of understanding people. In this chapter we briefly go through how design-science was used in studying mobile photography in the MC2 project. We describe how it was used in designing, implementing, and evaluation three consecutive mobile photo sharing systems. We also go through in more detail the evaluation methods used for each system.

1 Introduction

The mobile photography studies in the MC2 project focused around three systems: MMM-1 designed and constructed in co-operation with UC Berkeley and Futurice, the MobShare system designed and constructed in co-operation with Futurice, and the PhotosToFriends system designed and constructed from MobShare by Futurice. These three subsequent systems provided and exceptional opportunity to design and study in consecutive iterations: the user studies made with one system could be used as input to the following one (see Figure 1). This approach is familiar in design-science research which was the methodological framework used.



Figure 1. The three consecutive systems designed within the MC2 project.

In this chapter of the final report we briefly go through what design-science research is and how it was applied to the Mobile Photography studies in MC2.

2 Design-Science Research

Design-science paradigm is fundamentally a problem-solving paradigm which has its roots in engineering. Behavioral science, on the other hand, has its roots in natural science research methods, and in the context of information systems its goal is to develop and justify theories that explain or predict organizational and human phenomena surrounding the analysis, design, implementation, management, and use of information systems. These theories impact the design of further information systems, and that is how the cycle progresses. Design-science research is discussed here as described by Hevner⁴.

In a research field, such as consumer mobile photography, where existing theories are often insufficient the design-science research approach provides a methodological framework. Taking it as a fact that technology and behavior are inseparable in information systems the method used in the MC2 mobile photography work (*i.e.*, the MMM-1, MobShare, and PhotosToFriends systems) is to start from current literature, as well as existing systems and technology, and to gain a better understanding of the interactions between behavior and design in photo sharing systems that leverage mobile technology. And by this method it is possible to study and discuss the user behavior and technology as complements, not as separate things.

However, the design-science research, which has its background in information systems (IS) research, does not fully apply to the research done here. IS research studies systems that are implemented within an organization for the purpose of improving the effectiveness and efficiency of that organization. The organization in the discipline of IS research is a business organization, and IS research addresses the interplay among business strategy, IT strategy, organizational infrastructure, and IS infrastructure. This mobile photography research is not done in a business context, although the importance of related commercial technology is emphasized. The organizations studied in this work are social networks of acquaintances (*e.g.*, friends, family, and colleagues), the motives and rationale behind user behavior are from the perspective of a consumer, not an employee, and the systems constructed and evaluated are built for either research purposes or as commercial systems for consumers. Therefore, the IS design-science research was used more as a methodological framework rather than a method to follow. Although the objectives of IS research are not the same as in this work, the main approach of studying relatively unknown phenomena by the iterative build and evaluate cycle can be applied.

The new technologies built in the mobile photography research were, as mentioned above, the three mobile photo systems MMM-1, MobShare, and PhotosToFriends. The user behavior related to these systems was studied and evaluated with qualitative and quantitative methods to gain a deeper understanding of the issues related to media use and metadata in photo sharing systems.

3 Evaluation and Analysis Methods

The principle of the methodological framework used here is to design and construct user-centric systems for photo sharing to be able to empirically study them in real life context, and to understand the impact of design decisions made. Therefore, the evaluation and analysis methods used in this research play an important part. Below is a summary of the user study and analysis methods used in the three systems designed and studied within MC2. A more detailed description of the used analysis methods is in the original articles themselves (see below).

The MMM-1 system's was given to fifty-five people to use for four months. Their use of the system was analyzed with three methods: a videotaped user interface test done on five test participants, a weekly survey on all participants for seven weeks, and two focus group discussions (altogether 15 subjects in the two groups). The test people were students at UC Berkeley or researchers in the project.

⁴ Hevner, A.R. 2004. Design Science in Information Systems Research, MIS Quarterly 28(1), pp.75-105, March 2004.

The main method of analyzing MobShare was two sets of user trials. For each trial there were five core users who were given Series 60 compatible camera phones (Nokia 6600 or Nokia 7610) and some guidance into using MobShare. It was emphasized that using the system was by no means compulsory. All of the data transfer costs for uploading the pictures were paid for, and all of the core users were paid a fee for volunteering in the study. Three interviews were arranged: before, in the middle, and after the trial period. The interviews were about the users' photography habits and social networks, as well as their use of MobShare. In addition, the users were asked to fill out a diary, and the MobShare server logged the users' activity. Each trial lasted 5-6 weeks. The first set of users was a group of friends aged 25-26, four female and one male. The other group was a family where the core users (*i.e.*, the phones and fees were given to them) were the father and mother of the family, two children, and their grandfather. Both of the test groups shared photos also to people not hired as core test users (*e.g.*, friends and family). Altogether 87 people took part in the trials (10 core users and 77 secondary users). The photographs, comments, and user logs were qualitatively analyzed after the user studies.

The similarity of PhotosToFriends and MobShare made it possible to use quantitative user data from PhotosToFriends to get a better understanding of the qualitative findings made with MobShare. The analysis of PhotosToFriends focuses on two goals: first, to qualitatively compare PhotosToFriends to the MobShare system and discuss the effects and rationale behind the differences, and second, to leverage the quantitative user data of hundreds of users to get a quantitative understanding of the phenomena identified with MobShare. The PhotosToFriends was analyzed through anonym user data on several thousands of users. The data was used to study the social activity of a shared image gallery. Also, the differences between MobShare and PhotosToFriends were qualitatively analyzed from the perspective of commercial requirements on photo sharing systems.

4 The Lessons Learned

The design-science research provides a good and grounded approach for engineering work in multidisciplinary research. Traditionally engineering research methods have been more formal because the work has been closer to formal sciences, such as mathematics. However, engineering software for human-computer interaction has little to do with mathematics, physics, or chemistry. The research questions and design challenges are need an approach closer to social sciences or humanities. The design-science research approach combines the traditional problem solving approach familiar to all engineers with a qualitative approach to understanding behavior.

On the other hand, as mentioned above, design-science research comes from the study of information systems where the application domain is most often a business organization. Therefore, the more practical guidance does not fit a domain such as consumer technology. To apply this methodology into application domains outside business organizations further work is needed. Especially in merging the software engineering methodology, which already requires an understanding of user behavior in requirements elicitation, to the design-science approach.

Community Modeling and Community-Centric Design

Mikael Johnson, Kalle Toiskallio

Mikael.Johnson@hiit.fi, Kalle.Toiskallio@wsp.fi

Abstract

Web 2.0 is all about community, but what do we really mean by "community"? The aim of this article is to expose different literature discussions on community, to compare and contrast why community is such a hot topic in different disciplines. The viewpoint taken here is that of a service provider who designs for communities. The different community perspectives – sociology, engineering, virtual worlds, e-commerce – are really fairly different, perhaps incompatible, and the contribution of this article is in explaining the differences. It is no simple task to choose among the wide variety of methods and standpoints available for community-centric design. We managed to sort out the community confusion for our own purposes and outline social design strategies based on Strauss' social world perspective.

1 Introduction

The Mobile Content Communities (MC2) project gathered researchers from different disciplines to understand digital communities by trying out design concepts, models and prototypes. This article is based on the many, both fruitful and frustrating, discussions among the project researchers to make sense of the term community. During the project we had the opportunity to approach many communities and ponder about the nature of the research phenomenon we call community. The main questions we struggled with were

- what's the difference between digital communities and "plain communities"? is it a special case or something really different?
- can one just point at something online and refer to it as "community", or do we need empirical investigations to determine whether "it" is a community or not?
- what are the salient attributes, or dimensions, of a community?
- what do people mean by "creating a community", is it a shorthand for "creating a computermediated platform for a bunch a people to form one or many groups around shared interests"?
- people talk about community needs, but how do those needs differ from user needs?
- is there a difference between user-centred design and community-centred design?

To answer these questions we start by explicating some more aspects of the community confusion, after which we will present and compare a few community perspectives.

1.1 Community Confusion

Community is a highly controversial concept in digital community research. Because it has created more confusion than order, we must sort out what exactly we mean by community before we can claim that we model it. In the mc2 project we, as technology (or product or service) developers and researchers with the help of our project sociologist, turned to sociology to help us understand what community is about. Unfortunately, about half way in the project, we found that what sociologists mean with community and what developers mean with community are two very different things. Luckily this confusion enabled us to strengthen our understanding of community.

From a technology development perspective it is common to talk about a community around a product. Interesting questions are how they (the community) are interacting together, what kind of software could support their communication better (like mobile photo sharing), should there be different functionality for those who interact more rarely compared to those who engage in more intensive interaction? Here,

"community" means a bunch of people who happen to use the product that we as developers or researchers contribute in to developing.

From a sociological perspective this way of using the concept of community is odd. Sociologists are not used to divide people into groups based on their relation to a specific technology, but rather they would like divide people into groups based on their relation to a geographic location, a common interest, a shared practice, a shared circumstance, and so on (Marathe; Brint). However, there is no reason why these conceptions of community couldn't live together. I am a Mac user⁵, a Microsoft Word user, a MobShare user, but also a researcher at HIIT, a member of a sailing club, a member in the City Car Club, a resident at Katajanokka, and so on.

In addition, a sociologist would point out that the detailed study of interaction between community members is on the border between sociology, anthropology, communication studies, and social psychology. Concepts like group, group dynamics & cohesion (Statt 1994), identification, identity formation, role, self-presentation have already been applied to computer-mediated communication (Döring). To complicate matters even more, there are competing theories within sociology that all highlight different aspects of community. The most famous ones are Barry Wellmans social networks (1999), all the different theories on social capital (ranging from Pierre Bourdieu to Putnam, a good review of the concept can be found in Tamaschke 2003), Etienne Wenger's communities of practice (1998), and social worlds by Anselm Strauss (1978).

What to do in this situation, can we say anything about community? Well, luckily we can. However, it is up to the ones who are asking to define which aspects of community they're interested in. The next section presents potentially important community aspects.

2 Community Perspectives

In this section, we start with two different definitions of community and outline four community perspectives. The first community definition by Steven Brint is more sociologically oriented and the other definition by Elise Porter is more close to technology.

The problem with many previous community models, for instance Rheingold's discussions on "virtual communities" and "smartmobs" is that they do not provide clear criteria for when something is or is not a virtual community, and what are the virtual community's similarities to other kinds of communities. Brint's 8 different community types solve this problem. These are based on four variables: 1) geographic vs. choice basis 2) activity- or belief based 3) frequency of interaction and location of members 4) amount of face-to-face interaction. Figure 1 illustrates the community types.

Brint considers communities as

"aggregates of people who share common activities and/or beliefs and who are bound together *principally* by relations of affect, loyalty, common values, and/or personal concern (i.e. interest in the personalities and life events of one another."

However, from a technology development perspective this definition is not so useful, because the technology is not visible. For this reason we present another community definition, or actually a definition of *virtual* communities by Elise Porter:

"an aggregation of individuals or business partners who interact around a shared interest, where the interaction is at least partially supported and/or mediated by technology and guided by some protocols or norms"

⁵ I will get back to the term "user" and problematise it in subsection 5 Power to the community.



Figure 1. Community types (Brint 2001)

As you note, Porter brings two things more closer to the community discussion compared to Brint: business and technology. Furthermore she notes the different ways of establishing a community, whether it is initiated by community members or sponsored by an organisation. Figure 2 highlights this distinction as well as the different relations among community members.



Figure 2. Community typology (Porter 2004)

While Porter doesn't go very deeply in any of her community dimensions, her overview is worth reproducing here, because it highlights the different dimensions of community very well. Porter's 5P-model of community attributes highlight:

- purpose: shared interest / activity
- place: location of interaction, degree of computer-mediation
- platform: support for synchronous and asynchronous communication
- population: groups size & commitment
- profit model: how the money flows.

To conclude our overview of the different understandings of community, we present Helena Holmström's summary of community perspectives from her PhD thesis.

Community perspective	Description	Research
Sociology perspective	Definitions emphasizing features such as size and location, and more recent definitions emphasizing relationships and social interaction.	Hillery (1955) Wellman (1982) Rheingold (1994) Baym (1998) Hamman (2001)
Technology perspective	Definitions emphasizing technical structure and architecture, technical functions and the design of the community-supporting software.	Stanoevska-Slabeva and Schmid (2001) Lechner and Schmid (2001)
Virtual worlds perspective	Definitions emphasizing a sense of immersion that mimics reality and prolonged, repetitive interaction such as the interaction found in E.G., MMOS and MUDS.	Curtis (1992) Dibbel (1998) Pargman (2000)
E-commerce perspective	Definitions emphasizing communication and information transfer, marketing purposes and the opportunity to use community features to draw people to a specific website, E.G., stickiness.	Hagel and Armstrong (1997) Kim (2000)

Table 1. Examples of perspectives from which communities can be studied (Holmström 2004)

3 Community-centric design

Now that we know some of the different aspects of "community", we can take a look at communitycentric design and what different authors claim that it is. Online community researcher Jenny Preece (2000) has coined her concept of community-centered development by combining ideas from three different movements: user-centered design (Norman 1986), contextual design (Beyer & Holtzblatt 1998), and participatory design (Mumford 1983, Greenbaum & Kyng 1991; Muller 1992; Schuler & Namioka 1993).

Since the 1980's lots of different "flavours" of *user-centered design* have emerged, but most researchers and practitioners agree on Norman's two major principles. First, the designers should put the users first, not a specific technology, nor the elegancy of the code. Second, the needs of the users should dominate the design of the user interface, and the needs of the interface should dominate the design of the rest of the system. *Contextual design* emphasises the use(r) context, the uniqueness of particular settings over general

processes. *Participatory design* is all about involving the user in the design process, so that users and developers work together on solving the "workers' problems in the workplace" (CPSR 2006).

Of these design movements, user-centred design with its companion *usability research* is perhaps the most established, as there are not only a large range of techniques available (Benyon & Turner & Turner, Kuniavsky, Gulliksen 2002, Hyysalo 2006), academic and practical courses on the subject, but you can work as a usability designer, comparable to industrial designers. Contextual design is part of a larger movement striving for ecological validity that is visible in many research fields. Participatory design is more about arranging the design activities so that there is time for user participation and giving the users the right to say 'no' to a suggested design. While some claim that participatory design is just a dream for democracy in design, it is perhaps worth noting that it has actually been used successfully to develop community networks (Schuler 1996) and online communities (Lazar & Preece 1999).

Preece starts out by discussing usability and its relations to tasks & task hierarchies, human diversity (physical, cognitive and perceptual, personality, cultural, experience, gender, age, and capability as defined by Shneiderman 1998), and synchronous & asynchronous software tools. However, because the aim is to support communities, which differ from use of software in traditional work contexts, she also introduces her concept of *sociability*. Traditional context models in user-centred design cover fairly well the relation to organisational environment, work process and tasks, but since online communities in her text are not workplaces, there is a need for another overall concept that describes the social organisation in the community. Preece's sociability refers to the purpose of the community, people's interactions and roles, and the policies that guide them (p. 79 2000), see figure 3.



Figure 3. Usability and sociability (Preece 2000)

Returning to our sociological vision, this use of the concept sociability would at first sight seem really odd. Preece's version of sociability seems to cover all discussions of social order, social interaction, and communication, in other words almost all social sciences. As such, Preece's sociability becomes an umbrella concept referring to all socially relevant issues. This makes it useless for sociological research purposes. A sociologist could ask research questions like, to what degree the idea of community is realised in practice? For these purposes, Simmel's concept of sociability as preconditions for sociable conversation is much more usable. According to Simmel, a sociable conversation should 1) have no goal or result 2) avoid too objective or too intimate issues, 3) allow equal participation, and 4) be interesting in itself. Applied to online communities, Simmel's sociability describes the ideal chat situation where everyone can

feel appreciated. In practice, though, this is rarely the case, since there might be hidden agendas as the chatters might want to further their online careers or show off.

Anyway, a second look at Preece's sociability concept reveals it potentiality. It is not a concept to be used for sociological research purposes, but rather it contains one suggestion of what a developer with a technical background should be aware of when designing software tools for communities. It just might function as a crash course to the social sciences. And, perhaps Preece's main point: sociability can be considered already during design, not just after all the coding work has been done when there are no resources left to change the design.

Preece has also applied the 'good old' star lifecycle model (Hix and Hartson 1993) to community-centered development. The model emphasises that all stages are parallel, not sequential. It is also a good example on how Preece draws on established user-centered design techniques.



Figure 4. Community-centered development (Preece's 2000 adaptation of Hix and Hartson 1993).

Perhaps one of the most useful parts of Preece's book, is her checklist for sociability and usability (p. 290-292). While too long to reproduce here, it gives details on how to evaluate a design for a community from a user/member point of view regarding these 8 questions: 1) Why should I join this community? 2) How do I join (or leave) the community? 3) What are the rules of the community? 4) How do I get started reading and sending messages? 5) Can I do what I want to do easily? 6) Is the community safe? 7) Can I express myself as I wish? 8) Why should I come back?

While Preece's book is easy to read if you have a background in usability, there is another book that fast approaches a classic status regarding online communities. Based on ten years of experience with building online communities, Amy Jo Kim wrote down a set of design guidelines to help other designers. Each chapter in her book (2000) deals with these guidelines in detail, but a brief summary is appropriate here.

- 1) Define and articulate your PURPOSE
 - Purpose, objectives, needs, vision, intended users.
- 2) Build flexible, extensible gathering PLACES
 - Where people gather in groups for a shared purpose: e-mail lists, discussion topics, chat rooms, multiplayer games, virtual worlds, websites. Key: small-scale and flexibility.
- 3) Create meaningful and evolving member PROFILES
 - Profiles make member identity, history, and reputation visible. System profile, personal profile, public profile.
- 4) Design for a range of ROLES
 - Greeting visitors, helping new members, rewards for regulars, support the enthusiasts, respect the gurus
- 5) Develop a strong LEADERSHIP program
 - The organisation responsible for the community: greeter, host, editor, cops, teacher, events coordinator, support, manager, director
- 6) Encourage appropriate ETIQUETTE
 - Groundrules for participation, systems to enforce and evolve the community standards
- 7) Promote cyclic EVENTS
 - Weekly, monthly, yearly; meetings & presentations; planning event support follow-up
- 8) Integrate the RITUALS of community life
 - Celebrate important social transitions (weddings, funerals, graduations, etc.), holidays, marking seasonal changes.
- 9) Facilitate member-run SUBGROUPS
 - This is necessary to grow a large-scale community.

Kim also notes three underlying principles: 1) design for growth and change, 2) create and maintain feedback loops, and 3) empower your members over time. The third principle (figure 5) is very interesting and relates to subsection 5 Power to the community.



Figure 5. Empower your members over time (Kim 2000).

4 Community needs and social design strategies

Preece introduced the concept of "community needs" in her book as a key issue that developers must understand "prior to making decisions about the technology and social planning" (p. 208). Community needs could for instance be what kind of public and private discussion spaces are needed (p. 210). With the help of a "community needs assessment", developers can determine the main purpose of the community. In addition, understanding the community's needs involves "identifying the main kinds of activities the online community will engage in" (p. 217).

In Preece's discussion of community needs, she makes use of the old concept of "user needs" familiar from technology development contexts. It is important to realize that from a technology development perspective a "user need" is not the same thing as human needs in psychology. Psychological needs theories want to explain human action by proposing context-independent needs. In technology development, a user need is often very much context-specific and it is not used to explain human action. Instead, a user need is seen as the user's relation to the technology in question. One could even say that a "user need" is a shorthand for "user needs for technology that the developers can provide" in a particular userdeveloper-technology context. Based on these user needs, developers then make user requirements (for the particular technology-to-be), which then are transformed into specifications, features, and finally working technology in use.

Kotler (1997), the author of the classic marketing research book, has presented a simple but useful taxonomy of consumer/user needs:

- 1) stated needs, e.g. "The customer wants an inexpensive car."
- 2) real needs, e.g. "The customer wants a car whose operating cost is low."
- 3) unstated needs, e.g. "The customer expects good service from the dealer."
- 4) delight needs, e.g. "The customer buys the car and receives a complimentary road atlas."
- 5) secret needs, e.g. "The customer wants to be seen by friends as a value-oriented savvy consumer."

From a sociological viewpoint this way of discussing needs is fairly naïve, because again, it shows no sensitivity for all different social viewpoints one could take on for instance the "secret needs". This is where we depart from the established ways of treating needs. Because we find it important to have concepts to discuss those secret needs, we chose to import Strauss concept of social world and shed light on different kinds of secret needs. This is why the mc2 community model was created.

We think that the user needs – describing the users' relation to technology – can be called user needs in design for communities too, and want to reserve the concept of "community need" for a special purpose. Since the above mentioned "secret needs" do not describe the user's relation to technology, but an individual's relation to other individuals (friends) in an important member group, we will rename these secret needs.

We call these secret needs *community needs*, since we don't think they're secret, because when asked directly, the user would probably agree and not think it's a secret. Instead we want to highlight that many of the needs have a social background and can be understood with the help of for instance Strauss' community subprocesses (see below, section 4.2). In the example above, for instance, we can reflect on what value-oriented and savvy means from the perspective of social comparison (a subprocess of organisational dynamics and fashion). Our strong opinion is that most of the "really" (secretly) wanted issues have their background in social comparison and social questions in general. It is precisely these social aspects that the mc2 community model can help developers to understand in their technology development process.

4.1 Overview of the MC2 Community Model

Based on previous work on mobile contexts, we have created storage of point of views for analysing use situations of mobile devices, or more generally, when being on the move. The storage (a.k.a. the Mobix model) consists of 24 socio-spatial attributes of context of use divided into 6 groups. We refer the interested reader to the project report for more details, but here is a listing of the attributes:

- 1) Sociological attributes
 - Maintaining group or community, Social comparison, Member groups and reference groups, Presented identity, Presented group identity
- 2) Psychological attributes
 - Goal, Motivation, Habitual actions, Personal space
- 3) Organisational attributes
 - Tensions between collaborative organisations, Organisation vs. individual tension
- 4) Time, place, space
 - The official use of a space, The level of publicity of a place (semi-publicity), Assumptions of a place, Auditive environment, Visual environment, Haptic environment, Information environment, Time tables, rhythm of day
- 5) Attributes of mobility
 - ♦ Travel process, Nodes

- 6) Managing tasks
 - Non-recurring vs. frequent tasks, Degree of preparations, Alone vs. in a group, Focused vs. divided task

These 24 attributes are termed "Mobile Context of Use" in the Overview below (Figure 6).



Figure 6. Overview of the MC2 Community Model

The MC2 community model provides concept designers with two analytical tools, marked as eyeglasses or lenses in the figure. The "mobile context of use" lens is more detailed, dealing with contextual attributes within the settings of social worlds and their sub-worlds. This lens gives a picture of situated action. The other lens, the "social world frames" (presented in the next subsection) gives a larger frame, explaining the main social setting in question.

By analysing the setting(s) and context(s) inside of them concept designers can distil the segments of the inherent community needs, such as the need to discuss about authenticity questions.

4.2 Strauss' Social World Frames

This subsection presents an overview of the "social world frames" lens depicted in Figure 6. Strauss suggests that his concept of social world can be used to analyse phenomena as varied as the following, for example: opera, baseball, surfing, collecting stamps, country music, gay, politics, medicine, law, mathematics, science, Catholicism.

In every social world - be it visible or hidden, public or private, new or established, open or closed, hierarchic or free - one can identify at least one **primary activity**. It can be mountain climbing, research, collecting, etc. and it happens in a certain site. **Technologies** are related to the activity and it is **organised** in a certain way. These characteristics can be delineated to subprocesses: finding a site, financing it, protecting; technology innovation, production, marketing, teaching; building, expanding, defending, taking over, and changing organisations. In social worlds learning takes place in meetings, technologies are borrowed, and skills are learned and taught. A social world is divided into **subworlds**. Discussions emerge about **authenticity**, who was the first, what's most important, and who's got the power to define these issues? One can analyse **socialisation**, how individuals come into contact with a social world, how the introduction is carried out, different career paths, marginalisation, and parallel memberships. In every social world, the discussions and negotiations take place at different **arenas for communication**. In social worlds, for instance in architecture, art, and literature there are different **social movements** and **fashions** that evokes emotions. The mass-circulated magazines of a social world helps members with hints and advice, it markets various places and future events, reports on past events, and mediate information and opinions about important matters.

4.3 Community roles

One common question in design for community is who are the users, or, which user groups are there? When studying Strauss theory and other theories on communities, we found that this question should be reformulated if we want to deeply understand a community. Instead of asking about user groups, we should consider "user paths". While Strauss terms these career paths, another sociologist, David Unruh (1983), has coined a widely used typology of community roles. These roles are based on a member's degree of involvement in and commitment to a voluntary (choice-based) community. In one point of time, a member can be in one role, and in another point of time, the same member can be located in another role.

Unruh's Community Roles Typology:

- Insiders are those few persons who have power to redirect goals and change things in the community.
- **Regulars** are the main body of the community. People who follow the community's informal and formal rules.
- **Tourists** are just visiting. They are interested to see what is happening in the community, but they do not get involved in those activities. Since they are not stakeholders, they don't care if things go wrong in the community. In some cases they are newbies.
- **Strangers** are outsiders, those who know nothing of the habits of the community.

This typology is very useful when we want to assess the stability of community needs over time. User groups tend to be defined very statically, and refer to a snapshot of a community. By using the term "user paths" instead, and referring to a community member's changed social position over time, grasping the community life cycle becomes easier.

4.4 Social Design Strategies

We have also converted Strauss' social worlds perspective to guidelines for online community developers. These guidelines have two functions. They can be seen as an addition to the already existing work on online community guidelines by Preece, Kim, and others. Compared to Preece's & Kim's guidelines, these social design strategies maintain a strong link to social science theory. They can also be seen as an introduction to Strauss' social worlds perspective.

- **Primary activity.** Recognize the main social activity, but do not deny others.
- Activity-related technology. Be aware of social dimensions of and reactions to the tools (offered to users) related to the main social activity.
- Sites and satellites. Consider the possible "architectures" of the main site(s) and "satellite sites" (incl. fan sites), even if the structure could not be simply constructed as such.
- **Organisational dynamics**. Support and allow the birth of sub-communities, and their positive and negative relations: alliances, intrudings, collective insults etc. Recognize "sects" among more neutral sub-communities: believers who try to change the whole community in a sense.
- Authenticity. Recognize the authenticity discussion when it appears and facilitate it by describing several alternative/simultaneous roots of the explicit start of the community. Allow and support also discussions on preferred future of the community.

- Socialisation and outsiders. Enable easy individual movements from one sub-community or group to another. Consider the pros and cons of transferring one's personal status untouched from one group to another. Consider also the attitudes of members toward outsiders, and the action patterns possible or offered to members.
- ♦ Arena. Enable not just communication but also other common activities, such as possibilities to construct, or destroy, something "physical" together. Allow lurkers as a critical mass of (potentially active) audience.
- Social movement and fashion. Be aware of the social movements in your branch and think about how you can live with them successfully. Fashion you can try to handle: support several sub-arenas (such as fan sites) to comment fashion questions.

5 Power to the community

In subsection 2 that dealt with the community definitions and in later subsections we have used community with a double meaning. The first is the more evident, community as a group of people interacting around a shared interest. The second sense is more implicit, community as the target group of a technical product. In this second sense, some would even say that the community is a group of "users" that use a product online. This reference to the controversial term "user" is an important lead to understanding community as a change in technical innovation that has happened during the last five or ten years.

Different research fields use the term user differently. In the field of human-computer interaction the "user" traditionally referred to a person sitting in front of a computer in an office, completing tasks by entering information and commands and using the output. In the field of information systems, "user" refers to a user of the computer output, who might be a person (or even an organisation) not directly interacting with the computer. To distinguish the person sitting in front of the computer, information systems researchers talk about "end-users". However, in software engineering, the term "user" can mean the users of a software tool, who actually might be developers themselves developing software for other "users". (Grudin 1994)

How can one make sense of this problem with the basic vocabulary related to computing? One way to do it, is talk about "users" only in relation to a specific technology, or, actually, as a way of participating in the production of a technology. Then the term "user" gets its meaning from its relation to the other actors who participate in that technology production. For instance, technology sponsors, innovators, vendors, service providers, educators, architects, designers, tech support, etc. The user does not hold a very favourable position, since traditionally the innovation is seen to flow from the different developers via the other mediating stakeholders to the user, and not vice versa. The interests of the users are not the ones that are served first, because in most cases business and technology production come first, giving the interests of the users a very challenging position.

However, this is something that has changed as computing technology has become cheaper and more pervasive. One key point that community-centric design makes is that software for communities becomes useful after the launch of the product/service/community. Effort is needed from the community moderators and value is created by the content-producing community members. This means that the traditional "maintenance phase", when many considered the project to be completed, has changed to something important, because now there are both significant costs and value involved.

The second point in this shift is the change in the direction of the innovation flow. Now the community members are seen as an important source of innovation. The position of the users of community software has changed as they have a bigger say. Of course this is not the case for all software. For instance, me being a Microsoft Word user is not a choice, it is more of a circumstance, because everybody else uses it. And, there is no active community participating in its design.

Giving the users more power has been the agenda for many researchers. In the 1970s Alan Kay and Adele Goldberg (1977) wanted to increase the general computer literacy, even children should be able to use computers. In those days it was about programming, so they invented the Smalltalk programming language for this purpose. In the 1980's the research field of end-user computing (Nardi 1993) established itself to empower the end-user. Both of these efforts are ways of making the computer artefact more

flexible. Nordic researchers Anders Mørch (1997) and Peter Bøgh Andersen (1999) have continued this trend of flexible user interfaces with their concepts of tailorability and elastic interfaces in the 1990s. But it is not until the more recent gaming and online communities that this phenomenon has gained a larger audience. Tero Laukkanen in this same volume gives an excellent introduction to the topic.

As a summary, the term "community" can be used in one or more ways to signify the following changes:

- 1. Post-launch focus on community created content.
- 2. **Place**. Many designers use the metaphora of place, when designing software for community. They construct the member's place online. These spatial metaphors are heavily and variedly used to make collective social settings among members more understandable to themselves.
- 3. **Non-work context**. Previously the users didn't have a choice in using ICT, they had to use the software in the company or quit their job. Therefore, the motivation of the users was not a key issue. Now, as the Internet is used for fun and the community members are supposed to participate voluntarily, motivation and incitements are key issues.
- 4. Large amount of (simultaneous) users. New and qualitatively different phenomena emerge with thousands of users interacting online. Past models considering small work groups are not enough.
- 5. **Change.** Communities form, change, develop, decline, and sometimes become inactive. No longer can the user needs (or the needs of the community and it's members) be considered stable. They change and the design has to live with it.

6 Conclusion

During the MC2 project we have become wiser about "community" in the following ways, we have:

- distinguished several different ways of understanding community, mainly sorted out the differences between the technology development perspective and the sociological
- provided a simple overview of "community" attributes, e.g. Porter's 5P model, which enables focusing questions, e.g. what aspect of "community" are you interested in?
- outlined the key principles and design strategies for community-centric design
- analysed the concept of "community need" an turned it into something different than user needs
- built and evaluated a community model for understanding the previously mentioned community needs, including community roles
- discussed "community" signifying a change in technical innovation that has happened during the last five or ten years

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Mobile Media

This section we describe how the MC2 project has studied the role of mobile social media, especially in the domains of multi-player gaming and digital photography. Mobile devices are primarily used for social purposes, they are always connected to the network, and they are also increasingly used for media creation, and consumption. There are many recent examples of the growth of importance of user-created media content, with examples ranging from citizen journalism of blogs to machinima movies depicting events inside popular game worlds. New features of mobile devices, such as integrated cameras and open software platforms enable more instant and ubiquitously accessible modes of group communication and collaborative multimedia content creation.

The Mobile Content Communities (MC2) project has made several practical contributions to foster the rapid development of mobile media, that has truly started to gain market momentum only during the timeframe of this project, and some of the research work conducted can be described as ground-breaking in its nature. We have also had an intense dialogue with industry players and can claim that this work has contributed to the developments in major companies in the domain, such as Nokia, Yahoo! and Digital Chocolate.

The first paper in this section describes our work to embrace the Multi-User Publishing Environment (MUPE) that is an open source mobile platform designed for simplified and faster application and service creation for very heterogeneous and, unfortunately, unstable software development environments of mobile computing. This paper, entitled *Toolkit for user-created augmented reality games* (Kuikkaniemi, et al.), presents a collection of tools called the MAR (Mobile Augmented Reality) Toolkit as an easy-to-use aug-mented reality toolset for MUPE developers. We have also demonstrated MAR Toolkit by implementing a game called Mupeland Yard, and the design of the game and results from game session trials are discussed.

Then we take a closer look of implemented product concepts. We start by *Extending* a Prediction League Game into Mobile by Sarvas and Järvinen, which describes a social

game PreLe (Prediction League), and a community toolkit called Prediction League Engine that is used to easily enable community created prediction games. The authors discuss the properties of prediction games from the user point of view and how to better take advantage of the unique characteristics of a mobile phone in extending the prediction game into the mobile space. It is also worth noting that Digital Chocolate has published a product called Mobile Sports League Network (MSLN) in USA that has many similar features to the Prediction League Engine.

Then we move onto the design and detailed user studies on another prototype developed within MC2, which was a comic story creator for recording life situations and making narratives out them for others. In his paper, *Telling stories with MMS: How does comic story based messaging fit into group communication?*, Antti Salovaara describes how the initial comic story creator prototype was developed into a full product, Comeks, which was designed by a MC2 spin-off company Bulbon Ltd. The use patterns of Comeks are contrasted with the use patterns of widely available mobile messaging (MMS), and it is important to consider many different forms of participation in messaging conversations when designing novel tools for mobile group media.

Finally, in *Mobile Photography is Sharing and Socializing*, Risto Sarvas introduces how mobile photography was studied in three consecutive systems in co-operation with UC Berkeley and a small Finnish company called Futurice. The systems constructed within the project have lead to a commercial service platform called "Photos To Friends", and a commercial service called Kuvaboxi that has been made available through the MTV3 web portal in Finland. The paper introduces design, implementation, analysis, and results phases in implementing these systems. It discusses the role of interaction and communication in photo sharing and how the discussions around the photos, and the social traces and explicit comments that people make, can have a role, which can be considered as important as the photos themselves.

One of the unifying themes in these papers is that it is sensible to look at mobile applications as a part of networked systems rather than as isolated components built on the mobile development platform. In many cases, it makes sense to design applications with mobile and desktop parts to distribute the functionality over the devices. In more pervasive applications, it is relevant to consider how the potential computational and display capabilities of the surrounding environment can be utilized in service development.

Toolkit for user-created augmented reality games

Kai Kuikkaniemi, Marko Turpeinen, Antti Salovaara, Timo Saari, Janne Vuorenmaa

Abstract

In this paper we present MAR (Mobile Augmented Reality) Toolkit as an easy-to-use augmented reality toolset. It is build on top of MUPE – Nokia developed open source mobile platform based on Java – which considers the special qualities of mobile technology. MAR Toolkit contains four components, map interface (MAP), physical object tagger (POT), public display (PUD) and silent communicator (SIC).

We have successfully demonstrated MAR Toolkit by implementing a game named as Mupeland Yard based on classical board game Scotland Yard. In user testing we found that common usability issues related to mobile technology and MUPE-platform troubled the tests. However, especially POT component raised lot of interest among developers. We found that using graphic 2D tags for providing location information for augmented reality games is a simple and robust alternative for more technology intensive GPS and cell-ID information.

1 Background and introduction

Mobile is the new computing frontier, with new demands and new possibilities. Mobile phones are ubiquitous: always with the user, always connected and widely adopted devices that can be used also as application implementation environment. Furthermore, mobile devices have quite different requirements, restrictions and qualities than desktop and laptop computing. Mobile devices are context-aware and at the same time very sensitive for usability issues in comparison to PC environment. Building a wellfunctioning application in mobile environment means that the special characteristics of mobile technology must be considered. This is especially true with regard to developing ubiquitous computing applications with mobile technology, such as Augmented Reality (AR) applications for current mobile phones.

On the positive side, there are significant numbers of mobile phones in the market, and a large proportion of them support a certain application development environment. On the other hand, there are rather quite many application development environments (e.g. Java⁶, Symbian⁷, Windows Mobile⁸, Brew⁹), with several different versions, and practically each phone supports bit different feature sets. Supporting these different versions is hard for individual developer, an especially for hobbyist.

Moreover, mobile development is cumbersome because the coding is performed on PC, and tested with an emulator, which is often is not an exact match to a real multimedia phone. Also user testing with mobile phones is a time consuming process that many coders accustomed to the PC-environment may find overly complex. Furthermore, the mobile development is difficult due to many other issues such as uncontrolled problems in the mobile connectivity (due the network problems), clumsy download procedures, limited I/O and user interfaces, and the fact that running applications constantly in the back-

^{*} All authors are from Helsinki Institute for Information Technology (HIIT). Contact information is surname.lastname@hiit.fi

⁶ Java in mobile, known also as J2ME (Java Mobile Edition) <http://java.sun.com/javame/index.jsp> operating system independent application environment.

⁷ Symbian <http://www.symbian.com/> is a operating system for Smartphones, several versions such as UIQ <http://www.uiq.com/> and Series60 <http://www.forum.nokia.com/main/platforms/s60/>

⁸ Smartphone operating system developed by Microsoft http://www.microsoft.com/windowsmobile/default.mspx>

⁹ BREW (Binary Runtime Environment for Wireless) is an application environment developed by Qualcomm. http://brew.qualcomm.com/brew/en/>

ground consumes too much energy in the perspective of common users who are mainly using mobile phone as voice communication device.

Regardless, there lies a huge promise in mobile devices because they are personal, always with the user, always connected to network and to an increasing degree context aware. Mobile phones were originally developed for a single purpose - wireless telephony. Short text messages (SMS) were the first application besides telephony that became widely adopted and popular. Today, in Asia alone people are sending more than 500 billion messages annually [1]. Besides SMS no other data based mobile application has reached global success. The most prominent new applications are probably mobile games, mobile Internet and mobile email.

In our research we have developed an application toolset that is relatively easy for developers to use, and takes into account both the limitations and properties of the mobile. The tools are called the MAR (Mobile Augmented Reality) Toolkit. The toolkit is developed based on MUPE platform. The properties of the toolkit were tested and demonstrated by developing a game on top of it called Mupeland Yard and testing it with pilot users.

2 Multi-User Publishing Environment

MUPE¹⁰ – Multi-User Publishing Environment – is a Java based application development environment developed by Nokia Research Center, and published under Nokia Open Source license¹¹. MUPE is originally based on architecture similar to Multi-User Dungeon (MUD). Hence, the application consists of a "virtual world", rooms inside the world, and users, rooms and objects inside rooms (illustrated in the figure 1.). In addition to the MUD architecture, MUPE has various types of services – messaging and context (not shown in picture), which are important addition considering the mobile use cases.



Figure 1. Simplified MUPE architecture – MUPE's MUD origins

MUPE could be described as application browser, because applications are developed in the server-side, and the same mobile client fits for all applications. As a result MUPE tackles the challenges of mobile application development with a novel approach. Instead of developing applications that fit all phones, developer can concentrate on server-side development, like with web applications, and the client side is tackled by the platform.

¹⁰ MUPE <http://www.mupe.net>

¹¹ NOKOS, Nokia Open Source Licence http://wilbur-rdf.sourceforge.net/docs/LICENSE-NOKOS.html



Figure 2. MUPE as application browser

In addition, MUPE is specifically designed to support both client and server side context feeds. Examples of client side context information are information about surrounding Bluetooth¹² devices, mobile network cell information, which is helpful for locating the phone, and status of the phone. In addition, the server can use universal context sources like weather information, radiation information, and even Google results as context information in some applications.

However, in practice MUPE cannot truly support all potential context feeds due the selected environment – Java. Java was selected because it has largest technology base of possible programming environments, and it is device provider independent environment. Conversely, Brew, Symbian and Microsoft smartphone environments have a much more limited technology base. Then again, MUPE supports many additional Java specifications, but there are not that many Java based phones that have implementations of all the specifications. As a result, with Java phones it is relatively hard to for example access external files in the phone. Nevertheless, it is common expectation that some of the problems related to Java will be solved within next years.

MUPE is an open source development environment that is common in PC world, but in the mobile domain there only a few open source projects, especially in the magnitude of MUPE. However, the selected approach is not easy. The support for all the handsets is still quite demanding a task to tackle, and to develop both the architecture as well as needed software components is not easy either.

Currently most MUPE applications are mostly developed in research environments. First generation MUPE applications have all been basically multiplayer applications, varying from simple role-playing type applications to various types of strategic games. Using the camera functionalities of mobile phones has been also popular with MUPE applications, because the camera in the mobile is easy to use and "powerful" in terms of communicative capability. Using the camera one can create and influence different gaming patters as well as the user interface, as demonstrated in the development and testing of our MAR Toolkit. In practice the MUPE client is fixed and most of the development is performed in the server side, but in case of new Java interface extensions, the current MUPE- client can be upgraded to support new functionalities with a specially designed plug-in interface.

3 Augmented reality gaming

There are several perspectives on *augmented reality* starting from computer-generated graphics on top of the perception of the real world, as if observed through magic eyeglasses, to the virtual components that have only some relatively abstract reference to the real world. In short, the core idea of augmented reality is that an application and the physical, tangible real world have binding references to each other, and the actions in the real world have impact to the user's situation and activity in the application.

¹² Bluetooth is a short range wireless network protocol popular in mobile devices, laptops and mobile accessories http://www.bluetooth.com/bluetooth/>

Another term that has gained popularity in recent years is *pervasive gaming*, meaning that the game experiences are interwoven with our everyday life [Bedford et al. 2005]. Pervasive gaming has been extensively studied in the iPerG-project¹³, which has developed for example enhanced reality Live-Action Role Playing (LARP) –game titled as eLarp, and artistic games under the title "city as theatre". In general, iPerG games can be considered as augmented reality games.

Widely acknowledged examples of augmented reality games are for example PacManhattan¹⁴, Can You See Me Now¹⁵ and Uncle Roy All Around You¹⁶ [Flintham et al. 2003]. In PacManhattan the idea of the game was derived from the PacMan¹⁷, but when the PacMan was played in the computer screen, the gaming world in PacManhattan was the real Manhattan, and the wireless device and Wi-FI were utilized for enabling the playability. In Uncle Roy All Around You –game utilizes efficiently different types of players. Hence while others are playing online one segment of the gamers are active in real world locations that are relevant to the gaming world. One of the first commercial augmented reality games was Botfighters¹⁸, which was an SMS-based game and launched already back in 2000. The most popular and widely spread augmented reality game is probably GeoCaching¹⁹, however one may speculate whether the virtual dimensions in the GeoCaching are sufficiently correlated with related real locations to qualify as an augmented reality game.

Hence, there are various approaches in the augmented reality gaming. Most of the games are utilizing position information in some form or another. Such gaming technology is most often dictated by the selected physical position/location technology. For instance GPS requires usually special hardware. Further, network cell-ID requires positioning and consequently more complex application development environment such as Symbian, whereas with Java the positioning must be performed either by utilizing Bluetooth context information or user-generated location information. Pervasive gaming is related concept to the augmented reality gaming.

4 MAR Toolkit

The purpose of our MAR Toolkit is to make the process of creating mobile context-aware games and other applications easier for the developers. In typical cases it would take several weeks to program the respective functionalities with the simplest application development environment. With MAR Toolkit and MUPE, it is possible to create a new feature to a rich mobile augmented reality game or application within hours. This quality is most important in the case of games that are developed and played within small communities, like various Live-Action Role Playing game setups. In such cases game developers have rarely skills or resources for building required functionalities from scratch.

Our MAR Toolkit provides a set of four tools that be easily used in mobile context-aware game development. Each MAR Toolkit component is a separate tool - you may use as many components as you wish in your game. With the help of MAP component the players can browse the map of the game and select objects from the map. POT (Physical Object Tagger) enables people to bring tagged objects from the real world into the virtual world by using the camera of the mobile phone. Together MAP and POT can enable the basic requirements for the location-based gaming; visualization of the locations, and reliable and easy input for location information. PUD (Public Display) can be used to show the game status for the game master or other gamers. SIC (Silent Communicator) is a tool for quiet communication during the game. The game master may for example use the vibration messages to signal game event to the player, or player-to-player communication can be managed without breaking the magic circle in the game.

¹³ Integrated Project (IP) in Pervasive Gaming http://www.pervasive-gaming.org/index_swf.html

^{14 &}lt;http://www.pacmanhattan.com>

^{15 &}lt;http://www.canyouseemenow.co.uk>

¹⁶ <http://www.uncleroyallaroundyou.co.uk>

¹⁷ PacMan is one of the best known computer game classics developed by Namco in 1979.

^{18 &}lt;http://www.botfighters.com/>

^{19 &}lt; http://www.geocaching.com/>

4.1 Mupeland Yard

As a substantial demonstration of the functionalities provided by our MAR Toolkit an augmented reality game was implemented. In practice this game is derived from popular board game "Scotland Yard", however in this case the gaming takes place in the real-world context with certain adaptations. In practice, Mupeland Yard is new variation of orienteering, which has been enhanced with mobile clients and gaming elements.

The basic idea of Mupeland Yard is that there are two types of players, a criminal and a detective. All the players navigate in the gaming environment by using our MAP interface. The gaming environment could be anything from an outdoor area to a big apartment complex. The criminal will start a few minutes before the detectives. Detectives follow the hints provided by the game application. Often the first hint is a location on the map that leads to a relevant tag. Activating such a tag, players can get new hints. A criminal wins if he can exit the game environment before the detective can catch him. Capture takes place if a detective arrives at a tag within few minutes of the time frame to the criminal. An exit, i.e. a won game, happens via a special harbour tag or special airport tag.

4.2 MAP interface

MAP is a component that shows the map of the game to the players. It can also create objects and place them on the map. Selecting an object can launch an action. With these actions one can modify the MUPE world.



Figure 3. View of MAP in emulator

The figure is an example in which the MAP Component has been used. A map is very often the most essential part of the game. The MAP Component makes the handling of maps and objects in the MUPE world games easy. In the current implementation the maps are static images. However, it is easy to extend the MAP component with Java to accept also images from map services such as Google Maps.

4.3 Physical Object Tagger (POT)

POT provides easy to use environment for using physical tags in MUPE worlds. The following short usage scenario and Figure 4 illustrate how POT can be used in an augmented reality game.



Figure 4. Using tags in a MAR game

Ville would like to include physical real-life objects into his MAR game that has a lot of game-like features, to support immersion. But since most of the game is mediated through a mobile phone the interconnection with physical world is difficult.

Then he finds a barcode reader app. for camera phones, and realizes that there is also an application that allows identifications with a barcode to be attached with game objects. This way players can use authentic-looking sticker-tagged objects in the game instead of just mobile phones. Ville prepares a set of handguns with stickers.

To make the game even more interesting, he gives a bunch of stickers and guns to players in advance to be experimented. By modifying a barcode with a normal pen the weapons' capabilities change. Players can now try to create optimal guns through trial and error.

The idea is simple: First the developer creates a tag (a 2D bar code) based on an ID (a 2-byte hexadecimal value). Then one creates an action in the MUPE world that is invoked when the given ID is returned by the user (the developer can also use existing actions). Then the game developer prints out the tag and puts them in specified places for users to take photos of. Finally, the users can take a photo of the tag, resolve it and send the results to the MUPE server, which then launches the action the game developer assigned for the ID, which can modify the world or do anything else appropriate. In addition the developer or game master must assigned the tag locations to the MAP component is she wishes to use the MAP to indicate the location of the tags.

POT is designed to be as generic as possible. The game developer can change the used image analyzer as desired. Concurrently, there is a support for two different image analyzers: Dummy and VisualCode. Dummy image analyzer always returns id string "dummy" no matter what the source image is. VisualCode analyzer uses open-source project called visual codes to analyze the images as 2D bar codes. POT uses VisualCode analyzer by default.

When using the POT component the sequence of the needed actions from player point of view are:

- Take a picture of a tag
- Solve tag (menu option)
- Send tag (menu option)
- Read the response from the server

The figure 5 is illustration of a situation in which the POT was used in the mobile augmented reality (MAR) game session. The user is photographing a tag that represents the bank. After the user has solved and sent the tag to the server he acquires a strategic hint about the game. As a side effect, the game became aware of the current location of the user.



Figure 5. Capturing a tag with mobile phone

POT Tags are standard Visual Codes tags, and they can be created with the following tool (Figure 6).



Figure 6. Creating POT-tag

The first version of the POT component was non-standard extension to the MUPE-client. The tag solving can be implemented either in the phone or in the server. I our case, the mobile phone was selected in this case, because this way it was possible to eliminate the network traffic completely, and in all cases of decreasing the traffic substantially. Current mobile phone computing capacity limits the tag-resolution. A new version of the POT component utilizes the MUPE standard plug-in interface and can be acquired from the MUPE website.

4.4 Public Display (PUD)

Public Display (PUD) is a component that can be used for showing the status of the game. The main purpose of a PUD component is to help the game master to get better understanding of the game situation. The game developer may also want to keep PUDs visible to players. In this case PUDs may work for example as a location bound headquarter providing players information about the game status. PUDs can also be used literally as public displays that can be shown to external spectators.

PUD is designed to give an overall picture about the game status during the game. The main user group of the PUD component is the game masters. However the game master may want to show the PUD to the players too as a strategic part of the game. PUDs may also be publicly shown to everybody interested in following the game.

MUPELand Yard				
Name	Role	Last seen at	since	
S. Holmes	Detective	Art gallery	2 min 44 s	
Mr.X	Criminal	Broker 2	1 min 13 s	
Knackerton	Detective	Head quarters	5 min 28 s	

Figure 7. View of PUD in Mupeland Yard

Figure 7. is an example of a PUD view. The PUD view must be specified by coding XSL functionality to the PUD component. This selected technology enables that the PUD component can be easily embedded to existing website. In practice the PUD component utilizes web standards, which makes it very easy to distribute the PUD clients. This version of PUD is passive for the viewers, but a similar approach could be also taken to make the PUD component dynamic towards to game world. Hence, the PUD elements can be used to implement online-client to the same game world as what the mobile clients are using. PUD element can for example contain the same map illustrations as in the MAP-interface.

The technical details about how often the PUD display is refreshed etc. can be configured with the PUD Control Center, which is illustrated in the following figure 8.

👻 🤇 👋 PUD Contro	ol Center - Mozilla Firefo	(<2>	
<u>F</u> ile <u>E</u> dit <u>V</u> iew <u>G</u> o) <u>B</u> ookmarks <u>T</u> ools	<u>H</u> elp	0
🔶 • 🚽 • 🛃 🔇) 🏠 📄 http://localhos	st/pudclient/	~
Select a PU Current PUD 1 History views for PUI Go PUD confi	UD		
Poll interval	15	seconds	
History length	3	minutes	
PUD description file		Browse	
MUPE	server configuration		
MUPE server address	127.0.0.1	1	
MUPE server port	8080]	
x	SLT application		
Program location	/usr/share/java/saxon.jar	1	
Save			
-			
Done			

Figure 8. Configuring PUD

4.5 Silent Communicator (SIC)

Silent Communicator (SIC) is a component that enables the sending of silent/quiet messages. A silent/quiet message can contain text, color or vibration sequences or other means of non-verbal communication. Silent communication may be an essential part of the game when one does not want the players from the opposite team to notice you are receiving messages.

A typical usage scenario for Silent Communicator can be illustrated as follows:



Figure 9. Using SID in a MAR game

"Tigers" and "Dragons" are having a clan battle in a MAR game. To disguise their true identities they cannot send messages to each other directly. This makes cooperation difficult.

To overcome the problem, both clans install clients in their phones that can send messages with just a few presses of a button and the messages is communicated to the receiver directly as a set of vibra alerts or flashes of the screen without requiring the receiver to open and read the message.

This way special cooperation schemes can be planned in advance (which is fun in itself) and games are less unpredictable and thus more exciting.

In the first implementation round the SIC- component was not implemented in the whole extended user trial because the Java-vibration interfaces turned out to be very unstable at experimental applications. However, it is rather easy to create color based messaging with MUPE push functionality without the advanced SIC component.

Basically, at the moment SIC doesn't support communication between players. That means silent/quiet messages are static and they are associated with a certain room within an AR mobile game. In the future development rounds the idea is to develop the SIC component further. It is also important to test what kinds of games may require such functionality.

5 Demonstration and testing

A game enhanced by our MAR toolkit has been tested several times in different locations with different players in a workshop type use context. As such the game play experience has appraised as good and positive response. One of the major problems is the somewhat clumsy user-interface of the MUPE in general and the procedure related to establishing the POT components, which have unnecessarily many steps. Even tough the problems the initial test where encouraging and further development is considered.

Furthermore, the initial purpose for creating an easy to use toolkit for user-generated augmented reality games was at least partially fulfilled. The components of our system as such seem to work well, and using the components appears to be relatively simple, even tough the tools have not been tested in objective setting. The reason why the goal has been achieved only partially is that the Java and MUPE as application development environment are not yet so simple, that common user could take the tools and create new applications with them. Using MUPE and our MAR Toolkit require some s coding experience, and it may taker a while to get accustomed to this new environment. Then again, for an experienced MUPE developer, using our toolkit is very easy and it is possible to create new applications within a few hours.

6 Discussion

The MAR Toolkit components are all generic and useful tools for building mobile augmented reality games and other applications. Implementations as such are already sufficient for demonstration and prototype implementations. Usability could be streamlined in order to ease the use. However, already current version of MAR Toolkit and MUPE can be used to set-up an enjoyable and interesting game session, if game master and players are willing to spend some extra effort and who have relevant coding skills.

Furthermore, the MAR toolkit components are in our opinion "good" examples of desired features and functionalities that are relevant in the mobile context. When considering the fact that the MUPE is in practice an application browser and the web is providing increasingly application- type properties, the MAR toolkit components could be also utilized as extension to the mobile web browsers. This way the web and "real life" could be integrated more efficiently and web applications may provide interesting new features to this sum. Especially the camera component with 2D-tag support could be a very useful component in all mobile application development environments as well as with the mobile web. Regardless, a significant problem with the 2D-tags is that there is no dominant standard that could be readily adopted and utilized as basis of application design.

User-generated augmented reality gaming is most interesting domain. Most of the real-world outdoor games can be enhanced with the components explained in our paper, and many of the board games could be translated to an augmented reality game by utilizing the location information, for instance. Furthermore, the GPS-based, more exact location information is not necessarily needed in order to build playable

and functional augmented reality games. Actually, in many cases the 2D- tag enabled user generated location information can be even more suitable for gaming purposes. The 2D-tags are relatively simple to use, supported with the most popular hardware and software and they have as high resolution as needed, and they work both indoors and outdoors. For example, GPS doesn't work outdoors and cell-ID is very in accurate for many gaming purposes. In this sense, we feel our work on mobile AR gaming may open relevant, new types of windows for gaming application development.

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Extending a Prediction League Game into Mobile

Risto Sarvas, Atte Järvinen

risto.sarvas@hiit.fi, atte.jarvinen@hut.fi

Abstract

This paper describes a social game PreLe (Prediction League). It is a web-based open source software for groups and communities to make their own predictions in customizable leagues where people can predict on anything. This paper discusses the properties of prediction games from the user point of view and how to take advantages of mobile phone characteristics in extending the game into the mobile space. The lessons learned in building the system and analyzing its mobile extension are: looking at mobile applications as a part of networked systems rather than an isolated development platform, and to design applications with mobile and desktop parts to distribute the functionality over the devices.

1 Introduction

Social games and entertainment applications are gaining popularity and they are much promoted by service providers and game companies. Networked computers and game consoles market themselves with games where human-human interaction plays a key role. Another trend in computer gaming is the belief in the potential of mobile gaming, which is to become more popular with more smart mobile phones in the market (*e.g.*, Symbian phones). One of the arguments for mobile games is that the phone is a social device by nature and therefore playing social games on them is intuitive. After all, the phone was made initially for communication between people.

One popular gaming genre, which has an exceptionally long history, is betting. Especially through Internet access betting online and across national borders is very popular. However, in this paper we look at betting in the form of predicting. In our definition predicting is the same as betting, but no serious money is involved. Predicting is more like play and often less serious in nature because there are no high bets. Examples of predicting can range from tomorrow's weather to guessing who is going to win a song contest on television.

Because predicting is popular and most people find it entertaining there are already free prediction engines and systems for people to take into use (e.g., [3]). Also, the growing markets in mobile betting, and more generally gambling, can be seen as an indicator of people's need to predict even away from the desktop, and the micro-payment enabled by phone billing makes mobile phone even more suitable for betting. Digital Chocolate has also released a prediction mobile game that leverages the sociality in sports betting [2].

In this paper we present our PreLe system for user-created and user-managed predictions. We briefly describe what the system is and especially its mobile part. Then we analyze the key characteristics of usercreated predictions and the key characteristics of mobile phone technology. Then by example scenarios we combine these two approaches and discuss how the mobile phone extension enables a wider range of use for the whole system.

2 Prediction League (PreLe)

PreLe is a computer system designed for people to predict on any kinds of events and socialize through the predictions, results, and discussions in the system. Users can create their own prediction leagues or join leagues created by other users or the service provider. The created leagues can be predictions on user-created events (*e.g.*, friends' console gaming tournament) or professional events provided by the service (*e.g.*, professional sports). The PreLe system is in the intersection of three research domains: usercreated content, virtual communities and groups, and online and mobile gaming. In this paper we look at what are the characteristics of user-created predictions and how do they combine with the characteristics of mobile phone technology in designing mobile extensions to a prediction league game.

2.1 System Description

The PreLe system is a web-based server software for enabling anyone with very basic web server skills to host a league of her own. The main user interface of PreLe is the web browser interface to the system. Using the browser the user can create, edit, view, and add predictions as well as leagues. PreLe supports three kinds of prediction types that address most of the traditional ways of predicting and betting: the score-based prediction (*i.e.*, predicting a numerical outcome, such as, the temperature tomorrow at noon), the "1X2" prediction (*i.e.*, 1 = home wins, x = a tie, 2 = visitor wins), and the winner/loser prediction (*i.e.*, predicting one winner or loser from a list of choices). See Figure 1 for an example screenshot of the web interface. The PreLe system runs on a web server and uses PHP and MySQL. It is an open source program licensed under the MIT License.

Local Time	Make Predict	ions							
04.05.2006 01:07	1: League	2: Make Predictions	3: Vie	w Results		4: View Standings		5: Messag	e boar
Logged in	League: The Ultin	mate League (Super Le	ague)						
Matti Nykänen	Type	Event	Prediction	1	Random	Closes	Starts		
Log out	1 Winner/Loser	Wimbledon	Nieminen 💌		n/a	04.07.2006 14:00	04.07.2	006 15:00	3
Log out	2 1 X 2	Juventus - Real Madrid	1 • x O	2 0	n/a	04.08.2006 17:00	04.08.2	006 18:00	3
Main	3 Score	New York - Detroit	3 -	2	n/a	10.09.2006 21:00	10.09.2	2006 22:00	3
ome									
Paques	3								
reate Filter	Undate								
lter Standings									
anage Filter									
Managerial									
reate League									
anage League									
reate Tournament									
anage Tournament									
Administrative									
eate Super League									
Anage Super League									
terrende e e e e e e e e e e e e e e e e e e									

Figure 1. The desktop web browser interface for PreLe.

2.2 Mobile Extension

To address situations where the users of PreLe might not have access to a desktop browser, and to take advantage of the characteristics of mobile phones, a mobile extension was implemented to PreLe. In other words, the extension was designed to be a secondary user interface when the primary one was not available. The mobile extension was implemented with Java MIDP 2.0 and tested on Nokia Series 60 phones. Like the PreLe server software, the mobile extension is open sourced under the MIT License.

My Leagues	The Make Prediction		
pele (Super League)	Choices 1 Blues		
Make Predictions View Results	o X o 2 SaiPa		
View Standings Message Board Poistu	Closes: 10.02.2005 00:00 Starts: 10.02.2005 00:00		
Valitse Peruuta	Valinnat Back		

Figure 2. Two screenshots from the mobile extension of PreLe.

3 User-Created Predictions

The events and social interaction of people predicting or betting can be categorized at least by two variables: the size of the group that is doing the predicting, and the duration of the prediction event. Also, the current PreLe system brings forth a third dimension that influences the kind of social interaction around prediction: whether the predictors are participating in the game. In other words, the predictors are the same people as the competitors. This third dimension is naturally closely related whether the predicted event is a professional game or not.

3.1 Group Size

We have divided the size of the group into three clusters that are somewhat intuitive but intentionally leave the grey areas between unclear. We follow the division of the circles of relationships presented in [4]. The smallest cluster we call a group, where there are 2-20 people, and the people within the group mostly know each other. These kinds of groups are families, colleagues, friends, sports hobbyists etc. We assume that often the binding force around a group is not necessarily the sport or game that is predicted on, but something more social in nature, such as friendship, school, or work.

The second group size cluster we call a community. In a community there are roughly 50-200 people who do not necessarily all know each other but they have a clear sense of belonging to a community. Communities, in our definition, can be amateur sports clubs, sports fan clubs, employees of a company, school, event participants etc. Unlike in the case of a group, here we assume that the sport, game, or event predicted on is often related to the defining attributes of the community.

The third group size cluster we call a public. This is large amounts of people ranging from hundreds to millions. These people do not know each other and due to the number of people probably never can, or even want to. However, there are some attributes that limit a public from the whole world population. For example, language, geography, or access to information, but also, interests, culture, and motivation limit the number of people. Examples of publics are the ice hockey fans in Finland, the viewers of a TV show, the readers of a newspaper, high school graduates of 2005, and so on.

From an individual's point of view these groups are by no means mutually exclusive. One person naturally can belong to several groups, communities, or publics at the same time. Actually, we assume that each of the smaller clusters can be found inside the larger ones, for example, inside communities there are probably several overlapping groups.

3.2 Duration of the Event

Another major variable that we see influencing the kind of prediction events emerging around systems like PreLe is the duration of the event predicted on. The end-user commitment or lock-in into the prediction is quite different whether the duration is one day or several months. We have divided the different durations of predicted events into three categories.

The first category is day. These events last roughly from few hours to few days (*e.g.*, one weekend). These events include games and play like LAN parties, amateur sports one-day tournaments, conferences etc. Characteristic of day events is that the interaction among people and interaction with a system like PreLe is more intensive than in events with longer duration, for example, a console game tournament arranged for one evening.

The next duration category we call week. This time frame ranges from several days to few weeks, and it includes events like the Olympics, Soccer World Championships, or any other game or play lasting roughly a week. In contrast to a day event, the interaction and predicting is less intensive. In other words, people do other things during the event than predicting, for example, go to work, sleep, meet other people, and so on, and return back to the prediction event when they want. This emphasizes the hypotheses that longer duration predictions become more asynchronous social interaction than shorter ones.

The third duration category we call a season. This duration lasts from several weeks to several months. Seasonal events are, as implied, sports seasons, like ice hockey, and football leagues (professional or amateur), or TV show seasons. Seasonal events require some organization, often have some structure in them,

and can be repeated annually. In this category the fact that people interact outside the prediction is even stronger than in shorter events. For example, during the Olympics people probably break their daily routines to watch and predict the games, but longer events like football seasons are often integrated to the daily life and become routine.

3.3 Participation

The third dimension we emphasize is the participation of the predictors in the play or game they are predicting on. Obviously, this can be a major issue in professional sports where betting is popular, and there are legal and moral laws addressing the issue. But in amateur games, like a LAN party or a darts competition at the pub, this is often not an issue that can not be solved within the participants by social control or other means.

In addition to the problems rising from predicting on one's own self, we argue that the participation of the predictors in the predicted event is an interesting characteristic in analyzing the kinds of social interactions and the level of user creativeness. For example, the level of organization for predicting on a professional sport might be less than for organizing both for the predictions and the game predicted on. Also, the number of participants is probably a factor on whether the predictors are the same as the players. In amateur events it is possible that some of the predictors are participating in the game itself, but not necessarily everyone.

4 Mobile Phone Characteristics

Mobile phone technology has special characteristics that should be leveraged when designing games or other social applications targeted for group use. From the perspective of mobile gaming, these are the special characteristics that differentiate mobile phones as a game platform from other mobile platforms, mainly handheld game consoles (*i.e.*, Sony PSP or Nintendo DS). [5]

In this section we go through the main characteristics of mobile phone technology, as presented in [5], and how the characteristics have been used in designing the PreLe mobile extension. We also point out the opportunities that the technology provides which have not yet been implemented in PreLe.

4.1 Connectivity

This is the inherent quality of current mobile phones: they are designed to be connected to the network at all times. As the data networks' coverage has increased, the mobile phones have turned out to be the best connected wireless computers in the world. Other types of connectivity are also available, such as Bluetooth for short-range connectivity and WiFi network connectivity.

One purpose for the mobile extension in PreLe is to enable access to the predictions through the mobile phone and the notification of events through the phone as well. Especially, in the latter case of notifying the user and keeping her aware of the predictions works only when the device has network access practically all of the time. Although the current version of the PreLe mobile extension requires the user to "pull" the latest information (or at least to have the application on all the time), technology such as SIP (Session Initiation Protocol) make it possible to "push" this information into the application without user initiation.

4.2 Mobility and Ubiquity

The other key characteristic of mobile phones is their mobility. This means the possibility to carry and use them outside the more traditional computer use situations, or in the case of PreLe: outside the traditional computer gaming situations. The ubiquity of the device is in this context the same: having access and possibility to participate in the predictions anywhere.

These two characteristics are closely related to the connectivity of mobile phones. In PreLe the combination of mobility and connectivity makes the gaming ubiquitous: the user can take the game anywhere where there is network coverage, and the gaming is not limited to the desktop computer or the living room console.

4.3 Sociality

Current mobile phones store and manage lots of information about its owner and the people with whom the owner is connected. The phone has social information such as call logs, buddy lists, an inbox for text and email messages, and so on. Also, mobile phone is a communication device, and therefore, associated with sociality and keeping in touch with people.

In PreLe the social nature of the phone is used to encourage the users to socialize through the game. It is more intuitive for users to be in contact with other people via a phone application than a handheld game deck or a dedicated device. The mobile phone is very intuitive to use for communication, especially with friends, family, colleagues and so on.

4.4 Personalization

Mobile phones are also very personal devices. Each family member often has a mobile phone of their own, which is often customized starting from the purchase decision of a certain model to the individual ring tones, background images, and applications.

One main technical benefit of the personal nature of the phone is the ability to use it for payments. Although this is not part of the PreLe system, the billing functionality is important to keep in mind from the business perspective, especially in betting. The other benefit of personalization is that it is safe to assume that almost everyone has a mobile phone.

4.5 Media Creation

With the large number of cameras integrated into mobile phones it can be said that people are getting more familiar with creating media (*i.e.*, photographs, video) with the phone. Therefore, media creation is becoming a familiar feature of mobile phones.

In the case of PreLe this is key in documenting the event predicted on or just enriching the social interactions around the predictions. For example, the users can upload or "blog" photos or stories from the event as it happens (see, *e.g.*, [1]). Currently this is implemented only on the desktop browser part of PreLe, not on the mobile extension.

4.6 Programmability

One of the key differences between mobile phones and handheld game decks is programmability. Most mobile phones have open programming interfaces, which are open to anyone with basic programming skills, especially the Java MIDP environment. From the end-user perspective this open and standard programmability means portability and compatibility. For example, implementing the mobile extension in Java MIDP has made it possible to use the extension in most smart phones. Also, the open source distribution of PreLe makes it possible for users to modify and further develop the mobile extension.

5 Use Scenarios for Mobile PreLe

To summarize, we describe in this section four use scenarios. The idea is to show by concrete examples how to take advantage of the analysis discussed above.

5.1 Betting on Professional Hockey with friends

A group of friends are ice hockey fans. They know each other from work, and socialize also outside the ice hockey context, although the discussions are often about ice hockey. They follow the ice hockey league regularly and few of them have season tickets to the games. All them occasionally bet on the ice hockey games. In the PreLe system they are interested in keeping track of each other's betting history. They like to speculate on the games beforehand and the success of the betting afterwards. They use PreLe mainly from work or home to make the predictions and look at the results.

The excitement always builds up before a game. Few of them watch the game at home, some of them watch it live at the arena or in a pub. Occasionally, some of them are at a business trip during the games.

In these situations where they do not have access to a networked PC (home being the exception) they use the mobile extension to make last minute changes but mostly to see how the rankings changed immediately after the results of the game have been input into PreLe.

This use scenario is about a group which makes predictions on a season, where the predictors are not the players. The main mobile phone characteristics leveraged are connectivity, mobility and ubiquity.

5.2 Dance Tournament at the Office

A dance tournament is held at the office as a recreational activity to cheer up the spirit in the working community. They also decide to use PreLe to predict on each other in the tournament. To spice up the predicting there is a small money pool that is divided by the best and the second best predictor.

Because the playing, betting, and having fun happen all at the same time it means that the intensiveness of the event puts pressure on the usability and flexibility of PreLe. The main functions used are making the predictions and looking at the results as the tournament progresses. Here the mobile extension serves as a personal user interface to the system. The participants can make their predictions from their phones rather than queue up to the available networked PCs. The tournament also includes photos taken during the event that the players would like to share. Other kinds of media might be shared after the event, such as graphs and diagrams of how the dancing and the predicting progressed. These are shared after the event to reminisce rather than during the event.

This use scenario is also about a group of predictors who make the predictions within a day, or more precisely one evening. Here the predictors are the same people as the players. The main mobile phone characteristics used here are the personal nature of the phone, the network connectivity, and the portability or compatibility of the PreLe program in different phones.

5.3 Weekend Amateur Football Tournament

Several amateur football teams are having a tournament that lasts for a week. One player in one of the teams decides to set up a PreLe system. She puts in the game schedule beforehand and advertises the league to all tournament participants whose email address she has and invites people to forward it to anyone involved. During the tournament there is no Internet access on the football field, therefore, she uses the mobile client to put in the results of the matches. She has mentioned in her invitation emails that there is a mobile extension to PreLe available for use from the field. For those who have not downloaded it she sends the direct URL to their mobile phones. During the tournament some people put photos from the event on the website for others to enjoy.

This scenario is about a community using PreLe in an event that lasts for a week. Here not all the predictors are players, but some of them most probably are. The mobile phone characteristics used are mainly the connectivity, mobility and ubiquity, and, as in the previous scenario, compatibility. This scenario also takes advantage of the media creation capabilities of mobile phones.

5.4 Fans host a league during a beauty pageant

Two active users of an Internet message forum on beauty pageants have an idea to host a league for the upcoming Miss Nation competition. The competition is taking place in the following evening and is broadcast on national TV. They install the PreLe system on a home server and invite other users from the forum to participate. To their surprise a lot of people join the league to predict the winner.

This scenario is for the public and the duration is one day. The predictors are most probably not the participants. This scenario does not emphasize the mobile extension; the key characteristic here is the open source and ability to customize PreLe. This is a key characteristic of the mobile extensions as well. Therefore, the programmability and high compatibility of Java MIDP technology is taken advantage of.

6 Conclusions

In this paper we have described our PreLe system for user-created predictions and prediction leagues, and our design rationale for extending this game into the mobile phone.

From the point of view of mobile gaming and entertainment applications, the lesson learned is looking at mobile games "outside the box". That is, not to see mobile games as smaller versions of console games, but to look at mobile games more holistically as applications that are used in different social, temporal, spatial, and technological contexts.

For mobile application design in general, the lesson learned is the distribution of functionality to different devices. In other words, to identify the best characteristic of each terminal (in this case the desktop web browser and the mobile phone) and design specifically for them. Mobile applications should take advantage of the fact that people have access to other devices and terminals rather than think mobile applications as isolated components.

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Telling stories with MMS: How does comic story based messaging fit into group communication?

Antti Salovaara

User Experience Research Group antti.salovaara@hiit.fi

Abstract

One of the prototypes developed within MC2 was a comic story creator for recording life situations and making narratives out them for others. The initial prototype developed into a full product, Comeks, designed by a spin-off company Bulbon Ltd. A field trial of Comeks was organized around the turn of the year 2005-6 to learn about the evolving uses for such a narrative communication tool. In the trial, a group of 8 high school students used Comeks for 8 weeks. The findings from the trial, presented in this chapter, emphasize the importance of designing multiple ways for participating in mobile messaging conversations, to resist high participation threshold: the problem that replying to messages becomes so burdensome that conversations die quickly and the full potential of the tool is not used.

1 Introduction

SMS has proved itself as an extremely useful medium for interpersonal communication, but recent years have shown that MMS – which was planned to be the successor to SMS – has not become even nearly as popular. On idea was that MMS would enable communication of a wider spectrum of experiences, telling stories, and enable story-telling through its multi-slide structure. It has however turned out that MMS has not been suitable tool for such communication.

However, the concept of multimedia story-telling in interpersonal communication is a sensible concept despite the failure of MMS. Therefore, when an idea of a mobile comic story creator program was invented during the MC2 project's product concept design process (see chapter "Scenario and concept development process"), it was worthwhile to investigate the idea further.

The rationale for the need for such a communication medium was in the observations of live-action role playing (LARP, see chapter "Live-action role-playing"). There, as the game is in progress and everyone strives for creating an authentic atmosphere of a would-be fantasy world, really few opportunities exist for documenting the gameplay. This means that as the game is over, often nothing has been recorded of the session. In order to re-live the gameplay experience and its best moments, even a simple tool to take pictures and create stories that visualize the game situations could be useful. When coming up with this initial idea, it was realized that taking the pictures with a mobile phone might still be too intrusive in the game situation and the tool therefore would not be optimal for this purpose, but at the same time it was noticed that it could be useful in other everyday activities and leisure-time communication. Therefore MC2 set out to develop a prototype of this tool and organize a field trial to learn how it is used. The student group who started this work continued the project to a fully designed software product for mobile phones, called Comeks.

As a new communication medium, such as a mobile comic story creator, becomes available, it takes time until its use matures and people find their best personal ways to use it. Such an *appropriation* process on how the useful functionalities of a system are discovered and learnt may have outcomes that may surprise the designer of the system. The system may be re-purposed to achieve goals that have not been in the scope of the original design. Often the emerging use patterns are a result of a social process in which the user, user group, or user community has some specific needs that demand special functionalities from the system, and the people circumvent the shortcomings of the system by working around them, by developing new practices to interact together. Therefore, an evaluation of an open-ended communication tool such as Comeks must be sensitive to the practices that may develop within the user group over a period



Figure 1. Screenshots from Comeks, showing four steps in a creation of a frame for a comic story.

of time. Thus, when planning the field trial evaluation of Comeks, the research question was qualitative: *how well does comic story based messaging fit into group communication*? This was explored with a long-term user test that allowed for maturation of practices, and analysis of the whole appropriation process.

2 Comeks

As described above, origins of Comeks were in MC2's concept design process, but the when developing a prototype, the design expanded beyond the immediate idea of documenting live-action roleplaying sessions. For the field trial, the full-fledged version of the product developed by Bulbon Ltd²⁰ was used. It is a multimedia message composer program implemented with Symbian C++, running in Nokia Series 60 phones. Comeks provides an alternative to the standard MMS messades composer – when the comic story is ready, it uses the standard MMS functionality to deliver the story to the recipients' phones. By relying on MMS in message delivery, Comeks is one-way compatible with all MMS-equipped phones: any such phones can receive Comeks messages. In the receiving end, Comeks messages are normal multi-part MMS messages that can be viewed slide-by-slide.

With Comeks, users can augment and annotate images with speech bubbles and other comic-related accessories, put images in a sequence (enabling storytelling), and tune the colour balance in the pictures in various ways (brightness, contrast, hue, different colour shadings etc.). Figure 1 shows some of the basic functionalities provided by Comeks for comic creation. When started (A), Comeks shows an empty comic strip to which the user is asked to create the first frame. After choosing "Add frame", Comeks opens the frame editing screen. User adds an image into the frame, either using the phone's camera or by accessing the picture gallery (B). When image has been added, user can choose to annotate the image with a speech bubble (C), add decorative borders around the picture, or add comic-style special symbols (exclamation marks, texts like "Poff!", "Wham!" etc). After being finished creating the frame, user returns to the main screen (D) and may start the creation of the next frame. This can be done by selecting "Add frame" again. All the frames remain editable throughout the comic story creation process, and they can also be rearranged, deleted, duplicated and so on.

3 The method

To run a field trial on Comeks with real users, a group of students from a Finnish high school were found through invitation posters that were left on message boards in a selection of schools close to centre of Helsinki. Three groups contacted the researchers based on the invitation. The selected group consisted of 4 boys and 4 girls who formed a group that interacted with each other both in the school and on leisure-time. All the students (hereafter called users) were on the third grade and preparing for the final matriculation exams that were approaching in the spring. The study lasted 2 months in total, starting in mid-December 2005 and ending in the beginning of February 2006. The users were provided with Comeks-equipped phones. It was emphasized to the users that they should not feel pressed to use the system if

²⁰ See www.bulbon.com



hen s/he ce in the repaired

Figure 2. The user research method applied in Comeks study: 1. User (U) sends a message to another user; 2. Both sending and receiving are logged in the server; 3. Researcher (R) reads the messages and interviews the users.

quickly with this method.

For this study, a modification was used that collected in each phone all the MMS messaging (including all Comeks messaging) that the user sent and received during the field trial. The messages sent and received during the day were transmitted to a server every night. The researchers were able to examine the multimedia messaging between the users in almost real time. Based on the collected data, each user was interviewed bi-weekly about the messages. Figure 3 shows a part of a communication log from one of the users. Printouts like these were used to carry out the cued-recall interviews. In this way, the memories about the situations of message creation and reception were still rather fresh in the memory. Every message that the user had sent or received was interviewed separately. On messages that had been sent by the user, the following questions were of particular interest:

- What was the surrounding situation in which the message was created
- Why the message was created in such-and-such way: was there a style or a visual element that the user was looking after.
- Why these particular recipients were chosen for the message.



Figure 3. An excerpt of multimedia communication log collected using ContextLogger. Printouts like these were used in the interviews with users to spark their memories about the situations in which messages were sent or received.

Based on these general questions, follow-up questions were asked as is common in semi-structured interviews. In total, 24 interviews were carried out, amounting to 18,5 hours in total. After approximately 8 and half weeks of use, the 8 phones were collected back and concluding interviews were held. The users also received 20 EUR present cards for their participation.

In data collection with ContextLogger, informed consent was of course followed in the setup: the users were aware that their MMS messaging was tracked this way, and they had given their permission to it in the beginning of the field trial.

4 Findings

During the field trial, 120 multimedia messages were sent by the users, 85 of them being created with Comeks. Seven out of eight users contributed to the creation of the messages; on one user, it turned out to be impossible the make the phone account work properly and reliably, despite of hours of struggling by the researchers, the user herself, and tech support of the operator. Some examples of pictures exchanged between users are shown in Figure 5.

Figure 6 shows a diagram on individual differences between the users in multimedia message creation. It also provides a comparison between the use of Comeks against the use of normal MMS. As can be seen, Comeks was more popular than normal MMS (although this may be a result of research design).²¹

Figure 7 provides a view to how the activity varied from day to day during the field trial period. The average number of Comeks messages created by each user was approximately 0,2 Comeks messages per day (when the 7 well-working phone accounts are counted in). However, the individual differences in the activeness were large, as can be seen in the comparisons in Figure 7. The generally speaking rather weak activeness implies a question why Comeks was not used very often, although the users unanimously told that they liked the user interface, the idea was nice and the program was easy to use. The following subchapters attempt to answer to this question, each one closing with a lesson learned from the study. This analysis is based on the statements gathered in the interviews from the users.

²¹ All the names have been changed to retain the anonymity of the users.

A: Oskari to Eva:





Enters the fruit-slaver.









B: A reply from Eva to C: Eva to everyone in the D: Tessa -> Henna: Oskari: user group:



"Once upon the time, there was a banana ... "



"The banana was forgotten..."



But hey, what can you

Hei

do"

minkäs teet

Tänä iltana Napakym pissä..



"...3 young gentlemen"



"Live performance by:"

Remember to watch! Hahaha :D a bundle of love to you all, and strength to the next week. -dame lisa-



"Are you planning to go to "This evening in Napakymppi that party about 20 (or so) [a popular TV program]..." mornings left is school on Fri? Because if you are



"There is a cool alternative: Be an overlooker in a teenage disco :D could you make it?"

Figure 5. Examples of messages that users sent mostly between each other, but also sometimes to other people who had an MMS-equipped phone (message D).



Figure 6. The numbers of multimedia messages created by users. The graph counts unique messages: a single message sent to many recipients counted as one in this graph.



Figure 7. Comparison of Comeks usages between active and passive users by visualizing it with sliding averages (±3 days windows). One user has been excluded from the calculations because her phone account did not start working.

4.1 Participation threshold and gift-giving: the need for a common space

In the field trial, creating comic stories appeared to require a lot of effort. It was quite common to spend e.g. 30 minutes to prepare a long story with good pictures (see example Figure 5). In these cases, it was natural that the sender of the message was always eager to receive feedback from the recipient (or recipients): had the message been received, how it was interpreted, and was there a reply message to be expected. On the other hand, to the recipient, being aware of the amount of effort that had been invested on creating a message meant that some acknowledgment for the message was expected.

In this light, it is interesting that *hardly any replies were sent to comic story messages*: only 14 Comeks messages (15,6% of total) were replied, 10 times with another Comeks messages (the remaining ones being normal text messages). This unexpected behaviour was noticed quickly during the first weeks of the trial, and the interviews were adapted to find explanations to this phenomenon. It was found that receiving messages

produced often an uneasy feeling in the recipient: the Comeks message was perceived as a *gift* that implied a pressure to reply with an equal return present. However, creating such a return present was not always possible due to many reasons: the recipient could not always be in a situation that was worth taking a picture, or he or she did not have time to start writing anything back, or there was no inspiration for message creation at the moment. Therefore, no immediate multimedia reply was often possible (the turn-takes in Figure 5 are an exception to this). The users also told that answering with a simple text message was not a good choice either: they felt that replying with an SMS was "lame" compared to what had been received. As a result, recipients often did not reply anything back immediately, and soon the time window to reply properly back was lost, making recipients feel somewhat ashamed of their passiveness. And on the other hand, senders of the messages were either disappointed or even frustrated that they did not receive any response to their messages.

The conclusion is that the *participation threshold* for using Comeks in interpersonal communication, both in creating Comeks messages and replying to them, became too high for most of the users. This was because they did not find conventional ways to participate in the message *gift-giving* ritual. They were not able to create return gifts that would have shown enough effort invested in their creation process. In SMSing, this threshold does not manifest as a prohibitive factor. In their study on teenage text messaging, Taylor and Harper [4] showed that gift giving is actually one of the key phenomena that maintain the exchange of messages between mobile phone users.

Overcoming the threshold is a design problem that needs a solution that allows users to create replies that do not demand excessive efforts. For example, if it was acceptable to reply with a simple text message, the variety of different replies would be bigger, and users would experience more freedom when using the system. Another goal is that the program should also encourage people to continue creating also beautiful messages, not only guide all the communication into a SMS-like messages.

A solution to this problem can be sought by thinking what kind of a media Comeks is for communication. Using visual communication makes Comeks often more social than how SMS messages are used. This is because the pictures take often portray social situations. And since Comeks also provides storytelling capabilities, this aspect is increased. Therefore, the messaging resembles group communication more than one-to-one communication like SMS. However, architecturally Comeks is based on MMS, which has the same one-to-one messaging scheme as SMS. A medium that would allow all the members to see each other could do a better job here.

In another project, our research group has run field trials on a mobile multimedia group messaging application – called mGroup – that lets people send their messages to media spaces that resembled multimedia chats [2]. The results of these studies provide an interesting contrast to the use patterns of Comeks. In a field trial in a rally, the 8 users sent more than 200 messages to the system during only 4 days of use. These messages varied from simple text statements to multi-part messages composed of text and image items. Messages were often replied to, and new ones were also posted often. The outcome of the trial was thus different to that of described in this chapter. The differences may be due to a different use context (a group of friends visiting a rally together vs. a group of schoolmates using a system for 2 months), but the explanation might also be in the scheme how mGroup collected all the messages to a common space for everyone in the group to see, while MMS-based Comeks stored the messages in the inboxes of different phones, this way separating discussants from each other.

The lesson learned from the analysis is that when creating multimedia messaging applications for mobile phones, the social aspect of communication should be taken care of in the design, by facilitating users' awareness of each other's messages. Using a mGroup-like common space is not the only solution: an email-like public recipient list could also do the job.

4.2 Diverging patterns of use between users

Also an analysis of individual differences in the use of Comeks was carried out. It became apparent that the active users (Eva, Oskari, Tessa) found multiple ways to use Comeks for communication, such as:

• Creating comic stories that draw inspiration from one's everyday life situations. For example, the idea to create the story about a banana (shown in Figure 5) originated from a situation in which Eva found an old banana at her house.



Figure 8. A screenshot from Comeks' image filter feature.

- *Exploring the image editing functionalities.* Oskari found it interesting to explore what are the limits of image editing in Comeks, especially its image filter feature.
- *Creating stories together.* In the middle of the field trial, Eva and Oskari created some messages together. These messages were planned together, and sometimes the pictures for them were taken in both user's cameras, after which they were collected together and the final story was composed.
- *Thank-you messages after the nights out with friends.* Tessa took often pictures when she had a night out with her friends. The next day she selected the best pictures, created comics out of them and sent them to the people whose faces appeared in the pictures. In most cases the recipients were not part of the field trial user group, but other friends who had a MMS-equipped phones.

The ways how Comeks was used by Eva, Oskari and Tessa in the latter part of the trial were different, although the starting point was the same: everyone had received the same tutorial in the beginning on what the system was like, but the appropriation processes ended up being different. In contrast, the analysis of the messages by the 4 less active users shows that no clear patterns of use developed during the field trial. The only clear categories of messages by these users was Christmas greetings, and TV series reminders sent between Anne and Eva: they had already years before had a habit of reminding each other if a certain TV series was starting and the both should remember to watch it. Other messages were thematically more random.

The high-level finding from this discussion is that open-ended systems – such as Comeks that could be characterized as a leisure time communication application – should be easily appropriable by different people. How this goal should be achieved in practice is of course a more difficult question. The detailed analysis of the interviews is still ongoing at the time of writing this chapter. The analysis will focus on explicating how the three active users interpreted and made sense of Comeks differently than the passive users, and why this resulted in a more active use of the system.

While still searching for big answers in the analysis, a few (rather vague) lessons learned from Comeks' field trial can be provided. All the users found tinkering with the image filtering (see Figure 8) exciting, and it was used a lot for playful exploration, not only for creating finished stories. While the overall uses diverged, on this level the users showed similar use. Another lesson is that it seemed to be easier for everyone to start creating messages about traditions (such as Christmas) or other social events and habits that the users already shared (such as the TV series reminders described above). When possible, communication tools should be especially suitable for communicating about such shared events. This idea will have to be considered in different ways depending on the communication tool being designed.

4.3 Preparations for future messages by creating picture collections

Although Comeks has a built-in functionality for taking pictures with a camera, all the users reported that they used the phone's standard camera application for image capture. When creating the Comeks messages, they visited the image gallery of the phone to pick the required photos. Reasons for this were many. First, collecting building blocks into a separate space (i.e., image gallery) allows for simultaneous preparation of multiple messages. This would not be possible in Comeks alone, because only one message can be edited at a time. Another reason for using the camera was that its use is faster than Comeks' inbuilt camera. Therefore social situations are faster to capture with it. These findings point out the emerging trend of integration smart phone's different capabilities in a modular way. New programs will benefit from other phone's resources and users find currently more use for targeted simple applications that can work together. When new tools are developed, this could be taken into account. In Comeks, the current design could be extended to non-visual data by allowing e.g. speech bubble texts be picked from phone's calendar events, message inboxes rather than forcing users to type everything manually every time. This could encourage communication of new topics through Comeks. For other phone applications, similar extensions can be envisioned.

5 Conclusion

Interpersonal communication applications can be adopted into use in many ways, and especially in leisure technologies this can be seen as a beneficial property. Making the tools appropriable for many purposes increases their usage and customer base. When designing communication applications with this objective in mind, analysis provided in this chapter has pointed out the importance of not only leaving the purpose of use for the users to be defined, but also bearing in mind some facts of social practices that emerge around the usage of the medium: facilitating reciprocal communication by lowering the threshold for participation, providing users some awareness of others' messaging activity, leaving room for playful exploration because that can be exciting to many users in its own right, and integrating programs modularly with other phone's resources, because many users like to use specialized tools for different tasks.

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Mobile Photography is Sharing and Socializing

Risto Sarvas

risto.sarvas@hiit.fi

Abstract

In the MC2 project mobile photography was studied in three consecutive systems in cooperation with UC Berkeley and Futurice. The three year study involved roughly 150 users in qualitative studies and several thousand in the quantitative analysis. Also, the systems constructed have lead to a commercial service, namely, the Kuvaboxi service by Futurice. In this chapter we go through these three systems: design, implementation, analysis, and results. The main result is the role of interaction and communication in photo sharing and how the discussions around the photos have a role as important as the photos themselves.

1 Introduction

The work done of mobile photography in the MC2 project is around three systems. The first system, MMM-1, was designed, implemented, and evaluated in co-operation with UC Berkeley's School of Information and Futurice from January to December 2003. The following system, which forms the core of this research, is the MobShare system designed, implemented, and evaluated in co-operation with Futurice from January 2004 to January 2005. From the MobShare system, Futurice made a commercialized version named PhotosToFriends which was released in April 2005. PhotosToFriends was then used as a study platform in user studies in MC2 in Fall 2005. In this chapter we go through all three systems and how they were designed, implemented, and analyzed, and draw together the main results of each study. In the text we refer to the publications written about the systems in the MC2 project.

2 The MMM-1 System

The Mobile Media Metadata system version 1 (MMM-1) was designed and built from January to September 2004. It was done in co-operation with the Garage Cinema Group at the School of Information (formerly the School of Information Management and Systems) at UC Berkeley, Futurice Ltd., and Helsinki Institute for Information Technology HIIT's research projects DECore and Mobile Content Communities (MC2). MMM-1 was a photo metadata creation system for networked cameras that took advantage of contextual information and previously generated content metadata to facilitate the creation of content metadata immediately after capture. The system is described in detail in [4] and the user test findings in [8].

2.1 Design

The objective of MMM-1 was to take advantage of the two special characteristics of camera phones: the inherent network connectivity and available context information. Also, to implement the system the open programming interfaces of the device were used.

The research question that the system tackled was the media management problem and how it could be solved by having semantic content metadata stored with the photograph at the time of capture. However, it was identified that mere computational extraction of semantic content metadata from media does not provide high level information. And, on the other hand, the user has knowledge of semantic content information at the time of capture, but this information is effectively lost as time goes by. The same is true of the camera phone device: at the time of capture it has access to contextual information.

Rather than attempting to reconstruct semantic metadata by analyzing media after it has been captured, MMM-1 aimed to leverage contextual information and network effects to computationally assist users in creating useful semantic metadata at the point of capture. The system created, shared, and reused semantic metadata at the point of capture using the network connectivity of the camera phone. The content

metadata was designed to be created by the following process which had the following principles (see also Figure 1):

- 1. Gather all automatically available contextual metadata at the time of capture.
- 2. Use metadata and media similarity processing algorithms to infer and generate new metadata for captured media.
- 3. Share and reuse media and metadata among users to facilitate metadata creation and new media applications.
- 4. Interact with the user during capture to verify and augment system supplied metadata.



Figure 1. The metadata creation process of MMM-1. After image capture the client component of the system gathers available contextual metadata. Then that information is sent over the network to the server component that processes the context metadata and the media to come up with suggestions for user verification.

At the end of the process the user would have the picture annotated with semantic metadata that was, to a certain degree, standard among all the users of the MMM-1 system.

2.2 Implementation

The system was implemented as a client-server model, where the Series 60 compatible Nokia 3650 phones were the clients and an Apache Tomcat and HTTP servers the server components. To leverage the network effects of many people all the metadata and the captured media was transferred to the central server. In that way the freshly captured metadata and media could be compared to other people's metadata and media. For example, if 85% of photos taken at a certain location are of the same object, such as a tourist attraction, it is probable that the just captured photo in that same location is also of that object.

Of the designed annotation process, the client program captured the time and date of the capture, the phone number of the phone that the photo was taken with, and the cell tower identification number. This was sent to the server that processed the cell tower information to provide a guess of locations, and another algorithm that processed the phone number to see who are the people that have been associated in previous pictures with the owner of the phone.

After the phone client had uploaded the information, it opened up an XHTML web browser to a web page given by the server that contained the server's guesses. From the web browser interface the user could verify or correct the guesses. See Figure 2 for the general architecture of MMM-1.



Figure 2. The physical architecture of the MMM-1 system.

For describing the contents of the photos captured, the system used a simplified metadata structure (*i.e.*, an ontology). The structure was based on the faceted metadata hierarchy designed for the Media Streams system at UC Berkeley. The structure had main categories, facets. The objective of these facets was to be as independent of each other as possible, in other words, one could be described without affecting the others. In the MMM-1 structure the facets were Person, Location, Object, and Activity. See Figure 3 for an example of the metadata structure used.



Figure 3. An example ideal image annotation in the MMM-1 system. The ontology used was hierarchical and faceted. Each description could include zero to infinity facets, which were Location, Activity, Person, and Object [I].

Bicycle

2.3 Analysis

Once the system was constructed it was tested by deploying it to 55 users, who were graduate students and researchers at SIMS, for four months. All the test users were administered a weekly survey for seven weeks. In addition to this there was a user interface tests made with five participants, and two focus group discussions. A more detailed account of the system evaluation is in [4], and especially in [8].

2.4 Results

The main lesson learned from evaluating the system was that there has to be a purpose for the creation of the metadata so that the user perceives the benefits of the annotation effort. The MMM-1 system was initially deployed without any application for the metadata, and not until there was a desktop browser component built to browse the annotations, the users had no use or motivation to create the metadata. Although it sounds obvious in hindsight, it did emphasize that the effort people are willing to put into creating metadata is next to nothing, and the metadata has to have clear and understandable benefits, preferably immediate benefits, for users to go through any annotation task. In the systems that were constructed after MMM-1 (*i.e.*, MMM-2 and MobShare) this issue was tackled by concentrating on the user motives for sharing.

One of the main hindrances of the system was its reliability on the GPRS network connection. The annotation process was designed so that the user interaction worked over the network connection that turned out to be more unreliable and slower than the design anticipated. This in turn caused the user interaction to be so slow that it frustrated most users.

The so-called vocabulary problem also became imminent. The users used existing words to describe different things, and vice versa. Also, the annotations turned out to be personal (*e.g.*, a stuffed toy monkey was annotated "George"), and therefore, not intuitive for anyone else.

It is worth mentioning, that in a more institutionalized metadata annotation scenario, such as creating metadata as part of a job in a public archive, the motives for doing the effort are simplified by the fact that the person is paid to do the work. In a consumer oriented scenario, such as the user tests of MMM-1, the motives to do the work have to come from the user herself. This also means that in consumer oriented scenarios for media metadata, the metadata has little value as such, or at least it is an overwhelming task to motivate people to create metadata just for the sake of metadata – the effort put into creating metadata has to be less than the benefits perceived from it. Therefore, the metadata has to be coupled with an application for it, and depending on the application, it affects and limits the kind of metadata that is created. For example, if the application for the metadata is in publishing pictures, then the motives for creating the metadata are related to the publishing task, and so is the created metadata as well.

This snapshot photographer perspective on metadata and the related metadata creation effort is the main contribution of the MMM-1 system to this research. The system was designed based on the traditional library sciences principles for metadata: objective and structured information for a public audience. What the evaluation demonstrated was that in scenarios where the metadata is not used or created for the purposes of an organization, these principles do not hold true. As the user trials on the following MobShare system emphasized, the user-created information associated with photographs is contextual, personal, and dynamic.

Although the main lessons learned from MMM-1 tend to be lessons learned from design mistakes, one success was significant. The pictures taken with the phone showed a new photography behavior: the kind of pictures taken because the camera was always with. These were pictures were taken ad hoc and often in a humorous context to capture a special moment where they previously did not have a camera with them. The main objective of the following MobShare system was to study further the kind of pictures people take with camera phones and with whom do they share them.

3 MobShare

The MobShare system was designed and implemented from December 2003 to March 2004. The research done with it forms the main part of this research. The system was done in co-operation with Futurice Ltd. as part of the Helsinki Institute for Information Technology HIIT's research project Mobile Content Communities (MC2). MobShare was a photo sharing system designed for sharing mobile phone photos on a central web server. Its design principle was to facilitate the sharing of photos from mobile phones, and there was no special emphasis put on metadata. Also, the system was used as a commercial prototype for Futurice, and therefore, it was especially focused on end-user needs. The system is described in detail in [7] and [9]. There were two user trials done on the system. The findings of the first one are described in [5] and the findings of the second one have not been published.

3.1 Design

MobShare was built very much on the lessons learned with MMM-1 on end-user requirements for mobile photo sharing. Futurice, the partner in designing the system, had also experience with mobile photo blogging services and products in general. As mentioned above, one of the emergent findings with MMM-1 was the new photo taking behavior the users exhibited with the camera phones. Because the camera was always with, they tended to find new opportunities and situations to take pictures in. Also, these photos were used to relay light, transient, and often humorous messages to their friends and family [8]. Therefore, there was a strong need from the users to share the images. This urge to share and communicate with photos was as noticeable as the need to create metadata was unnoticeable.

In addition to the previous work done on photo sharing, multimedia messaging (MMS) was used as a lesson learned. MMS had, at the time, enjoyed low commercial success in comparison to its high expectations. Because people seemed to have a strong urge to take photos and share them, it was an interesting questions why it was not used as much as expected. Our opinion of the low success was that MMS was designed to be a conceptual extension of text messaging rather than relying on metaphors and practices familiar in snapshot photography. This point of view was one of the main drivers in the MobShare design.

The architecture used in MMM-1 was also a clear influence in MobShare. To address the network problems encountered in the over the network user interaction, the MobShare phone client was designed to work so that when the network was used, it required no user attention. Secondly, the benefits of having a central server were taken into account in building the server side of MobShare: all pictures in one place, and desktop web browser access to photos, which meant a richer user experience and higher level of access than, for example, in phone-to-phone photo sharing (*i.e.*, MMS).

The main contribution of MMM-1 was the change of perspective for user-created media metadata, in other words, that the basic principles of the traditional library sciences metadata did not hold true in the context of snapshot photography. Therefore, the design of MobShare focused very little on metadata creation. However, the implications for metadata that MobShare and its user trials suggested were significant.

In addition to the lessons learned from MMM-1, a camera phone user study on ten Finnish users was conducted [3]. The user study pointed at the transient nature of mobile phone pictures in comparison to pictures taken with a traditional camera. It also emphasized the habit of sharing pictures in groups, in physical proximity, as well as by email. Thirdly, one of the findings was the personal nature of a mobile phone when compared to a camera. Traditional cameras are often shared property within a family, but mobile phones are personal property. [3]

Finally, the literature on personal photo management and digital photography in general was studied to better understand the state of the art. Especially the user interface solutions in commercial systems and academic photo management applications for PCs was a fruitful source in designing MobShare.

3.2 Implementation

The system architecture was generally the same as in MMM-1 with the addition of a desktop web browser interface (see Figure 4). The client component was a Series 60 compatible application and the server side was implemented with J2EE and Apache Tomcat technology.



Figure 4. The general physical architecture of MobShare.

As mentioned above, the overall architecture was a client-server model. Initially the MobShare client program had the photo taking and sharing in one dedicated program. However, this was in practice redundant because the photos could be taken also with the phone's own camera program, and the benefits of having a camera program integrated with the sharing were not used by the users. On the other hand, to tackle the speed and latency problems of the GPRS network the picture upload process was designed to be user-initiated: the taking of pictures was a separate task from sharing the photos. The objective was to decouple the photo capture and the photo sharing, partly to follow the traditional film camera process where they are decoupled, and partly to keep the capture and the picture upload tasks separate so that the slow network would not affect the photo capture. See Figure 5 for the picture sharing process on the MobShare phone client.



Figure 5. The sharing of pictures in the MobShare phone client. First the pictures are selected for posting, and then a new gallery/album is created for the selected pictures. The gallery is named and the recipients are selected. In the end the pictures are optimized and uploaded to the web server.

All the viewing, commenting, and organization of the captured and shared photos were implemented on the server side. This was because the server enabled desktop browser access (the users would not need a smartphone to view or receive pictures) and the desktop access enabled the use of a large screen and better input devices (*i.e.*, keyboard and mouse).

MobShare did not publish the images but limited access to galleries on an individual basis. For each gallery, the user had to explicitly choose the people who have access to the gallery, or in other words, who the gallery is shared with. There were no pre-defined lists of users (*i.e.*, buddy lists) that the user could take advantage of. Once a new gallery was created the people whom the gallery was shared with got an SMS notification to their phone. The notification invited the recipient to visit the new gallery in the given URL, and it included the name of the person who shared the pictures and the name of the gallery.

To view the pictures, the user logged into the MobShare website. There she had her personal view of all of her own galleries and the galleries shared with her (see Figure 6). The galleries were organized in temporal order and according to ownership. The width of the gallery in the visualization was the time between the capture of the first and the last picture in the gallery. By selecting a gallery the system showed all the thumbnails of all the pictures in that gallery. By selecting a thumbnail the picture was shown in full size, and a textbox for comments. The pictures could be commented individually, and a summary of the comment for all pictures in the gallery were shown next to the thumbnails. There was also the possibility to comment the whole gallery rather than an individual picture. Galleries could also be created in the web browser interface of MobShare, where the functionalities were much more versatile (*e.g.*, adding and removing recipients of a gallery, creating galleries with no recipients, and deleting galleries). On top of the thumbnails there was also a list of the people who had visited the gallery. Any pictures or comments that had been shared since the user's last visit were colored red.



Figure 6. The web page interface of MobShare. A) User's own galleries, and galleries shared with her. B) List of people who the gallery is shared with and who have visited it. C) Gallery-level comments. D) Picture-level comments. E) The thumbnails of pictures in the gallery.

Unlike public blogs or web pages MobShare was built for controlled sharing, meaning that the user has full control over who have access to the pictures. This also meant that for each gallery there was a distinguishable group of individuals associated with it.

3.3 Analysis

The main method of analyzing MobShare was two sets of user trials. For each trial there were five core users who were given Series 60 compatible camera phones (Nokia 6600 or Nokia 7610) and some guidance into using MobShare. It was emphasized that using the system was by no means compulsory. All of the data transfer costs for uploading the pictures were paid for, and all of the core users were paid a fee for volunteering in the study. Three interviews were arranged: before, in the middle, and after the trial period. The interviews were about the users' photography habits and social networks, as well as their use of MobShare. In addition, the users were asked to fill out a diary, and the MobShare server logged the users' activity. Each trial lasted 5-6 weeks. The first set of users was a group of friends aged 25-26, four female and one male. The other group was a family where the core users (*i.e.*, the phones and fees were given to them) were the father and mother of the family, two children, and their grandfather. Both of the test groups shared photos also to people not hired as core test users (*e.g.*, friends and family). Altogether 87 people took part in the trials (10 core users and 77 secondary users). A more detailed account of the first set of user trials is in [5].

3.4 Results

The main result on the MobShare user trials was a qualitative understanding of what kind of social uses people can have for mobile photos shared over the Internet, namely commenting and discussions, forming of groups to share photos with, the role of photo sharing as a means for keeping in touch, and the lifecycle of a mobile photo from capture to archival. It turned out that for the group of friends in their twenties the system provided a practical and entertaining way of communicating with friends and family. For the family, the system did not find such a need, because they saw each other daily and could share photos from the computer screen in the living room. An exception in the family setting was a daughter of the family who lived in a different city and sharing photos to her felt natural for them.

The pictures taken by the users were mostly of people. The galleries they shared were, in the group of friends, mostly of events, such as birthday parties or visits to friends, of travels to abroad, the photos of which were shared during the trip, and of themes, such as dogs or pictures taken at work. In the family setting the pictures were mainly of the children of the family, and the galleries a set of photos sent to someone in a gift-like fashion, mostly photos where the recipient was herself or had a special relation to the people in the photos. The children of the family created also galleries of artistic and experimental pictures. For the family, MobShare acted more like a convenient technology to view and show the mobile phone photos on the large screen of a PC. For the group of friends, MobShare was means for keeping in touch with their social network.

Whether it was over the network or at the living room, it was obvious that the purposes the users had for the photos were social. Even the picture taking was often social activity, for example, in the case where two children of the family took photos of a television screen while distorting the television picture by tuning the channels. The shared galleries also showed that the meaning of a picture is not necessarily created at the time of capture, but often during the discussions and comments during the sharing of the photos. Also, the meaning was contextual in the sense that the same picture could have a different comment, and therefore a different meaning, depending on with whom the picture was shared. From the perspective of snapshot photography this is not such a surprising finding. From the perspective of media content metadata it confirms that the information that people associate with their pictures is often social, and therefore, dynamic and contextual, as well as highly semantic.

One of the main contributions of the MobShare user trials, and in retrospect the MMM-1 evaluation, was an understanding on how design and implementation choices strongly influenced how the users could and would use the systems. Although, from a software engineering perspective it sounds obvious, in the context of photography it is not that intuitive. The difference between mobile phone photography and film or digital camera photography is the heterogeneity of available technology. The heterogeneity is much due to the nature of smart phones as multi-purpose devices. For example, the same device can be used to capture a photograph and send the picture as a message, not to mention all the other functionalities of phones that do not necessarily have anything to do with photography. In that sense digital cameras are more straight-forward devices with purposes and uses inherited from their film-based predecessors. Related to the multi-purpose nature of smart phones, a source of heterogeneity in camera phones are the open programming interfaces (APIs) that no digital cameras currently offer. The open APIs mean that potentially the camera phone can be used for anything, and examples of innovative new uses are the games that use the camera as an input device.

The heterogeneity of mobile phone systems from the point of view of snapshot photography becomes obvious when viewed through a generalized lifecycle of photos. To share photos taken with a mobile phone camera they can be shown from the screen or transferred to another device for viewing. There are currently four popular architectures for transferring photos from the phone: (1) to another phone over the network (*e.g.*, MMS), (2) to a PC (*i.e.*, the same procedure as with regular digital cameras), (3) to a network server over the network, and (4) to a printer over a cable or Bluetooth. Each of these ways of transferring pictures has unique characteristics. For example, transferring from a phone to another phone enables immediate sharing of pictures to practically anywhere the recipient happens to be with her phone. On the other hand, transferring pictures to one's own PC is often a familiar way of managing digital photos: once the photos are on the PC they can be edited, organized, published, etc. with the vast variety of applications. Also, there are no transfer costs between a phone and a PC or a printer, unlike often is the case in over-the-network transfers (*e.g.*, MMS or GPRS costs).

The lifecycle of a mobile picture can be divided into five subsequent phases. These phases are intuitive for any photographer and emphasize the heterogeneity of mobile picture sharing architectures.

- 1. *Capture* of picture using the mobile phone.
- 2. *Transfer* of pictures from the mobile phone.
- 3. *Sharing* of pictures means making pictures available for other people to view and discuss, and as a recipient, being notified of pictures available for viewing and discussing.
- 4. *Viewing* the pictures involves not only looking, but also the related social interaction, such as talking about the pictures and commenting them.
- 5. *Archival* of pictures for later use, for example, a shoebox for paper photos, or a CD-ROM for digital pictures.

In Table 1 the most common mobile picture sharing architectures are compared in relation to the lifecycle described above. The lifecycle of a traditional film camera photos is included as a contrasting example.

Architecture	Capture	Transfer	Sharing	Viewing	Archival
MMS	Phone camera	Over the network when shared	Coupled with trans- fer. Shared individu- ally	From phone screen	Phone's message in-box. No archival sup-port
Phone to PC (same as digital cam- eras)	Phone camera	Cable, memory card, or Bluetooth	Variety of sharing methods	From PC screen, via web browser, printed photos	PC's hard disk, web server, CD-ROM
Photo Blogging	Phone camera	Over the network when shared	Coupled with trans- fer. Shared on a web page	Via web browser.	Web page. Often no explicit archival support
Phone to Printer	Phone camera	Cable, memory card, or Bluetooth	Shared by showing printed photos	Tangible viewing of paper photos	Photo album, "shoe box", framed
Traditional Film Camera	Film camera	Film roll develop- ment	Shared by paper pho- tos	Tangible viewing of paper photos	Photo album, "shoe box", framed

 Table 1.
 Photo lifecycles in common mobile photo sharing architectures.

The table makes the following points:

• Lifecycle is technologically distributed over several devices.

- Coupling of lifecycle phases can be integrated in the system (*e.g.*, transfer and sharing in MMS are coupled into one function).
- None of the architectures are designed to have continuity over the whole lifecycle.
- Some transitions between lifecycle phases require user effort (*e.g.*, transferring pictures from phone to a PC).

Heterogeneity has been considered as an aspect of emerging ubiquitous and mobile computing environments, and to address the diversity of media and technologies in which people have interwoven current communication patterns. In [5], we examined the mobile photo lifecycle from a systemic perspective and took that perspective in our user study on MobShare. The study showed how the assignment of phases of the lifecycle to different platforms affected the social discourse and activity around the photos. This opened a novel way to identify the interaction design qualities of heterogeneous systems as mobile photo architectures are: the artful integration of distributed functionalities assigned to different platforms, and flexible and continuous lifecycle support in the integration. We argue that coupling/decoupling strategies have a key role in implementing these qualities in inherently heterogeneous systems such as MobShare. To harness the best capabilities of mobile devices, and get over their known limitations, they need to be studied as parts in an ecology of devices.

4 PhotosToFriends

The PhotosToFriends system (KuvatKavereille is the Finnish version) was commercial version of the MobShare system designed and implemented by Futurice Ltd. The objective of the system was to be a more commercially oriented and a polished version of MobShare, which was designed mainly as a research platform and a service prototype. Calling PhotosToFriends "MobShare version 2" would not be too far from the truth. The design and implementation work extended the work done on MobShare and the system was launched commercially in February 2005.

4.1 Design

The goal in designing PhotosToFriends was to build a reliable system that would be easy to take into use, be used regularly (*i.e.*, similar to the regular use of email), be entertaining and generally a positive user experience. A crucial part in achieving this was to scale the system to handle thousands of users rather than hundreds as in MobShare, and therefore, to support all kinds of browser technology (MobShare supported only Internet Explorer web browser), use cases (MobShare did not support the ordering of print photos), camera technology (MobShare was built only for camera phone photography), and Internet notifications (MobShare notifications were sent only via SMS). Also, better general usability of the system was an important goal.

4.2 Implementation

The experiences and research done on MobShare was taken into account in both the design and implementation of PhotosToFriends. The architecture of PhotosToFriends was identical to MobShare and the biggest technical changes were done in scalability and reliability of the server component. The two biggest changes, from the perspective of this research, were the new gallery user interface, which replaced the horizontal timeline view of MobShare, and the support and facilitation of awareness and notifications of social activity.

The general usability of the system was emphasized by moving the location of the comments next to the pictures themselves, enabling notifications by email, showing in the gallery view the number of new pictures and comments for each gallery, and a new graphical layout for the whole system. See Figure 7 and compare it to Figure 6 to see the main differences between these two systems.



Figure 7. The web interface of PhotosToFriends. The user's own galleries and ones shared with her are shown on the top. New or unvisited galleries, comments, and photos are marked red. The people who have visited the gallery have their names underlined.

In addition to improvements to MobShare, new functionality was added, such as the possibility to order paper photos from the user's own photos but also from any photos shared with the user. The other major change was the support for uploading pictures from a PC with a web browser. On the other hand, some functionality was also discarded. Mainly the gallery level comments and the possibility to view several galleries as one or side by side. The reason for discarding these functionalities was that they were not used that much and the goal to minimize the complexity of the service for easy user acceptance.

Practically in all other aspects PhotosToFriends was identical to the MobShare system: the central architecture, the gallery-based organization of pictures, the association of people individually with a gallery, the controlled sharing in contrast to publishing, identification of users by phone numbers, and notifying users when another user shares a gallery with them.

4.3 Analysis

The similarity of PhotosToFriends and MobShare made it possible to use quantitative user data from PhotosToFriends to get a better understanding of the qualitative findings made with MobShare. The analysis of PhotosToFriends focuses on two goals: first, to qualitatively compare PhotosToFriends to the

MobShare system and discuss the effects and rationale behind the differences, and second, to leverage the quantitative user data of hundreds of users to get a quantitative understanding of the phenomena identified with MobShare.

4.4 Results

The most visually notable difference between MobShare and PhotosToFriends is the changing of the horizontal timeline view (see Figure 6) into a user-based list of galleries (see Figure 7). The rationale behind the change is twofold: first, displaying the timeline view in MobShare used lot of computational resources and was not scalable as such, second, and more importantly in the light of this research, people do not have accurate time metadata in their digital photos. In PhotosToFriends it was possible to upload any digital images via the web browser, and quickly it became apparent that some users did not have the time and date of their photographs correct. Some users even had the time wrong by several years. Therefore, visualizing the organization of galleries based on the time and date of the capture was misleading and confusing when the time metadata was not accurate. One design choice would have been to use the time and date of the photo upload. However, this would have not supported the cases where the time was correct and the organization based on it very intuitive.

In MobShare, where the pictures were uploaded only from the mobile phone, the time metadata was often accurate, because people tend to keep the mobile phone's clock in correct time. This is most probably, because people use the phone's clock as their watch and it also has other uses, such as, in call logs, which motivates the users to keep the clock in time. This change of the gallery organization echoes that, in practice, the time metadata of consumer photos can not be relied upon.

Another design decision in PhotosToFriends also echoes the realities of consumer photography: the support for regular digital photos (*i.e.*, photos taken with digital cameras or scanned digital photos). Although currently there are more mobile phone cameras sold in the world than digital cameras, it seems that people use digital cameras when they take pictures that they consider important. Another probable factor is that using the mobile phone in PhotosToFriends requires that the user has a smartphone and knows how to install client programs on it. Uploading digital cameras photos requires knowledge to transfer pictures from the camera to the PC and from the PC to the service via a web browser. To put it simply, transferring pictures from PC is much simpler, and people are more familiar with it than uploading from a smart phone. This heterogeneity of mobile photo systems is discussed in the previous section on MobShare in more detail.

However, the main contribution of the research done on PhotosToFriends are the design decisions and quantitative data on awareness of social activity. Unlike in public blogs or web pages the user in PhotosToFriends (as in MobShare) has full control over who have access to the pictures. As a result of this, for each gallery there is a distinguishable group of individuals associated with it (see Figure 7), and for each individual it is possible to record what pictures they viewed and what comments they wrote and when. This is possible to do for every user and user group because the service is a central web service rather than individual PC applications. In PhotosToFriends social activity is posting photos to the galleries, writing comments, clicking open galleries, and clicking open a thumbnail. Also, everyone can see who are the other people the gallery is shared with, and who has commented what and when. The owner of the gallery can see who has visited the gallery and when was the last time.

The awareness and notification of social activity grew to be a key feature in the service. The awareness and notification supported both immediate interest on the social activity, as well as long-time interest. In other words, immediately notifying the user that there is some ongoing social activity, and on the other hand, storing and showing the social activity of her photo sharing in a longer time scale. For example, the user could go back to old galleries and reminisce the comments and visits to photos from last year's birthday party.



Figure 8. Cumulative data on social activity of 2755 galleries in PhotosToFriends from the day of the gallery creation to four months later. The data excludes galleries that were not shared to anyone. 'Self' in the figure means the owner of the gallery.

The awareness of ongoing social activity was done by enabling notification via text messages to users' phones and via email (e.g., there is a new gallery, or there are new photos in a gallery). Once the user had logged in, the names of the galleries with new photos or comments were colored red, the number of new comments and pictures was shown in red, and inside each gallery the new comments and photos were marked red as well. The awareness of past social activity was supported by storing all comments and pictures, showing the latest visits to the owners of the galleries, and viewings of individual photos (see Figure 7). Figure 8 shows quantitative data how the social activity in a gallery develops over time. The figure shows both the immediate social activity in the very first days after a gallery has been created and shared (circa 90% of photo posts and 50-60% of comments in the first week). It also indicates the user interest in past social activity (the percentage of visits saturates towards 100% slower than posts or comments).

The quantitative user data indicates that a photo gallery in PhotosToFriends has a relatively long lifetime before it is not visited any longer, and the reason for this is the social activity around the photos in the gallery (*i.e.*, the visits, the comments, and the number of views). The design decisions to facilitate the awareness of social activity support the view that the social activity around the photos is in itself interesting to the users, and that social discourse is a key characteristic when people share photos. The IRC-galleria and Flickr systems are other examples of social activity having an integral role in a picture sharing service.

5 Conclusions

The MC2-related studies on mobile photography with the three systems described above is an exceptional body of research in this field. It is a three year study involving roughly 150 users in qualitative studies and several thousand in the quantitative analysis. Also, the systems constructed have lead to a significant commercial service, namely, the Kuvaboxi service, which is the leading Finnish online photo sharing service with tens of thousands of users.

The main findings of the study can be divided into two: understanding the sharing and uses people have for mobile photos, the design lessons learned in these systems. These results can be further studied in the publications written (especially [3, 4, 5, 6, 7, 8]) and in the forthcoming doctoral dissertation by Risto Sarvas.

The main findings in people's uses are that people use photographs, especially mobile photographs, both in communication and in storing personal and shared experiences (*i.e.*, the traditional use of snapshot

photographs), and this activity is social: keeping in touch with friends, relatives, and acquaintances, enhancing togetherness by reminiscing shared experiences, and in interacting with other people through photographs and associated discussions.

In the design implications, the main results is in how different design decisions affect the way the systems and the photos are used. For example, by grouping shared photos into photo galleries rather than having them as individual photos, it encouraged the sharing of several photos and facilitated the documentation of events rather than fictional narratives. One significant finding was the importance of facilitating the user awareness of social activity happening around the shared photos. It turned out that people often logged into the system just to see who had visited their photo galleries and whether they had commented them. Another important finding was the importance of the discussions and comments on the photos. One could say that the discussions became as important as the photos.

These findings also have implications for metadata in photographs. Mainly, that the current metadata standards in photography support very little the kind of uses people had, namely, sharing and commenting. Current standards, such as EXIF, provide only technical information where only the time and date of capture have direct use for the everyday photographer.

6 Epilogue

People are creating more and more media themselves. Some of it is for publications, such as blogs or amateur videos, but the vast majority is for personal use in communicating and reminiscing shared experiences. The difference that digitalization and everyday access to the internet has made is that the social networks have broadened to include people outside family, friends, relatives, colleagues, school friends, etc. In any case, the motives for creating and sharing media are social. This is a business opportunity for services and products that facilitate this social use. Examples of this is the popularity of photo sharing web services. It would seem that now is the time to get people locked-in into a media sharing service, so that as their media accumulates into the service they become more and more locked-in. The research done on mobile photography in the MC2 project is relevant in understanding the traditional uses and the new emergent uses people have for their media, whether it is mobile or not. Also, the example case of Kuvaboxi demonstrates that the findings can be applied to create a successful online media sharing service.

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Community Gaming

This section examines in detail a selection of community gaming activities that have been studied within the MC2 project: users and players of an online virtual environment Habbo Hotel, players of multi-user role-playing game Neverwinter Nights, creators and players of Live-Action Role Play events, Geocachers and game modders.

First we describe two forms of online gaming activities, both with different kinds of characteristics and user base. In their paper entitled *Who are the Habbo Hotel Users?*, Johnson and Toiskallio study the usage of Finnish instance of Habbo Hotel. This study is based on a large body of empirical data from participant observations, a survey, user interviews, and fansite articles. The authors find that there is a multitude of different ways in how Habbo users enage in the activity. *Neverwinter Nights* by Sauli Tiitta examines the community that has evolved around one user-managed Neverwinter Nights game server, which comprises a game world called Narfell. He has interviewed dungeon masters, player guide team members, developers and players from Narfell, and illustrate how the community functions are provided and managed, especially in different forms of dialogue between Neverwinter Nights players and dungeon masters.

Then we move on to "gaming in the wild", meaning games that include components of user mobility and collaboration in the field. However, these games are not typically associated with the term mobile gaming, as the mobile phone plays little role in the game-playing activities. The paper entitled *Live-action role-playing* by Antti Salovaara presents the findings from participatory research done within Finnish live-action role-playing (LARP) community. The community activity is studied using ethnographic methods: researcher's active participation in community activities and interviews with chosen players and game masters. One of the results was the characterization of the "playmaker" role for gamers, meaning that some players enjoy the community gaming activity because they can create fun experiences for others. In his paper *Case Geocaching: Networks in a Mobile Content Community* Matti Rantanen stud-

ies how theories on network evolution and learning could be applied in the context of mobile content communities. The community dynamics of a game called Geocaching, which is a nomadic treasure hunt game inviting open content creation and global participation.

The last part of this section is a summary of a study of user-generated game content, i.e. game modding. In his paper *Creative Gamers: Examining the modding culture and its mobile prospects* Tero Laukkanen has reported the existing practices of PC-based game modders and the existing collaborative modding culture. The chapter also concludes with a brief look at the status and possibilities of mobile game modding.

Who are the Habbo Hotel Users?

Mikael Johnson and Kalle Toiskallio

Mikael.Johnson@hiit.fi, Kalle.Toiskallio@tkk.fi

Abstract

Who are the Habbo Hotel users, and what is so important in Habbo that one quarter of the Finnish 10-15 years old population like to spend time there regularly? In this report we try to tackle this question head on, armed with empirical data from participant observations, a survey, user interviews, and fansite articles. Neither previous user models from usability studies nor player models from games studies seemed to fit Habbo directly, which motivated an exploration of which aspects of Habbo users would be more salient than others. We found some correlations between demographics (mainly age and gender) and ingame activity. We distinguished 11 different types of popular Habbo activities. We found a multitude of different ways in how Habbo users talk about other users. The study remains inconclusive regarding one particular user categorisation in favour of another. However, we can point out the important aspects of Habbo, which can function as a basis for future user categorisations depending on the purpose of categorising.

1 Introduction

This is a report on our research driven by our curiosity towards the Habbo users, who are they and why does Habbo fascinate? At this stage in the project, Habbo Hotel does not require a lengthy introduction, but a few words are still necessary. Habbo (Figure 1) is a virtual world designed as a hotel and a popular meeting place among children and teenagers. People familiar with Internet technologies describe Habbo as a graphical chat environment on the web that can be accessed with a web browser with the Shockwave plug-in. Others talk about a virtual hotel where one can hang out and make new friends.



Figure 1. Screenshot from Habbo Hotel (Sulake 2006)

When checking in to the virtual hotel one creates one's own cartoon like Habbo avatar that can walk, dance, eat, drink and chat in the cafés, restaurants, swimming pools and games rooms. Besides experiencing these common rooms in the hotel, one can decorate and furnish a room of one's own. In contrast to many online games, there is no entrance fee to the virtual world, which allows the majority of users to chat for free. The profit model is based on micropayments in the hotel instead. Virtual furniture, minigames, and membership in the Habbo club are bought with so called Habbo credits. These credits can be purchased with pre-paid cards, bank transactions, or special text messages that add a specified amount of money to the customer's mobile phone bill.

The research approach in this report is based in user research and games studies, research fields that aim at understanding users and players. *User research* (Hackos & Redish 1998, Beyer & Holtzblatt 1998, Kujala 2002, Kuniavsky 2003) is based on the idea that knowing more about the users will help designers create better products that meet the user needs. User research typically includes identifying user groups, understanding their context of use (ISO 9241-11 1998) by visiting user sites and making interviews and observations of the users in their own environment. However, the underlying assumption of many user research models is a product development model where the user needs are fairly well stabilised. Design for digital communities on the other hand does not assume an existing target market, especially online entertainment products strive to facilitate the formation of new communities around the product. This, and because entertainment products are used in a leisure context, is why it is difficult to apply mainstream usability and user research models to understanding Habbo users.

Games studies have researched computer games for more than a decade from technical, aesthetic and sociocultural perspectives by a growing number of researchers with different backgrounds (Aarseth 2003). Closest to Habbo is the research on MUDs (textual chat environments) (Cherny 1999) and virtual worlds (Bartle 2003, Book 2004, Brown & Bell 2004, Yee 2002). Most attention has been paid to the gameplay itself, the question of what constitutes a game, and structural game elements (Konzack 2002). There is some research on ingame player models (see below) and also offgame motivations to participate. For instance, the "Children and Young People as Players of Game Cultures"-project (Ermi et al. 2004) report that 75 % of the 10-12 y. children (N=284) play digital games at least once a week, that owning games is a good argument for inviting friends, and that games aid in learning English.

The question why do people play massive multiplayer games has been asked many times in games studies. Table 1 presents four player models from Bartle (2003) that have acted as inspiration for our Habbo research. Bartle's infamous socializers-achievers-explorers-killers model has been applied in many cases, but since Habbo is a non-violent game environment, the killer category does not fit. Following the hermeneutic rule that if the parts change, then the whole needs to be revisited, we engaged in looking for other models.

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Bartle 1997	Farmer 1992	Hedron 1998	Yee 2002
MUD	Habitat (graphical chat)	Ultima Online	Everquest
Socializers	Passives	Survival	Achievement
Achievers	Actives	Competence	Grief
Explorers	Motivators	Excel	Leadership
Killers	Caretakers	Prove Mastery	Relationship
	Geek Cods	Seek New Challenges	Immersion
		Everything Is One	

Table 1. Player models for virtual worlds (from Bartle 2003).

Farmer's model of passives, actives, motivators, caretakers, and geek gods from Habitat seemed to fit Habbo fairly well. It made sense to understand motivators as those few who create games for the others in Habbo (also called nurturers and playmakers in our previous papers, see Salovaara et al. 2005a and 2005b), caretakers as the Habbo moderators, and geek gods as the Sulake game developers. However, Farmer's model lacked a lot of context and demographics to satisfy us, which motivated us to move forward with the aim of finding suitable player categories for Habbo.

2 Methods and Research data

When talking about users we made the following initial distinction: demographics and ingame activity. This distinction was elaborated on during our survey work (see Figure 2 on page 92), but it enabled us to break down the initial who-is-the-user question in to three different questions: 1) what is the demographics of the Habbo users? 2) What are the popular ingame activities, and 3) Does the demographics correlate with the ingame activity? These questions are addressed in section 3.1 Statistics: Habbo Visitor Profile.

The survey suggested that we needed to go deeper into what the popular activities in Habbo were, to pinpoint the different motivations to participate. Our fansite studies (Johnson & Toiskallio 2005) and player interviews revealed the diversity in the emergent Habbo activities. We describe the emergent use in section 3.3 Emergent Habbo categories, but before them we must describe the pre-defined Habbo categories made by the developers (section Pre-defined habbo categories).

Table 2 summarised the empiric data in the Habbo case. In this report, we focus on the survey data, fansite articles, and player interviews. For data analysis, we have used both quantitative methods (frequencies, cross-tabulation, cluster analysis) and qualitative methods (qualitative content analysis and membership categorisation analysis).

Main empiric data	Background data
 survey: Habbo visitor profile, 06/2004 N = 10000, 21 questions with structured answer alternatives, 6 open questions 	 First-hand Habbo experiences / participant observation once or twice per month sporadic visits to Habbo Hotel
 fansite (Habbo-themed website) articles Habbo's own amateur "mediaworld", 2004 selected articles from ~25 fansites with 5-50 articles each, 150 MB downloaded material 	 project meetings at Sulake once every 2-3 months 5 recorded meetings, ~10 informal
 developer interviews, 04-05/2005 10x 1,5-3h open-ended thematic interviews, some development documents client developers, server developers, graphic designers, ADs, project managers 	Confidential work with Sulake • community manager survey, N=4, 2003 • user feedback for release 9, 2006 2 TKK student assignments • data gathered by students • usability test, fansite starter kit
 player interviews, 10/2005 12 players interviewed in 2 individual, 2 pair, and 1 group interviews artefact analysis of Habbo Hotel stereotypic images, affordances 	 Informal second-hand experiences friends, colleagues in Habbo professional media articles

Table 2. Empiric data in the Habbo case.

3 Results

Based on one exploratory player interview and trying out Habbo for ourselves, in late 2003 we had learned that the Habbo visitors could at least be categorised into furni collectors, chatters, late-evening party people, mafioso, sheriffs (volunteer moderators), and cheaters. In addition, the hotel manager, employed by Sulake, would be the one caring for the community by creating official events and organising competitions.

3.1 Statistics: Habbo Visitor Profile

Because there were no data available on the Habbo visitors, we decided fairly early in the project to do a visitor profile survey, to get some quantitative background data for our otherwise mainly qualitative analysis. We were interested in both ingame and offgame Habbo issues, so we created a model of how we understood the Habbo visitor (Figure 2).



Figure 2. Model of the Habbo Visitor

We did not include the International Community Lifecycle, since our survey was restricted to visitors to the Finnish Habbo Hotel. Our objectives was to find out which of these attributes were related to each other, for instance if age or gender says anything about what the visitors do in Habbo.

The survey was carried out as a web-based survey and a link to the web form was put on the Habbo frontpage, under the Habbo News section. We asked 27 questions, of which 21 had structured answer alternatives and the last 6 were open. The survey was open for two weeks, during 22.6.2004-6.7.2004, and we got roughly ten thousand Habbo responses (N=10 613). During this time around 160 000 users visited Habbo, which gives us a response rate of about 6%. We discarded about 300 answers, typically double or empty answers, but also some answers intended as jokes.

We did three major kinds of analyses, 1) frequencies, 2) cross-tabulation, 3) cluster analysis. We start with an overview of the frequencies (4.1.1), continue with findings from the cross-tabulation (4.1.2), and end with the visitor clusters (4.1.3).

3.1.1 Overview

Table 3 shows an overview of the survey answer frequencies, based on what people usually ask us first about Habbo.

age	75% of the respondents were between 10-14 year old.					
gender	The gender balance was roughly 50-50, equal amounts of boys and girls.					
region	We got answers from all over Finland, not only big towns or countryside.					
access location	93% log on from home					
Habbo age	years in Habbo: 0-1 1-2 2-3 3+					
	% of respondents: 29% 26% 27% 17%					
Visit frequency	everyday 46%, a few times a week: 40%					
Visit freq. fansites	more than half visit at least once a week					

Table 3. Overview of survey answer frequencies

3.1.2 Findings

In media interviews, Sulake has reported that 90% of the Habbo visitors don't pay. However, this doesn't mean that these non-paying visitors are not interested in Habbo furniture. Based on preliminary interviews and fansite stories we had got the impression that it is possible to have nice rooms and make careers in Habbo without spending money. Our survey showed that a large part of the visitors get furniture through donations, competitions, or as rewards for favours. Of the $26\%^{22}$ (2557) who said that they don't buy anything, 57% (1451) still receives furniture donations, 48% (1229) trades furniture, and 31% (782) gets furniture items as pay for "work" in Habbo. Thus, we can draw the conclusion that from "I don't spend money in Habbo" does *not* follow "I'm not interested in furni". In other words, also people who don't spend their own money in Habbo contribute to Habbo's virtual economy through ingame transactions and value creation.

Before we did our study, we had good reasons to believe that two factors very much influence Habbo behaviour and attitudes: habbo-age and visit frequency. Our data showed that this is indeed the case. Habbo-age has a strong influence on Habbo attitudes. Figure 3 shows a few trends. We can distinguish different types of curves:

- 1) A rising trend that stabilises at 4-6 months (green, yellow, blue)
- 2) A decreasing trend that stabilises at 4-6 months (red, lila)
- 3) A decreasing trend all the way (orange, brown)

From these curves we can draw two conclusions. First, since it is possible to distinguish trends *at all* means that Habbo-age is a really important variable. Second, the data suggests that there is a learning curve of about 3-4 months, after which opinions stabilise. In addition, the slight change in the later parts of the curve can be interpreted as a decrease of participation in Habbo, foreshadowing the end of their Habbo careers.

The other variable that clearly influences the Habbo career is the visit frequency (Figure 4). The data suggests that those who visit Habbo often are more likely (decreasing trends) to arrange events, trade furniture, meet with Habbo-friends outside Habbo. And, those who visit Habbo rarely are more likely (rising trends) *not* to want people in their rooms, *not* have heard about gangs nor fansites, not like spending time in their own rooms.

These two figures show that common sense and research data agrees. The more time one spends in Habbo, the more likely one is to be active (arrange events, trade furniture, etc.) there. The learning curve was very interesting to note. But is there any underlying variable that can predict time spent in Habbo? Can we say that people of a certain gender, age, or from a certain region are more likely to be active in Habbo? We will go through these questions in subsection 3.1.4, but before that we will turn to other patterns in our data. A cluster analysis will show the relevant patterns in the data, which factors make a difference.

²² Disclaimer: The percentages should be read as percentages of the answers to the survey, which is biased towards active Habbo visitors. The number of all Habbo users who don't buy anything is much larger than 26%.



Figure 3. The importance of Habbo-age.



Figure 4. The importance of visit frequency.

3.1.3 Cluster Analysis

The aim of the cluster analysis was to create a manageable number of player clusters to explain the data. Since this was an explorative questionnaire, the emerging cluster dimensions were considered more important than the exact percentages. Three criteria were important in the analysis: 1) we wanted groups that one can explain, 2) no logical conflicts within groups, e.g. non-buyers and buyers probably in different groups, 3) as large part of the data as possible included, e.g. anything that explains more than 50% is good. The SPSS-statistic program provided the functionality: Two-Step Cluster.

We ran around 30 different cluster analyses to find out what would be a sensible number of groups to meet the above criteria. The first sensible cluster result is shown in Figure 5, and the significant variables

Age (median) Gender

Computer in my room No login restrictions Network connection Visit frequency - everyday - a few times per week Habbo-age (years) - 0-1 1-2 2-3 3+ Paying

Not interested in furni Own room activity - organise events - invite friends - don't feel comfortable Wants - friends - fame Regular gang Need moderators

Fansite visits

Age (median) Gender Computer in my room No login restrictions Network connection Visit frequency - everyday - a few times per week Habbo-age (years) - 0-1 1-2 2-3 3+ Paying Not interested in furni Own room activity - organise events - invite friends - don't feel comfortable Wants - friends - fame Regular gang

Need moderators

Fansite visits

Age (median) Gender Computer in my room No login restrictions Network connection Visit frequency - everyday - a few times per week Habbo-age (years) - 0-1 1-2 2-3 3+ Paying Not interested in furni Own room activity - organise events - invite friends - don't feel comfortable Wants - friends - fame Regular gang Need moderators

Fansite visits



Silent majority

**51% more than once a week



I don't pay



Playmakers



47% more than once a week

Gang-members



Older people

**19	"We just want to
**51% girls/women	help keeping this
22%	place nice"
48%	
30% ADSL	_
31%	1. Star
31%	
36 - 18 - 12 - 34 %	20.0
some	No. 1
27%	
30%	N N
34%	
61%	1
48%	
27%	and the second second
39%	
58% never	(1%)
23% more than on	ce a week
Lovo moro man on	

Figure 5. Habbo user groups based on cluster analysis

However, these clusters were based on all variables, which in our case meant that a lot of the background variables (gender, age, etc.) took over. For instance, when we tried to create 7 clusters instead of 6, the following emerging group would have been an all-girls group. To remedy this issue, we decided to analyse background variables separate from in-game variables. An analysis of in-game variables suggested that two dimensions were more distinguishing than others: 1) privacy – publicity, and 2) arranging events – not spend time in own room. Figure 6 shows our previous clusters put on these dimensions.



Figure 6. The two most important ingame dimensions.

In the next subsections we turn to two of the background variables usually considered important, age and gender.

3.1.4 On Age & Gender in Habbo

A characteristic of critical research is its careful examination of the roles of gender, age, region, ethnicity, etc. in all analyses. It is important to study in what ways Habbo behaviour is gendered, reasons for why equal amounts of boys and girls visit Habbo²³, the influence of Habbo on identity formation processes of teenagers, the barriers and opportunities for ethnic minorities to express themselves in an a virtual world where the user interface language is the language of the cultural majority, etc. However, since these are large research topics on their own, there is not space enough to discuss them thoroughly here. We refer the readers with knowledge of Finnish to a few master's theses on Habbo: Pietiläinen (2004) has studied communication and action in Habbo from a Finnish language perspective, where as Sihvola (2005) and Koskinen (2006) have done analyses from a youth work perspective.

While postponing the problematisation of gender in Habbo (see Johnson & Tamminen 2007), we do sum up the similarities and differences that can be found using cross-tabulation. The table below is based on the question "I am", with the answer alternatives "a boy", "a girl", "a man", "a woman". We did not define the age for when someone becomes a man or a woman, the respondents could define themselves as boy, girl, man, or woman.

²³ Much research on virtual worlds report rather skewed gender balances, why is Habbo different?

	Boys	Girls	Men	Women
Ν	4672	4744	497	317
%	46%	46%	5%	3%
Age (median)	13	12	15	15
Age (ave)	12.8	12.6	16.7	17.2
Computer in my room	42%	24%	55%	32%
No login restrictions	41%	32%	60%	53%
Does not know network connection	18%	41%	11%	27%
Visit frequency				
- everyday	47%	45%	47%	42%
- a few times / week	39%	42%	37%	36%
Habbo-age (years)				
- 0-1	31%	31%	25%	33%
- 1-2	26%	28%	17%	23%
- 2-3	26%	29%	27%	25%
- 3+	17%	12%	31%	20%
Paying	Most ²⁴	most	most	most
Not interested in furni	10%	15%	18%	21%
Own room activity				
- organise events	39%	50%	35%	35%
- invite friends	61%	62%	52%	52%
- don't feel comfortable	44%	45%	51%	51%
Wants				
- friends	65%	68%	58%	56%
- fame	48%	26%	46%	24%
Regular gang	38%	26%	38%	34%
Never needed to call a moderator	27%	39%	29%	44%
Visits fansites at least once a week	50%	34%	47%	27%

Table 4. Gender similarities and differences.

The similarities in Habbo-age, visit frequency, and furni interest are striking. Regarding age, it seems like the older visitors tend to be less social compared with the average. Regarding gender, a larger share of the girls (50%) reported that they arrange events to get others to visit their room (cf. boys 35%). Like in many previous gender studies, boys tend to have easier access to the service (Habbo) compared to the girls. Also familiar from gender research, more boys than girls report that they strive for fame.

3.1.5 Bias towards active players

As with surveys in general, also this survey gathered answers from the committed and active community members. This is visible in the table below.

²⁴ Exact percentage is confidential business knowledge

	0-1y	1-2y	2-3y	3+y
Every day	15%	11%	12%	8%
A few times a week	11%	12%	11%	5%
Once a week	1%	1%	1%	1%
A few times a month	1%	2%	2%	1%
Less than once a month	0%	1%	1%	1%

Table 5. Checking Habbo-age and visit frequency is a way of determining sample bias.

3.1.6 Open questions after the survey

Although we were satisfied with the survey and what we learned from doing it, the survey still left some questions open. First, we targeted the survey to answer the question "who are the Habbo users", not what motivates them to go there. Second, the survey was successful in describing a snapshot of the Habbo community, but community research tell us that the motivations for community members to participate change during their career in the community. To answer these questions we studied the Habbo fansites and interviewed Habbo visitors. We will come back to these questions in the conclusion.

Third, when doing the explorative survey we did not fully understand the diversity of all the Habbo activities going on. During our analysis we learned that a Habbo "event", as we called it in the survey, can be broken down in to many dimensions. For instance, the event (or series of events, making it more like an activity) can be described in terms of large or small, long-term or temporary, visible or underground, open or closed. Furthermore, the group activity leading up to the event can be hierarchic or democratic, valuing uniqueness or competition, and the purpose of buying furniture and decorating the room varies from just for fun to becoming rich, to imitating real world games. The point being, in the survey, where people answered that they would create an event to get people to visit their rooms, we lacked data on what kind of event they were talking about.

Our fansite studies and visitor interviews made us wiser in the above respects, which is why we will now proceed to talk about this emergent play and emergent visitor categories. First, however, we will outline the pre-defined Habbo categories made by the developers.

3.2 **Pre-defined habbo categories**

The Habbo aesthetics de-emphasise bodily differences between visitors. All avatars look like they are of the same length, height, and age. The visitors can choose their own clothing, hair styles, and skin colours from a pre-defined set (Figure 7).



Figure 7. Self-presentation possibilities for Habbo avatars

There are two avatar categories visible in the user interface in Figure 7, girl and boy (Tyttö and Poika in Finnish). Unlike many other MMOGs, the Habbo designers chose not to use categories such as race, nationality, region, or alignment (good, evil, etc.).

There is a dozen special Habbo badges that show the special status of certain Habbos. Some of these the visitors can buy, some of these are earnable, and some of them signify volunteers or other workers. Table 6 shows a summary of these badges.

Buyabl	е	Earnat	ble	Specia	al Habbos		
ţ,	Habbo Club	8	Habbo X (guides)		Habbo Staff	0	Netari assistants
Ê	Habbo Club (golden)		Official Fan- site Author	:	EOPH / Hubu	Ø	Mental support
	Halloween smile		Battle Ball gurus	0	Netari youth worker		VIP guest

Table 6. Summary of Habbo Badges

3.3 Emergent Habbo categories

By combining elements from the pre-defined sets, the Habbo visitors have chosen their own **clothing styles**. Table 7 below shows an example of a classification of Habbo clothing styles made by a fansite author.

 Punk	Gothic	Teeny (teenier)	Wannabe	Own style	
 Bright col- ors, irks	White skin, dark clothes	Pastel colors, round cheeks	Strict clothing, smart behav- ior	Doesn't care about fash- ion	
	<u>E C C C C C C C C C C C C C C C C C C C</u>				

Table 7. Some examples of common clothing styles (Kriisipalvelu.net 2005)

However, Habbo visitors are not only clustered based on their looks, it is also about their textual description, the room decoration theme, their style of chatting, and behaviour patterns. A common way of talking about Habbo avatars is through a their profession. Some Habbo visitors **pretend to have a profession in Habbo**, which involves decorating their room and behaving according to the selected profession. Some fansites have written articles on this role-playing phenomenon. Figure 8 shows an illustration of some professions. The tools and utensils that the avatars seem to hold in their hands are not available in Habbo, but have been added through image manipulation (with Photoshop or other graphic software). In addition to these illustrated professions, our user studies have found some additional professions: pharmacist, actor, police, doctor, fireman, postman, veterinarian (Nerokala 2005, DJ Joneppe 2002).



Figure 8. Some Habbo professions: journalist, nurse, tv-show host, bartender (DJ Joneppe 2002)

Imitating TV-show formats is another popular way of creating a hotel guest room theme. Figure 9 shows two examples, Habbo Idols (a room visited during a user interview 19.10.2005) and Habbo Bachelor (Unelmien Poikamies in Finnish) reported on the fansite Kriisipalvelu.net (May 2006). We have also found mentions of other tv-shows such as Greed, Do you want to be a millionaire, Big Brother, Survivor, America's Next Top Model, and different Dating-formats.



Figure 9. Two examples of visitors imitating TV-show formats in Habbo: Habbo Idols (left) and The Bachelor (right).

The diversity of the popular Habbo activities is very large, however one way to **compare activities** is to look at the their **characteristics over time**. For instance, an activity can be open to everyone, or only for selected visitors (closed). It can be fleeting, or continue over a longer time period. The activity can be arranged in a hierarchical way or be more democratic, and it might be very visible or more underground. Below (Figure 10) are three examples highlighting these dimensions. To the left is an orphanage, where people come to be connected as child and parents, and continue to roleplay as a family. The room owner stands in the image to the right, the child is in the middle (yellow shirt), the child queue in the bottom left, and the wannabe parents in the upper left. The image in the middle shows bingo, using a set of interactive dice furni: the person who rolls the same dice number as the room owner wins. The image to the right shows a gang's recruitment room.



Figure 10. Three different kinds of social activities: orphanage (left), bingo (middle), gang (right).

Table 8 shows some differences in three different group activities in Habbo.

		6 1	
	Orphanage	bingo	gang
Open-closed	Open	Open	Closed
Fleeting-durable	Fleeting	Fleeting	Durable
Hierarchical – democratic	Game master + democratic par- ticipants	Game master + democratic partici- pants	Hierarchy with par- ticipant ranks
Visible – underground	Visible	Visible	Underground

Table 8.	Some	character	istics o	of group	activities
I able 0.	oome	cilaracter	100100 0	JI SIOup	activities

For the above activities the Habbo furniture functioned as props for the mentioned activities that can be characterised as role-playing or games of chance. Following Caillois' typology of play (1961), one could also expect to find room activities with **competitions**, and perhaps activities intended at producing bodily dizziness / vertigo (ilinx). Figure 11 below show an example of a competition, Habbo Soccer.

The top left screenshot shows the arena, with the field in the bottom right and the audience in the top left (sitting in the green sofas). The idea is that the four team players try to walk past the other team players to their end of the arena, and score a goal by stepping on one of the rugs beside the wall. The three screenshots to the right show a game tactic: one of the black and white players – the one with the hat – steps in the middle between the tables, letting the red opponent go by. The idea is that the other black and white player would stop the rushing red player by standing in the way, as the first black and white player with the hat rushes towards the goal. The fourth screenshot shows how the team mate was just a bit too late, which gave the red player a free passage towards the goal. The fifth screenshot shows the red player just a little closer to the goal rug to the left compared to the black and white player to the right. And in the final screenshot the red player scores the goal as he steps over the rug first.



Figure 11. Habbo Soccer

However, back to Caillois' types of play, in Habbo it's very hard to produce bodily dizziness, since the actor in the game is an electronic body. On the other hand, the virtual world has other properties that have inspired games. Furniture traps, tele-running, and sumo-wrestling is can be mentioned as examples. Figure 12 shows a furni trap game that **plays with the spatiality of the hotel**. The assistant to the room owner runs the game by moving six tables in a row-like way, one table one square forward at a time, thereby reducing the available floor space for the players. The number of players is reduced as they are trapped. In some games, the trapped players can buy themselves out of the trap to continue the game.



Figure 12. Furni trap game: 1) starting position (left), 2) decreasing available floorspace (middle), 3) one player is trapped (right).

Table 9 (based on Rutzki's article on the Aalto-fansite) sums up these different Habbo activities.

	2	(,	,
trading furniture	competitions	talk shows	
casinos	dice games	clubs & hotels	
dating	team sports	orphanages	
beauty contests	formula tracks		

Table 9. Summary of different Habbo activities (Rutzki, fansite Aalto 2005)

Yet another way of clustering Habbo activities is to look at **the role of the furniture in the activity**. In the above examples the furni has played a secondary role in the room activity. It is also possible to consider furni items as ends in themselves. For instance, furniture museums have appeared in Habbo: when a room is filled with all different furni items, which the owner has spent much time to collect. Or, when the room owners just want to decorate the room with the aim of making something beautiful. Figure 13 below shows three examples of Habbo furni laid out in a way that should make the room owner very cool.



Figure 13. Furniture that makes you look cool. TV-wall (upper left), lots of writing desks (lower left), icehockey theme (right).

The TV-wall is cool, because it's an original idea in Habbo, since to place a tv-set above another, once has to use a special bug/feature that is not known to everyone. This shows technical competence, patience, and a sense of aesthetics. The room filled with writing desks is cool, since Habbo visitors know that one has to be member of Habbo Club for ten months to get just one desk of this type. This fortune shows that the room owner is a successful trader. The ice-hockey theme on the right is cool because of its thematic decoration, and because the owner show off with several furniture items that have only been for sale during two week periods in the hotel's history: the hanging mat (5-19.7.2003 and 13-20.9.2004), the samovar (20-27.08.2004), the royal chair (27.09.-04.10.2004 and 1.11.2005 18-20), the holographic girl (13-27.11.2003), the space-craft door (21.04.-02.05.2005), and the golden ice cream-machine (05.07.-18.07.2005).

Table 10 below summarises the role of furniture items (virtual assets) in Habbo activities. Furniture can be an end in itself, it can be a means for something else, or play no role at all.

Furniture as an end in itself	to collect all different furni items furni as aesthetically pleasing
Furniture as a means for something else	to make friends to make others happy to become famous to show status to become rich

Table 10. The role of furniture in Habbo activities

	as props for role playing as props for chatting
Indifferent to furniture	socialisers / chatters that keep contact with friends made in and outside Habbo hackers (against the system) grief players

Based on our player interviews, we have also looked at how the Habbo visitors talk about the other Habbo visitors. In addition to describing Habbo visitors based on what they do in Habbo (activities), Table 11 summarises the membership categories that were used during our interviews to explain to us what other kinds of Habbo visitors there can be.

	r
Age	small children "my age" (teen) older (identified by ways of chatting, topics)
Gender	Combinations of nickname, avatar, real body (e.g., boy with girl avatar but masculine nickname)
Habbo-age	newbie, regular, guru (identified by looks, ways of chatting)
Trading furniture	Little by little skilled traders cheaters
Habbo-Club membership	member not member
relation to room	room owner visitor shared rights
Nationality / language region	visitors from other hotels speaking another language
Friendship made in or outside of Habbo	Real friends Habbo friends
Time of day	daytime (children with flu at home, mothers) after school (preteens) evening (older, best discussions)

Table 11. Membership categories not related to particular Habbo activities.

4 Conclusion

During our Habbo visitor interviews, we tried to find out whether the visitors would identify themselves with one particular visitor category or Habbo activity as presented above. None of the interviewees really accepted to be labelled as one particular category, as they all mentioned that they started out doing certain things in Habbo and then moved on to try other things. They claimed that they got bored of doing the playing the same game or keeping the same room activity after a few weeks.

These responses bring us back to the original question, who are the Habbo users? During the project, we sought to generate some user groups, categories of some sort to explain that the people who visit Habbo can be divided into these and these categories. We started out by exploring Habbo for ourselves and making pilot interviews, ending up with a few preliminary categories: furni collectors, chatters, late-evening party people, mafioso, sheriffs (volunteer moderators), and cheaters. The survey gave us more back-ground data to work with as it confirmed our assumption that time spent in Habbo really correlates with knowledge of and activity in Habbo. A cluster analysis of the data suggested six user clusters that we named Oldtimers, Playmakers, Silent majority, Gang-members, I don't pay, and Older people.

In addition to these clusters we noted that regarding the posed in-game questions, we found two dimensions that correlated more strongly than the others: a strive for publicity vs. privacy, and arranging events vs. not spending time in own room. The fansite studies and our interviews opened up the emergent types of use. We have shown examples of Habbo clothing styles, Habbo professions, TV-show formats, competitions, and other fun ways of being together in Habbo. We briefly analysed some characteristics of and the role of furniture in the Habbo activities. We also provided a listing of the categories our interviewed visitors used when describing Habbo players.

When going through all these different ways of describing the Habbo users, the diversity of the Habbo uses is striking. Answering the question of who the Habbo users are with one particular categorisation does not seem fair. Neither is a simple two-dimensional model enough. What I can do, however, is to provide a summarising list of aspects that are important in Habbo. It is possible to distinguish different user categories based on all of the dimensions in the list. Depending on the motives behind the question, different categorisations can be made. The list can also function as a map for discussing a Habbo career with a Habbo user: which aspects drew the user into Habbo, which aspects made the user come back, and so on.

Own avatar	Clothing styles, character description
Own room and furniture	collecting, trading, decorating
Friends	school, hobbies, new friends, dating, distant friends
Play	beauty contests (popularity), TV shows, games of chance, Habbo- sports, playing with spatiality: furni traps, tele-running; insider clubs, roleplay
Habbo Career / visitor trajectory	celebrities, getting rich, popular room, in a game or gang, fansite author, being a Habbo guide
Testing boundaries, rules	expressing self, finding and using glitches in the hotel architecture, treating others (cheating, bullying)

Table 12. Summary of important aspects of Habbo

While this study answers the empirical question of what users do in Habbo, the study also highlights a general aspect of many community software products: the users' important roles in the innovation process. The users take part in the content production, some as active playmakers, and others as equally important participants and audience. What the users do in Habbo becomes both a fundamental part of the use experience and a source of inspiration to the Habbo developers.

Our work shows that there are no self-evident ways to group all the users for all situations. For instance, it is not clear how stabile the user clusters based on the survey are over time. On the other hand, Table 12 supposedly presents the Habbo dimensions that won't disappear over time (assuming the technology doesn't change drastically). There are several reasons for why different stakeholders need categorisations. Marketing for instance, needs some knowledge of the demographics of the Habbo users, but since demographics do not necessary correlate with action in the game, it is hard to design for demographics. Therefore categorisations of player activities are more useful for development. However, categorical knowledge (a.k.a. stories and narratives) plays an important role in design. Long-term interaction with the users through various user feedback channels provide the developers a broad resource of anecdotes of what and how the users innovate with the Habbo furniture.

So, the question is not how many personas is enough to represent the users of Habbo, since in the Habbo case there are two particular features that makes developer-user dialogue more easy compared to many other product development contexts. First, the developers have easy access to what the users do with and in Habbo, anyone can log on and check it out. Second, the online discussions in the fansite forums provide the developers with loads of user feedback and insights into what the users expect. Then it is possible both to meet the expectations as well as make surprises.

Future work involves reflections on what kinds of user categories one can make. In this report, we have not taken a strong position in advance of what we were categorising but tried to be open towards different things: individuals vs. groups, ingame (rooms, activities) vs. demographics (age, gender, region, etc.). The empirical data could be analysed more to distinguish user careers and lifecycles.

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Neverwinter Nights

Sauli Tiitta

Sauli.Tiitta@hiit.fi

Abstract

Neverwinter nights game provides anyone the possibility to create his own game world to Internet and tell stories with other players on your own. This report presents one game world community called Narfell. How the community has been formed and what needs each part of the community has. The research was conducted by interviewing all together 23 dungeon masters, player guide team members, developers and players from Narfell by using IRC chat. Research indicates the importance to have a well-organised community and to listen and to provide a communication channel between players' and dungeon masters'.

1 Introduction

Neverwinter nights (NWN) role-playing game²⁵ was released in June 2002. The original NWN CD, called official campaign, offers about 60 hours of role-play in a standalone single-player mode. But what has made the game popular is the possibility for multiplayer gaming over Internet. To facilitate this, the game package includes a modding toolset called Aurora to make new game worlds. After the original release, Bioware²⁶ (the company behind the game) has made two extra game packages, called Shadows of Undrentide (SoU) and Hordes of the Underdark (HoTU). With each game package, a new solo campaign has been included, and more tools to make game worlds, including new race and class options to the game characters, etc. Aurora has been designed to be easy to use, to give everyone an opportunity to create one's own game world with the toolset. Even a novice user is able to construct everything from a quiet, misty forest to a king's court and fill the world with characters, items and script settings to make characters behave in a unique way.

The world is managed and the actions are mediated through the dungeon master (DM), who has nearly unlimited control for running the adventures. Player can also make own NWN game modules that can be shared in Neverwinter Vault web pages. These modules can be run individually as solo campaigns or also played together with friends.

1.1 Bioware's role in game community

Bioware does not host any of the game servers but has given the freedom for anyone to publish a selfmade game world and ask players from all over the world to come to play. However, Bioware has denied any game servers to claim money from players. Players can, and also are, asked to give donations, but those should and must be voluntary. When a player starts a multiplayer NWN game he can see a list of game servers. On March 2004 there were over 700 game servers to choose from if you owned both extra packages to the game.

2 Persistent vs. non-persistent world

Some servers have a long-term story going on and all the actions made today will affect to the way how the game looks like tomorrow. Dungeon masters have the role of creating ideas of what kind of longterm things there could happen in the game. That kind of a world is being called persistent world. Often story-telling servers are persistent worlds. The so-called powergamer servers are often non-persistent worlds. DMs do make some action to game world but more or less randomly and without long-lasting plots.

²⁵ http://en.wikipedia.org/wiki/Role-playing_game

²⁶ http://www.bioware.com/

3 Powergaming vs. story-telling servers

There are mainly two kinds of game servers in NWN, powergaming servers and story (role-playing) servers. In powergaming servers, killing monsters and achieving experience points (XP) is what players are looking for. Immersion to the game is not so important and if your character gets killed you can resurrect him/her and continue the game with only a minor penalty. The fun in powergaming servers comes from getting experience points (XP) by killing monsters and being more powerful than other characters (by levelling up your character, based on increasing XP). Players often use out of character (OOC) talk in the game, such as "How much tnl?" (tnl="to next level"). In story servers, players' role-play much more with their characters. They use gestures, talk more with others and try act in the game as the character would act. The fun for role players comes from the nice interaction between characters in the game. Role-players can chat about in-game topics, and emote with other characters for hours and enjoy the gaming experience.

Since role-players do not want to mix off-game (OG) conversations with the in-game (IG) world they need and want to have another forum to talk about off-game issues. This is why a story-telling (role-playing) server was chosen to be a representative server from NWN in this report. In story-telling servers, there is a need for a community off-game. This report will explain how one example of such a Neverwinter nights community functions, using an NWN server called Narfell as an example.

4 Methods

In the research, it appeared difficult to find a large enough, active and voluntary group of players from Finland. The original idea was to organize a focus group (5-7 persons) session where information about playing would have been elicited. But then, either the distances were too long or then a (key) person from a group didn't want to participate in the research. We then decided to look for an active game community from the NWN servers. This way, #Narfell chat was found and the first contact was made. Player leader who was responsible for that channel at that time wanted to know more about the research and later on even asked if he could help to find people to participate in the research. He also opened a dedicated chat channel (#Narfell_survey) where chat interviews were made. #Narfell_survey was not private and therefore anyone could come and see what the conversation was about in there. From 23 participants only two interviews were made in private chats. One participant said that in his opinion participants' answers were not trustworthy enough since others (and especially DMs) could follow the interview. However, the questions made were quite neutral, so we do not see that as a big problem. The log from each interview's was saved into a text file and later analysed. Interviews lasted from 60 minutes to 120 minutes. Approximately 30 questions were asked from each individual. Dedicated questions were posed to players and player guides (i.e. players who play a lot) and to player leaders and dungeon masters. Questions were merely a skeleton to the interview and more detailed questions were made during the interview.



Figure 9. Example of #Narfell IRC chat.

4.1 Participants

23 participants were interviewed (18 males and 5 females), of which 12 were normal players, 3 were player guides (PGs), 3 were player leaders (PLs) and 5 were dungeon masters (DMs). Also among those 23 par-

ticipants two players and two dungeon masters actively develop for Narfell. Players were from the following countries: USA 13, AUS 3, BEL 2, FRA 1, GER 1, ITA 1, ESP 1, NZL 1. The youngest were 18 and the oldest 38 years old.

4.2 Analysing the material

Players' and player guides' answers were put together as well as player leaders' and dungeon masters' answers. In total, 58 A4-papers of data were collected. Then most important findings were taken out from the data.

5 Narfell server

Narfell server²⁷ was founded one month after NWN game was released in June 2002. Masume (a nickname), the founder of the server, is 27 years old and lives in Florida, USA. Narfell has been a role-playing server right from the start. The server become immediately popular. Web pages came out quickly after the server was launched for full time use. Narfell was upgraded with Shadows of Undrentide package in 2004 April, when most of the players had acquired the SoU package. The server is open to all players, the only restriction being the need to have the SoU package. There are 1400 registered players and from those, approximately 400 players are actively playing in Narfell. There can be 50 players and 10 DMs in the game at the same time in Narfell. There is a plan in near future to split Narfell server into two separate servers that are linked together. In that way there could be 100 players in Narfell area at the same time.

Narfell is not at the biggest NWN game world. Some game worlds are combinations of many servers that are linked together, each server including ~60 players. In some servers there can be a few hundreds of players at the same time playing in different parts of the game world. But there is one unique feature in Narfell that doesn't exist in other NWN game worlds: players get experience points from DMs' on a regular basis. Normally, NWN game engine gives experience points only when you battle with someone and win. But in Narfell, DMs can give experience points to players without any player "action" occurring in the game. If a DM thinks that a player has done good role-playing, he/she can give some experience points to the player. And since it is quite difficult to get experience points in Narfell by killing monsters role-playing, experience points are scarce, and thus very important to the players. Some players said though that it feels quite empty to get experience points without any danger involved. Those who have used to advance in NWN servers by killing monsters and have liked that, either change their way of playing or stop playing in Narfell.

5.1 Narfell in the beginning

In the beginning Masume did almost everything by himself, not counting the help to make web-pages to Narfell. Players found the server and liked the way how Masume dungeon-mastered. When choosing the NWN server from GameSpy list players saw there were often a good number of players in Narfell. That encouraged new players to come and see what kind of server Narfell is (i.e. the snow ball effect). Information about Narfell also spread from mouth to mouth among NWN players. Narfell was one of the first servers' to be fully for role-playing style of play. Masume asked help from some players to be DMs in Narfell. And after a while, the first player guide was appointed to Narfell mainly in order to help beginners adjust to Narfell role-playing server.

5.2 Time zones in Narfell community

Since the game is being played all over the world, there are mainly three different time zone areas; USA, Europe and Australia/Asia. In the US prime time, the server is most of the time full; during European prime time, it is easier to find an opportunity to play. Players normally play in Narfell from late afternoon to late evening in their local time zone during working days. On weekends players play more also in the daytime.

²⁷ http://nwn.black-flag.com/index.php

Because of the time zones, players play from Monday to Friday with people that live at the same continent. On weekends, players have the possibility to play the whole day.

5.3 Powergamers in Narfell

As said, player characters (PCs) in Narfell do not get so much experience points from killing monsters and other enemies. With this modification, DMs have changed game rules to prevent powergamers to become too powerful. In Narfell, PC's level is normally quite low (3-6) even after having played the same character for a long period of time. The PC can get very easily killed if PC's level is low. Powergamers usually do not role-play, and they act the in game world as they would be in a chat. They use shout commands (that are heard by everyone in the game world) and talk about off-game issues with others ingame. Role-players in Narfell normally first ask those powergamers politely to change their way of talking. In most of the cases powergamers either change their way of playing or leave the server.

6 Roles in Narfell community

6.1 Dungeon master's role

Dungeon master's role is to make players' gaming experience fun and exciting. Without DMs playing can be quite boring. DMs need to challenge and make players' to think and solve tasks together. DMs want that the players are appreciating their efforts since they do serve players free. Some players would like to see DMs as their slaves. Problems in-game appears when DM decides to leave the server since it is not easy if possible to replace any DM. There are plot and player character's development issues that can be known by only one DM. Every DM has unique way to be a game master that cannot be replaced by any. Often one DM has got some tribe or group of people to whom they provide quests. The absence of one DM can affect many story lines in that group and, for example, interrupt some major story lines. Players can get frustrated to that since that makes the world non-persistent.

The server is located at Masume's home in Florida and he has the final word to every decision made in Narfell. There are approximately 15 active dungeon masters (DMs) who have two main roles: to be a roaming DM (give experience points to players when seeing good role-play) or to be story or plot DM. Of course, DMs also look after the way players play in game world.

6.2 Player team's role

In Player Guide team there is 3 Player Leads (PLs) with 10 Player Guides (PGs). Player Leads are a link between DM's and players. PLs with a help of PGs gather information from the issues concerning players. They also help with any in-game or off-game questions that players may have. PLs or PGs can contact players or vice versa in-game (IG) by using private conversation there or off-game (OG) in IRC by following the conversation and making Instant Messages (IM) if needed. Player leaders or player guides are not specifically shown in the game world so players' need to learn through practice and IRC chat who is in the player guide team. It is easier for the players to talk about game related things to someone from PG team than straight to a DM. Players need neutral party to tell game related things.

While PLs have only a little time to play IG player guides have more time to play. Therefore those players who would like to help the community in some way but still want to play a lot can take PG role. Player team's role is very important; without it the gap between players and DMs would be too big.

6.3 Developer's (modder's) role

Developing or modding role is independent from other roles in the community. Anyone who has the willingness and some skills to do area or item building or code scripting can ask or be asked by DMs to make something to the game world. In Narfell approximately half of the people from developing team are players' and the other half of the team are dungeon masters. Developing team works closely with DMs in Narfell in order to prevent vast job and to get feedback as much and often as possible. If some key developer decides to leave the server or don't have time to develop it can have major affects to the server. In Narfell the progress of the link system is stopped since developer has left the server.

Modding in Narfell is being done only with the help of own personnel. Help from outside the Narfell is not needed. One of the most difficult tasks in developing is to keep the balance in the server. If, for example, too much gold with too minor efforts is been provided to the players then the game becomes too easy. After Narfell was upgraded with SoU package in February 2004 players complained that the game is too difficult. Players faced too strong opponents and the way of playing changed dramatically. Some players were so disappointed that they left the server. Changes were made to the server by DMs and developers in order to bring the right balance in to the game.

6.4 Player's role

Player's role in Narfell is to interact with other players. That is usually done by playing in a group. Good role-playing is very important; you should always play the game from your character's point of view. Good player don't complain when things don't go the way he has planned to. Taking initiative is also important. Good player is active and not passive in game world. In off-game good player is nice to each other even though his character is evil in the game. If player's motive is not to have fun in the game then he doesn't enjoy playing in Narfell for a long time.

If player finds his place in the game world and are part of some group he is needed in that specific group. If he wants to quit playing or change into other character or responsibilities in the server it is correct to play out his death in order to give meaning to his absence.

6.5 How to become a PG or a DM?

In most cases people are asked to take some kind of responsibility. If a PL sees, for example, that some player enjoys playing and is good role-player in Narfell, PL might ask if he/she wants to be a player guide. Good role-playing in game seems to be the best recommendation player can give from him/herself. Player leaders see their role as important as DMs role. So it is not a promotion in itself to change the role from player leader to dungeon master, for example.

Player guide team role is not written into the game, you can play NWN multiplayer game without guide team role. DMs want to hear players' opinions and thoughts about the game but they are too busy in their other duties and also it is not so easy for players' to comment things concerning DMs to themselves. In Narfell there seems to be a need for a link between players' and dungeon masters' in order to keep both players' and dungeon masters' happy.

7 In-game and off-game worlds

There are two separate worlds in Narfell – in-game and off-game worlds. When new player comes to Narfell he is first mostly involved in in-game world. When he gets to know the player better and better he gets interested what kind of person there is behind the player character. But since in-game off-game conversations are prohibited by the server rules player gets more and more involved in IRC chats that are being held off-game in #Narfell and in some private channels as well. Chat rooms encompass more areas of life. In Narfell the off-game becomes more and more important to players and in-game loses it's importance. Some players even stop to play in-game but still daily follows and take ignition in off-game chats. Many players said that off-game world is more important to them than in-game world if they would need to choose one over the other. But first you need to feel part of the in-game before you feel to be a part of off-game community. The off-game community keeps the game interesting because: 1) without off-game community the game wouldn't last long because the game would loose it's interest after a while without getting to know the real people behind the characters. 2) Without off-game community in-game playing would get too slow since important in-game happenings should be told in-game and that would take time. Off-game is an important channel to know what happens in in-game.

7.1 Communicating in Narfell

Internet Relay Chat (IRC) is the main communication channel in Narfell. All Narfell chats are located in Kechara.Sorcery.net server. There is one main open IRC channel (#Narfell) that is open to everyone. Over 90 % of players frequently visit to #Narfell channel to see what is being discussed there. In #Nar-

fell channel people talk and share all kind of things. Approximately 25 % of all talk in #Narfell is game related such as what is happening in game world, asking questions about the game world and give feed-back about the game mechanics. Mainly the talk in #Narfell is small talk and getting to know people behind the characters. Only forbidden issue in Narfell seemed to be talking good about other servers or even recommending those. "Narfell is the only NWN server"-thinking is expected from everyone. In IRC anyone can make their own channels where other people can attend. DMs team and PGs team work separately from each others on their own forums and IRC channels, they mainly contact each others on Guide – DM speak channel in IRC. They used to have one shared channel before, but since there were some arguments between PGs and DMs, shared chat channel was eliminated.

Narfell forum sites are used by some players to share game experiences. Only ~ 25 % of the players follow forum sites. Some said that following and writing in IRC is not what they see being active in Narfell community. But writing and reading forum sites is what is being active.

8 Narfell community

Narfell community is active. IRC chat #Narfell is being used almost 24 hours a day and there is almost 100 people logged in on that channel all the time. Forums are being used quite actively also. As one player said forum is good place for getting information about the happenings in the server and in-game. Narfell community functions in in-game and off-game levels. There are many off-game levels in Narfell community: forums, chats, emails and face-to-face meetings.

8.1 Narfell communities relation to NWN community

Neverwinter nights community can be found from GameSpy chat (all players that are playing NWN can chat there together), from NWN vault (especially developers can help others and get help to their problems) and from Bioware's Bioboard (forum where anyone who has NWN game license can write and read things from other NWN players). People are not committed to NWN community the same way than to their favourite NWN server. There is not common goal or common interest in the same way in NWN community than like in Narfell's community. People are looking for uniting aspect in what to build up friendship. In Narfell uniting aspect is the willingness to role-play the best possible way.

8.2 Real life meetings outside Narfell

On last September 2003 one DM from Narfell died suddenly. Because of that some players couldn't play in Narfell for some weeks because all sad emotions aroused when they tried to play in Narfell. Some player said that it was a good reminder for him even though he plays in virtual world real life still rules. Some people from Narfell went to his funerals and bought together something to remember him.

Three Narfell players from Australia have met each others once last year and are planning to meet each others again this year. On their meetings they talk only a little bit about the Narfell to each other and mostly about their other parts of their lives. Real life meetings don't change the way how they play against each others in Narfell. Playing in-game in character and being a friend off-game are two totally different things.

9 Conflicts in community

Although almost everyone seemed to be happy with the server there has been some dissension in Narfell. Since contacting between persons in Narfell is not face-to-face cliques and misunderstandings can easily appear. It is not wise to talk openly in forums about sensitive issues like player vs. player issues. Player vs. player issue means situation where players argue whether it is ok to kill other player characters (PCs).

Some players have been able to hack into the Narfell server so that they have all the most expensive weapons and shields, etc. what you can find from the world. Then DM has taken control over his character and interrogated him with other DMs and asked where he has got all that stuff. Then usually DM has taken all equipments from the cheater and let him be. DMs don't know how it is possible to hack into their server, but it seems that it is possible.

In chat there are small conflicts quite regularly. Rude talk or recommending other servers can be a reason why the person can be kicked out from the chat.

Autumn 2003 one former DM in Narfell created his own solo campaign. Other players from Narfell got interested in playing in his campaign. Masume, the leader of Narfell, heard about the campaign and wanted to hear more about it. He felt it was a threat against Narfell that players went to play somewhere else. After some arguments that was taken in IRC Masume kicked out some players and also DMs from Narfell. Some players and DMs who didn't agree with Masume also left the server voluntarily. Those DMs who were either kicked out from Narfell or left from there voluntarily have created two new separate persistent NWN worlds called Highmoon and Coldwood. Highmoon server will be briefly described here as an example of new and small community.

9.1 Highmoon server

Highmoon was the dream of one ex-DM from Narfell. Highmoon demands two extra game packages in order to be able to play that (Narfell demands only one). In the beginning the server was run from her computer. She has got a lot of help from other people to build and maintain the server. After Highmoon had been in live status (before server is officially ready it needs to be tested for some time; that phase is been called as beta testing) for some months she was unable to run the server because of some real life issues. She needed to shut down the server for a while and ask help from her DM friend in order to find other location for the server and also to be in charge of the server from that day on. New head DM was ready to help her because of their friendship but he didn't feel that was some kind of promotion to him. Since server was down for some weeks almost all normal players vanished from the Highmoon because they were too lazy. He hired two new DMs to the server and also found some new developers to the server. However, from two main developers one is too busy and the other one has some real life issues that prevent them to be fully committed to the server. Since the players disappeared from the server the next thing from him is to get the players back and find some new ones.

10 Why to take responsibility in the community?

Narfell is very hierarchical server; server is being run by Masume. Narfell is his dream and all major decisions must be accepted by him. What is other players' motivation to take responsibility? Some players think that after they would take some responsibility in Narfell all fun would die. Dungeon masters' main reason to play in Narfell is anyway to have fun. DMs have fun to see how players play together and how players react to situations created by DMs.

DMs and developers can create things to Narfell even though their hands are tight to please Masume. DM can't tell his or her own stories in Narfell, there can't be two or more main story tellers in PW server. So if a DM would like to tell own story without the need to please someone else he would need to build own world.

After players find that they like the server and the people in there they start to be committed to the server. They want to be useful to the server. Also some see that they can do things better than how things are done. They want to influence and make their own contribution to the server.

Some DMs are very committed to the server since they can't imagine being in some other server than in Narfell.

11 Conclusions

Narfell is interesting game community since it is quite small but very active. The server hasn't yet the link to be able to have more than 50 online at the same time. Interesting question is how the server will change after the number of players will expand. Narfell has created player guide system in order to help the communication between players and dungeon masters. Players seem to need instance that represent them towards DMs.

It is important to keep all sides happy in community. Dungeon masters, player leaders, player guides, players and developers are connected with each other and need each other in order to have fun. If the cooperation fails and cliques occurs it can lead to someone been kicked out from the server or leaving the server voluntarily.

New player who comes to the Narfell server is first interested in having good game experience only. After a while the player has committed to the server and friendships with other community members become more and more important to the player. On a long run the friendships seems to become more important to the community members than playing the game.

Each person who is active in the server is irreplaceable. Their absence will affect to other sides of the server. Dungeon masters try to share the information as much as possible through DM specific chats and by using forum billboards. One tool that they would need is how to share the information easily and in pre-packed form.

Even Narfell server is run by amateurs they have specific and well organised hierarchy. They have even invented player guide team role in order to help the communication between players' and dungeon masters' even though NWN game in itself didn't provide any tools to that. Narfell game community is adapting to the needs of their members and not restricted to the tools or habits that have been done before.

Live-action role-playing

Antti Salovaara

antti.salovaara@hiit.fi

Abstract

This chapter presents the findings from participatory research done within Finnish liveaction role-playing (LARP) community as a part of case studies done within MC2, concentrating on describing what activities are included into larping, from individuals' perspective. In the research, this question was approached through ethnographic methods: researcher's active participation in community activities and interviews with chosen players and game masters. In the last chapter, tentative implications to game design are presented. These include discussions on (1) game master's role in pervasive gaming, (2) benefits of allowing many ways to contribute to the community (i.e. playing and game-mastering), and (3) why being a game master is fun.

1 Introduction

Live-action role-playing (or larping, for short) means organized events that simulate possible circumstances in a fictitious world and often contain game-like elements. In the game, participants play roles of fictitious characters whose actions they act out in real and whose feelings and motives they try to empathize. Because characters' actions are played through real actions, also the physical environment and its objects are used in the game's internal, fictitious world (for instance, a piece of plastic can be claimed to be a magical device in some fantasy setting). This definition will serve as our working definition, since a final one is still under a lot of debate among players.

Although mobile or and other technologies are deploy in larps only very occasionally, what makes larping interesting from MC2 point of view is its game-like nature and the active community around the activity in Finland. Larping is also inherently mobile activity, as the players are required to move about in the game area in order to fulfill the goals and motives their characters. Therefore they are an interesting "frontier community" to study in relation to mobile and pervasive gaming.

The results presented in this chapter have been learned through active participation in larping and its related activities from August 2003 to this day. This has consisted of playing in 4 larps in different parts of Finland (Turku, Raahe, Kuopio, Helsinki), following active players' mailing list discussions, interviewing players and attending to Solmukohta, the annual Scandinavian role-playing convention. We start by providing a closer look on the nature of larping, using a vignette of a typical weekend-long larp

2 What larps are

Live-action role-playing resembles traditional tabletop role-playing with the exception that when players gather around a table to play, the game is usually based on narration whereas in larps it is based on acting on character's behalf. Mike Pohjola provides a good description of both types of play in his book Myr-skyn aika (The Age of Storm) [2, pp. 8-9]²⁸:

In roleplaying games, the participant immerses in a character and guides her actions in a fictitious world. In The Age of Storm [Pohjola's role-playing book], the character can be, for instance, a short-tempered but noble bandit or an irritable, protective village witch.

The roleplayer empathizes with the character's personality, view of the world, emotions, background and motives. The idea with this is to experience things through the character. During the game, the

²⁸ This is a translation from Finnish by the chapter's author. Cited and translated with a permission from Mike Pohjola.

player guides her character either by describing her actions in a tabletop game, or by performing them herself in a live-action role-playing game.

A tabletop role-playing game, is based to a great extent on imagination. One of the players does not have a character of her own, but is instead a game master who describes the world around the characters. The game master can also play the roles of occasional encounters. If the player Jaakko wants his character (an imperial soldier called Ulf) to light a fire, he says: "Ulf collects wood in a forest, makes kindling with his knife and lights the fire with a tinderbox." To this, the game master may respond like this: "The wood is a bit wet, but Ulf has some dry birch bark in his pocket, and he succeeds in lighting the fire. However, it makes quite a lot of smoke."

On the other hand, live-action role-playing game, or a larp, is more holistic in nature. There each participant has a character that she dresses up as. A player's goal is to not only feel like being the character but also behave, speak and walk like the character. The game master has planned characters and propped the game location to look proper, but during the game she does not need to describe or narrate anything. The characters see and experience everything the players do. Jaakko, dressed in a blue, eagle-figured uniform, does not describe orally his character's actions but instead physically collects wood from the forest that serves as the game area and really tries to start the fire.

As can be seen in the excerpt, the game master's role of steering the in-game (i.e., fictitious world related) activities is more profound in tabletop games than in larps, which results in decreased story-telling emphasis in larps. Another result in acting things in real is that freezing the time is not possible since things happen simultaneously and are not mediated through the game master. It is more up to the player what the game will be for him/her.

Since no single master mind is needed during a larp to decide on outcomes of characters' actions, there is a possibility for having multiple game masters that prepare the game: write character descriptions for the players, prop the place to look authentic, take care of practicalities such as food and toilet paper etc. In fact, most larps are organized by a group of people.

2.1 Types of larps

The most common type of larp is a so-called one-shot game where anybody can sign up (as long as there are free characters prepared by the game masters). Since getting enough players is crucial, there is a calendar about upcoming larps at <u>www.larp.fi/kalenteri.html</u> where game masters can advertise their game and tell what type of players are wanted (for instance, "this is a game focused on post-apocalyptic atmosphere-creation and is not intended for players under 16 years of age"). Usually these "calendar larps" are quite newbie-friendly games and although attendance to the game takes usually the whole weekend, the actual game lasts only 10 hours. Rest of the time is spent with hanging together.

More demanding games are based on invitations (so-called kutsularppi in Finnish) that game masters hand to selected players they already know. These games are sometimes announced in the calendar as well, if not enough invited players sign up or some new faces are wished.

Not all games are one-shots. Another possibility is called a chronicle where many sessions are organized and same players play the same character from a session to another. This way the character's actions and destiny becomes emotionally more important to the player and longer plotlines are possible. Between the sessions, game masters prepare new interesting settings to the players, based on what happened in the previous session.

Larps can also be big and small from the point of view of number of players. A typical game has 30-70 players and 2-4 game masters and is played in a suitably remotely located course centre, rented from some outside association or a congregation, for instance. Remote locations are for avoiding outsiders' entry in the area, since such occasions ruin the illusion of a fictitious world effectively. Also smaller larps are organized, the smallest heard of by the author was a 3-hour claustrophobic elevator-jamming larp for 4 people. There have also been massive larps for 300 or more players.

Another way to categorize games is according to their genre. In the next section, a story about a scifi-style larp in presented. A prototypical larp is based on elements of medieval high (i.e. epic) fantasy where characters can be humans, elves, dwarves and other standard fantasy creatures known from books, wizards may cast spells and so on. Another common genre is horror, but very many games do not contain any supernatural elements or fall to any specific genre category. They can be authenticity-aiming historical games or located in modern life, with all the variety of speculations (like "what would be the life be now if X did not happen" etc). Also games with exaggerated emphases, resembling parody, have been played: soap operas in Dallas style or super hero larps, for instance.

2.2 An example of a weekend-long one-shot larp lifecycle

This section tries to provide a typical story of a larp from its first preparations to the post-game debrief.

An idea of the new game is formed. In October, a game master (GM) with his two friends from the same tabletop game group get an idea of a larp that takes place in the Star Wars universe but contains horror elements. These elements however are to come as a surprise to the players. They start thinking about what the circumstances in the game could be: in a remote planet, Jedi knights are losing their power but they cannot admit this openly in afraid of anarchy. Based on this idea, the GMs start writing character descriptions, or *briefs*, about the main characters. One of the GMs starts searching for a place to rent for March, and writes an announcement to larp.fi.

Players start signing up. After the announcement has appeared in internet, players start sending mail, containing information about the type of character they would like to play. The GMs find out that they have to convert some male characters to female since there are more female players than was expected. There are also too many people who would like to play a Jedi knight, so they have to make some players unhappy but that cannot be helped. Things get complicated since no proper players are found to play some key characters, and character briefs should already be sent to the participating players. Otherwise everything is fine: the location is reserved for the game, and enough participation fees are already collected to be able to buy some material to prop the place to authentic Star Wars looks.

Game masters end up in a final hurry. In February, when two weeks are left before the actual game, GMs find out that people are surely getting angry since they have not received their character briefs and do not therefore know what type of clothes and other prop material they should get for their characters. GMs spend sleepless nights preparing the descriptions. There are some cancellations, so one of the GMs is put to play one key character as a replacement. Finally all character briefs are sent to players.





Figure 1. Different situations from pre-game preparations in a larp. A) Gaming site of a science fiction larp in Raahe, Finland; B) Players propping the inside of the house shown in Figure A; C) Game master (to the right) giving a group brief to players who played refugees in the game; D) Players propping themselves in another science fiction game in Kuopio, Finland.

Gathering to game location a day in advance. On Friday afternoon, the GMs and some fellow players get to the place (Figure 1 A) and start propping the place (Figure 1 B). Some players from the other side of Finland also arrive, since by travelling the same day as the game takes place they would not make it to the starting time. By the midnight, already 20 people have arrived. After having done with propping (to which also players participate but with a varying amount of actually helpful support), they have a sauna. Since beer and larp do not go well together, nobody has brought alcohol with him/her.

The game is delayed by 1-2 hours because of last-minute hurry. On Saturday, the game should start at 14.00 but different in-game groups (so-called factions) still need to be briefed about the starting setting of the game (Figure 1 C). For instance, one GM takes all the Jedi knights aside and tells them that their game starts at the main house and that they have heard rumours about a battle fleet of unknown starships approaching the solar system. These kind of briefs take more time than GMs have expected and some players get irritated at the delay. Others say that it is always like this: "game start always late". People generally spend this time by enhancing their personal props (Figure 1 D)

The main brief takes place before the game. Finally there is the main brief where players are informed about some necessary off-game issues: where are the toilets, what is the amount of tolerable physical interaction (e.g. can you really drag somebody in the ground if your character has first fainted the other one with a shock gun), where is the medical kit and so on. Then players are asked to go to their starting positions and the game starts with a blow of a car's horn.



Figure 2. Debrief immediately after the game (in this case, around at 3 AM).

First two hours. First two hours of the game are uneasy since it is first difficult to think of being somebody else, but gradually things start working and happenings start feeling more real. Players start thinking from their characters' head and try to find ways to succeed in the goals that GMs have put to their briefs (for instance, the brief of one character may say that "your character wants to find out who is that person who has tried to blackmail you lately, and when you find that person, teach him/her/it some good manners").

Game's end and the immediate debrief. The game ends at 02.00 in the night and players gather to the main house to hear what each one of them did in the game (Figure 2). This session is called *debrief* (loppubriiffi in Finnish) and it is important part of the game experience since then you have a possibility to share things that happened to your character with everybody else (for instance "I almost managed to find that YOU where the blackmailer, but then this other character came and threatened me with saying aloud another secret that I wanted not the Jedi knights hear, and..."). However, usually there are players that just cannot keep their mouth shut and tell everything that they did, irrespective if it is interesting or not to others. Therefore final debriefs can take 2-3 hours and may feel like a torture to others.

Next day. On Sunday, people concentrate on un-propping the place, in order to return it in a nice condition, and try to arrange lifts to railways stations and big cities in other players' cars. Mostly Sunday is just chill-out activity and talking about the past game with people whose characters were related together in the game.

Written debriefs to game masters within a few weeks. After people have returned home they often send a written debrief to the GMs about their characters' actions. This way GMs get feedback from the game and have possibility to do a sequel that builds and the happenings of the past game and contains same characters.

3 Community activities in larping

Community activities were studied by participating as a player to four games during fall 2003. Three of them were science fiction games, because that allowed for better taking photographs also during the game (i.e. taking in-game photos). One game was very genre-specific game with Victorian era melodrama, in-spired from books by Edgar Allan Poe, Arthur Conan Doyle, Oscar Wilde and Brontë sisters.

3.1 Research method

Participation in the games was not just about playing, but instead, targeted to capture the broadest possible on-location activity. This covered observation of all the activities from the game masters' arrival to the place in Friday noon to the point when the game location was cleaned and ready to be returned back to the owners.

The game masters were specifically contacted in advance and offered help in preparing the game place. The help was always gladly accepted, and therefore the researcher arrived at the location together with the game masters. While helping in practicalities, it was possible to observe what arranging the event is from game master perspective. Pictures were taken whenever possible when anything interesting was taking place. On average, 113 pictures were taken during each weekend-long visit. Notebook was used to record single happenings, also during the game, if the circumstances allowed it (i.e., note-taking fitted into the things the researcher's character could do, and in-game situation was suitable). In most games, the researcher was playing a tailor-made character like a war reporter, which allowed for unobtrusive documentation during the game. A few interviews were conducted during the visits if there was spare time for that.

After the visit, a report was written from the notes to summarize the visit. The photographs were either burnt to a CD and sent to the game masters, or uploaded to a web folder to let game masters see pictures from their game. This was done as a reward for hosting the researcher. Pictures from games are also always wanted, but no one ever seems to have a possibility to dedicate his/her time for taking them.

3.2 How larpers have organized themselves

To make it work, larpers have created an active network of relationships with each other. This network covers the whole Finland, and as a result, all players have lots of friends throughout the country. There are dedicated associations for larping and role-playing in every big city in Finland (46 groups listed in www.larp.fi/larpattajalista.html). Active networking is needed because each game needs many players, and game masters need to know the participants well (preferably a month) in advance in order to provide the best possible characters for each player. There is said to be 2000-5000 larpers in Finland. When the members in SuoLi ry (the Finnish umbrella larp association) were calculated in October 2003, there were 810 members in total. The statistics have not unfortunately been published in public.

Through participation in many games people learn whose games they like most, and start to sign up to their favourite game masters' games whenever they can. Whenever people talk about past games, they always remember to mention also the game master who organized the game.

Although there is a clear distinction in the roles of a game master and the players with respect to what happens in the game, this does not appear as a separating factor in pre- and post-game activities. In the larps that this research has covered this far, in off-game settings the game masters and the players have hanged out together without any noticeable hierarchal relations. Players also participate in propping the place, which strictly speaking would be game masters' responsibility. So, things are done very much together and there usually are neither apparent master/servant nor producer/consumer relations between the game masters and normal players.

3.3 Finnish specialities

Nordic countries are the most active larping areas in the world, and the game culture has also evolved into a distinctive direction compared to other countries. Nordic way of playing emphasizes playing without intricate game mechanics. That is, when having a battle in the game, players do not go into difficult arithmetic in their heads to solve conflicts, but instead try to imagine what the most obvious outcome would be in the game world's reality. For instance, a usual rule with laser guns and projectiles in sci-fi games is that every shot hits the intended target, and the player who has been shot has to act accordingly. An alternative way to solve the hit-or-miss issue is to use so-called KPS (kivi-paperi-sakset, or paper-rock-scissors) quickly and then act according to the outcome.

Winning the game is also an insensible concept in most Nordic larps: people are not seen as competing against each other, trying to find a winner in the end. On the contrary, they are together trying to enact a believable game world by acting realistically in the game world's in-built rules, laws and physics. Characters still have motives that often are conflicting, but losing against another player can also be fun enjoyable as long as it seems to fit into game worlds internal logic. Playing a tragic character is quite popular.

In Finland, game masters have a special role in determining what characters each player will be playing. In other countries it is even possible that a player can decide by herself what type of character she will be playing. In other words, "the player can bring her own character to the game", freeing the game master(s) from the character-writing responsibility completely. By allowing the game master write the character for

the players, more interesting relations can be built between players, thus achieving more interesting tensions in the game. But this "tyranny" of deciding each player's character reaches only to the starting setting of the game: when the game starts, each player is free to do whatever she sees suitable for her character.

Giving this type of a special role for the game master means a lot of extra work in terms of preparing the game. But people who organize the games really like planning ingenious conflicts between characters and setting up interesting situations for action. Many game masters read a lot of books and comics and see a lot of films. And naturally, they enjoy normal playing as well, and therefore attend to games that other game masters organize.

Yet another Finnish specialty is that majority of players seems to be females. There are however no statistics on this issue, but it is a common discussion topic among the players that in many cases the game masters have to rewrite character descriptions to make it possible for all the female participants play female characters. Playing the opposite sex is of course possible but it is not usual.

4 Implications to game design

The previous chapters provided answers to the research questions: on describing the community's activities in Finland and on the best experiences that larps can give to people. Based on these initial findings, the following implications can be drawn.

4.1 Coping with the outsider issue

One of the crucial things in organizing games is to fight for retaining visually consistent and believable milieu. All propping (both the milieu and the players) is targeted for this purpose. Small errors in the visual looks are tolerable (however, there are differences among larpers in this issue) and do not ruin the immersion, but having outsiders (i.e. non-players) in the game area destroys the game experience immediately. The reason for this is that there is no in-game explanation for these different-looking people to exist in the world, which drops the players back to reality from the in-game excitement. To minimize the possibility of such things happening, games are always organized away from normal life or and in hired, closed areas or places unless they are intentionally situated in the contemporary life.

When designing mobile games, especially alternate reality games, there needs to be an in-game explanation to presence of outsiders.

4.2 Managing the degrees of freedom using a game master

Larps and all other role-playing games allow for a lot freedom for players to control their character. Without game masters creating struggle and plots for the players, meaningful activities within the game would be difficult to achieve. In the game design literature, there has been some discussion about how the amount of perceived realism in the game matches with what the player actually is allowed to do in the game. If the game, by its visual output, shows a lot of details, the person easily becomes frustrated if he/she cannot interact with them because of arcane, clumsy user interface. For instance, Janet Murray [1] discusses agency, which means the positive feeling the player senses when he/she can interact with the game world in the way that matches with the affordances in the world and the user interface. Games such as Tetris with abstract visual output give a hint of minimal degrees of freedom in user's actions, whereas photorealistic games suggest a lot of freedom to the player to control his/her character. In role-playing games, including larps, this freedom is taken to the extreme.

If mobile games try to mimic real life by allowing the players move around as they wish, the game logic should also support all the possible ways that this may affect the gameplay. One possible way to control this complexity is to use a game master as the final judge who can change the course of events within the game.

4.3 Multiple ways of gameplay

The previous sub-section raised the issue of allowing different ways of gameplay: that of normal players, and that of masterminds, that is game masters. With this kind of solution, the fun factor of gameplay must naturally cover also the latter ones. With role-playing games and larps it can be seen that this requirement is also possible to achieve: there are a lot of willing people who like to organize games to others.

Explaining the fun in organizing games thoroughly is not yet possible at this stage of research, but some suggestive answers can be given. When asked, the game masters have mostly given following explanations:

- It is fun to do something else for a while instead of normal playing.
- The person had found a good idea for a larp but no one was going to organize that type of a game. So the person decided to do that him/herself.
- Writing character descriptions and planning tensions between characters is creative work and people enjoy it.
- Organizing larps is one sort of literary work since it involves a lot of writing. Therefore it can be used as a channel for publishing one's works if writing novels, poems, short stories etc. does not feel interesting.
- It is nice to see when players enjoy gaming and you have made it possible.
- It is a wonderful feeling when you see your imagined world come alive through players' actions, and turn something else than you personally expected, thus making it even more wonderful.

In [3] these answers have been contrasted to similar game-master like activities that take place in the other MC2 case communities (GeoCaching, Habbo Hotel, and Neverwinter Nights).

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Case Geocaching: Networks in a Mobile Content Community

Matti Rantanen

matti.rantanen@hiit.FI

Abstract

This study adopts two central theories on network evolution and learning and investigates them in the context of mobile content communities. These two theories are preferential attachment (Barabasi and Albert, 1999) and the strength of weak ties (Granovetter, 1973). The case study used is geocaching, a nomadic treasure hunt game inviting open content creation and global participation. For the purposes of the study an extensive data set spanning community interactions over five years in the Bay Area, California was collected. The community dynamics were studied using the two theories mentioned. The results indicate that the mechanisms producing social structure in geocaching differ from those modelled by preferential attachment, the social structure being more a product of ongoing exchange of ideas between the core participants of a locale (such as Bay Area) and the peripheral participants coming in from elsewhere. The strength of weak ties theorem considers such patterns of participation ideal for learning and diffusion on innovation. Evidence is still lacking, but the findings suggest close to ideal dynamics for learning and diffusion.

1 Introduction

In the study of social networks some of the most central ideas are *preferential attachment* (Barabasi and Albert, 1999), a process describing the way connections are established where they give best value, the *scale-free network* (Barabasi, 2002), a network that supports both high clustering and long-range connections, the idea of multiple *affiliation* (Watts, 2003) that connects networks of different types, the *strength of weak ties theorem* (Granovetter, 1973) explaining how most new information resides in the peripheral relationships, and *structuration* (Giddens, 2001) that assumes individuals not operating as free agents, but connecting with those that occupy positions in the network close to us.

The objective of this study is to adopt some of these central theories and ideas on networks and translate them to the context of mobile communities. More specifically, we want to understand what type of individual behaviour are present in a mobile community and whether their study with theories on network interaction (such as preferential attachment and weak ties) can help us understand the consequences in a system. To perform such analysis we collect a large data set representing the social interactions in the studied community and analyse how collective action becomes a consequence of individual, local behaviour. The study is structured as follows: I will first introduce the reader to the subject of study, then move on to describing how large data sets can be collected for online communities. Finally I will discuss the network theories I use to analyse the community dynamics, followed by results and conclusions.

2 Subject of Study

The subject of study is a massively multiplayer mobile treasure hunt game called Geocaching (www.geocaching.com). It is suitable as subject for several reasons: Firstly, it is a large community of approximately 30,000 active participants. In other words, it has scale. Secondly, it has been operational for five years, thus it has significant history, which enables the study of network dynamics. Thirdly, it is truly mobile and global, the activity being diffused to user-defined real world locations around the world, and as all content in the game is user created Geocaching is a perfect fit with the research agenda of the Mobile Content Communities project.

The origins of the activity go back to year 2000. On May 3, one day after the unscrambling of the GPS signal, Dave Ulmer hid an experimental target in the woods in Oregon, near Portland, USA and posted the coordinates from his pocket-GPS online. Later in July Jeremy Irish, a Web site developer from Port-

land, picked up the idea and designed a Web site dedicated to Geocaching, from which point the activity started diffusing also to outside of USA. For the early adoption of the game it was critical that players trusted their own instincts in creating geocaches as few examples existed. Also, it was critical that early adopters displayed perseverance and continued in their attempts to enrich the environment with geocaches despite the low level of overall activity. In this respect, the game balance was quite different to what it is today: it was about high interpretive flexibility in regard to what was possible, of trial and error, and establishment of a common understanding. Since then, the practice has somewhat stabilized, although innovation still takes place. For more on the history of Geocaching see (Anon. History of Geocaching, 2006). For ethnographic field notes on Geocaching, please consult (Sarvas, 2006).

3 Methods

The methods used for this study are a combination of field study and Web site data analysis. The field study was conducted during Spring 2005 in the USA when the author was visiting the University of California at Berkeley. Its objective was to gather first-hand and rich data on the activity in order to appreciate the patterns of interaction affecting the game play experience. Due to stringent rules on the protection of human subjects in the USA (put in place as consequence to the famous Milgram experiments on obedience to authority) the author applied for permission to interview and observe subjects over the age of 18. The permission was granted in March 2005 and the study commenced. The Web site analysis was conducted later during Spring 2006 after the author had returned to Finland. Its objective was the reconstruction of events for the community members since 2000.

The role of the field trial was that of an exploratory study that conformant with principles of ethnography help the researcher understand the individual participants' feelings, challenges and experience. The idea was not to study the community with a pre-defined set of questions but develop them along the way. Studies conducted in this way have a better chance of reporting something original that the participants feel strongly toward, instead of trying to find evidence on existence of problems that the researcher feels strongly toward, and which might not in fact be central to the activity being investigated. The specifics of the field study and the Web site data analysis are discussed in the following sections 4 and 5.

4 The Field Study: Individual Participation and Events

I approached prospect subjects for the field study via e-mail, sending invitations to a random sample of ten having found a particular cache in Berkeley. Note that there is no search tool for selecting users matching a given profile. In addition, three cache owners were approached asking their willingness to cooperate and post a recruiting add on my behalf on particular geocache pages. All the three cache owners accepted the idea (although one did check my legitimacy through the University of California at Berkeley). I also received unexpected help from the community. For example, one member further posted by request on Livejournal (www.livejournal.com). Another helpfully suggested I should also post on the Bay Area Geocaching discussion groups.

I selected seven candidates for the field study. They represented three *conceptually important cases.* 1) a beginner/peripheral participant with no social contacts within the community and no caches hidden, 2) an active participant having hidden caches and known to some within the community, and 3) a core participant maintaining 30 or more caches, having arranged events, and viewed as a "father figure" by others. All the seven subjects were recruited for extensive participatory observation in which the objective was to understand the activity as *they* understood it. Two of them were beginners (in fact they were a couple that had separate player handles), two were active participants, and three were father figures. The methods used were a combination of participatory observation and ethnographic interviewing in which the interview follows a pre-defined interview guide but takes place in the context of activity. Most of the interview and observation were video taped for later analysis.

Since its inception Geocaching has evolved to include social events as well. They emerged in 2001, during the second year when someone created a cache that invited people to meet at the cache location at a given date and time. Since then the idea has been widely adopted and serves the purpose of "putting names with faces" (as one subject put it) and socializing among the already acquainted. During the Spring 2005 I participated in four such events to get a sense of the multiple layers of socializing in the community. One

of the events I attended was a global get-together organized in Florida by the name of GeoWoodstock III, the third annual get-together event inviting global participation (although of the several hundred participants only a couple were from outside the US continent). The other events attended were smaller, local efforts, one of which a poker game adapted to Geocaching, another a dining out event at a local pizzeria. The remaining two were Saturday picnics with activity for kids and event specific caches to motivate participation.

4.1 Challenges in Conducting the Field Trial

Initially I considered it sufficient to analyse a small sample of participants representing conceptually important cases and understanding the idiosyncrasies in their in-game practices and social networks. But it soon became evident that to do so would require participation in almost every conceivable "cache hunt" that the subject ventured in. Many of the caches included hidden meanings, kind of inside jokes that became apparent only by observing the dialogue among the players involved, and which later on played important roles in social discourse. This dialogue, however, was hard to keep up with as players interacted both on- and offline and went Geocaching spontaneously without prior notice.

Also, the time scale on which social relationships get established is sometimes beyond the scope of such a field study. For example, players in a large community may interact only once during the study with no particular consequences, but as interaction is ongoing (outside the scope of study), social ties may eventually get established as players identify patterns of regularity from randomness. This is characteristic for Geocaching as well where little by little the contributions and distinct identities of players emerge from the crowd, creating a definitive mental image of one another, contributing to sense of community.

5 Network Data and Web Site Analysis

In order to study the social networks in Geocaching and put some of the theories and models on networks to test, a more extensive data set than the qualitative field trial was needed. This section discusses some of the considerations for such data and how it was acquired. It is worthwhile to note here that the structure of data influences the type of analysis made possible, and for this reason, some of the challenges in acquiring data are discussed in conjunction with network analysis.

5.1 Acquiring the Geocaching Data

As the Geocaching players engage in the game play they continuously document their participation in the online blogs of respective geocaches. They do this for at least two reasons: Firstly, they collect a point for each find they make, and secondly, they want to let others know where they have been and what they though of each cache. To study of the Geocaching network needs to exploit this practice. The three data elements used in modeling of the Geocaching network are the identities of players, the geocaches, and the affiliation relationships among the two. The data is collected via the web site by querying the site's internal search engine for geocaches. The problem is, however, that the search retrieves geocaches (which there are over 200,000) in a geographically bounded area, as the individual participation may be diffused globally. In other words, it excludes all interaction for players taking place outside the defined boundary, and searching for all over 200,000 geocaches is impractical. However, if the study were merely interested in the development of the geocache network in a designated area, such as the Bay Area (California), the data would serve the purpose, although outside influence on local practice would be neglected.

The above illustrates a typical dilemma in network studies: As the analysis is concerned with relationships (not the intrinsic properties of subjects) and as one or two special type of relationships may explain the dynamics of a community (such as a central subject connecting otherwise disconnected sub-groups), it is problematic to exclude subjects before initial analysis. However, the initial boundaries have to be drawn somewhere but the researcher should at the same time acknowledge that they may need be redefined as new information emerges on the nature of interconnectivity. In many cases, the best way to proceed is to iterate between choice of boundary and phenomena investigated if complete data is impractical to acquire.

5.2 The Data

The data was retrieved in January 2006 using a specially developed Web robot. The plan was to acquire data on all geocaches hidden in the Bay Area (near San Francisco, Berkeley, Oakland and Marine County) including the blog entries in which players articulate their visits. The robot retrieved a total of 1,118 caches and 57,412 blog entries posted by 4,653 individual players. Of the 4,653 individuals those 749 having found caches in Berkeley separate profile data was retrieved. This was used to examine the origins of the players having participated in the local Berkeley game community.

To get a better sense of the data, see figure 1 below for a plot of cache finds for a given player. Each of the red markers indicates a cache find, and they are projected onto their actual geographical locations using Google Maps technology²⁹. The player whose finds are projected has well over 1,000 finds overall as only 330 are observed in the data, indicating participation extending well beyond the boundaries of this study. Notice how the cache finds are concentrated in San Francisco (the peninsula) and Marine County (North of San Francisco) where the individual lives.

Although network data sets are required to be complete (as discussed in beginning of section 5), data in Geocaching is never complete until all cache data is acquired. This is impossible, however, as there are more caches created daily than the Web robot can retrieve. This is also a worthwhile consideration for third-party developers to keep in mind when considering retrieving community data for services. A viable solution in such circumstances is to gather an initial data set (such as done here) and analyse the connectivity of the network based on the number of subjects for whom the data is complete. The collected data set turns out complete for only circa 300 subjects of the observed 4,653, indicating that the interactions of subjects are well diffused geographically. A more careful analysis also reveals that the 300 subjects for whom the data is complete have only a few finds, many being early quitters³⁰. This analysis on the data indicates that the data for the reliable study of social networks is still far too small. For example, consider the player whose finds are projected in Figure 1. The data represents only about 25 percent of his interactions.

In addition to the problem of data completeness, another problem emerged. It turned out that when searching for caches based on location www.geocaching.com reports only live caches, excluding all temporarily disabled and archived ones. For the geocacher this is a desirable feature but for reconstruction of community history it results in missing data. Fortunately the community history can be accurately reconstructed by other means. Unfortunately, however, this other method provides poor scalability as it involves retrieving the participation per individual. A complete participation history was constructed nevertheless for a group of 23 players having participated in an event cache in Spring 2005. The motivation was to examine the level of shared history and idiosyncrasy for a group and get an idea of how well the players overall connect with the global Geocaching community.

²⁹ Figure 1 was constructed using a script that first inquires the local research database for cache locations and dynamically writes JavaScript code. This code is posted online and when retrieved by the Web browser invokes a request to the Google Maps API that takes care of rendering the data onto the map interface.

³⁰ It might be impossible to determine whether a data set is complete for a given subject given incomplete data. But in some cases, as in geocaching, local data includes global descriptions for subjects. The piece of information we use is the number of cache finds made by the player overall (the locally observed information on individual's global participation), and calculate the ratio of observed interactions over all interactions in the community. If the ratio is 1, we can say the data is complete for the subject.



Figure 1. Cache finds from the data set for a given player projected onto their correct locations. Red markers represent caches (there are 330 markers).

6 Network Theories and Geocaching

In this section I will describe some of the central concepts to the study of networks and analyse using the data retrieved from the Geocaching Web site how the theories translate and how they help us understand the functioning of a mobile content community. The theories I have chosen for this analysis are the *strength of weak ties* theorem (Granovetter, 1973), the idea of *homophily/heterophily* (Rogers, 2003), *preferential attachment* (Barabasi and Albert, 1999) and *scale-free networks* (Barabasi, 2002). I could have chosen the theories differently, but I believe these theories work well together. This section is organized so that after presenting each of the theory. I will start by discussing preferential attachment that relates with scale-free networks, then we move on to discussing heterophily/homophily and the strength of weak ties. But first let us discuss how we define social relationships.

6.1 Defining Social Relationships in Geocaching

If we want to study social networks by utilizing publicly articulated information online, there are two ways in which relationships can be defined. In the first, relationships are considered based on point-to-point interaction, such as message exchange. In the second, relationships are considered as shared affiliation, such as having acted in the same movie (Watts, 2003) or worked in the same corporate board of executives (Davis and Greve, 1997).

Although the Geocaching Web site data does afford means to model social relationships using both methods, affiliation makes a lot more sense. One should always take into consideration the practice at hand and what type of data the users are producing. In the case of Geocaching individuals are not trying to articulate relationships (point-to-point) but affiliation in respect to certain type of experiences. If someone wanted to study social networks where relationships are articulated point-to-point (not via af-

filiation), systems worth investigating include www.friendster.com, www.orkut.com and www.linkedin.com³¹.

When studying affiliation networks, it is useful to acknowledge their dissimilarity. In Geocaching there are at least two distinctly dissimilar types of affiliation: The typical geocaches inviting asynchronous (individual) participation and the (shared) event caches inviting synchronous participation. The primary activity resides in the asynchronous activity, this being the environment in which a sense of belonging and awareness of one another is created and maintained. The event caches then serve the purpose of "putting names with faces" as one subject put it, and promote further cohesion among participants having found the "strength" to face one another face-to-face.

6.2 Preferential Attachment³²

One way to understand participation in a community is to examine the way in which individuals, groups or generations are connected to one another. We can assume that the connectivity for individuals gradually develop during participation but connectivity is almost never evenly distributed, some being better connected than others. From the point of view of social dynamics it is important to understand how connectivity evolves in a community, how it is distributed, and what mechanisms produce it.

Barabasi and Albert (1999) have proposed a very simple and intuitive model on how connectivity in a network evolves when nodes display preference regarding what node to connect with. Barabasi and Albert originally proposed that the probability for a node receiving a new connection is linearly dependent on its current connectivity. Say, if a node has 10 connections and another node has five, a new node in the network is bound to connect to the node with ten connections twice as likely than with the one with five. Such departure from random connectivity was a significant step forward in the study of network dynamics since the mechanism seemed to explain the evolution of connectivity in many real life networks, such as the movie actor network studied by Watts and Strogatz (Watts, 2003), link structure on the World Wide Web, among others. What was particular to these networks was the existence of few disproportion-ately well-connected nodes. Preferential attachment seemed to produce distributions in connectivity where few powerful nodes emerged, and explained such advantage arising from seemingly minor advantage in initial connectivity that locked in further incoming connections.

6.3 Results: Preferential Attachment and Geocaching

In the context of Geocaching I wanted to find out what the mechanisms are for "connecting" among people via caches and eventually determine the type of social structure the mechanisms produce. To investigate, I used the data set of 1,118 caches and respective blogs and calculated how the popularity of caches evolved during the first 12 months since placing the first cache in the Bay Area. Preferential attachment would claim that if players decided to visit caches based on prior visit frequency, few caches would emerge as dominant, others getting very few hits. On the other hand, if the number of prior visits to caches were indifferent to the players (and no other attribute dominated the decision process either), we should see visit frequencies similar from cache to cache.

Figure 2 below represents the development of cache popularity for all caches observed in the 1,118 cache data set from January 21, 2001 to January 21, 2002. Each of the legends in the graph represents the cumulative number of visits to a given cache and begins on the month of the cache going live (months being indexed 1 through 12). Although one of the first caches achieves highest cumulative visit count, its rate saturates around Month 8. This suggests that there are no super nodes in the network: the underlying mechanisms being different to those in preferential attachment. Couple of things can explain the observed. Firstly, the game does not motivate revisits, consistent popularity requiring a steady stream of

³¹ Note however that applications such as LinkedIn also use affiliation, although the primary connection appears to be the one-to-one personal relationship.

³² The concept of preferential attachment is closely affiliated to scale-free networks as these networks arise from the preferential attachment mechanism of network evolution. These networks are commonly referred to as scale-free as there is no cut-off for the degree distribution. In a way, they are of infinite scale and display no upper bound for the number of connections for a node (the degree distribution continuing to infinity). Please consult (Watts, p.104) for more.

"new faces." Secondly, the game is heavily dependent on the mobility patterns of the players. When locals have made the find, further activity relies on visitors. Thus, it is possible there are two phases to cache visits: the rush of the locals and the steady stream of visitors to the area. When the locals have exhausted their interest, only visitors and new locals keep the caches alive.



Figure 2. Cache popularity. Each legend represents the cumulative number of visits made to the cache.

In Figure 3 I have calculated the visit rate as visits on average per month for each cache. Each of the bars represents a cache in the order of its creation, Cache 1 being the first one created and 49 the last one during the 12 months studied. It is interesting to observe that visit rates are rather uniformly distributed, no single cache dominating. If one does dominate, it is Cache 46. The cache is called Sounds of the Bay and is hidden near Fisherman's Warf in tourist San Francisco. Since it was created in December 2001, its 11 visits per month rate is calculated only over a period of 30 days. However, it has maintained this exceptionally high rate since, being the most popular in the area to date. This suggests that location and the *existing* mobility patterns of the users are important in determining success. Nevertheless, this does not imply that popular caches would be significant socially. Such an inquiry is left as future work.

In any system in which content is user created it would be useful to understand what motivates content creation and what are the consequences of patterns in content creation. The preferential attachment model of network evolution (as proposed by Barabasi and Albert) does not really help in this inquiry. In fact, few network theories do. The problem of preferential attachment is that it assumes the node creation and connection processes as independent, not reciprocated. I will leave the design of new models as future work, but it is still worth taking a look at the statistics on cache "production" and "consumption." See figure 4 and 5 on how the two are correlated. Note however, it is impossible to determine causality from these figures alone.



Figure 3. Average visit rate for cache. The visit rates for each cache represented by order of going live. (Cache 1 was first, 49 last to go live during first 12 months.)



Figure 4. Caches created.



Figure 5. Visits to caches.

Now departing from the statistics outlook on data I have plotted the *group interlock network* that represents how the caches are interlocked with one another. Whereas the above data represented the visit frequencies of distinct caches, this network represents the relationships among the caches. The relationships are determined based on visits of the players. That is, caches visited by the same players are related. See figure

6 below. The caches are labelled with their true names. Note that relationships are non-directed (the order of visits being overlooked).³³



Figure 6. The group interlock network for caches visited during first 12 months.

What we can observe from figure 6 is how "caches share players." Consider the extreme case of bell weather boat and Admiral's Reading Room. All the people having visited bell weather boat also visit Admiral's reading room. But equally interesting is the lack of relationships. Consider the caches on the opposite sides of the network diagram. They have few people in common therefore they segregate the community. For example, consider Willies Cache: A Looney Tunes Puzzle Cache (on the left) and Only on Sunday! (on the right). They have no players in common. Community uniting caches can be observed as well. Consider Olde Growth Cache right in the middle. It is a "landmark" cache that "shares" players with most other caches. It therefore is common to most players engaged in the network. However, we should keep in mind the limitations of our data. Since it does not represent all interactions for the players observed, we cannot determine the roles of the caches for certain. For example, in figure 6 the caches on the left and right of the graph appear non-related but new data could in fact produce now missing relationships. This is one of the central challenges in network data that was already discussed in section 5.3. And these limitations in mind I will restrain from doing node categorisations yet I have collected more data.

I will now move on to discussing social interaction within the community through the principle of heterophily/homophily and the strength of weak ties. Whereas this section concentrated more on the role on caches as resources upon which a community emerges, in the following discussion the focus is on the network of individuals.

³³ The interlock network was constructed using Ucinet network toolbox by first creating the affiliation network then transforming it columnwise as adjacency matrix and plotting it with NetDraw.

6.4 Heterophily/Homophily and Strength of Weak Ties

A central principle for human communication is that exchange of ideas occurs most frequently among individuals similar to one another. In network studies similarity is commonly referred to as homophily, and dissimilarity as heterophily. When people are similar communication becomes more effortless and thus more effective. On the other hand, when dissimilar people interact, the exchange of ideas requires more effort as there is less common ground. Communication may seem inconsistent and cause cognitive dissonance, an uncomfortable psychological state. For these reasons people typically group together with those with whom communication of ideas is more fluent. In other words, people arrange themselves in homophilous structures.

The paradox in social formation and communication is that organization in homophilous structures restricts opportunities to adopt new ideas. Granovetter conducted the seminal work in this field by studying the process of acquiring a new job (Granovetter, 1973). He found out that 56 percent in his sample acquired a job through personal connections, another 19 percent used formal means (such as advertisements and headhunters), and roughly 20 percent applied directly. This is not surprising, but of the 56 percent most of the personal connections were "weak ties" job applicants interacted only occasionally or rarely. This was the surprise in Granovetter's work: New opportunities arise mostly from our less maintained connections that are typically of the heterophilous type.

If we are to understand how well a community provides opportunities for adopting new ideas or caters for the rapid diffusion of innovation, we should pay attention to homophily and heterophily. From the point of learning and adoption of new ideas both homophilous and heterophilous structures are needed: innovations spread rapidly in a homophilous structure, but commonly there are few innovations to share (as suggested by Granovetter). On the other hand, heterophilous structures are were innovations arise. However, they are typically poorly maintained and infrequent due to the high costs of communication.

6.5 Results: Heterophily/Homophily and Strength of Weak Ties in Geocaching

In section 6.1 I discussed the social network in Geocaching as operating on two levels: the asynchronous and synchronous interaction. Both of them contribute to the *shared repertoire* (a term used by Wenger (1998) in communities of practice) of ideas, concepts, jokes, and styles that construct the way participants develop the game play and interpret their own participation in it. In this section I will analyse the type of heterophily present in both of the two modes of interaction by examining the mix of different backgrounds of participants using one variable. The variable I use is the home location of the player. It is convenient in a number of ways: Firstly, the players commonly articulate it. Secondly, it ties the participant to his/her local game community whose ideas and innovations the subject represents. Thirdly, it distinguishes differences in real life culture among the subjects arriving from different parts of the world (which is probably closest to the conventional meaning of heterophily in network studies).

For the study of heterophily I use a 749 profile sample of players having found caches in Berkeley. The objective is to determine the mix of locals and visitors coming from different locations to participate in a local Geocaching community. In future work I intend to compare the mix of background in a number of locations and vary their size to see how the mix varies. For now, however, we focus on a single location.³⁴ The experiment was as follows. Of the 749 profiles I randomly selected 100 and sorted subjects into five bins: locals to Bay Area (California), Californians outside Bay Area, Americans outside of California, for-eigners to USA, and those not having disclosed their home location. The results were as follows: 24 of the 100 were locals, 28 from elsewhere in California, 15 Americans outside California, 3 foreigners (from Canada, Germany and Kuwait), 22 chose not to disclose the information, and 8 could not be sorted. The origins of the players having participated in Geocaching in Berkeley between late 2001 and early 2006 (calculated from the 70 examples) are illustrated in percentages in figure 7.

³⁴ Note, however, that players may not in fact perceive their participation characterized by locales (such as Berkeley) but through *interaction chains*. But we will leave such actor specific analysis as future work.



Figure 7. Mix of nomadic participation in the local Berkeley Geocaching community.

What is surprising is how well non-locals are represented (considering the cost of travel). Such mixed patterns in participation are signs of heterophily and cater for opportunities to learn, adopt new ideas, and diffuse innovations in the network. For example, the player from Kuwait could have taken home ideas for creating new type of game play he encountered in Berkeley. The flow of information in the other direction is not so obvious, but through blog posts he may have rendered some of the local practices of his game community in Kuwait available to those in Berkeley. This type of "glocalized" (a term coined by Wellman, 2005) participation in which actors far and wide come to interact for a short while is a common pattern in today's global society. However, implications are not always that well known. For example, in the context of Geocaching the mixed patterns of local and global participation may well keep the community alive. Earlier in section 6.3 I suggested that caches might be short lived without visitors from outside of the local community. The results presented here seem to support the idea that visitors provide traffic to caches as locals having made the finds move on (becoming more global themselves).

Thus far I have discussed the mix of social resources in the asynchronous mode of participation. What mix of social resources are then in play during synchronous interaction – the organized events? To investigate, I selected one event cache and retrieved the participation history for each participant. I then analysed the places where the players had made finds to determine how well they mixed with the rest of the global community. The inquiry is thus similar to the above where the social mix at a given location was analysed. Here, however, the focus is on the outward reach of the local community and the mix of experiences present in the situated interactions of an event.

The event itself gathered 22 participants in Marine County (just North of San Francisco) in Spring 2005. The event was organized as a "poker run," an appropriation of poker for geocachers. Seven of the participants had over 1,000 finds, 11 had over 100 finds, and the remaining 4 (me included) had less. The number of finds ranged from circa 8000 to 50 (numbers are approximate to preserve anonymity). Such group composition is rather typical to Geocaching events, many having high number of finds, and a long participation history. There are typically a couple of beginners joining in as well, as in this case. The mix of locations visited by the group is illustrated in Table 1. The Columns represent the countries and the States in the US where the 22 group members have geocached. The trailing column indicates the number of members being affiliated by having geocached in the same region.

US destinations				Foreign destinations	
State	Memb.	State	Memb.	Country	Memb.
California	21	Pennsylvania	3	Mexico	5
Nevada	13	Oklahoma	3	Germany	5
Oregon	9	Wisconsin	3	Sweden	3
Hawaii	9	North Carolina	2	Italy	3
Arizona	9	New South Wales	2	United Kingdom	3
Florida	7	Alabama	2	Antarctica	2
Utah	7	Mississippi	2	China	2
Colorado	7	Arkansas	2	France	2
Washington	7	New Jersey	2	Netherlands	2
Massachusetts	6	Ontario	1	India	2
Virginia	6	South Carolina	1	Japan	1
New Mexico	6	Alaska	1	Denmark	1
Illinois	5	Kansas	1	Dominican Republic	1
Texas	4	Rhode Island	1	Peru	1
Main	4	Delaware	1	Vatican City	1
New York	4	lowa	1	Cambodia	1
Ohio	4	West Virginia	1	Thailand	1
Tennessee	4	British Columbia	1	Vietnam	1
Wyoming	4	Missouri	1	Cuba	1
Maryland	3	Montana	1	Costa Rica	1
District of Columbia	3	Nebraska	1	Georgia	1
Louisiana	3			Switzerland	1
Michigan	3			New Zealand	1

Table 2. Participation history of the 22 member group by location.

California is not surprisingly the most common location for the members. However, note that one of the participants has not found caches in California, him being a "daring" visitor. Looking at the data, one can determine that the group is cosmopolite in respect to participation history, many of the distant parts of the globe being represented. What is interesting to note as well, many of the distant locations are shared among participants, such as Antarctica, China, and India. Such *individual* destinations such as Vietnam, Georgia, and Costa Rica provide information to the group on peripheral community activity whereas *shared* destinations provide also for bonding as participants discover having things in common.

7 Conclusions

This study looked at some central network theories and models in the context of a mobile content community, a game known as Geocaching. The intention was both to guide the analysis of the community in question by framing the study using these theories and models, but also to experiment how well they could translate to such a specific case study. Regarding network evolution I examined how the popularity of caches developed. It became evident that the numbers of visitors to caches does not follow the preferential attachment mechanism where the popular get more popular, eventually locking in most of the network traffic. Instead cache popularity seemed to follow a different type of model where pre-existing mobility patterns of individuals – such as pedestrian traffic – as well as flow of local and global visitors construct the overall visit pattern over time. What the exact network model in the case of Geocaching is remains an open question, but it looks like it needs to take into account the reciprocated nature of "production" and "consumption" of network resources lacking in the preferential attachment model.

The study also analysed the community through select theories on network learning. The idea was to identify the mix in resources available to the participants through the two primary modes of interaction in the community: the organized events and the game of hide and seek. I looked at the origins of players coming *in* to a given location to participate in game play, and found out that over half were non-locals. At the time of Internet this is not surprising, but considering the situated nature of the game it is an interesting finding. I therefore argue that Geocaching has the mechanisms for creating lots of weak ties that interconnect local communities and give rise to the efficient communication of local innovations across the global community. I also examined the *outward* reach of the local community by looking at the participation patterns of a group having taken part in an organized event. There I found the local group having

participated in game play across the globe but also having many locations in common with one another. I thus argue the participants at such organized events possess the capabilities to develop game play having a well-represented understanding on the overall community simultaneously sharing experiences in common facilitating interaction.

Finally, the use of the Web as a source for information in this study opened up many interesting questions that were not originally part of the inquiry. Many Web sites have their own ways to structure information, some actively restricting access to it. Also, the dynamics of the practice represented by online data vary, and in most cases access to complete and current data that describes the relationships of the subjects and the evolving network structure may be unrealistic. Such nature of data, practice and conflicting interests create challenges to researchers investigating the social formation in online practice as well as third-party developers wishing to build services on top of publicly articulated social interaction data. This is a new area inviting further inquiry. Currently little is known on the structure of information on community sites, the dynamics of the activity represented, the willingness of sites to collaborate with third parties, and the consequential restrictions imposed on network analysis.

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Creative Gamers:

Examining the modding culture and its mobile prospects

Tero Laukkanen

tero.laukkanen@uta.fi

Abstract

Modders are computer-savvy gamers, who modify and extend commercially released games with their own creations. The value of user-created content has been widely acknowledged in computer gaming, and today an increasing number of developers design modding support for their games. This chapter will give the reader a thorough insight into the modding culture and its collaborative online networks by answering three simple questions: what, how and why. We will learn about the diversity of user creations – from game content to modding tools – the modders' self-sufficient yet social methods of education and content creation, and the varying motivations individual gamers have for modding. To coincide with the overall theme of the MC2 research project, the chapter concludes with a brief look at the prospects of mobile game modding. The mobile game developers interviewed for the study remain somewhat pessimistic, citing several technical, commercial, as well as cultural hurdles that prevent the support for mobile modding from being a viable business strategy in the near future.

1 Introduction

Undoubtedly the hottest buzzword in the field of information technology at the moment is Web 2.0. Referring to the new generation of Internet services that facilitate direct collaboration and information sharing among the users, the concept entails participatory technologies such as wikis, podcasts and weblogs [1]. As the Web 2.0 evangelists discuss ideas such as 'collective intelligence' and the 'architecture of participation', it is worth noting that the notion of user-centric co-production, while certainly always current, is not entirely novel. Although the commodification of culture in the industrial age has made participation difficult or even illegal, some people have always had a strong desire to be more than just audiences or consumers in their own culture. In 1992, in his seminal study on television fans [2], Henry Jenkins introduced the term 'participatory culture' in reference to the fan communities' appropriative and collaborative cultural practices. Though the fans Jenkins wrote about had little support in terms of technology, via Xeroxed fanzines, mailing lists and get-togethers they had formed a peer-to-peer network for collaboration and information sharing, thus challenging the traditional hierarchy between producers and audiences. Obviously only a few years later the proliferation of home computers and the rapid expansion of the Internet gave fans much more powerful tools for grassroots production and distribution of knowledge. Importantly, these new technologies also made fan-like behaviour attractive and accessible to the mainstream audiences [3].

While the "fandomization" [3] of popular culture audiences has been apparent for some time, it is only now that the entertainment industry is beginning to recognize the value of the actively participating communities. Only a few years ago online fan communities were still regularly haunted with 'cease and desist' letters from the studios' legal departments obliging fans to remove all copyrighted imagery from their web sites. There is, however, one field of entertainment industry, which has acknowledged and successfully harnessed the commercial value of fan productivity for more than a decade now: computer gaming. Ever since id Software's revolutionary demon kill-fest Doom (1993) attained unprecedented longevity largely in the strength of user-created content, game developers have been investing more and more effort to support fan production – or 'modding', as the practice has become known. Official modding tools are bundled with the games, parts of the source codes opened to public, support communities established, in-house workshops organized, and high-profile modding contests sponsored. The numerous fan creations, ranging from custom-made character models to so-called 'total conversions' are distributed in the gamer communities, constantly breathing fresh life to aging titles. As the industry is reaping the monetary rewards, the modders themselves are taking great pleasure from just being able to express themselves in a collaborative environment. All in all, it is difficult to imagine better poster boys for the Web 2.0's participatory philosophy than modding communities – and they have been around for more than a decade.

The following chapters will introduce the reader to the modding culture by answering three simple questions: what, how and why. What it is that modders produce? How do they do it? And why do they do it? The answers provided are based on a two-pronged study conducted during the MC2 research project. In the first part of the study, in order to gain a thorough understanding of the various forms of fan production, a wide variety of modding-related web sites were explored, and numerous user-creations tested firsthand. In the second part the focus was on the modders themselves, their working processes and personal motivations for modifying the games. An online questionnaire was set up, accumulating forty-seven responses in total from modders all over the world. For practical purposes these two studies focussed only on the fan production of three specific games: Half-Life (Valve Software 1998), The Sims (EA/Maxis 2000) and Grand Theft Auto III / Vice City (Rockstar Games 2002, 2003). The selected titles all come from different game genres and their modding scenes have evolved quite differently. Of the three, Half-Life represented first-person shooters, which have traditionally been at the forefront of modding. Half-Life itself is arguably the most modified game of all time, and its developer Valve has benefited enormously from its extensive modding support. The Sims, often described as a virtual dollhouse, has been an unprecedented crossover success, and due to the developer's conscious efforts to simplify custom content creation, has also greatly expanded the demographic profile of modders. Finally, the controversial but immensely popular Grand Theft Auto III and its sequel Grand Theft Auto: Vice City were examined together, because their modding communities are more or less the same. What makes GTA modding particularly interesting is the fact that it has blossomed without any support from the developer.

In the context of the MC2 project the objective of the extensive research on computer game modding was not only to understand the unique game-cultural phenomenon itself, but also to provide insights and inspiration when developing the supportive practices and technologies for the anticipated mobile modding communities of tomorrow. Taking a step closer to the research project's main agenda, an additional interview study was conducted with several Finnish mobile game developers. The developers' views on mobile modding will be presented in the final chapter.

Before delving into the "whats", "hows" and "whys" of the current modding culture, it is worthwhile to take a brief look at how the culture has evolved into its present form. As Aristotle put it, "If you would understand anything, observe its beginning and its development."

2 The evolution of modding culture – From hackers to mainstream

It could be argued that modding has been around just as long as games themselves. Throughout history players have tweaked the rules of games such as chess and poker to better suit their particular gaming needs. Some of these modifications have survived, while most have been long forgotten. Even if we limit our perspective to computerized gaming only, we can see that modding and gaming have gone hand in hand from the very beginning. *Spacewar* (1962), distributed as demonstrational software for a room-sized PDP-1 minicomputer, and arguably the first-ever videogame, was enthusiastically modified in the handful of university computer labs where PDP-1 was installed [4]. While it would be quite a stretch to call the small group of Spacewar hackers a blossoming modding culture, they nevertheless were doing the same thing that modders do today: modifying a game someone else has created to their own personal likings. Furthermore, the pioneering hackers exhibited certain qualities, which would become crucial not only in the development of modding culture, but also in the overall advancement of information technology. These qualities are often summed up as the 'hacker ethic'. As Steven Levy reflects on the popularity of *Spacewar* hacking:

"The group effort that stage by stage had improved the program could have stood for an argument for Hacker Ethic: an urge to get inside the workings of the thing and make it better had let to measurable improvements. And of course it was all a huge amount of fun." [4]

Hackers were driven by their passion to examine, understand and ultimately improve on someone else's code. Although that passion occasionally came at the expense of healthy social life, hacking itself was very much socially motivated [5]. Instead of money, the ultimate reward for hackers was the respect of their

peers. In the early 1960s these peers were colleagues and fellow students at the computer labs, in today's modding culture they are the fellow members of global online communities.

Of course, modding could not develop into a widespread hobby until personal computers with decent gaming and programming capabilities became commonplace. To some extent this happened in the 1980s with machines like Apple II and Commodore 64. The popularity of these early home computers gave birth to a new breed of hackers known as 'crackers'. As the name suggests, crackers were computer enthusiasts who used their programming skills mainly to disable the copy protection schemes of commercial games. Cracked games were then distributed for free among the growing subculture. Though some crackers did venture into more creative hacking – a famous example is *Castle Smurfenstein*, a *Castle Wolfenstein* (Atari 1983) parody, in which the Nazis of the original game were replaced with characters from the cartoon show *The Smurfs* – the distribution of cracked games, no matter how creatively modified, was unauthorized. The birth of a legitimate modding would have to wait another decade, until 1993 and the arrival of *Doom*.

Inspired by the innovative, yet unauthorized, modifications of id's previous title *Wolfenstein 3D* (1992) Id Software's lead programmer John Carmack – once an enthusiastic hacker himself – made a conscious effort to design *Doom* in a way that would facilitate custom content creation [6]. In practice this meant separating the art assets, such as level architecture, graphics and audio, from the main program. This content could then be edited without touching the program code and - crucially - shared independently from the executable. Id insisted that the fan-made add-ons, known as "WADs", should only work with the full retail version of *Doom*, not the freely available demo version. Demonstrating a distinctly different mindset from crackers, most modders respected id's wishes. As a consequence anyone who wanted to try the myriad custom WADs online communities were raving about had to buy the retail version of *Doom*. This helped boost the already impressive sales of the game and thus set a precedent for the mutually beneficial relationship between game developers and their fans.



Figure 1. Original Doom (left) and one of the popular "total conversion" modifications of the time, Aliens TC.

The fact that *Doom* would become the first game to spawn an active mod scene was of course also very much due to timing. At the time when *Doom* became a hit, the Internet was really starting to take off thanks to the advent of World Wide Web. Were it not for the rapidly expanding connectivity and burgeoning online communities, the gospel of *Doom* WADs would not have reached such masses and the genesis of modding culture would have been further postponed.

Encouraged by *Doom's* success the developers of next generation FPS games took their supportive efforts to increasing heights. Games such as *Quake* (id 1996), *Half-Life* (Valve 1998) and *Unreal Tournament* (Epic 1999) were designed to be even more "modder-friendly", official modding tools were bundled on the game CDs, online communities set up, and even in-house workshops organized for modders. The viability of modder support was affirmed in a spectacular manner when *Counter-Strike*, a team-based multiplayer 'total conversion' for *Half-Life* became an online phenomenon at the turn of the millennium, attracting more players than all the professionally produced FPS titles combined. When in 2001 Valve released

Counter-Strike commercially, it went on to sell millions, even though it was always available for free at the mod team's web site.

Although FPS games have been the pioneers and poster boys for the modding culture, user creativity has gradually been embraced in other genres as well. BioWare's marketing for its online/off-line role-playing game *Neverwinter Nights* (2002), for example, focused heavily on the bundled Aurora toolset, which enabled users to create their own scenarios much in the vein of traditional tabletop role-playing [7]. *The Sims* (EA/Maxis 2000), examined in this study, is as far removed from FPS games as possible, yet relies heavily on user-created content. It has also introduced modding to a new breed of 'casual modders'. Other genres where modding is quite commonly supported include flight and train simulators [8], strategy games and sports titles. According to a survey conducted in 2002, more than one third of developers provided modding tools for their games [9]. Since then the percentage has undoubtedly gone up. Even whole gaming concepts, such as the massively multiplayer online game Second Life or *The Sims*'s lead designer Will Wright's upcoming Spore, are now based upon on user-creativity.

Thus far the legitimate modding culture has concentrated on computer gaming. Although many console games have featured in-game content editors, sharing of the custom content has been problematic. However, with the increased connectivity and memory capacity of consoles it seems that the PC exclusivity is soon coming to an end [10]. Microsoft already offers content downloads on its Live Marketplace service, and has hinted that in the future users could also share and possibly even sell their creations alongside professional content providers [11].

To summarize the preceding, for the past decade modding has steadily approached the mainstream of gaming culture. Unfortunately the increased visibility has not come without a price. For example, there are increasing signs of semi-professionalism, as mod teams strive to replicate the success of commercially released mods. Although this has lead to higher production values, as Kücklich points out, 'once modding becomes market-oriented, [the modders'] motivation to innovate is likely to go out the window' [12].

Perhaps the most worrisome indication of the potential adverse side effects the "mainstreamization" of modding was the highly publicized 'Hot Coffee' incident in the summer of 2005. Shortly after the PC version of the hit game *Grand Theft Auto: San Andreas* was released, a fan-made modification called 'Hot Coffee' began circulating in the net. The modification unlocked a sexually explicit mini game, which the developers had left in the game code, but which could not be accessed without installing the mod. Rock-star's hugely popular and unapologetically decadent GTA series has always been a favourite target for various anti-gaming watch groups in the United States, so when the news about the risqué mini-game broke, a major moral outcry was inevitable. Subsequently a federal investigation was put to motion, the rating of GTA: San Andreas was changed from 'Mature' to 'Adults Only', major retailers such as Wal-Mart pulled the game off the shelves, and the game's publisher Take-Two Interactive lowered its expected quarterly earnings by \$40 million.

'Hot Coffee' debacle provided distressing insight to the precariousness of the cooperative pact between modders and the gaming industry. Throughout the incident Rockstar and Take-Two actively tried to shift the blame to the modders, at first even arguing that the whole mini game was fan-made. While the relationship between modders and developers has usually been seen as mutually beneficial, the benefits of an active mod scene are not easily quantifiable (the few commercially released mods notwithstanding) [13]. The costs of lawsuits, recalled games, and tumbling share prices, on the other hand, are very concrete. Adding another worrying twist to the issue, ESRB (Entertainment Software Ratings Board), the selfregulatory body of American gaming industry, also urged developers to suppress modding. In a statement made during the 'Hot Coffee' investigation the ratings board insisted 'the computer and video-game industry to proactively protect their games from illegal modifications by third parties, particularly when they serve to undermine the accuracy of the rating' [14]. It remains to be seen whether in the future the fear of bad publicity will force the gaming industry to completely reassess its position towards user-created content.

3 What? – The diverse forms of user-created content

It is somewhat unfortunate that the words 'mod' and 'modification' have become so ubiquitous when discussing the output of the modders. This can lead to the false illusion that every modder is essentially

doing the same thing, when in reality there is great diversity both in form and scope. Just to take one example: a *Sims* fan might cut-and-paste the face of her favourite pop star from a photograph into a *Sims* character, whereas *Half-Life* modder might write hundred lines of C++ code to change the behaviour of the game-controlled enemy. While both are certainly examples of modding the original game, to call the outcome of both instances 'mods' is vague at best.

In essence game fans modify every aspect of the games. This does not mean that everything is modified with equal enthusiasm, however; in general the most popular objects for customisation are game characters and game levels (also known as maps), while interfaces and game sounds are quite rarely altered independently. Of course the nature of the game affects the emphasis of modding: in character-oriented games such as *The Sims* it is understandable that the main focus of modding is also on the characters, while in first-person shooters, where strategic use of the environment is critical, game levels get more attention. Another contributing factor is developer support. If the developer releases an official level editor, the majority of modders will most likely create new levels. Developer may also design the game in such way that only certain forms of customisation are possible without considerable hacking. However, if these attempts to control fan production are in conflict with the fan community's desires, the community will soon enough produce its own modding tools where necessary.

Despite the diversity, it is possible to recognize certain common types of user-created content that are created for most games. To begin with, the modifications can be divided into two main groups: audiovisual modifications and functional modifications. Audiovisual modifications change the way the game looks and sounds, while functional modifications change the way it works. These main types can be further divided into several subtypes, as presented in Table 1.

Audiovisual modifications	Functional modifications
Gameplay environments	Scripting
Custom characters	Programming
Custom items	
Interface elements	
Sounds	

Table 1. Taxonomy of user-created game content

Of course, there are also fan creations that are simultaneously both audiovisual and functional modifications. For example, often the effect of a functional modification, e.g. a new gameplay feature, needs to be visualized in some manner in the game world. As noted before, modders' emphasis on the different subtypes varies quite a bit between games. Figure 2 illustrates how the various modification types apply to *Grand Theft Auto III*.

In addition to the problem of data completeness, another problem emerged. It turned out that when searching for caches based on location www.geocaching.com reports only live caches, excluding all temporarily disabled and archived ones. For the geocacher this is a desirable feature but for reconstruction of community history it results in missing data. Fortunately the community history can be accurately reconstructed by other means. Unfortunately, however, this other method provides poor scalability as it involves retrieving the participation per individual. A complete participation history was constructed nevertheless for a group of 23 players having participated in an event cache in Spring 2005. The motivation was to examine the level of shared history and idiosyncrasy for a group and get an idea of how well the players overall connect with the global Geocaching community.

USER-CREATED CONTENT FUNCTIONAL MODIFICATIONS (Scripting) for GRAND THEFT AUTO III · 3-IN-1 MOD (Bodyguard, Car health indicator, Speedometer) heart INTERFACE ELEMENTS (Weapon icon from GAMEPLAY ENVIRONMENT Real Weapons Mod; Color Radar) (Ultimate Stunt Park add-on with custom textures) **CUSTOM ITEM** ('59 Cadillac model USTOM CHARACTER and texture) (Michael Knight model & skin) **CUSTOM ITEMS** (Real Weapons Mod models & textures)

Figure 2. Modification types for Grand Theft Auto III.

Modifications of the gameplay environment change the audiovisual appearance of the game world. Typical examples of such modifications are levels/maps, which define the architecture and sound design of an entire gameplay arena. Maps are a particularly popular form of custom content for online FPS-games such as *Half-Life*. Each online battle takes place on a separate self-contained map, and players constantly crave for new battlefields to keep the game interesting. To satisfy the online gamer community most FPS developers provide official map editors for their games. Modifications of the gameplay environment can also be smaller in scope, replacing only a portion of the environment with custom content. These can be simple bitmap textures, such as wallpapers for *The Sims* and billboard advertisements for *Grand Theft Auto*, or more complex three-dimensional constructions, such as *GTA* modders' numerous add-on buildings.

Character customization concentrates on the 3D character model or on the bitmap "skin" wrapped around it. Skin editing is generally much more popular than modelling, because it is relatively simple and does not require any specialized tools. The themes for the custom characters are similar in most games, with inspiration coming mainly from movies, television and other games. Since dressing up the virtual people is a central element in the *The Sims* gameplay, skin editing has a particularly prominent role in Sims modding. Sims' skin artists also often collaborate with modellers, who provide them with proper "mannequins" for the elaborate costumes.

The category of custom items is perhaps somewhat vague, but it refers to any user-created in-game items that are not characters or static parts of the environment. The context of the game pretty much determines what this means in practice. For *Half-Life* custom items are mainly weapons, for GTA vehicles, and for *The Sims* furniture and appliances. A common incentive for custom item creation is to replace the fictional brands of the game world with familiar real world products. In the GTA games, for example, this means replacing the fictional cars with detailed models of Ferraris, Fords, Volvos, etc.

Interface elements include load screens, icons and other graphical elements that do not exist in the game world. In some games these can also be modified, but it is not particularly fashionable form of modding. Another largely overlooked form of audiovisual customization is the sound design. For *Half-Life* and *GTA* some weapon sound effect collections are available, with the sound files usually taken directly from other games.

Of functional modifications, scripting is somewhat simpler, taking advantage of the functions defined in the existing program code. *Half-Life* modders, for example, use scripting to create pre-defined actions for their maps, while *Sims* modders use scripting to "remix" the functionality of custom items. *GTA* modders have even created new minigames with innovative scripting. Unfortunately the *GTAs* are not designed with extensive scripting in mind, so using such scripted features is rather cumbersome. Programming delves deeper into the game's core, making it possible for modders to create completely new functionalities. *Half-Life* is actually one of the very few games that allow proper re-programming, which is one of the reasons why the game is so revered among modders. Re-programming the game's core mechanics has also allowed *Half-Life* modders to create very extensive modifications known as 'total conversions'.

Total conversions are ambitious modding projects that combine most or all of the previously mentioned custom content types into entirely new gaming experiences. The most famous *Half-Life* total conversion is of course *Counter-Strike*, which turns the single-player science-fiction adventure into a tactical multiplayer game where teams of terrorists battle Special Forces in various scenarios. Besides the fact that they only work if the original game is installed, very little separates top-quality total conversions like *Counter-Strike* from professional games utilizing a licensed engine. Of course there are also dozens of total conversions for *Half-Life*, which are too niche for retail release, but nevertheless have amassed a dedicated fan-base of their own. Some of the more popular multiplayer total conversions include *The Specialists*, which imitates the over-the-top style of Hong Kong action movies, *Natural Selection*, which mixes real-time strategy elements into the FPS game, *Vampire Slayer*, which pits vampires against humans, *Sven Co-op*, which enables co-operative team-play through various missions, and *International Online Soccer*, which utilizes the FPS engine to create a multiplayer football game.

There are no universally accepted criteria for what constitutes a "total conversion". Some of the aforementioned examples are more radical diversions from the original game than others. However, one thing they have in common is that they all utilize a modified source code. While *GTA* modders are not allowed access to the source code, they have created some quite extensive 'mod collections', which combine numerous separately created modifications gathered from the community. A popular collection entitled *RealGTA*, for example, replaces all of the game's fictional vehicles, storefronts, billboards and weapons with familiar real-world items. The collection also includes some simple functional modifications.

In addition to customised game content modders also produce modding tools. Unofficial tools are produced if the developer does not provide official for a certain task, or if they have proven inadequate. Maxis, for example, has released ten official content editors for *The Sims*, but modders generally prefer the unofficial alternatives. Most toolmakers are modders themselves, and the inspiration for the tools comes from particular needs confronted in their own modding projects. However, there are also dedicated "toolsmiths", whose own modding is limited to testing of the tools. The feedback loop from the community to the toolmakers is very direct, and unofficial tools are constantly fine-tuned to modders' wishes. As the following GTA toolmaker explained in the email questionnaire:

"The inspiration [for new tools] simply comes from what the modding community needs. From there I'll get a "base program", which will do the bare minimum for its purpose, then release it as a beta. Modders then download, try and then usually on the forum or by email give me feedback on what features they'd like, and I then try my best to fulfill their requests."

Through continuous iterations unofficial tools may ultimately become so efficient that even the developers prefer to use them. The official *Half-Life* (and *Half-Life* 2) level editor Valve Hammer, for example, started life as an unofficial editor for id Software's *Quake* [15].

In addition to mods and modding tools there are of course many other forms of game-related fan production, such as websites, fan art, gameplay videos, and game guides. Although this game memorabilia was not investigated in my own studies, it must be emphasized that the modding community is an inseparable part of the game's larger fan community, and many of the modders engage in other forms of fan production as well.
4 How? – Learning, creating and sharing in a "modding scene"

In the context of Web 2.0 discussion, modding makes a particularly interesting object of study because of its pronounced "cyber-communality". For all intents and purposes the whole subculture exists solely in the virtual realm of the Internet. In the processes of learning the craft, creating custom content and sharing their creations with other gamers, modders employ the resources of multifaceted collaborative online networks. Some of these networks are purely utilitarian, some of them more social in nature. Together they form (sub-)cultural economies, which I refer to as 'modding scenes'. Figure 3 depicts the generic structure of a modding scene and the primary interactions between the actors. Each game (or game series) has its own, usually quite autonomous modding scene.



Figure 3. The collaborative network of a modding scene.

4.1 Learning

As described earlier, the past decade has seen modding steadily inch its way towards the mainstream of gaming culture. One indication of this is that modding is becoming a common method of teaching at game design schools. However, although it is now possible to learn various aspects of modding at educational institutions of the "real world", only precious few modders learn their ropes in a classroom. Or, given the option, would even like to. Much of the fun in modding comes from the sense of discovery that can only really be achieved via trial and error approach. As one *Half-Life* modder describes his learning process:

"I'm self-taught. I use to look at how the professionals did the game and I try to toy a bit at first. What if I change this? Hey! this would be cool if I did the same here, and so on."

Compared to the authoritarian classroom learning, the more freeform self-education can actually be very effective. As Himanen notes, "The examples of the ability of ten-year-olds to learn very complicated programming issues tell us much about the importance of passion in the learning process, as opposed to the slow going their contemporaries often find their education in traditional schools to be." [5]. Although modding extends beyond the intellectual challenges of programming, the same passion for exploration and personal development is transferable to the more artistic forms of user creativity. Of course, relying on trial and error as the only method of learning can be unwise, as the following GTA modder observes:

"I'm a self taught programmer. This is good in some ways, as working everything out for yourself naturally gives you a better understanding of it, but the downside is that you could be re-inventing the wheel, or taking a complicated approach to something which might not require it."

To avoid re-inventing the wheel most modders take full advantage of the knowledge resources offered by their participatory network. The countless step-by-step tutorials archived on community sites and myriad of discussion forums dedicated to modding related issues constitute the 'collective intelligence' [16] of the modding scene. Idealistically, via the information pool of a mod scene, the accumulated knowledge of all modders is always available to every modder. In the eloquent words of Levy 'no one knows everything, everyone knows something, all knowledge resides in humanity' [16].

Of course, modders are nowadays rarely completely on their own when it comes to learning the craft. With the value of productive fan communities well established, developers are increasingly willing to lend a helping hand. Although the extent of developer involvement varies, it is common to at least provide user's manuals for the official modding tools, and to set up a community site where additional information can be shared. Developers can also outsource modder education. While this was not the case with any of the modding scenes in my own study, *Unreal Tournament* developer Epic Games, for example, has partnered with a training company called 3D Buzz for a series of training videos and a comprehensive book on *Unreal Tournament* modding.

4.2 Creating

Modders also rely on the participatory network in the actual creative process, as they collaborate with each other via the online communities. Of course, because the forms of user-made modifications are so diverse, the extent of collaboration also varies greatly. The most obvious venues of cooperation are 'mod teams' working collectively on a total conversion mod. Like professional development teams, total conversion teams require individuals with specialized skills - level designers, modelers, programmers, and even composers – working together towards a common goal. One notable difference is that mod teams usually collaborate exclusively via the Internet, utilizing members-only discussion forums, real-time messaging services, and private playtesting servers. While Internet collaboration allows modders from all over the world to work together, the lack of face-to-face responsibility means that commitment to the project can falter easily. All in all, only a tiny fraction of the total conversion projects ever reach a playable state. When a mod "dies", it can be very frustrating for those who had invested time, effort and expectations into it. The following *Half-Life* modders account their (separate) bad experiences.

"I have contributed to another mod (Hybrid Theory) However the mod recently died and I am very angry about it because I gave up several hours of not only my time, but the time I could've been using for Night at the Office. I will definitely not work on 'someone elses' mod again, as it is not worth the gamble that the mod may not even get released and your hard work goes to waste."

"I have worked with other people on 'failed mods', however these collaborations do not usually work well as the mod leaders on these projects are often inexperienced and do not realize the difficulty of the task and will frequently abandon the project at the first sign of any real work."

The collaboration on total conversions is not limited to the confines of the actual mod team. In the development phase the feedback and encouragement from the fan community that (hopefully) forms around the mod is obviously very valuable. Once the mod is released the collaboration becomes more concrete, as fans also start creating new content, such as maps and character skins, for the mod. Indeed, it is actually somewhat misleading to say talk about *Half-Life* modders, when in reality most modders create content for one of the game's numerous total conversions. Total conversion communities are usually quite autonomous, collaborating via the discussion forums on the mod team's web site.

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Figure 4. Fans of the popular Half-Life total conversion The Specialists utilize online forums to exchange modding-related information and to collaborate on modding projects.

Besides total conversions, modders often also collaborate on less extensive modifications. When working on stand-alone creations, such as maps or characters, the modders' primary modes of cooperation are feedback and testing, and content recycling. To receive feedback modders post images of works in progress to the discussion forums. Community sites usually have dedicated forums for this very purpose. If possible, modders may also provide playable versions of the unfinished creation so others can test it and get a better feeling about possible problems. It is common that during the creative process several iterations of the modification are posted, with each fine-tuned according to the peer feedback.

A very common practice among modders is also to use someone else's creations as a basis or as an element of their own work. Modelers, for example, often tweak existing character models, and mappers borrow prop models and textures to spice up their maps. Recycling is especially popular among beginners, as it allows them to create something tangible very quickly compared to creating everything from scratch. Most often the reworked/recycled content is extracted from the original game (or from other games), but the publicly available creations of other modders are also commonly harvested. Unfortunately, perhaps due more to the adolescent obliviousness than maliciousness, proper credit is not always given to the original authors. Indeed, content theft, whether purposeful or accidental, is one of the issues that seem to cause much friction in the modding scenes. As the following *Sims* modder explain:

"The biggest feather-ruffler [in the modding community] would have to be thievery, be it by newbies, who don't know any better, or by experienced enough modders, who think they can pass it off as their own. Heaven forbid one should be accused of stealing, there is no worse offense in the community."

4.3 Sharing

Though custom content can also be created for personal use and enjoyment, majority of modders release at least some of their creations to the wider community. There are three primary channels of distribution for custom content: personal sites, community sites and general game file archives. The importance of these varies somewhat between mod scenes. Prolific modders usually have their own personal websites where they can present their own creations and receive direct feedback. Modders often put just as much effort on their sites' appearance as they do on the mods, and even register their own domain names. In *The Sims* scene 'team sites' where a handful of modders share their creations are also plentiful.

By far the most important forums for custom content distribution are the collective file archives on fan community sites. (Even modders with personal sites often upload their creations to the community archives for added exposure. On the other hand archives sometimes acquire content from modders' personal sites without asking permission, which has occasionally caused ill feelings.) Community archives often feature editorial reviews, user ratings and download counters, which give modders highly valued peer feedback and help users find quality content.

Because of their large file size total conversion mods are usually distributed via commercial game file archive services such as Fileplanet, FileFront, and GamersHell. Since the archive sites host commercial game content such as game demos and trailers alongside amateur mods, they are very popular among gamers, and are able to present mods even to the more casual gamers who do not actively follow modding community sites.

One of the unwritten laws of modding culture has always been that mods are distributed for free. However, as more and more people enter the scene, modders can no longer escape certain realities of the commercial environment it operates on; namely the fact that bandwidth costs money. One of the popular Sims community sites, for example, has reported monthly bills of several thousands of dollars [17]. While such expenses are of course rare, it takes quite a philanthropic modder to shell out even a fraction of that from her own pocket. Hosting expenses have become a particularly acute issue in *The Sims* mod scene, where downloading and using custom content is common even among casual gamers and traffic on popular sites therefore enormous. Sims modders have come up with two primary funding models: donations and subscriptions. Donations are optional, but sites accepting donations often reserve certain custom content items only for their "benefactors". Most of the biggest collective file archives in *The Sims* scene charge subscription fees, with only a small sampling of the archives' content available for free downloading. While donations seem to be a commonly accepted form of funding, the subscription sites, or 'pay-sites', have caused quite a bit of controversy among Sims fans.

At the moment *The Sims* modding scene is, to my knowledge, the only one where such pay-sites exist. However, as custom content creation and usage becomes a more mainstream practice, similar situations are bound to arise elsewhere as well. One possible solution to the problem is developer participation. Currently this kind of support is surprisingly rare. Ironically, EA/Maxis is one of the few that does provide an official venue for content sharing. The Sims Exchange service enables automatic uploads and downloads directly from the game itself. However, the service only accepts custom content created with the official tools, so Sims modders still need alternative distribution channels as well.



Figure 5. To cover hosting expenses, most of the user-created content on the popular Sims Resource archive is only available to paying subscribers.

Valve's online content delivery system Steam demonstrates another approach to developer sponsored mod distribution. Several "Steam approved" total conversions are showcased in the Steam store alongside commercial titles (albeit not quite as prominently), and Valve has suggested that mod authors would eventually be able to collect royalties from the total conversions distributed via Steam. Of course, whether this is beneficial for the modding culture in the long run is open to debate. As discussed earlier, an increasingly market-oriented approach to mod making can lead to risk-averseness and stifle innovation. Worse, it could end up destroying the collaborative community spirit so central to modding. As Mactavish stresses, rather than just celebrating the participatory aspects of modder networks, we should pay close attention to the ways in which commercial interests attempt to regulate modding [18].

5 Why? - Modder motivations and industry incentives

To ask why modders create modifications is akin to asking why someone likes to write or draw or play tennis. Obviously people are bound to have varied reasons for choosing their hobbies. Furthermore, these motivations often change over time, thus a person's motive for taking up modding may have been very different from the motivation to still continue with the hobby. In fact, most of the modders that responded to my email questionnaire had found modding more or less accidentally, and first experimented with it simply out of curiosity. While many of them had prior interests – such as drawing, architecture and programming – that in hindsight suggested they might enjoy modding, few had any pre-existing desire to create content for games, nor career plans relating to game development.

"I think I visited the official site to register my game and found the community page and started visiting the sites listed. One site led to another, etc, etc, etc." (*Sims modder*)

"Searched for cheats for GTAIII on the PS2, came across GTAforums.com, and got into the modding scene." (GTA modder) The fact that modding scenes are always tightly knit with other online fan activities practically ensures that avid gamers will stumble upon modding at some point. Of course nowadays developers also often promote the availability of user-created content and modding tools in the back of the game box. However, more interesting than the initial reasons for trying out modding are the reasons that encourage some of the gamers to continue with it after the first experimentations. In this regard the questionnaires revealed quite a few different motives. Though naturally most modders had a mixture of reasons for modding, there usually also seemed to be one primary motivation. Based on these primary motivations, the following modder profiles could be recognized: fans, controllers, artists, hackers, contributors, and socializers. These six profiles can be organized into three groups based on the source of motivation: for fans and controllers the primary motivation for modding stems from the game itself, for artists and hackers from personal interests, and for contributors and socializers from the modding community.

Profile	Source of motivation		
Fans	Came		
Controllers	Game		
Artists	Personal interests		
Hackers			
Contributors	Community		
Socializers			

Table 2.Modder profiles

Fans - Although all modders are bound to be fans of the game, here the category of fans refers to modders who have chosen to modify their game primarily because they want to extend their own "love affair" with the game. These modders could be compared to fans of TV series who get more mileage out of their favourite show by writing fan fiction (= original stories based on the fictional universe of the series), creating remixed videos of episodes, etc.

"I was totally addicted to *GTA3* and *Vice City* from the minute I got my hands on them, and after I'd played them every which way possible, modding was the only way to take things further." (*GTA modder*)

Controllers - Controllers have taken up modding because it enables them to tailor the games exactly into their own liking. Here again the analogy with fan fiction is apt, as modders attempt to fix the "plot holes" game developers left, and engage in "what if?" games with the game world.

"I like being able to control my gaming experience by creating my own things instead of relying on someone else's interpretation to get exactly what I want." (*Sims modder*)

Artists - For the artists modding is mainly a forum for creative expression. They enjoy visual aspects of modding, such as 3D modelling, skin editing, and mapping, and take pleasure from seeing their creations come alive in the game. Artists often have prior interests, such as drawing, graphic design or architecture.

"I prefer mapping. It simply is what I'm interested in (in creating new worlds). It is a great and fun feeling to create something and then see it come to life." (*Half-Life modder*)

Hackers – Hackers are "old-school" modders who relish the intellectual challenge of modding. In the modding communities they tend to be coders and/or toolmakers, and often have prior interest in programming.

"I see my main occupation in finding out new ways of modifying the game, like decoding file formats. And to make my findings useful to others, I create tools." (*GTA modder*)

Contributors - For the contributors being able to provide the community with new game content, modding tools, and assistance is an especially important motivator. They take great pleasure from knowing that others enjoy their creations.

"The most enjoyable would be seeing people using and, more importantly, enjoying the custom content I have made." (*Half-Life modder*)

Socializers – Like contributors, socializers enjoy being a part of the like-minded community, but they are content with a more passive role in it. They may not enter the modding scene in the hopes of making new friends, but once the relationships are established, they can become the glue that ties the modder into the scene.

"The best part would be simply getting together with others, and working together as a team to learn to do things which no one thought possible, and making some friends along the way." (*GTA modder*)

It must be stressed that the aforementioned profiles are not mutually exclusive; if a modder falls into the fan category, for example, it does not mean that she could not also value greatly the creative or communal aspects of modding. In particular, practically all of the modders that took part in the email questionnaire seemed to hold the positive reaction from the community in high regard. In this sense modding culture closely resembles what Raymond in his analysis of hacker subcultures refers to as a 'gift culture' [19]. According to Raymond, gift cultures arise in situations of abundance where everyone has access to everything they need, and the only available measure of success is reputation among one's peers. Raymond does not dismiss the personal satisfaction derived from the creative process itself, but insists that all hackers take part in this 'reputation game' whether they are aware of it or not. While the hacker subculture is perhaps more competitive than modding – the goal of hackers is usually to improve something, rarely just to change it to their personal liking – few modders are totally immune to peer recognition.

"The most enjoyable part was to release a map that everybody loved, and that map would start getting overplayed!" (*Half-Life modder*)

"Most enjoyable: The positive feedback, so much so that I feel like a celebrity, lol." (Sims modder)

6 The prospects of mobile modding

As noted in the introduction, one of the incentives for the extensive study on computer game modding in the mobile-oriented MC2 research project was to provide some foundation for the development of the supportive technologies and practices for the mobile modding communities of the future. During the three years of MC2 project mobile modding has not yet materialized in any significant manner, although there are interesting experiments in the arena, such as Nokia's open-source MUPE platform for multiplayer games. The absence of mobile modding activity is perhaps a little surprising, considering how commonplace other forms of DIY activity, such as personalized ringtones, backgrounds and logos are in the mobile space.

To find out whether there is any particular reason for this absence, and to learn what exactly the prospects for mobile modding are in the near future, an interview study was conducted in the fall of 2005 with several leading Finnish mobile game developers. Eight people in total participated in the study, coming from Digital Chocolate, RedLynx, The Rocket, Rovio Mobile, Sulake, and Universomo. Because one of the other main themes discussed in the interviews was mobile game design, the participants all were (or had been) game designers. At the time of the interviews most of them held a senior position and had some organizational responsibilities in their companies.

The developers' views regarding mobile modding were very similar, suggesting they are perhaps representative of the mobile games industry in general. In essence, the developers were quite pessimistic about the prospects of mobile modding at least in the next couple of years. At the moment there are still too many technical and commercial hurdles to overcome to seriously consider building support for user-created content in the games.

In the technical side the limitations of the Java platform coupled with the plethora of handset types were cited as major problems.

"In J2ME [exchanging content between server and client] works very poorly and in most phones not at all. That's where it falls apart for us. Java application made with J2ME can't use external data or

modify its own data. If we produced Symbian based games, it would be possible. But then, bye-bye mass markets."³⁵ (Developer 1)

The file size limitations particularly in the low-end phones also make it difficult to support user-created content in the downloadable market.

"In S40-phones you typically only have 64 kb of space. You can't assign 12 kb of it to some widget that only communicates outside, because then you wouldn't have much room for the game itself." (Developer 1)

While it is usually possible, as one developer noted, to find workarounds for most technical hurdles, it was the business side of mobile modding that troubled the developers the most. The success stories from computer game modding did not convince them that similar approach would prove successful in the mobile space.

"It's not so much about the technology, it's more about whether we want to allow such a thing. [...] The mobile world is quite different from PC or others. It's like...you have to keep it pretty secure. Because if it's easy to change something, it will also be easy to copy whatever you want. So in general preventing cracking is the issue there...or maybe postponing is a better word. [laughs]" (Developer 2)

Besides piracy, developers were worried about the additional expenses modding support would generate. With much smaller budgets than in PC development there is also less latitude, and every penny has to be put to good use.

"It would be quite expensive to make such a level editor. So it would be like an additional expense. [...] And after all, you are measuring production costs, so you would have to have pretty persuasive arguments to make such a thing, and not use the money just to make the game itself better." (Developer 3)

Some developers were concerned that the availability of user-created content could hurt their own sales.

"If you make it so simple that anyone can do it, then what's the point in making sequels anymore? [...] You have to think carefully about the modding, when you want to go there with each title so that it won't kill the commercial potential of the game." (Developer 3)

As for more indirect sales effects, it was noted that poor quality of user-created content could potentially tarnish the entire brand thus diminishing its commercial value.

While the technical and commercial issues troubling the developers were perhaps somewhat predictable, there were some thought-provoking observations about the whole concept of mobile modding. In short, does it even make sense?

"The reality is that mobile gaming is still very marginal. And the whole culture...it is as casual gaming as can possibly be. The phone is a device that you use now and then, incidentally. The level of commitment is utterly different than with console or PC gaming, or online gaming. It's such a different universe that I just don't see [it happening]" (Developer 2)

"One good question I think is that why would someone want to create content for mobile games, when it could be much more impressive and creative for PC games, where you can really take the graphics and audio so much further?" (Developer 3)

Despite the generally pessimistic outlook, there was a glimmer of hope that technological advances such as 3G would eventually enable something resembling modding in the mobile context.

"I'm sure modding will eventually come to mobiles in some form. Probably some tools will be in the web. That will be the first step. [...] And one thing that will certainly be used for modding is the camera. Like for example you can exchange some backgrounds and some textures. You'll take a picture and it will end up there. I'm sure we'll see things like that pretty soon." (Developer 4)

"If you look at three years from now, I think 3G will change the situation massively. When downloading times decrease and processing power increases, perhaps we will see something like a share-

³⁵ The interviews were conducted in Finnish. Translations by the author.

ware, freeware games culture in mobiles. [...] In a couple of years you'll have a mobile phone in your pocket that's maybe more powerful than a PSP, has a big screen, broadband connection and other stuff... It's a whole different situation then." (Developer 3)

However, there were also developers who were much more conservative, even cynical in their estimates of the technological advancement in the foreseeable future.

"This industry hopes and prays that the same thing would happen here that has happened with computers, meaning that as the high-end constantly advances, the rest of the market will eventually follow. The problem is that, at least based on what we've seen so far, the big masses pretty much stay put while the high-end races out of reach. So the nightmare scenario is that in three years time we'll have high-end phones that are beyond our current comprehension, but most people will still play games with more or less similar phones as they do now. [...] After all, playing games is not as high in the needs hierarchy as it is with computers. You don't stop doing other stuff to play games with your phone. You play with the phone when you need to kill time. It's a time sink so to speak. Therefore it seems unlikely that gaming would be able to bring about such technological pressures. But this industry sure would like for it to happen. [laughs]" (Developer 1)

7 Conclusion

This article has introduced the reader to an energetic gaming subculture, which collaborates via multifaceted online networks in the various aspects of learning, making and sharing user-created content. However, as we have seen, it is not all roses and dancing. Issues such as increased professionalism, paysites, and content theft – not to mention grubby old-schoolers pouring scorn on impatient newbies – prevent modding culture from being a participatory paradise. Potentially one of the most worrying snakes in the paradise is the conservative political climate in the United States. Will the fear of bad publicity in the aftermath of 'Hot Coffee' incident compel the gaming industry to downgrade their modding support into restricted customizing options with official tools?

Meanwhile mobile developers remain cautious about the prospects of mobile modding. At the moment there are no plans for developing modding support. While there is some optimism that technological advances will make it feasible and commercially viable in the future, there are also doubts whether modding will actually even make sense in the restricted mobile environment.

Nevertheless, whether mobile modding will ever catch on in a significant manner, and whether we will see increased attempts to control computer game modding, there is little doubt that developers can no longer completely ignore users' desire to put their own personal touches into the games. As one *Half-Life* modder succinctly summarized the joys of modding:

"I like the way you can alter everything, yet still making it right. The feeling of omnipotence."

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Game Experience

Gaming has been for some time already the highest growing media and entertainment domain. Furthermore, gaming and "gaming-like interfaces" are spreading to new frontiers like simulation, training, education, healthcare and even to different kinds of business processes. At the same time it has become harder to define what gaming really means. These were one of the reasons why we thought that it is important to understand in depth what game experience really is. Especially, we wanted to focus on this mutil-faceted question from the directions of mobility and sociality in gaming. Following three papers introduce three very different, but equally insightful, perspectives on game experience research.

The first paper - Gameplay Experiences and Mobile Contexts by Laura Ermi – presents a theoretical framework for analyzing user experience in the gameplay. The paper concentrates on discussing how the theoretical framework can be utilized in analyzing challenge-based immersion in enjoyable gameplay experiences. This paper is a review of psychology theories utilized in the project to describe the game experience as well as a review of the qualitative psychology tests that were implemented during the project. The paper illustrates how different games actually produce different emotions and finally serve different playing motivations. Paper also concentrates on analyzing the special characteristics of mobile gaming.

While Ermi's paper considers widely many characteristics related to the game experience varying from playability to sensory immersion the next paper by Britta Nietzel focuses more on single aspect of game experience – the spatiality. The paper is entitled *Fluid Places: On Real, Virtual, and Fictive Spaces and Places in Digital Games.* The title describes well the basis of the analysis – Nietzel explores the different ways spaces and places are defined in games and how the border between in-game and out-game space is created. Nietzel also analyzes how the notion of space and place could be created in mobile gaming environment.

Finally, while the Ermi's paper concentrated on the theoretical perspectives of game experience and qualitative measurement on the emotions elicited by gameplay, the last paper titled as *Quantitative Game Experience Studies* by Ravaja et al. describes a

complementary psychophysiological approach, were the gameplay enjoyment was measure by using direct physiological measurements during the gameplay. The authors have produced a collection of empirical game experience studies during the project. While the first tests were designed for only creating foundations for the empirical game experience research by utilizing single-player gaming test setting, already these studies produced internationally acknowledged results. According to the first quantitative studies it seems that game events, which in real-world terms might translate to negative emotions, like for example when players drop or loose something in the game, actually produce significant part of the game enjoyment. Furthermore, quantitative game experience studies were continued to analyze multiplayer gaming contexts. These studies clearly showed how playing with friends produce higher emotional responses than playing with strangers or machine. The MC2project illustrated the potential of quantitative game experience studies, and this line of research will be continued in another projects like Fun of Gaming (FUGA), which is a EU-financed research project and many ways a MC2-project spin-off.

While gaming is continuously growing and expanding phenomenon also the game experience is a concept, which gains continuously new angles. Furthermore, all the studies clearly state that different games produce very different emotions and it is apparently very challenging to make generalization related to game experience. Then again these studies all revealed new aspects on gaming, which were not trivial beforehand. Hence, even tough each game produce different experience, it is evident that gaming experience is something, which is distinct of the rules and behavior in real-life. Furthermore, understanding the game experience can be very useful while designing games, and especially important when we are including social interaction to games.

Gameplay Experiences and Mobile Contexts

Laura Ermi

laura.ermi@uta.fi

Abstract

In this chapter, a theoretical framework of user experience associated with game playing is presented and discussed in detail. The framework is based on a model that distinguishes three aspects of gameplay immersion: sensory, challenge-based, and imaginative. Especially the role of challenge-based immersion in enjoyable gameplay experiences is emphasised. In addition, games' playability, players' emotions, and social contexts of gameplay are examined. The chapter concludes by discussing the special characteristics of mobile games.

1 What is Gameplay?

Looking at the discourses of current digital game cultures, 'gameplay' is used to describe the essential but elusive quality that defines the character of a game as a game, the quality of its 'gameness'. It is a term often used when describing one's experiences of playing a certain game to other people, and anyone who plays games long enough will form their own conception of bad or good gameplay on the basis of their experience. However, there is not any commonly accepted definition on what it is – or what it isn't. To their book of difficult questions about digital games, James Newman and Iain Simons [31] have included the question "what is gameplay" and the answers of people from the games industry, academia, and elsewhere are far from consistent.

Gameplay is something that happens in the interaction between a player and a game. Respectively, it can be approached from the game design point-of-view or from the player experience point-of-view. In former case the researcher would be interested in what kind of elements, structures, rules or patterns in the game provide most interesting gameplay activities, and in the latter case what kind of experiences the player would make out of these activities based on her interpretation on her actions and reactions during the game. In order to understand what a game is and why people engage themselves in gameplay, we need to understand what happens in the act of playing, and we need to understand the player and the elements that constitute the experience of gameplay. This chapter will discuss the ways in which the gameplay experience can be conceptualised and present a theoretical framework that organises some of its fundamental components. The special characteristics of mobile contexts of gameplay will be discussed in more detail at the end of this chapter.

2 Components of the Gameplay Experience

Players' experiences with digital games are made of the same elements that also all other human experiences consist of. Thus the gameplay experience can be defined as an ensemble made up of the player's sensations, thoughts, feelings, actions and meaning-making in a gameplay setting. One way to distinguish different kinds of experiences is to sort them according to two dimensions: participation and connection (see Figure 1) [35].



Figure 1. Four realms of experience according to [35].

In case of digital game playing players do not just engage in ready-made gameplay but also actively take part in the construction of these experiences: they bring their desires, anticipations and previous experiences with them, and interpret and reflect the experience in that light. They also take into account other information such as game reviews and opinions of others. And since absorption is about directing one's attention to an experience that is brought to mind and immersion stands for becoming physically or virtually a part of the experience itself, in terms of this framework gameplay experiences can be classified as escapist experiences. The gameplay experience is not a property or a direct cause of certain elements of the game but something that emerges in a unique interaction process between the game and the player (see Figure 2).



Figure 2. Theoretical framework of user experience associated with game playing.

The framework of player experience presented in Figure 2 is a modification of the SCI-model of gameplay immersion [13]. The framework represents gameplay as interaction between a particular game and a particular game player. It is a heuristic representation of key elements that structure the gameplay experience, and is based on an idea of gameplay experiences including three kinds of engaging experiences: sensory, challenging and imaginative. Next the central concepts of the framework will be discussed in more detail.

2.1 Playability

Just like any kind of manipulation, acting in a digital game world requires relevant functionality and ways to access this functionality. Traditionally, this has been known as 'usability'. There is considerable amount of research and literature in the area of usability studies (see for example [25], [33], [36]) and traditional user-centred design offers several beneficial viewpoints also for game design. However, game design is, arguably, a much different task than designing utility applications. It is not just about minimizing the cognitive load of the user and making the software as simple as possible, as is usually the case in user interface design and evaluation [32]. Instead of requiring low mental capacity, games should be challenging and entertaining and the goal of the design should be to create meaningful play. On the other hand, according to [40] meaningful play can occur when the relationships between actions and outcomes are discernable and integrated. Since discernability indicates letting the player know what happens when she takes action, and integration means tying her actions and their outcomes into the larger context of the game, these concepts do not actually fall very far from concepts used in the field of usability. In conclusion, a usable game interface can be regarded as prerequisite but not as a sufficient condition for rewarding gameplay experiences. Furthermore, in order to experience immersion, the player must be familiar enough with the language of the interface. [19]

In game research, literature and magazines a concept of **playability** is often used instead of usability. It is a characteristic of a game that is often described as the degree to which the game is fun to play and usable, with an emphasis on the quality of gameplay [31][43]. Following the classification by [20] playability can be divided into audiovisual, functional, structural and social component. In that framework audiovisual playability refers to the style and appearance of the game, for example dimensionality (2D, 3D etc.), point of perception (1st person, 3rd person) and the degree of photorealism, and functional playability concerns mainly the control mechanics of the game. It seems that in practice these two aspects of playability are in many cases so intertwined that is not easy to separate them from each other. For example, navigation, intelligibility of the game screens, control mechanics and feedback given to the player might be considered being part of functional playability of the game, but the implementation of them is typically done by audiovisual means. Thus, together audiovisual and functional playability define the overall quality and usability of the **game interface**.

Structural playability on the other hand refers to a somewhat more complex concept: the aesthetics of digital gameplay defined by **game structures** such as game rules and gameplay patterns that emerge from the interaction between players and rules [20] [2]. For example, a rule that states that the player who collects more red tokens during the game wins, may probably result in a gameplay pattern where the other player tries to prevent him getting more of those tokens. But besides that kind of formal rule-based structures, also the **game content** might be regarded as one aspect of game's playability. Although for example the theme of the game is sometimes considered less important than the rules of the game, it is not irrelevant regarding the playability. The theme and narrative of a game guide the player to make relevant hypothesis on what the player can try to do and what kind of goals can be pursued in that particular game. Imagine for example playing *The Sims* without the theme related to people living in houses. Furthermore, for example in persistent games the insufficiency of the content may become a playability problem.

Finally, social playability refers to the kinds of social practices the game is suitable for [20]. It is not included in the framework (Figure 2) as a separate aspect of playability, because it relates to the wider concept of social contexts, and is actually present as playability through the other three aspects of playability: game interface, game structures, and game content. On this framework social playability is seen as a quality that defines for example how the game fits to different kinds of social contexts and to what degree the social context is relevant in gameplay. The role of social contexts in gameplay experiences will be discussed further in subchapter 2.5.

2.2 Different Aspects of Immersion

The concept of immersion is widely used in discussions of digital games and gameplay experiences. Players, designers and researchers use it as well, but often in an unspecified and vague way without clearly stating to what kind of experiences or phenomena it actually refers to. In media studies, the concept of 'presence' has been used with an aim to assess the so-called 'immersivity' of the system. There are different ways to define the sense of presence, but on the whole, the concept refers to a psychological experience of non-mediation, i.e. the sense of being in a world generated by the computer instead of just using a computer [27]. If immersion is defined as "the sensation of being surrounded by a completely other reality [...] that takes over all of our attention, our whole perceptual apparatus" [29] immersion and presence do not actually fall very far from each other, and are often used as synonyms [4]. However, since the concept of 'presence' was originally developed in the context of teleoperations [28], it also relies heavily on the metaphor of transportation. In the context of digital games, the term 'immersion' more clearly connotes the mental processes involved in gameplay. It is not the game or the experience that produces immersion but the player's preparedness and competency to be immersed is her investment to the experience [19].

It is often taken for granted that a bigger screen and a better quality of audio equal greater immersion [30]. It is of course likely that the audiovisual implementation of the game has something to do with immersive experiences, but it is by no means the only or even the most significant factor. McMahan [28] has listed three conditions to be met in order to create a sense of immersion in digital games: the conventions of the game matching the user expectations, meaningful things to do for the player, and a consistent game world. Genre fiction encourages players to form hypotheses and expectations and, according to [7], pleasures of immersion derive from the absorption within a familiar schema. On a very basic level, it can be argued that it is the basic visual-motor links that enable experiences of immersion even in games in which the graphics are not very impressive [18][21]. The increasing demand on working memory also seems to increase immersion [18]. For example, increase in the difficulty level may cause increase in the feeling of presence [38].

Brown and Cairns [4] have presented a classification that categorises immersion into gameplay in three levels of involvement. Ranging from 'engagement', via 'engrossment' to 'total immersion', their model is useful in pointing out how the amount of involvement may fluctuate in different game sessions and also during one game session. But this approach nevertheless fails to adequately respond to the qualitative differences between different modes of involvement; which is apparent also in the clear individual preferences different players have in different game types or genres. They note that immersion seems to have many common features with flow experiences [6].

Tamborini and Skalski [42] consider involvement and immersion as the essence of experiencing presence. According to their line of thought a game's ability to focus player's attention on meaningful stimuli leads to cognitive vigilance, involvement, whereas game's ability to isolate player from other surrounding stimuli defines its immersivity. In the gameplay experience framework used in this chapter [13] immersion is regarded as a much wider concept: it stands here for the psychological absorption and engagement that a person can experience while using media products such as games, movies or books. The framework distinguishes qualitatively different immersive experiences that are associated with gameplay experiences.

Sensory immersion relates to the audiovisual execution of games. This is something that even those with less experience with games can recognize: digital games have evolved into audiovisually impressive, three-dimensional and stereophonic worlds that surround their players in a very comprehensive manner. Large screens close to player's face and powerful sounds easily overpower the sensory information coming from the real world, and the player becomes entirely focused on the game world and its stimuli. Multisensory virtual reality environments such as CAVE [5], or just a simple screensaver, could provide the purest form of sensory immersion. In case of digital games, for example a player of *World of Warcraft* might immerse herself into the beautiful landscapes and views of the game while flying on a gryphon, or the player of *The Sims* might derive majority of her enjoyment from decorating the house to please her aesthetic eye.

In several contemporary games also the worlds, characters and story elements have become very central, even if the game would not be classifiable as an actual role-playing game. We call this dimension of game experience in which one becomes absorbed with the stories and the world, or begins to feel for or iden-

tify with a game character, **imaginative immersion**. This is the area in which the game offers the player a chance to use her imagination, empathise with the characters, or just enjoy the fantasy of the game. For example, the player of *World of Warcraft* may play the role of a night elf or dwarf, and imagine being this creature living in the world of Azeroth. The player of *The Sims* might use the game to create and tell her own stories and immerse herself into these narratives.

The form of immersion that is particularly central for games, as they are fundamentally based on interaction, is **challenge-based immersion**. This is the feeling of immersion that is at its most powerful when one is able to achieve a satisfying balance of challenges and abilities (cf. [6]). Challenges can be related to motor skills or mental skills such as strategic thinking or logical problem solving, but they usually involve both to some degree. Gameflow will be discussed in more detail in subchapter 2.3.

Since many contemporary digital games have richer audiovisual and narrative content than for example classic *Tetris*, the three dimensions of immersion usually mix and overlap in many ways. In other words, the factors that potentially contribute to imaginative immersion (e.g. characters, world, and storyline) are also apparent in the interaction design (e.g. goal structures) and the audiovisual design (how goals, characters and the world are represented and perceived) of well-integrated game designs.

2.3 Gameflow and Learning

Challenge-based immersion has an essential role in digital games since the gameplay requires active participation: players are constantly faced with both mental and physical challenges that keep them playing. Actually, one of the most influential theories of fun and creative action, the flow theory by Mihaly Csikszentmihalyi [6], identifies the 'flow state' as a particular successful balance of the perceived level of challenge and the skills of the person. In this highly intensive state, one is fully absorbed within the activity, and one often loses one's sense of time and gains powerful gratification. Digital games are generally excellent in providing opportunities for flow-like experiences since the challenges they present are often gradually becoming more demanding and thus players end up acting at the limits of their skills. In addition, the feedback given to the player is immediate. The activity of playing a game is a goal in itself. However, in the context of digital games flow-like phenomena seem to be fleeting experiences, which in turn suggests that they are something different from flow as traditionally conceived. Thus, the flow-like experiences related to gameplay could be called micro-flow [3] or **gameflow** [20], for example.

Grodal [18] regards digital games as a distinctive medium because they allow what he calls "the full experiential flow" by linking perceptions, cognitions, and emotions with first-person actions. The player must have and develop certain skills, both motor and cognitive, in order to engage in gameplay. It is widely acknowledged that digital gameplay experiences are based on learning and rehearsing [17] [23], and according to Grodal [18] it is the aesthetic of repetition that characterises pleasures of game playing. In the first encounter with a new game the player experiences unfamiliarity and challenge and starts to explore the game. After enough effort and repetitions the player can get to a point where she masters the game and game playing eventually reaches the point of automation and does not feel so fun any longer. Thus, games can be considered as puzzles that the players try to solve by investigating the game world [30].

In the framework introduced above, Kolb's famous experiential learning cycle [22] is adapted to gameplay. First the player must use her senses to obtain information from the game (concrete experience), and after that make sense of that information (reflective observation). From these meanings she can create new ideas on what to do – or try to do – in the game (hypothesis and conceptualisation). Finally, she will act on those new ideas and actively test them in the game world (active testing and experimenting), which in turn results to new concrete experiences. Generally, this way the player gradually tries to proceed in the game and solve the challenge it presents.

The **expectations and schemas** the player had formed on the basis of her **previous experiences** with digital games, games in general, or the general genre to which the particular game seems to belong, are modified to reflect the new experiences. The schemas help player to comprehend for example what is possible in a game, and what kind of strategies may be successful, and thus they influence on the hypothesis that the player uses while playing.

Besides contributing to the formation of cognitive constructs such as schemas, the gameplay is also heavily linked with the emotions of the player. The role of emotions in gameplay experiences will be discussed next.

2.4 Emotions

While it is sometimes claimed that interactive media such as games are able to provide more immersive experiences than traditional media and thus also more powerful emotional experiences, it should not be taken for granted. For example, a touching movie can make the viewer cry, but that kind of reactions are rather rare with digital games. Instead of tears, you might observe drops of sweat on the players' forehead or maybe tears of frustration at the most when the desired goals are not reached. For many contemporary digital games it seems that challenge-based and sensory immersion are more central than imaginative immersion into the worlds, stories, and characters of the games.



Figure 3. Different emotions roughly located on the dimensions of valence and arousal.

Nonetheless, **emotions** being a very central aspect of all human behaviour, it is likely that all kinds of games also provide emotional experiences. The ability to elicit emotional responses may be one of the factors explaining the appeal of digital games. People play games for the experience that can be achieved by engaging in the gameplay and 'fun' is the ultimate emotional state that they expect to experience as a consequence of playing [26][1]. The schemas that the players have shape their expectations and experience of enjoyment [7], and they may choose games they play according to their mood [4]. It is possible that people especially seek games that elicit optimal emotional responses or response patterns [38]. Thus, when choosing to play a certain game, one might anticipate it to create certain types of emotional experiences.

The central purpose of emotions is to **motivate** and guide behaviour. Emotional process begins with a quick evaluation on whether a certain event is meaningful for the person and for her own goals. This evaluation determines whether the valence of the experienced emotion is negative/unpleasant or positive/pleasant [16][34]. Another fundamental attribute of emotions is their arousal that can vary from calm or sleepy to highly aroused. For example anger is a more aroused emotion than sadness. According to the dimensional theory of emotions [39], all emotions can be described with these two dimensions: valence and arousal (Figure 3).

However, fun and pleasure are complex concepts. Playing games does not always feel fun or joyful: on the contrary, it quite often appears to be stressful and frustrating. Experiences that are usually classed as

unpleasant can be experienced as pleasurable in a gameplay context. It has been proposed [21] that the suspense, anxiety and physical arousal elicited by playing are interpreted as positive feelings because players anticipate a resolution and a closure such as winning the game or completing the task. When players manage to cope with a given situation successfully, the arousal is turned into euphoria, and the players experience this kind of cycles of suspense and relief as pleasurable.

In *Mobile Content Communities (MC2)* research project the emotional responses of the players have been measured by using self-report scales based on the two-dimensional model presented in Figure 3 [38][15]. The results suggest that different games elicit different emotional response patterns [38] but that the overall emotional experience is dominated by feelings of joy and pleasant relaxation – at least when the players are playing games that they themselves like to play [15]. In some games the overall emotional experience can be characterized with one or two dominating feelings, for example the players of *The Sims 2* have reported joy and pleasant relaxation. In other games the pattern can be more mixed and include several types of feelings, for example players of action game *Half-Life 2* have also reported a notable amount of fear, and players of *NHL 2005* anger. In a general genre level it seems that both strategy/simulation games (e.g. *Civilization III, The Sims 2*) and role-playing/adventure games (e.g. *World of Warcraft, Neverwinter Nights*) provide the most pleasantly relaxing gameplay experiences. Fear seems to be most related to action games (e.g. *Half-Life 2, Nethack*) and anger to aggressive sports games (e.g. *NHL 2005*). The results also suggest that the evaluation of the overall quality of the game is related to the reported feelings of joy and fear. [15] Fear and especially nervousness can also be desirable feelings in a gameplay experience, because they may be linked to the players' engagement with the game and her desire to succeed in it [12].

Moreover, when combining the self-report evaluations of different qualities of immersion [13] and the self-report evaluations of emotions felt during gameplay [15], it is found that all sensory, challenge-based, and imaginative immersion experiences correlate on a statistically significant level (p < .01) with emotions of joy, fear and anger, but not with pleasant relaxation or depressed mood. This suggests that the immersive experiences of gameplay are especially related to high arousal emotional experiences.

2.5 Social Contexts of Gameplay

Regardless of the stereotypical image of digital gameplay as a lonely player being glued to his computer, playing is a highly social activity for many. Research of social phenomena related to gameplay is typically centred around multiplayer games and especially massively multiplayer online games (see e.g. [41]). But to conclude that gameplay is social only in multiplayer games gives rather narrow view of the **social contexts** of digital game playing. Children have been reported giving testimonials of various social gaming practices, e.g. using friends as helpers or support in difficult games or in exiting parts of the games [11]. Just sharing the playing situation can be felt rewarding in itself. Also games designed for only one player are often played together, even if only one of the players is actually using the controllers. The other player can give advice or otherwise contribute to the gameplay from the observer position. That kind of "passive participation" or sharing the game situation can be perceived as one common way of playing.

Game communities can form around a single game or game series, a game event or a larger context such as role-playing or modding. The communities can be formed *outside* a game or *inside* a game in multiplayer games or game environments. Words such as 'groups', 'teams', 'guilds' etc. are typically used when referring to communities inside a multiplayer game. For examples and case studies of different kinds of game-related communities see the section on community gaming in this book.

There are several ways social interaction can take place *in* games. First of all, there is *co-existence:* the awareness of other players sharing the same game experience although there is not very much interaction among individual players. For example some players of *World of Warcraft* may be happy to play the game on their own although they probably wouldn't enjoy it that much if it was a single player game instead of a massively multiplayer online game (see [8]). Typically players are also provided with some means of *communication* so that they can share information, experiences etc. Many multiplayer games – and also single player games – also encourage *competition* between players or player groups. Competing can be direct as in many racing and sports games or indirect for example via high score lists. Sometimes competing can take a form of *combat:* in order to the other player to succeed, the other one must fail. Many multiplayer games also provide players with opportunities of *cooperation* and *collaboration*. Players can cooperate and join forces in order to reach their separate goals or they may have common goals that they want to reach

by collaborating. When for example one is stuck in a single player game it might be possible to advance with some help from a friend. The term 'metagaming' refers to all the practices that relate the game to elements *outside* the game. Garfield's model of metagame includes four categories: what player brings to the game, what player takes from the game, what happens between games, and what happens during the game other than the gameplay itself (See [40]). For example discussing and analysing the game session afterwards is a form of metagaming.

Nicole Lazzaro [26] has listed "the people factor" as one of the four main reasons why we play games. She has discovered that in addition to playing multiplayer games, players structure their gameplay experiences to enhance player-to-player interaction. For example, people may play games they do not like in order to spend time with their friends or they may enjoy just watching others play. Players can see games as an excuse and a mechanism for social interaction in general. It has also been demonstrated in psychophysiological studies that playing against a friend provides more arousing gameplay experiences than playing against someone unknown or against the computer's artificial intelligence [37] (see also last paper in the game experience section by Niklas Ravaja et al. in this book).

Social contexts also influence the interpretations that the player makes of her gameplay experiences. For example, a certain gameplay session might be interpreted as fun, challenging and victorious until one hears that a friend of hers made a better record effortlessly, after which the same concrete event might be reinterpreted and experienced more like a waste of time. The social significance of game playing, however, extends beyond the playing situation. A new game or just the number of games one owns can be highly regarded social capital among children for example, and one reason to get company and friends to come over to play.

Finally, one important social aspect of games is their social adaptability. Eriksson, Peitz, and Björk [10] have defined social adaptability as "the ability of a game to adjust [...] to changes in the social environment so that negative effects on gameplay or activities overlapping play sessions are minimized". Classic card games for example provide players with social adaptability in sense that the game demands only as much of attention as the players are willing to give. For many digital games this is not so self-evident: the game may not be easy to interrupt whenever needed. In case of mobile games the questions of social adaptability become perhaps even more essential than in traditional computer and video games.

3 Mobile Game Experience

When it comes to mobile games, the fundamental components of the gameplay experience are virtually similar to experiences with any other kinds of digital games. The main differences arise from the mobile context: for mobile use the gameplay device has to be small enough to carry, and the places, conditions and social circumstances of playing vary more than in computer and video games typically. For example, when it comes to playability and social adaptability of the game, it is important that the adjustment of the **sound** volume is very easy to do and that the player can totally mute the game if needed. Also game's **screen** has to be visible in many different kinds of lighting conditions, and the graphics and texts have to be clear enough to be read on a small screen. One important part of the hardware setup is also the **battery** of game device: a battery that runs out very quickly when playing has a devastating effect on the gameplay experience that is supposed to be mobile.

In cases where the mobility of the game does not only mean that an old videogame has been ported to a new portable device, also some other kinds of challenges arise. In so called pervasive mobile games the players are provided with a gaming experience that is integrated to their physical surroundings and game is potentially accessible at any place and any time. Pervasive games can take advantage of e.g. positioning and thus make moving in the real world a central and meaningful game element. A central aspect of location-based games is their need for a **network connection** and positioning information. Also in multiplayer games the need for reliable network connection may be an essential requirement. Since uncertainties are almost an inherent element in wireless devices, there is need for coping mechanisms and an advantageous direction for mobile game design may involve exploiting this kind of uncertainties. For all these reasons it is often advisable to include a separate analysis of mobile playability when evaluating the playability of a mobile game instead of just concentrating on the actual game.

The play-tests of a pervasive mobile game Songs of North indicated that majority of players negative feelings during gameplay were related to the technical problems of the game prototype. Especially network disconnections caused players to feel anger [12]. However, if the basic requirements for good playability are met in a mobile game, the experiences of immersion and emotions should not be very different from other kinds of digital games. Certainly, the limited audiovisual capabilities of portable device may have some effect on sensory immersion, but on the other hand, it might be that mobile players use headphones more often than players in front of television or computer screens do, and portable devices such as Nintendo DS also take advantage of interaction techniques that might actually enhance the sensory experience (e.g. blowing soap bubbles by actually blowing, and scratching your pet dog through a touch screen in Nintendogs game). The play that takes place in a hybrid space of real and virtual environments offers additionally possibilities for designing games to be less dependent on large screens and quality graphics (see the next paper by Britta Neitzel in this book). In a study where participants played a car racing game both on PC and on handheld device, the results showed that the self-reported sense of presence was higher when the game was played on a big screen. However, there was no difference in attentional engagement in these two conditions, which according to the authors suggest that also playing on a mobile device can provide immersive gameplay experiences [24].

In terms of **social adaptability** the main difference between mobile gameplay contexts and typical video gameplay contexts is that mobile games are more characteristically played in public places whereas video and computer games are more often played in private spaces. For this reason, the social playability of mobile games demands that the game is easy to suspend without sacrificing the accomplishments so far. In case the portable gameplay device is a mobile phone, the gameplay is quite likely to be interrupted by incoming calls or SMS messages. Because the mobile contexts are not typically very constant, the mobile playability also requires the game to start quickly, and offer enough meaningful play in short play sessions. In public places the **social acceptability** of the gameplay requires that the game does not disturb other people or embarrass the player [9]. A scenario-based interview study on pervasive gaming has resulted in a list of design requirements that fall mainly into categories of general playability and players' security [14]. The player security means that the game enables the players to control when they play and also ensures the players' security by giving them the possibility to stay anonymous to other players.

The gameplay framework presented in this chapter aims at describing the most fundamental elements related to digital gameplay experiences in general. Basically, the gameplay experience's core components are the same regardless of the technical platform the game is played on. However, gameplay experience of a certain game is probably quite different when the game is played on a game console at home than on a mobile phone at the park, for instance. The framework aims helping researchers and designers to better analyze the differences in different gameplay experiences, and maybe even help to pinpoint some new possibilities to create engaging and meaningful play – also on mobile devices.

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Fluid Places: On Real, Virtual, and Fictive Spaces and Places in Digital Games

Britta Neitzel

britta.neitzel@gmx.de

Abstract

This chapter focuses on the spatiality of computer games and aims at a closer description of the spatial implications of digital games. To do this, we will examine what kind of spaces we find in computer games, and what the particularities of digital games in respect to space are. The starting assumption is that digital games always take place in a mixed reality that consists of the "real" and the "virtual" space. These spaces are linked by the play activities that serve as transboundary elements. In a second step it is argued that the play activities transform the game space into game place and that computer games can be described and discerned by their "placeness". Especially user activities transform the computer *space* into a computer *place*. The paper closes with the particularities of mobile games in respect to place.

1 Spatial Implications of Games

Computer games seem to be deeply spatial. Spatial terms and metaphors are more than often used to describe a wide range of phenomena in them: computer games take place in the virtual *world* or in cyberspace, game *maps* are used for orientation in the games, especially when a player has to *navigate* through *labyrinths* to explore the game *world*. Fuller and Jenkins [6] describe the Nintendo games as *spatial stories* and Aarseth [1] calls spatiality the defining element of computer games. Let us try to arrange these spatial terms and metaphors according to the different aspects of spatiality they describe.

1.1 Division of Space in Games

Not only digital games are supposed to be spatial. Spatiality seems to be one of the defining elements in all games. Johan Huizinga [9] states that a game creates a "magic circle", a special place separated from the "real" world where the play activities can take place. This means that a distinction is drawn between game and non-game and that games have borders. Thus, borders play an important role in games. Salen and Zimmerman [18] consider borders as one of the most interesting feature in games because they have to be constantly in the mind of the player who has to know what is belonging to the game and what is not. The borders of the "magic circle" can be imaginary like in children's play or games can have very concrete spatial borders: the borders of a sports arena or a playing field, a stage, a board, or the walls of a theatre building. Both sorts of borders can appear together and both separate an inside from an outside. Thus, it can be argued, that the basic spatial practice of games is the metaphorical or material division of game space in an in-game space and an out-game space.

1.2 Definitions of the In-Game Space

The in-game space of computer games is a representation of space where the game activities take place, the terms *cyberspace, virtual world* or *game world* refer to it. The in-game space is further organised, e.g. the labyrinth (either as maze or as meander) is a very common form for the paths that can be explored in computer games, and "rooms" are quite common for separating different play spaces from each other. The rooms obviously constrain the possible movements of a player's avatar – Aarseth [1] calls them "indoor" games. Often a map is needed to find one's way through the rooms that form the labyrinth. In many of these games, e.g. in the *Silent Hill* or the *Metal Gear Solid* series we find two representations of space: The avatar and its closer environment on the main frame and a little frame with a map that grants orientation in a larger part of the game space. Also in "outdoor" games we usually find these two representations of the game space: a larger display of the active unit(s) – "outdoor" games are often strategy game where no single avatar is used – and a map of the world. And, as Aarseth [1] notes, the movements

in "outdoor" games, which appear to allow a free movement can be restricted e.g. by the landscape that forms borders that cannot be crossed.

The in games space always has a certain character; it is a "special place" where the play activities take place. Thus, it seems reasonable to call the in-game space a place – we will come back to this thought in subchapter 5.

1.3 Necessity of the Out-Game Space

While there are many spatial definitions of the in-game space, the out-game space remains unmarked and undefined. It serves as the environment and as the space that does not belong to the games. The concept of "a game" usually describes the system within the game border. The concept of play on the contrary includes the transgression of the borders between game and non-game. As the concept of metacommunication [3] shows a player has to be constantly aware that s/he is "just playing". This means that the outer non-play world is not completely blinded out in the process of play. If someone wants to play s/he has to draw a distinction, to set up a border that must always be kept in mind.

Computer games – more obviously than other games – need this unmarked space to be played. The unmarked space is the material "real world" where the player is situated and it is her who intervenes in and acts upon the representations of space in the immaterial "virtual world". Thus, material interfaces like keyboards, joysticks and game controllers in combination with the software serve to transform the input activities of a player in representations of activities on the screen.

These representations constitute a point of action in the virtual world. This is the place where the player can carry out the actions in the virtual world (see [14]). The player acts upon the represented space via representations.

Additionally the computer games have developed patterns of visual and spatial representation to support the connection between the inner and the outer game space. The space of computer games is displayed in a certain point of view. The point of view relates to the in-game space with the out-game space in that it establishes a viewpoint for the player. It is also a constitutive factor for the establishment of the in-game space, which, as a representation of space, always incorporates a certain angle from which it is represented. These facilities and modes of representation are usually unnoticed but they create the necessary background for the functioning of computer games.

To summarise, we can name four aspects of space that have important implications in computer games:

- 1. The separation of game-space in in-game space and environment (in-game space and out-game space)
- 2. The definition of the in-game space by spatial patterns and the non-definition of the out-game space. This means that the in-game space is focussed, designed and defined, while the out-game space is neglected. The game activities take place in the in-games space.
- 3. The necessity to relate in-game and out-game space
- 4. Spatial representations that support this relation

These four aspects lead to the assumption that the out-game space is an indispensable part of the game which has as its consequence the assumption that every game takes place in hybrid spaces or in a mixed reality (real and virtual). The neglection of the out game space is not necessary. This makes it possible to design the out-game space as well.

But before we can describe the meaning of these implications for computer games and mobile games we should have a look at the meanings of space, place and cyberspace.

2 Space

Space, or is not only a constitutive element of computer games, space is also "central to our lives" [4]. It is fundamental for our actions, without spatial orientation like left, right, up, down, near, far no actions

are possible³⁶. Space also provides us with some of the fundamental metaphors for or thoughts (see e.g. Shields, 1991), e.g. high and low.

Apart from the spatial orientation in everyday life Dogde and Kitchin [4] distinguish four distinct notions of space:

- Aristotelian, whereby space is "static, hierarchical and concrete"
- Newtonian, whereby space is "a kind of absolute grid, within which objects are located and events occur".
- Leibnizian, whereby space is "fundamentally relational and defined entirely in terms of those relationships".
- Kantian, whereby space is conceptualised as "a form imposed on the world by humans".

According to Dodge and Kitchin, the first three notions of space are used in geographical thought. In the Aristotelian conception as static, space is understood according to the Euclidian geometry as objective, empirical and measurable. The common sense notion of space is related to this conception. It is mostly Newtonian, and space is conceived as something like a container that contains us, and the objects around us. The relation between the objects only has relevance in this container but the common sense notion of space does not act on the assumption that the relations of objects are fundamental for space, like Leibniz does.

The representations of space inside the game are modelled according to our general notions of physical space. The game space is a container with a certain grid that contains objects. The grid structure is obvious in indoor as well as in outdoor games. Outdoor games like simulations and strategy games – most obviously *Sim City* – display the grid very clearly (see figure 1).



Figure 1. Sim City 4000, screenshot

The landscape of *Sim City* consists of squares of the same size that define where the objects – buildings, streets, and trees – can be placed. The borders of the squares only visually overlap; all game activities are strictly dependent on the grid.

But also in indoor games, a strict geometrical order underlies the space. This can be observed when one tries to get some "pick-ups" in these games – they are bound to certain places and the player has to reach exactly the place where they are located. The visualisation and orientation in game space is based on the model of a computable, absolute and static notion space. Like the common sense notion of space it is

³⁶ For more explicit examples see [7].

considered to be a container for the game and as a consequence the virtual game space can also be considered kind of a parallel universe.³⁷

Human geography challenges these views of space. It is not concerned with a static object but with the social construction of space. It has a dynamic concept of space in which spaces are constructed by activities and cannot be measured and calculated with mathematical methods. In human geography space is heterogeneous and consists of many different places that emerge out of spatial practices. In contrast to space, human geography calls its subject of inquiry *spatiality*. "Spatiality, then is distinguished from space-time physics as it divides space as used and constructed from space as mathematically formulated." [4]

Lefevre [12], one of the first scholars who studied the social construction of space³⁸ argues that three factors construct spatialisation and form a constant struggle on space:

- Spatial practices
- Representations of space (e.g. maps)
- Spaces of representation

Spatial practices are practices that have an impact on space, it may be the behaviour of youth groups that occupy space in making certain places their meeting points, it may also be the politics of an enterprise to buy certain areas for building purposes. They also include certain arrangements in space, e.g. in a classroom where the sitting positions of the pupils can be directed in one direction to the front, which directs the focus of interest on the teacher or in a roundtable situation where discussions among the pupils are facilitated.

Representations of space always have a purpose and are never neutral, e.g. every map concentrates on particular attributes of the space it represents: geographical maps concentrate on the geographical particularities of a presented space (rivers, character of the land, e.g. dry or humid, etc.), and political maps concentrate on the borders and the political influence of the represented states.

Spaces of representation include lobbies or halls that do not solely serve the purpose of entrance rooms but also the purpose of representing the place. Living rooms my serve the same purpose. Every government of course owns its space of representation.

This perspective on space shows that space is in no way absolute, static or objective but constructed and separated in places. A concept we will consider next.

3 Place

Human geography is concerned with places rather than with space. Places are not only set up by measurable factors but by social activities. Jess and Massey [10] define places as characterised by providing a setting for everyday activities by having linkages to other locations, and providing a "sense of place". According to Georg Simmel [20] places have individuality. They have to be described through their meanings and social impacts. Places are established and defined by their internal ongoings. Social relations and individual experiences transform spaces into places. Thus, places cannot be defined in purely physical terms but have to be related to mental images as well.

Space on the other hand can be described by (geo)metrical terms. Different places in space are defined by their position in space and in relation to the position of other places. Simmel describes US American towns as "spacial" towns: they have a clear geometrical order, streets and avenues are not named but numbered. In the streets one finds houses with apartments that both are numbered as well. All places are defined by the relation to each other and easily findable. A town related to places would be a medieval town that is an arrangement of public and private places, which are not numbered but named. The tradi-

³⁷ Aarseth [1] criticises this point of view. Following the Kantian notion of space he argues that cyberspace, and thus the computer game spaces, cannot be seen as a parallel space to the real space but have to be regarded as representations of space inside the real space.

³⁸ Originally his book "La production de l'espace" appeared 1974.

tion of the denomination of places is still obvious in the names of guesthouses, roadhouses, hotels, restaurants and pubs. Names are a sign of individuality, related to the unique attributes of the place.

A place that is outstanding in respect to its "placeness" is the home (see e.g. [8] [16]). It is the place where people have the freedom to do whatever they want to. At home they have to power for decisions concerning the environment, it is a place where they can feel save and cosy.

In his exploration of *Place and Placelessness* [16] for Relph the relationship between people and places is one of the most important defining features of places: "people are their places and places are their people". Thus, he distinguishes places by the relation people have to the places and discerns authentic and inauthentic places. "An authentic sense of place involves a sense of belonging, an inauthentic the converse." Placelessness is "a weakening of the identity of places to the point where they not only look alike, but feel alike and offer the same bland possibilities for experience." [16] The experience of being inside is – according to Relph – the defining feature of a place "To be inside a place is to belong to it and to identify with it, and the more profoundly inside you are the stronger is this identity with the place." [16]

He further discerns different relations to places and grades of placeness or placelessness:

- Existential outsideness: all places assume the same meaningless identity, a rejection of an individual by a place who cannot get access to the meanings of the place
- Objective outsideness: places are viewed scientifically and passively with an intellectual attitude, as e.g. in quantitative geography or in some architectural planning processes
- Incidental outsideness: places are experienced as little more than backgrounds for activities, like in visiting a city only to attend to a conference
- Vicarious insideness: places are experienced in a second hand way, e.g. through paintings, that gives an impression of what it means to be at that place
- Behavioural insideness: the physical patterns of a place are experiences as something that tells us we are here rather than somewhere else, they give particular places unique identities
- Empathetic insideness: emotional and empathetic involvement in a place, it arises out of behavioural insideness but also comprises a willing understanding and feeling of the meaning of a place
- Existential insideness: places are experienced without deliberate and self-conscious reflection yet are full of significance

While, as stated, the home and places we live in serve to create existential insideness, it is stated that e.g. global economy makes the world placeless in that sites lose their individuality by globalised and standardised architecture and functionalities. Spatial mobility too is supposed to create inauthentic spaces and at least incidental outsideness, like the example of the conference hopper shows. Cyberspace is the virtualisation of space, and is supposed to create placelessness as well, especially because it goes hand in hand with the idea that it renders the body obsolete and traditionally the concept of place is based on bodily experience. Does that mean that computer games, which are dependent on virtual space, are placeless per se?

4 Cyberspace

Cyberspace is created by information and communication technology (ICT). As every technology ICTs are transformative and change society in a number of ways, one is the transformation of space. It is claimed by some scholars that geography no longer matters because ICTs render geographical space spaceless. ICTs enable a globalised economy in that certain economical centres are no longer necessary. Places that sold goods change their faces by the possibility to use the Internet as a selling platform. Selling and buying are no longer place centred activities. And also the workplace looses its influence because mobile phones and the Internet enable people to work everywhere, at their home office or while travelling in trains or on planes.

But space is not entirely unimportant. Wealth is still unequally distributed and economy is still dependent on material goods and geographical sites. The question "where are you now", which is the most common question in mobile phone calls [11] illustrates this double logic of space and spacelessness. Especially when people are able to connect with others wherever they are they have to coordinate their movements and actions. ICTs are one factor of the emergence of greater mobility and at the same time serve to organise the living with this mobility. If people are travelling most of the time others need a possibility to get to know where they are to keep up social relations.

Dodge and Kitchen [4] quote Castells [5] who argues that the spatial logic is divided into the old "space of places" and the new "space of flow".

In the last paragraph, I'd argue that the two logics are not divided but rather interdependent. If modern society conveys placelessness in the "real" space it establishes the possibility for new places or a sense of place in the "virtual" world on the same time. Some scholars (e.g. Rheingold) argue that new authentic places can be created in cyberspace. I'd like to argue that it is especially games that inhabit this possibility.

In the last paragraphs we will have a look at the possibilities of placeness – or placelessness in computer games.

5 Games and Places

The activities a player of computer games carries out can be considered acts on and in the virtual space. In contrast to activities in other forms of cyberspace, e.g. the Amazon website, the virtual space does not solely serve as a means to achieve something else - ordering a book for example. Acting in the virtual world of a game means that the player is occupied with a certain spatial representation and its particularities. Game world and in-game spaces can be called places because they have a sort of individuality and a meaning. A room in an adventure game is not only a room, but also a room with a particular meaning in the game and for the player because s/he has to deal with its particularities. By these experiences the game-space may become a game-*place* for the player. Thus, as long as the player is able to act in this place, to react to its demands or to solve some of the riddles the relation between player and place can never be the feeling of existential outsideness (see subchapter 3). This can only emerge when the player is not able to act in the game, when it remains closed and inaccessible. E.g. in a text adventure when despite the efforts to go north, south, west or east the programme displays the same "in forest" again and again, when a player cannot find the exit of a labyrinth or the location of a key s/he needs to proceed or when s/he cannot win a boss fight. The bosses serve as kind of doorkeepers for the next level or the next room. This is another hint for that we deal with places and not with space in computer games. Places are often only accessible through well-defined entrances and one has to meet certain criteria to achieve the allowance to enter.

But what about the other possible relations to places and how are they supported by games?

Objective outsideness and incidental outsideness are possible attitudes in respect to game places. E.g. *Sim City* and also *The Sims* may be played with a kind of scientifically objective attitude that focuses on the possible arrangements of buildings or families without any interest for the internal ongoings. But they may also be played with behavioural or empathetic insideness. Due to the handling of representations of physical objects *Sim City* will support behavioural insideness, the establishing of certain physical patterns that create a particular place. *The Sims* may support also empathetic insideness because the player does not only set a physical place but also social relations of individuals and groups. This can more easily support empathy.

Incidental outsideness – watching a place only as background for activities – may occur especially in tutorials where most often certain moves are trained. This becomes obvious in the "virtual training" of *Metal Gear Solid*, where the training environment is displayed only schematic.

Many games may support behavioural insideness because as explained in paragraph 1 they have clearly identifiable special features.

Games can arouse different feelings of places. These feelings are for a large part dependent on the attitude of the player but they can be supported by the game design and can be directed in a certain direction. Game design can support certain attitudes.³⁹ The feeling of placeness seems to rise with the possibility to

³⁹ Game genres differ in respect to their "placeness". Simulations represent places that can easily become a player's place by allowing a broad range of actions in and on the game world, strategy games add the enemy armies to pre-

change places and to appropriate or usurp them, with the chance to alter and design the place or to have power over a place. This becomes obvious by the example of home.

5.1 The Relation of Mobile Games to Places

The display of mobile games constantly grows larger and gets a better resolution but the size of the display is limited by the fact that mobile phones are still phones that should be easily carried around. The abilities of the computer in a mobile phone are limited as well. Thus, mobile phones do not have the opportunity to display detailed places like PC or console games. Thus, they could hardly support a feeling of placeness for places in the virtual world.

But mobile games have the opportunity to strengthen the connection between the "real" world with the fictional world.

As stated in subchapter 2 the realisation of the virtual game space it is dependent on the input and the actions of a player. In respect to the spatial order of games this means that in course of the play there is a constant relationship between the inside (virtual game space) and the outside ("real" world). Thus, the play space is a hybrid space that consists of the virtual and the real world: play always takes place in a mixed reality. This mixed reality cannot solely be conceptualised as a geometrical space but consists of physical, social and mental features. For the non-mobile computer game the virtual space has a greater value.

Mobile phones enable the game to invert the value of the spaces. If they use technologies like GSM or GPS technology – and combine the location of the player in the real world with the virtual world in the telephone net and the display. These technologies make it possible for the "real world" to become the ingame space. In his analysis of *Botfighters* and *Geodashing* Aarseth [2] discerns the strategies these games use in location based and proximity based⁴⁰. In both cases a player acts in and on real places. The mobile phone serves as a map or a navigation system for the players to orient themselves in the game world. In contrast to PC or console games we've got only one representation of space: the map. But mere acting in the real world does not give the places one acts in a sense of placeness; the places can just serve as a background for the game actions. But if the game design integrates the physical or social features of the place in the game play the game can create a sense of behavioural insideness. E.g. a shopping mall, one of the most placeless places of modern cities, can become and adventurous site when integrated in a game. The game can add meaning to the meaningless and solely functional place.

The meaning can even become greater if the players themselves can decide what to do in the game place. If e.g. in a team game one team sets up the tasks the other team has to perform at a certain place this team has to deal with the possibilities of the place very intensely and has to create new meanings for the place. This may lead to existential insideness because the team creates a deep understanding of the place with its physical, social and then fictional features and it has the power to change the meaning of the place.

Thus, mobile games inhabit the possibility to re-create a sense of place in modern placeless environments by the playful appropriation of these spaces.

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vent the player from making the game space her/his place. Especially FPSs represent hostile places that resist the players attempts to move around in them; they are not only inhabited by enemies but also restrict the viewpoint and the possible actions.

⁴⁰ Location based: Games that depend on player position in physical space, proximity based: Games that depend on proximity between players in physical space.

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Quantitative Game Experience Studies

Niklas Ravaja, Timo Saari, Matias Kivikangas, & Mikko Salminen

ravaja@hse.fi

Abstract

In the present series of studies, we examined (a) emotion- and attention-related subjective and psychophysiological responses elicited by different video games and game events, (b) the influence of the type of opponent (computer, stranger, friend) on emotional responses to games, and (c) the influence of playing context (laboratory, coffee bar, subway station) on emotional responses. Zygomaticus major, corrugator supercilii, and orbicularis oculi EMG activity, electrodermal activity, and cardiac interbeat intervals were recorded during game playing. Different instantaneous video game events elicited reliable psychophysiological responses indexing emotional valence and arousal. Emotional responses were more positively valenced and spatial presence was higher (a) when playing against a human compared to playing against a computer and (b) when playing against a friend compared to playing against a stranger. This was the case not only with co-located players, but also with non co-located players. Emotional responses did not differ by playing context. The present findings may have practical implications for game design, given that they give information on the game events that maximize pleasure and attention, for example.

1 Introduction

Emotions are biologically based action dispositions that have an important role in the determination of behavior [e.g., 10]. Given that this is the case also in connection with gaming behavior, emotional responses elicited by games are an important target of investigation. That is, people seek, and are eager to pay for, games that elicit optimal emotional responses (or response profiles).

The present series of studies was designed to examine emotion- and attention-related subjective and psychophysiological responses elicited by different video games and game events. The main aim of the study was to investigate the phasic psychophysiological responses to specific game events (e.g., different actions and types of failures and successes). Examining this issue may have practical implications for game design, given that it gives information on the game events that maximize pleasure and attention. Likewise, it gives information on the optimal temporal placement and frequency of different game events (game event patterns). The other aims of the study series were to examine (a) the profiles of emotional responses and the sense of presence (i.e., the perceptual illusion of nonmediation [15]) elicited by games with different characteristics (e.g., the view from which the game is played, naturalness of the game, amount of violence), (b) the influence of the type of opponent (computer, stranger, friend) on emotional responses to games, and (c) the influence of playing context (laboratory, coffee bar, subway station) on emotional responses.

1.1 Dimensions of emotion

Most theorists endorse the view that emotions are constituted by three aspects or components: subjective feeling, expressive behavior, and physiological arousal; others add motivational state or action tendency and/or cognitive processing [10, 25]. A dimensional theory of emotion holds that all emotions can be located in a two-dimensional space, as coordinates of valence and arousal (or bodily activation [e.g., 10, 12]). The valence dimension reflects the degree to which an affective experience is negative (unpleasant) or positive (pleasant). The arousal dimension indicates the level of activation associated with the emotional experience, and ranges from very excited or energized at one extreme to very calm or sleepy at the other.

Other theorists have, however, suggested that the two main, orthogonal dimensions of emotional experience are negative activation (NA) and positive activation (PA) that represent a 45° rotation of the original main axes [28, 29]. The NA axis extends from highly arousing negative emotion (e.g., fear and anger) on one end to low-arousal positive emotion (e.g., pleasant relaxation) on the other, while the PA axis extends from highly arousing positive emotion (e.g., joy) to low-arousal negative emotion (e.g., depressed mood). The self-report NA and PA dimensions have been suggested to represent the subjective components of the two primary brain motivational systems underlying behavior and affect, i.e., the withdrawal-oriented behavioral inhibition system (BIS) and approach-oriented behavioral activation system (BAS), respectively [e.g., 29, see also 5]. In the present study, mood elicited by the games was defined in terms of the five affective feeling states that provide high and low end points on the aforementioned axes: fear, anger, pleasant relaxation, joy, and depressed mood.

1.1.1 Emotions, attention, and psychophysiology

In regard to the physiological component of emotions, it is well established that tasks requiring cognitive effort or active coping elicit emotional arousal accompanied by sympathetic nervous system (SNS) arousal and tonic heart rate (HR) acceleration [21]. Thus, in this connection, a tonic HR acceleration indexes emotional arousal. Electrodermal activity (EDA), commonly known as skin conductance, is another psychophysiological index of arousal. As people experience arousal their SNS is activated, resulting in increased sweat gland activity and skin conductance.

Although tonic HR acceleration is related to emotional arousal, phasic changes in HR are sensitive indicators of attention. There is a considerable body of research showing that HR decelerates when attention is paid to an external stimulus or information is taken in [e.g., 9, 27]. The phasic HR deceleration is an important component of the orienting response (initiates the processing of external stimuli), and is mediated by the parasympathetic nervous system [21].

Facial electromyography (EMG) is frequently used as a psychophysiological index of hedonic valence [e.g., 11]. Increased activity at the zygomaticus major (cheek) and corrugator supercilii (brow) muscle regions has been associated with positive emotions and negative emotions, respectively, during affective imagery and when viewing media [11, 21]. Several studies have also found that tonic activity at the orbicularis oculi (periocular) muscle area is greater during high-arousal than during low-arousal emotion conditions [e.g., 30]; orbicularis oculi activity appears to be particularly high during positively valenced high-arousal emotions [21].

1.1.2 Psychophysiology in game research

There is a paucity of studies using psychophysiological methods in the area of game research. However, in the research on psychophysiological reactivity to stress, video games have frequently been used as a stressor. Several studies have shown that different video games elicit considerable cardiovascular reactivity [e.g., 14, 17, 18]. In addition, Johnston, Anastasiades, and Wood [8] found that a two-person "soccer" video game elicited higher HR reactivity compared to a "squash practice" video game against a machine, suggesting that the social-competitive situation related to the former game results in increased arousal. This points to the possibility that psychophysiological measures may also be used to study the social aspects of game playing. Also, directly relevant to game research, Wolfson and Case [31] found that the background color (blue or red) of a video game predicted changes in game performance over time, and these changes were paralleled by HR.

From the perspective of game research, the aforementioned studies have serious limitations, however. That is, most of the studies have used change scores calculated by subtracting the mean baseline (before the game) value from the mean physiological value during the game, while in the rest of the studies, the game has been partitioned into 1-min epochs, for example, and change scores have been calculated for these epochs. These approaches do not enable the examination of psychophysiological responses to specific game events or game event patterns.

When properly applied, psychophysiological measures have several advantages over self-report in game research [see 21]. For example, psychophysiological measures can be regarded as more objective as compared to self-report, given that they are not dependent on language, do not require memory, and the processes of interest can be covertly assessed. An important advantage is that psychophysiological measures urements can be performed continuously (e.g., 500 samples per second) during game playing (and they do not interfere with playing). Psychophysiological measures have a level of temporal precision that allows researchers to investigate the phasic shifts in attention and emotion that occur in response to very short events in the game. Importantly, psychophysiological measures may also provide information on emo-

tional and attentional responses that, owing to their subtle nature, are not available to player's conscious awareness. In practise, examination of these issues requires that that the played games are video recorded and the game events of interest are scored from this video (video recording has to be time-locked to the physiological data); this enables the examination of the phasic physiological responses to specific game events.

1.1.3 Sense of presence

Presence has been defined as the perceptual illusion that a mediated environment is not mediated [15]. Although a complete sense of presence may be elicited only by emerging technologies, such as virtual reality, more traditional media, such as video games, offer a lesser degree of presence as well [15]. Factors such as a first-person view and naturalness may contribute to the experience of presence. Video games that engender a greater sense of presence are likely to elicit greater physiological arousal (at least when the game content is arousing), involvement, and attention (real-world stimuli, or stimuli that are perceived more or less as such, are likely to elicit greater attentional engagement compared to stimuli that are readily perceived as mediated presentations of real-world stimuli [see e.g., 19, 20]. Importantly, games contributing to a high sense of presence have been suggested to be highly entertaining and, simply put, fun (greater enjoyment [15]. The sense of presence may also facilitate game performance [see 15]. Thus, examining the factors in games that may contribute to higher presence is important.

1.1.4 The moderating role of personality

People's responses to different kinds of media have often been shown to vary as a function of their personality [e.g., 20]. Video games vary wildly in terms of thrill and violence, for example. It is likely that whether or not players find a thrilling, violent game as more entertaining and engaging compared to a nonviolent game with a happy atmosphere depends on the player's enduring personality traits. In this connection, the Sensation Seeking trait might be particularly relevant, given that high sensation seekers have a high general need for thrills and excitement [32]. That being so, we also examined the potential moderating influence of personality traits on the players' responses to games.

2 Methods

2.1 Experiment 1

2.1.1 Participants

Participants were 37 (26 male and 11 female) Finnish undergraduates with varying majors, who ranged from 20 to 30 years of age. All participants played video or computer games at least once a month.

2.1.2 Design

A 4 (Game) \times 2 (Level) within-subjects design was employed.

2.1.3 Games

Four games were used in the study: (a) Tetris (Tetris Worlds; THQ International Ltd., Woking, UK), (b) Super Monkey Ball 2 (Sega Corporation, Tokyo, Japan), (c) Monkey Bowling 2 (Sega Corporation, Tokyo, Japan), and (d) James Bond 007: NightFire (Electronic Arts Inc., Redwood City, CA). The games were played with the Nintendo GameCube (Nintendo Co., Ltd., Kyoto, Japan) and presented on a screen using the Panasonic PT-LC75E Multimedia Projector (Matsushita Electric Industrial Co., Ltd., Osaka, Japan). The image size was 114 cm (width) × 85 cm (height), and the distance between the player's eyes and the screen was about 200 cm.

2.1.4 Procedure

There were three 5-min game sessions for each of the four games; that is, a practice session and two actual play sessions (i.e., easy and difficult). The games were played in a random order. After each of the actual game sessions, the participant rated the game and his or her emotional and cognitive responses to the game on several dimensions.

2.1.5 Self-report

2.1.5.1 Momentary mood

According to Watson, Wiese, Vaidya, and Tellegen [29], PA and NA are the basic dimensions of selfrated mood. Thus, we defined mood in terms of the five affective feeling states that provide high and low end points on the PA and NA axes: joy, pleasant relaxation, fear, anger, and depressed mood. Given that high NA encompasses both anger and fear that are differentiated on the dominance dimension [24], and are related to distinct autonomic response patterns, fear and anger were assessed separately. We constructed 2- or 3-item scales consisting of affect terms to assess the affective feeling states. Specifically, the scales consisted of *joyful, lively*, and *enthusiastic* (Joy); *relaxed* and *calm* (Pleasant Relaxation); *fearful* and *nervous* (Fear); *angry, annoyed*, and *aggressive* (Anger); and *depressed, tired*, and *dull* (Depression). The participants were asked to indicate to what extent they felt this way during the preceding game. Each of the items was rated on a 7-point scale, ranging from 1 (*not at all*) to 7 (*extremely much*). These affect terms have previously been identified as indicators of the targeted emotional dimensions [e.g., 29, 7, 20].

2.1.5.2 Presence

The sense of presence of the participants was measured after each game with the ITC-Sense of Presence Inventory (ITC-SOPI [13]), a 44-item self-report instrument. Previous work with the ITC-SOPI has identified four separate factors: (a) Spatial Presence (19 items; e.g., "I had a sense of being in the game scenes," "I felt I was visiting the game world"), (b) Engagement (13 items; e.g., "I felt involved [in the game environment]," "My experience was intense"), (c) Ecological Validity/Naturalness (5 items; e.g., "The content of the game seemed believable to me," "The game environment seemed natural"), and (d) Negative Effects (6 items; e.g., "I felt dizzy," "I felt nauseous"). In the present study, we used only the 37 items addressing the first three factors. The wording of some of the items was slightly altered to adapt the instrument specifically for use with video games. Each of the items was rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The psychometric properties of the instrument have been shown to be acceptable.

2.1.5.3 Impulsive sensation seeking

The Impulsive Sensation Seeking (ImpSS) scale is part of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ [32]). The ImpSS scale consists of 19 items (e.g., "I tend to begin a new job without much advance planning on how I will do it"), and it can be divided into two subscales: (a) the impulsivity dimension describing a lack of planning and a tendency to act impulsively and (b) the sensation seeking dimension describing a general need for thrills and excitement.

2.1.6 Physiological data collection

Electrocardiogram (ECG) was recorded using the Psylab Model BIO2 isolated AC amplifier (Contact Precision Instruments, London, UK), together with three EKG leads in a modified Lead 2 placement. IBIs (ms) were measured with the Psylab Interval Timer.

Facial EMG activity was recorded from the left corrugator supercilii, zygomaticus major, and orbicularis oculi muscle regions as recommended by Fridlund and Cacioppo [4], using surface Ag/AgCl electrodes with a contact area of 4 mm diameter (Med Assoc. Inc., St. Albans, VT). Electrodes were filled with TD-240 electrode gel (Med Assoc. Inc). The raw EMG signal was amplified, and frequencies below 30 Hz and above 400 Hz were filtered out, using the Psylab Model EEG8 amplifier. The raw signal was rectified and integrated using the Psylab INT8 contour following integrator (time constant = 50 ms).

Electrodermal activity was recorded with the Psylab Model SC5 24 bit digital skin conductance amplifier that applied a constant 0.5 V across Ag/AgCl electrodes with a contact area of 8 mm diameter (Med Assoc. Inc.). Electrodes were filled with TD-246 skin conductance electrode paste (Med Assoc. Inc.) and attached to the middle phalanges of the first and second fingers of the subject's nondominant hand after hands were washed with soap and water.

The digital data collection was controlled by Psylab7 software, and all physiological signals were sampled at a rate of 500 Hz.

2.1.7 Video recording of the games

During all games, the output signal (video and audio) from the GameCube was stored as digital video (25 frames per second) with the V1d Random Access Video Recorder/Player (Doremi Labs, Inc., Burbank, CA). Psylab7 software was used to trigger the V1d Disk Recorder to start recording the game screen at the same time when the physiological data collection started. To calibrate the timing, Psylab7 software was used to (a) switch on an indicator lamp of the Psylab BIN8 Binary Input/Output unit for 1 s and (b) trigger the V1d Disk Recorder that video recorded the indicator lamp (a video camera was connected to the disk recorder). There was a lag of 280 ms in the starting of the video recording. After taking this lag into account, the recorded video image of the game screen was in time synchrony with the physiological data with a one-frame (40 ms) accuracy.

2.1.8 Scoring of game events

The exact onset times of predefined game events were determined by examining the played games, frame by frame, using V-ToolsPro 2.20 software. We scored the following game events in Monkey Bowling 2: (a) the monkey (inside the ball) falls off the edge of the lane to the depth of outer space (Event 1), (b) the ball knocks down at least one pin (Event 2), (c) the player misses the pins completely (Event 3), and (d) negative feedback after a poor throw (Event 4). None of the events was systematically followed by another event within a 6-s period following event onset.

2.1.9 Data reduction and analysis

Mean values for the psychophysiological measures were derived for one 1-s epoch before each event (second 1) and for six 1-s epochs after event onset (seconds 2 to 7). Logarithmic transformations were conducted for SCL and EMG data to normalize the distributions. The data were analyzed by the Linear Mixed Models procedure in SPSS with restricted maximum likelihood estimation and a first-order autore-gressive covariance structure for the residuals. Participant ID was specified as the subject variable, and the sequence number of an event and second (seconds 1 to 7) were specified as the repeated variables. The sequence number and second were selected as factors, and a fixed-effects model that included the main effects of these variables was specified. Event-related changes in physiological activity were tested using the following orthogonal contrasts: (a) linear trend across seconds 1 through 7 (Contrast 1) and (b) quadratic trend across seconds 1 through 7 (Contrast 2). These contrasts were used because, during the time period examined, a game event may elicit the following types of changes in physiological activity: (a) a progressive increase (or decrease) after event onset or (b) an increase (or decrease) after event onset followed by a decrease (or increase; a return to baseline).

2.2 Experiment 2

2.2.1 Participants

Participants were 99 (51 male and 48 female) Finnish undergraduates with varying majors, who ranged from 19 to 34 years of age (mean = 23.8 years). Of them, 61% played video games at least once a month. Participants participated in the experiment in groups of three same-sex persons. In each of the 33 groups, two of the participants were friends who knew each other before and one was a person unknown to the others (i.e., a stranger). In the present study, we used only the self-report and physiological data collected from the 33 so-called main participants (see below).

2.2.2 Design

A 2 (Game) × 3 (Opponent) within-subjects design was employed.

2.2.3 Video games

In the present study, we used two video games: Super Monkey Ball Jr. (Sega Corporation, Tokyo, Japan) and Duke Nukem Advance (Take 2 Interactive, Berkshire, UK). The games were played with the Nintendo Game Boy Advance console (Nintendo Co., Ltd., Kyoto, Japan). In the two-player condition, two Game Boy Advance consoles were connected with a Game Boy Advance Game Link Cable (Nintendo Co., Ltd., Kyoto, Japan).
2.2.4 Procedure

From the two participants who were friends, one was randomly chosen as the main participant. All three participants practiced both games for 5 min in the single-player mode. The main participant played each of the two games for 8 min against a computer (single-player mode of the game), a friend, and a stranger. The order of these six game sessions was randomized for each (main) participant. The main participant and opponent sat next to each other during game playing.

2.2.5 Self-report measures

All self-report scales were presented on a computer screen.

2.2.5.1 Presence.

The sense of presence of the participants was measured after each game with the ITC-Sense of Presence Inventory (ITC-SOPI; see Section 2.1.5.2).

2.2.5.2 Valence and arousal

Participants rated their emotional reactions in terms of valence and arousal to each of the games using 9point pictorial scales. The valence scale consists of 9 graphic depictions of human faces in expressions ranging from a severe frown (most negative) to a broad smile (most positive). Similarly, for arousal ratings, there are 9 graphical characters varying from a state of low visceral agitation to that of high visceral agitation.

2.2.6 Physiological data collection

Electrocardiogram (ECG) and facial EMG were recorded from the main participant as described under Section 2.1.6.

2.2.7 Data reduction and analysis

All data were analyzed by the General Linear Model (GLM) Repeated Measures procedure in SPSS. Analyses of the ratings measures data included two within-subjects factors, i.e., game (2 levels: Super Monkey Ball Jr. and Duke Nukem) and opponent (three levels: computer, friend, stranger). When analyzing IBI and facial EMG data, a third within-subjects factor was included, i.e., time (16 levels: the sixteen 30-s epochs). Two orthogonal contrasts were used to compare the appropriate levels of the opponent within-subjects factor: (a) computer vs. friend and stranger (Contrast 1) and (b) friend vs. stranger (Contrast 2).

2.3 Experiment 3

2.3.1 Participants

Participants were 69 (42 male and 27 female) Finnish undergraduates with varying majors, who ranged from 17 to 42 years of age. Participants participated in the experiment in groups of three same-sex persons. In each of the 23 groups, two of the participants were friends who knew each other before and one was a person unknown to the others (i.e., a stranger). In the present study, we used only the physiological data collected from the 23 so-called main participants.

2.3.2 Other study characteristics

This experiment was identical with Experiment 2, with the exception that, in Experiment 3, the players were in different rooms (i.e., they were non co-located), but they were informed with whom they will be playing.

2.4 Experiment 4

2.4.1 Participants

Participants were 35 Finnish men (n = 21) and women (n = 14), who ranged from 17 to 30 years of age.

2.4.2 Design

A 2 (Game) \times 3 (Playing Context) within-subjects design was employed.

2.4.3 Video Game

The participants played two different video games: (a) Golden Eye: Rogue Agent (Electronic Arts Inc., Redwood City, CA) and (b) Need for Speed 2: Underground (Electronic Arts Inc., Redwood City, CA). The games were played with the Nintendo DS handheld console (Nintendo Co., Ltd., Kyoto, Japan).

2.4.4 Procedure

The participant played the games in three different playing contexts (locations): (a) laboratory, (b) coffee bar, and (c) subway station. The order of the playing contexts was randomized for each participant. In each playing context, there was a rest period of 5 min, after which the participant played each of the two games for 8 min. Across the experiment, the two games were played in one of two orders (BA AB BA or AB BA AB), the order being chosen randomly for each participant.

2.4.5 Presence

The sense of presence of the participants was measured after each game with the ITC-Sense of Presence Inventory (ITC-SOPI; see Section 2.1.5.2).

2.4.6 Physiological Data Collection

Physiological signals (facial EMG, EDA, and cardiac IBIs) were recorded with the Varioport-B mobile data acquisition system (Becker Meditec, Karlsruhe, Germany).

2.4.7 Data Analysis

The data were analyzed by the Linear Mixed Models procedure in SPSS with restricted maximum likelihood estimation and a first-order autoregressive covariance structure for the residuals.

3 Results

3.1 Experiment 1

3.1.1 Emotional ratings

3.1.1.1 Joy

The four games were significantly differentiated by joy ratings, p = .003. As shown in Figure 1 (left panel), Super Monkey Ball 2 elicited highest joy ratings, but also James Bond elicited relatively high joy.



Figure 2. Joy (left panel) and pleasant relaxation (right panel) ratings for the different games.

3.1.1.2 Pleasant relaxation

The games were also significantly differentiated by pleasant relaxation ratings, p = .001. As shown in Figure 1 (right panel), James Bond elicited clearly lower relaxation compared to the other three games.

3.1.1.3 Anger

There was a significant main effect for game in predicting anger, p < .001. Figure 2 (left panel) shows that James Bond elicited highest anger ratings and Monkey Bowling 2 next highest ratings.



Figure 3. Anger (left panel) and fear (right panel) ratings for the different games.

3.1.1.4 Fear

The games were significantly differentiated by fear, p < .001. As was the case for anger, James Bond elicited highest fear ratings (see Figure 2, right panel). However, Super Monkey Ball 2 elicited next highest fear ratings.

3.1.1.5 Depressed mood

The differentiation of the games by depressed mood was also significant, p < .001. Figure 3 shows that Monkey Bowling 2 elicited highest depressed mood ratings, but also Tetris elicited slightly elevated values.



Figure 4. Depressed mood ratings for the different games.

3.1.2 Presence ratings

3.1.2.1 Spatial presence

There was a significant main effect for game in predicting spatial presence ratings, p < .001. As shown in Figure 4, James Bond elicited highest spatial presence, but also Super Monkey Ball 2 elicited relatively high ratings. In addition, games played with a higher difficulty level elicited higher spatial presence compared to easy games, p < .001.



Figure 5. Spatial presence ratings for the different games.

3.1.2.2 Engagement

Engagement ratings paralleled the spatial presence ratings. That is, James Bond and Super Monkey Ball 2 elicited highest engagement, p < .001. There was also a significant Impulsive Sensation Seeking × Bond 007 vs. Other Games interaction contrast, p = .006. As shown in Figure 5, James Bond elicited higher engagement among high Impulsive Sensation Seeking scorers compared to low scorers, while the reverse was true for the other games.



Figure 6. Presence-Engagement ratings for the different games as a function of Impulsive Sensation Seeking trait.

3.1.3 Physiological responses to game events

3.1.3.1 Event 1 (falling off the edge of the lane)

Contrast 2 indicated that Event 1 in the video game Monkey Bowling 2 prompted an increase in both zygomatic and orbicularis oculi EMG activity that peaked 2 s after event onset, ps < .001 (see Figure 6, left panel and middle panel, respectively). In addition, Contrast 2 showed that Event 1 elicited a decrease in corrugator EMG activity that peaked 2 s after event onset, p < .001 (Figure 6, right panel).



Figure 7. Zygomaticus major (left panel), orbicularis oculi (middle panel), and corrugator supercilii (right panel) electromyographic (EMG) responses elicited by falling off the edge of the lane (Event 1). = event onset time.

Contrast 1 was significant when predicting cardiac IBI, thereby suggesting that IBI decreased (i.e., HR increased) linearly in response to Event 1, p = .002; however, visual inspection of Figure 7 (left panel) suggested that there was, in fact, an initial increase in IBI followed by a decrease. Contrast 2 also indicated that Event 1 prompted an increase in SCL peaking 3 s after event onset, p < .001.



Figure 8. Cardiac interbeat intervals (IBIs; left panel) and skin conductance level (SCL; right panel) responses elicited by falling off the edge of the lane (Event 1). = event onset time.

3.1.3.2 Event 2 (knocking down at least one pin)

Contrast 2 showed that Event 2 elicited an increase in both zygomaticus major and orbicularis oculi EMG activity that peaked 2 s after event onset, ps=.003 and < .001 (see Figure 8, left and right panel), respectively. No significant effects were found for corrugator supercilii activity.



Figure 9. Zygomaticus major (left panel) and orbicularis oculi (right panel) electromyographic (EMG) responses elicited by knocking down at least one pin (Event 2). = event onset time.

Event 2 also elicited a decrease in cardiac IBI (i.e., an increase in HR) that peaked 3 s after event onset as was shown by Contrast 2 (Figure 9, left panel), p < .001. In addition, Contrast 1 indicated that Event 2 prompted a linear decrease in SCL after event onset (Figure 9, right panel), p < .001.



Figure 10. Cardiac interbeat intervals (IBIs; left panel) and skin conductance level (SCL; right panel) responses elicited by knocking down at least one pin (Event 2). = event onset time.

3.1.3.3 Event 3 (missing the pins completely)

Event 3 did not elicit any significant changes in zygomatic, corrugator, or orbicularis oculi EMG activity. However, Contrast 2 showed that Event 3 elicited a significant decrease in IBI (i.e., an increase in HR) that peaked 4 s after event onset (Figure 10, left panel), p < .001. In addition, Contrast 1 showed that Event 3 elicited a progressive decrease in SCL (Figure 10, right panel), p = .027.



Figure 11. Cardiac interbeat intervals (IBIs; left panel) and skin conductance level (SCL; right panel) responses elicited by missing pins completely (Event 3). = event onset time.

3.1.3.4 Event 4 (negative feedback)

Event 4 tended to elicit a decrease in zygomatic EMG activity (not shown), although Contrast 2 narrowly failed to reach statistical significance, p = .076. Contrast 1 indicated, in turn, that Event 4 elicited a linear decrease in orbicularis oculi EMG activity (not shown), p = .035. There were no significant changes in corrugator activity. Contrast 2 showed that Event 4 prompted an increase in IBI (i.e., a decrease in HR) that peaked 4 s after event onset (not shown), p = .003. Likewise, Event 4 tended to elicit a linear decrease in SCL (not shown), although Contrast 1 narrowly failed to reach statistical significance, p = .051.

3.2 Experiment 2 (Co-Located Players)

3.2.1 Presence Ratings

Contrast 1 indicated that Spatial Presence was higher when playing with another human being (i.e., a stranger or a friend) compared to playing against the computer, p = .029. In addition, Contrast 2 showed that playing with a friend elicited higher Spatial Presence compared to playing with a stranger, p = .020.

Contrast 1 showed that playing with a human elicited higher Engagement than playing with a computer, p = .001. In addition, playing with a friend elicited higher Engagement than playing with a stranger, p = .001.

3.2.2 Valence and Arousal Ratings

Playing against a human elicited a more positive emotional response compared to playing against a computer, p < .001. Although playing with a friend tended to elicit a more positive emotional response compared to playing with a stranger, Contrast 2 narrowly failed to reach statistical significance, p = .076. Contrast 2 also indicated that playing with a friend elicited higher self-reported arousal than playing with a stranger, p = .005.

3.2.3 Cardiac Interbeat Intervals

Contrast 1 showed that cardiac IBIs were shorter (i.e., higher HR) when playing with a human compared to playing with a computer, p < .001. Contrast 2 showed that playing with a friend elicited shorter IBIs (i.e., higher HR) compared to playing with a stranger, p = .003.

3.2.4 Facial Electromyography

Zygomaticus major EMG activity was higher when playing against a human compared to playing against a computer, for Contrast 1, p < .001, (Figure 11, left panel). Contrast 2 showed that playing with a friend elicited higher zygomatic EMG activity compared to playing with a stranger, p = .004.

Corrugator supercilii EMG activity was higher during the computer condition compared to the friend and stranger conditions, for Contrast 1, p < .001 (Figure 11, middle panel). Likewise, Contrast 2 showed that the friend condition elicited lower corrugator activity compared to the stranger condition, p = .006.

Playing against a human elicited higher orbicularis oculi EMG activity compared to playing against a computer, for Contrast 1, p < .001, and the friend condition elicited greater orbicularis oculi activity compared to the stranger condition, p < .001 (Figure 11, right panel).



Figure 12. Zygomaticus major (left panel), corrugator supercilii (middle panel), and orbicularis oculi (right panel) electromyographic (EMG) activity as a function of the opponent.

3.3 Experiment 3 (Non Co-Located Players)

3.3.1 Cardiac Interbeat Intervals

Contrast 1 showed that cardiac IBIs were shorter (i.e., higher HR) when playing with a human compared to playing with a computer, p < .010.

3.3.2 Facial Electromyography

When the players were in different rooms (non co-located), zygomaticus major EMG activity was higher when playing against a human compared to playing against a computer, for Contrast 1, p = .046. Contrast 2 showed that playing with a friend elicited higher zygomatic EMG activity compared to playing with a stranger, p = .043.

Corrugator supercilii EMG activity was higher during the computer condition compared to the friend and stranger conditions, for Contrast 1, p < .001. Likewise, Contrast 2 showed that the friend condition elicited lower corrugator activity compared to the stranger condition, p = .007.

Playing against a human elicited higher orbicularis oculi EMG activity compared to playing against a computer, for Contrast 1, p < .001, and the friend condition elicited greater orbicularis oculi activity compared to the stranger condition, p = .020.

3.4 Experiment 4

3.4.1 Physiological responses in different contexts

When examining the physiological responses (facial EMG, EDA, cardiac IBIs) to games, it was indicated that they did not differ by context (i.e., laboratory, subway station, coffee bar).

3.4.2 Spatial presence and physiological responses

Linear mixed models analysis showed that self-reported spatial presence was positively associated with EDA during game playing, p = .028. Spatial presence was negatively associated with cardiac IBIs (i.e., it was positively associated with HR), p = .039. In addition, spatial presence was positively associated with corrugator supercilii EMG activity, p = .044.

4 Discussion

4.1 Self-reported emotions and presence experiences

The results based on self-report data showed that the four video games (i.e., Tetris, Super Monkey Ball 2, Monkey Bowling 2, and James Bond 007: NightFire) elicited very different emotional responses measured in terms of discrete emotions (i.e., joy, pleasant relaxation, anger, fear, and depressed mood). If one wants to assess the "goodness" or "badness" of the different games on the basis of the emotional responses they elicit, it is probably not sufficient to examine any single emotion, but one should look at the emotional profiles associated with the different games.

When inspecting the emotional profiles related to the present games, the following picture emerges. Tetris elicits relatively high levels of pleasant relaxation, but also depressed mood; it elicits only (relatively) low levels of joy, anger, and fear. Super Monkey Ball 2 elicits high levels of joy and pleasant relaxation, but low levels of anger, fear, and depressed mood. Monkey Bowling 2 elicits low levels of joy, anger, and fear; however, it elicits high levels of relaxation and depressed mood. James Bond 007: NightFire elicits low levels of pleasant relaxation and depressed mood, and relatively low levels of joy; it elicits high levels of anger, and fear.

Obviously, one cannot categorically conclude that the best game is the one that elicits most positive emotions. Conversely, it is not warranted to judge a game as poor if it elicits negative emotions (i.e., anger and fear) as did James Bond 007: NightFire. As is the case for advertisements, a good game is likely to elicit a strong overall emotional response, whether positive (joy) or negative (fear and anger [see 21]). On the basis of the present emotional profiles, a good guess would probably be that Monkey Bowling 2 is not a very good game; it does not elicit strong emotions, with the exception of depressed mood. Of course, these suggestions should be validated by letting people to choose how much to play each game during a longer time period (i.e., a possible criterion variable), and by examining the relationship of their long-term selections with the emotional profiles related to the games.

It should also be recognized that the emotional profile associated with Tetris may not be very flattering, even though Tetris has (historically) been extremely popular game. Although the popularity of Tetris may have partly been predicated on its inexpensiveness and low hardware requirements, it is apparent that games are not always played in order to feel strong emotions. They may also entail intellectual challenge and satisfaction. Also more generally, the presence of a "non-optimal" emotional response profile does not mean that a game is bad in all situations or for all people. A willingness to play a given game may depend on the mood and personality of an individual.

We also found that the games were differentiated by the sense of presence (i.e., the perceptual illusion that a mediated environment is not mediated) elicited by them. James Bond 007: NightFire elicited highest presence (both spatial presence and engagement), which is not surprising, given the first-person view and naturalness of the game. Perhaps also not surprisingly, the games played with a higher difficulty level elicited higher spatial presence compared to the easy games. A higher difficulty level of the game taxes the cognitive resources, thereby diminishing attention paid to cues signalling that the game environment is not real. In addition, we found compelling evidence for the suggestion that the reactions elicited by different games may vary as a function of the personality of an individual. That is, James Bond elicited higher engagement among high Impulsive Sensation Seeking scorers compared to low Impulsive Sensation Seeking scorers, while the reverse was true for the other games. This is intelligible, given the preference of high sensation seekers for thrills and danger.

4.2 Phasic physiological responses to game events.

We examined phasic psychophysiological responses indexing emotional valence (i.e., facial EMG) and arousal (i.e., IBI and SCL) to different game events in the video game Monkey Bowling 2. The results showed that the game events studied (i.e., the monkey [inside the ball] falls off the edge of the lane to the depth of outer space, the ball knocks down at least one pin, the player misses the pins completely, and negative feedback after a poor throw) elicited reliable emotional valence- and arousal-related physiological responses. The emotional valence of the responses was not always what one might intuitively expect,

however. Given the importance of emotional experiences in (sustaining) gaming behavior, the present results suggest that information on the emotional responses elicited by game events and event patterns may be applied in game design.

Unexpectedly, we found that Event 1 (the monkey falls off the edge of the lane to the depth of outer space) elicited an increase in positive affect as indexed by an increase in zygomatic and orbicularis oculi EMG activity, and a decrease in negative affect as indexed by a reduction in corrugator EMG activity. In addition, the event elicited arousal as indexed by an increase in SCL (IBI data were somewhat equivocal). Thus, although the event in question represents a clear failure, several physiological indices showed that it elicited positively valenced high-arousal emotion (i.e., joy), rather than disappointment. This is an important finding suggesting that event characteristics such as visual impressiveness and excitingness may be more potent determinants of the emotional response of the player compared to the meaning of the event in terms of failure or success. In regard to the temporal characteristics of the physiological responses, it is interesting to note that all facial EMG responses peaked 2 s after the event, whereas SCL response peaked 3 s after event onset. It is well established, however, that SCL response develops slower compared to facial EMG responses [3].

We also found that Event 2 (the ball knocks down at least one pin) elicited increased positive affect as indexed by an increase in both zygomatic and orbicularis oculi EMG activity. Again, these responses peaked 2 s after event onset. However, this positive event did not decrease negative affect, given that corrugator EMG activity did not change. Although one might expect that success in a game would also elicit increased arousal, SCL data showed that arousal decreased in response to Event 2. An apparent reason for this is that there is likely to be high anticipatory arousal before the ball hits the pins, after which arousal diminishes. This is also in agreement with our previous study showing that arousal (as indexed by SCL) decreased after attaining the goal in the video game Super Monkey Ball 2 [22]. It is of note, however, that cardiac IBI decreased (i.e., HR increased) in response to Event 2. Given the aforementioned sympathetically-mediated decrease in SCL, it is likely that this HR increase does not reflect changes in cardiac sympathetic arousal, but is a parasympathetically mediated phenomenon. That is, in addition to anticipatory arousal, attentional engagement is likely to be high before the ball hits the pin(s), after which it decreases. Recall that high attentional engagement is associated with heightened cardiac parasympathetic activity that causes the heart to slow down [21]. That being so, when attentional engagement decreases after the ball hits the pin(s), cardiac parasympathetic activity (i.e., a decelerative effect) also decreases, resulting in increased HR. These data clearly demonstrate the interpretative difficulties associated with HR also in game research. SCL is clearly a better index of arousal in game studies, given that physiologically it is influenced only by the SNS [21], and therefore there are no difficulties when interpreting the data.

The results also showed that Event 3 (the player misses the pins completely) that was supposed to be a negative event did not elicite any emotional valence-related EMG responses. This raises the question whether facial EMG is insensitive as a measure of negative emotional responses to video game events (but see below). Of course, an alternative interpretation would be that this particular (putatively negative) game event simply did not elicit negative affect. However, Event 3 elicited cardiac IBI and SCL responses that were identical to those elicited by Event 2. Given that also Event 3 is likely to be preceded by high anticipatory arousal and attentional engagement and followed by a decrease in these variables, this finding increases our confidence in the interpretation presented above.

We also found that Event 4 (negative feedback after a poor throw) elicited negative emotions as indexed by a decrease in both zygomaticus major and orbicularis oculi EMG activity. In addition, it elicited an increase in IBI (i.e., a decrease in HR) and a decrease in SCL, suggesting that arousal diminished. Thus, Event 4 appeared to elicit depressed affect characterized by a combination of negative valence and low arousal. The data of the present study suggest that the valence of the emotional response to game events may vary as a function of the active participation of the player. Recall that a putatively negative event the player actively participated in (falling off the edge of the lane) elicited a positive emotional response. In contrast, Event 4 characterized by passive reception of negative feedback elicited a negative emotional response. This finding is in line with our prior research showing that, when playing Super Monkey Ball 2, the valence of the emotional response was positive when the player actively participated in a putatively negative game event, but it was negative when the player passively perceived a replay of the same event [23]. Given the reliable emotional valence- and arousal-related psychophysiological responses to game events, there are several ways how phasic physiological responses can be used to guide choices in game design. First, these physiological responses can be used to examine whether a given game event elicits the targeted emotional response. This implies that the game designer should intuitively know what kind of emotional response (e.g., positive vs. negative, fear vs. joy) a given game event should preferably elicit. However, this may also be an empirical question, given that it is possible to empirically examine what kind of emotional response to a given type of game event is associated with greatest self-reported overall enjoyment. However, the predictive validity of the emotional responses to games and game events can also be established by examining how the emotional responses predict game play in the long run. This can be accomplished in the following way, for example: (a) emotional responses to a set of different games or game versions are recorded, (b) people are let to choose how much to play each game during a longer time period (e.g., 3 months), and (c) the relationship of the previously measured emotional responses with people's long-term game selections is assessed. Of course, from the perspective of emotion theory, one might predict that game events eliciting positive emotional responses are particularly effective in sustaining game playing, given that positive emotions serve as affective rewards for goal-directed behaviors (e.g., game playing) [29]. On the other hand, it is well known that people may enjoy seeing horror films that elicit fear, for example. Thus, also negatively valenced emotional responses may be desirable in some connections [21].

Emotion-related physiological responses to game events vary also in terms of their amplitudes, with a high-amplitude zygomatic EMG response indicating a more positive emotional experience compared to a low-amplitude response, for example. That being so, the amplitudes of responses to different game events or event patterns can be compared to select events or event patterns that best elicit the targeted emotional response. Information on the temporal characteristics (e.g., rise time and recovery time) of emotional responses to game events may also be useful. The present study showed, for example, that EMG responses peaked 2 s after event onset, after which they recovered to (local) baseline relatively fast. To avoid player boredom, the recovery time of the responses should be allowed for. It may be advisable that different game events follow each other in close enough temporal succession so that the previous emotional response does not recover completely before the onset of the next response, for example. In psychology, it is well established that repeated exposure to an emotional stimulus may lead to sensitization or habituation) of emotional responses [2]. Thus, information on sensitization or habituation of emotional response to game events can be applied when making design choices concerning the temporal distribution of events. This issue relates to the reinforcement schedule of the game.

4.3 The effect of co-located opponent on emotions

We investigated how the nature of the (co-located) opponent (i.e., computer, friend, or stranger) influences Spatial Presence and emotional responses when playing video games. The results showed that arousal ratings and physiological arousal as indexed by cardiac IBIs were higher when playing against another person (friend or stranger) than when playing against a computer (self-reported arousal was low when playing against a stranger, however). Apparently, the social-competitive situation related to playing against another person evokes increased arousal [cf. 8]. The presence of another person who "observes" inevitably creates a situation that involves high task performance evaluation potential, thereby increasing arousal [26].

We also found that playing against a friend elicited greater self-reported arousal and shorter cardiac IBIs (i.e., higher physiological arousal) compared to playing against a stranger. This is likely because, as opposed to a stranger, a friend may serve as a continuing reminder of task performance [26]. Thus, it may be more important for a player to perform well when playing against a friend, which may result in increased arousal. An important finding was that playing against another human being elicited higher Spatial Presence and Engagement as measured by the ITC-SOPI compared to playing against a computer. In addition, we found that playing against a friend elicited higher Spatial Presence and Engagement compared to playing against a stranger.

We also found that playing against another human being elicited more positively valenced emotional responses, as indexed by self-report and (higher) zygomatic, (lower) corrugator, and (higher) orbicularis oculi EMG activity, compared to playing against a computer. This was expected, given the appetitive motivation of humans for social interaction [1]. This finding is also in line with the suggestion that high Presence conditions result in greater enjoyment [16, 6].

4.4 The effect of non co-located opponent on emotions

We also investigated how the nature of the opponent influences emotional responses when the players are non co-located (i.e., they are in different rooms and have only the knowledge with whom they are playing). The results obtained with co-located players were replicated. Zygomatic and orbicularis oculi EMG activity was higher, and corrugator activity was lower, when (a) playing against a human compared to playing against a computer and (b) playing against a friend compared to playing against a stranger. That is, playing against another human elicited more positively valenced emotional responses compared to playing against a computer and playing against a friend elicited more positively valenced emotional responses compared to playing against a stranger. In addition, cardiac IBIs were shorter (i.e., higher arousal) when playing with a human compared to playing with a computer. These findings are important, given that video games are increasingly played over Internet or LAN, so that the players do not see each other. The results speak for the benefits of games designed to be played with other humans and friends in particular.

4.5 Playing context

We compared the emotional responses to games in three different playing contexts (i.e., laboratory, coffee bar, subway station). However, the results showed that the emotional responses did not differ by context. This is an important finding supporting the validity of laboratory experiments in game research.

4.6 Summary

The present series of studies showed that different instantaneous video game events elicited reliable psychophysiological responses indexing emotional valence and arousal. Not only putatively positive game events, but also putatively negative game events that involve active participation by the player may elicit positive emotional responses as indexed by facial EMG. The results also showed that emotional responses were more positively valenced and spatial presence was higher (a) when playing against a human compared to playing against a computer and (b) when playing against a friend compared to playing against a stranger; and this was the case not only with co-located players, but also with non co-located players. Emotional responses did not differ by playing context. The present results suggest that it may be possible to use emotion-related phasic psychophysiological responses as criterion variables in game design in several ways, although the predictive validity of these responses to games remains to be established.

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Business and Legal

When MC2-project started, it was expected that mobile multiplayer gaming would emerge as a new entertainment market. One strong indicator was the introduction of N-gage – Nokia developed gaming phone. However, the situation related to mobile multiplayer gaming is today business-wise more or less the same as it was four years ago when the MC2-project was started. There are still no markets, but there are high expectations. Hence, the core business assumption related to MC2-project turned out to be somewhat premature.

However, while the mobile multiplayer gaming remained in incumbent, the mobile stand-alone gaming market remained in constant growth, and new mobile, content and gaming related business and legal issues emerged. Meanwhile, we also sifted our focus towards these new emerging phenomena, most notably the open content licensing and "virtual economy" -based business models.

The next four papers introduce four distinct analyzes in the domain. The first paper – *Mobile multiplayer gaming* by Fernando Herrera – is a summary of the key findings of a master's thesis. In his thesis Herrera analyzed the complex market situation related to mobile multiplayer gaming. The complexity of the business environment is clearly one big reason why the mobile multiplayer gaming market does not exist as it was expected four years ago. The paper gives a comprehensive overview of the different approaches the industrial players are pursuing in the market and identifies the roles of the different actors in expected multiplayer market scenarios. Furthermore, the paper illustrates different roles that community activity can take in the mobile gaming domain. Furthermore, it seems that the core characteristics of mobile devices also affect the community dynamics. It is worth pointing out that insight of his studies about mobile gaming market, among other merits, led Herrera to become a CEO of an international mobile gaming company

The next paper introduces the phenomenon titled as *Virtual consumerism*. Like the previous paper, also this paper is a summary of master's thesis, this time the author is Vili Lehdonvirta. Virtual consumerism was emerging activity already before the project started, but during the project this phenomenon went through a dramatic

growth. While four years ago the activity was interesting complementary feature in some games or a "hacker-activity", today it is a potential revenue mechanism for many different games and digital media services and a multi-billion dollar business. In the paper Lehdonvirta explores the different strategies of a virtual economy operator towards real-money trade. The lessons learned in this study have further led to many different research activities in Helsinki Institute for Information Technology, most notably the virtual economy research network (*www.virtual-economy.org*).

While virtual economy based business models provide potential new opportunities for digital media companies, the digital content licensing has turned out to be more of a problem domain for media companies. The common procedure in media business has been such that content owners acquire and control all rights related to the particular content. Due to the advent of various internet services it is possible that common users and amateur content producers can publish their own content. Furthermore, various services have enabled that common users can further distribute content among their peers. While on the other hand these new possibilities open up tremendous new possibilities, these new services are clearly problematic in the perspective or traditional content licensing procedures, copyright laws and traditional business models. In his paper Open content licensors and business models Herkko Hietanen explores the different new content licensing schemas, which are targeted to manage the problematic situation of utilizing the possibilities of new services while producing business creation possibilities for the original authors. This review is very relevant today due to the huge success stories of YouTube and Wikipedia, which are paving the way for dramatic change in digital media distribution, including television and even publishing. It is worth noting that during his research in content licensing Hietanen has been an active member of the community that has been developing the Creative Commons licensing framework by acting in pivotal role in localizing Creative Commons in Finnish and by working in the Creative Commons headquarters in San Francisco.

Finally, Olli Pitkänen's paper entitled *Legal aspects in mobile scenarios* concludes this chapter and this report. This analysis is based on the scenarios, which where developed in the MC2-project and where introduced earlier in the introduction chapter (pages 9 and 10). The analysis illustrates how the different potential mobile community scenarios need to tackle also many legal issues in addition to technical, usability and market complexity issues before the business could become stable. This paper is also part of the Dr. Pitkänen's doctoral thesis.

Together these papers illustrate the potential, complexity and novelty of the community based digital media. While we were never able to study the business impacts of mobile multi-player communities as we originally planned, we were able to witness and research the birth of many complementary services and market activities, which have impact way beyond what we thought mobile multiplayer gaming and communities alone would have.

Mobile Multiplayer Gaming

Fernando Herrera

Fernando.herrera@hiit.fi

Abstract

Mobile multiplayer gaming was thought to be one of the key drivers or "killer applications" driving the uptake for mobile games. However, a complex business and technological has been one of the main inhibitors for its growth. The following paper provides an overview of the different actors participating in the multiplayer mobile gaming value network. The paper concludes with a discussion of the general environment and a perspective on the future of the industry.

1 Introduction

When the study was started in 2004 there was a lack of literature directly addressing mobile multiplayer gaming, thus the following analysis draws from the literature on single player mobile games and mobile entertainment. Mobile gaming is built by the convergence of the telecommunications and gaming industry [1], [2]. The largest players in the field, being the media/content companies, operators and device manufactures, are trying to integrate into the new space [3]. These players are actively trying to secure a position in the newer sectors of the industry, however they are not directly moving into the core of each other's offerings. This is further contributing to the blurring of the industry's boundaries, as the middle ground between the largest players becomes increasingly blurred. The blurring of boundaries within the industry is illustrated in Figure 1.



Figure 1. Blurring of boundaries in mobile gaming (adapted from Ollila et al, 2004)

The literature on mobile gaming provides an overview of the key player roles in the industry and their respective activities. The majority of the literature relies on value chain representations or similar linear models to present value creation in the mobile gaming value system [1], [4], [5], [6]. The linear models are primarily intended to represent the flow of content and revenues in the industry. A sample value chain model for downloadable mobile games is presented in Figure 2.



Figure 2. Downloadable mobile games value chain [4]

Of the literature surveyed only two of the reports relied on a networked model which highlighted the interrelation and overlap between the different roles [2], [3]. Pelkonen categorizes the different actors/roles in mobile gaming along the operational phase of content creation, content aggregation, content marketing and content distribution. This is meant to represent a process model generic in all content industries [2]. Different actors participate in different phases and may cross phase boundaries. The model can be seen in Figure 3.



Figure 3. Mobile games value web [2]

Mobile multiplayer gaming carries an additional layer of complexity than standalone mobile gaming due to the need for connectivity and the service infrastructure required to run multiplayer games. To represent multiplayer gaming, Paavilainen uses of a value chain representation, which two distinct segments, one for the product component of the offering and one for its service component (2003). The product component refers to the purchasing of the actual game cartridge, whereas the service component is related to access to the game servers, mobile connection and ancillary services such as gamer statistics and match making services. The service component is the biggest differentiator between single player and multiplayer mobile games in terms of their value systems. In Paavilainen's model the interrelations between different roles across the product and service components of the offering do not extend beyond the device and the generic game concept or intellectual property rights (IPR). Although the model represents multiplayer mobile games that follow cartridge based distribution, by exploring the service component of multiplayer cartridge games it highlights some of the roles required for multiplayer gaming not present in single player mobile games. Paavilainen's value chain model can be seen in Figure 4.



Figure 4. Cartridge Based Multiplayer Mobile Games Value Chain (adapted from Paavilainen, 2003)

None of the models surveyed take into account the role of the consumer beyond passive consumption at the end of the chain. However, in the case of multiplayer mobile gaming the consumer plays a very important role as playing with other gamers rather than with predefined opponents is one of its key differentiation factors. The models also fail to take into account the different sources of value at different points in the chain.

Another shortcoming of the models surveyed is that they take a completely telecommunications centric view to mobile gaming, where the new offerings from traditional video game industry players also have possibilities for connectivity but with a drastically different approach than the one followed by the telecommunications centric view of mobile gaming. These next generation offerings such as the Sony PSP and Nintendo DS, are to rely on technologies that rely on unlicensed spectrum, such as W-LAN, for connected gaming [7].

To overcome the limitations of linear representation in understanding how value is created in the industry, a customer perspective will be taken in determining the different value systems involved in delivering the offering. In order to participate in multiplayer gaming, a consumer needs five things: a device which can play multiplayer games, access to the network used to play the game, an actual multiplayer game, a way to get the game, and access to other gamers with whom he can play together. Thus the different actors participating in the multiplayer gaming value system will be grouped under five respective role groups: 1) device platform, 2) access, 3) content creation, 4) publishing and distribution, 5) service platform. The different role groups and their main actors can be seen in Figure 5.

The role groups represent different parts of the offering as perceived by consumers. A mobile game is perceived as being separate from a mobile subscription to an operator and they are both perceived as being separate from the actual mobile device. However, they all need to come together to deliver the mobile multiplayer gaming offering. In this way each role group represents a unique value system that is visible to the consumer even though a particular player may fulfill different roles simultaneously. The groups, however, are highly interrelated and co-dependent on each other in forming the multiplayer mobile gaming value creating system. The different groups do not necessarily rely on the same value creating technology and thus can have different underlying value configurations, be it value chains, value shops or value networks. This leads to difference in the sources of cost and value for the different role groups.



Figure 5. Multiplayer mobile games: roles and key actors

'The analysis is limited to those actors and roles that are most visible to the consumer and that directly affect the quality of the offering. In practice, a firm might perform multiple roles allocated to the different actors identified. This represents a tradeoff between the level of detail of the analysis and the development of a manageable model. The different enabling technologies, such as game creation tools and billing platforms in place in the system, are discussed as support parts of the value system within the aforementioned role groups.

2 Industry Roles and Key Actors

2.1 Content Creation

This category consists of the actual creation of the content that forms the cornerstone of the system offering. Without games that appeal to consumers there is no mobile gaming. In the case of multiplayer games this includes the content that forms the game itself as well as the content origination of content arising from the communication activities between end-users. When it comes to commercial content, the main commercial actors are game developers and intellectual property (IP) owners. Gamers themselves are also important actors in content creation, as even in the most limited cases, by playing against each other, they form the source of challenge for a multiplayer game. Gamers also play a significant role in the creation user generated content such as forum posts and user communication when community infrastructure is made available.

Game development technology providers, such as companies providing game engine technology and middleware, play a support role in content creation. There focus is on technology development in order to make game development more effective. Companies in this group include Fat Hammer, a 3D engine provider, and Nokia. There is also a host of smaller players acting mostly on contract basis.

2.2 Game Developers

These companies concentrate on the development of mobile games. They need to optimize mobile games for existing technologies and devices, such as managing the need for the game to run in multiple device models [4]. Game developers participating in the mobile space are both pure play mobile game developers as well as well as companies with a background in the video games industry [6]. As content providers, game developers have been active in dealing intellectual property owners, either directly or through intermediaries such as publishers, to bring popular brands to the mobile space [8], [9].

In the case of the pure play mobile game developers the company base consists of a large number of small start-up, some employing only three to four people [5]. The pure play developers that enjoyed an early mover advantage have managed to become well established in the market, and are dealing with the operators directly as opposed to going thorough an aggregator or publisher. For many of the smaller companies however, it is necessary to reach the operator via a games content aggregator or publisher, which may be a role also being filled by one of the larger games developers [5]. Some companies operating in this area include: Gameloft, JAMDAT, Konami, Sumea and THQ wireless.

2.2.1.1 Intellectual Property Owners

IP owners posses valuable brands that can be leveraged in the mobile space [1], [5]. They are composed from companies from a diverse range of sectors, from Hollywood studios to retail giants. IP owners have high economies of scope as their IP can be applied to a wide variety of content types. The Lord of the Rings IP has been used in everything from computer games to promotional campaigns for fast food restaurants.

IP owners are not actively involved in the development of mobile games, but instead rely on up-front fees for the licensing of their brands as the main source of revenue in the wireless gaming space [5]. IP owners are very careful of how their brands are used, and in some cases want to have a hands on approach as to the actual content of the game and of its marketing. There are numerous cases already in mobile gaming where established brands are being leveraged. Finnish mobile game developer Sumea has launched both Ferrari branded game as well as a mobile phone remake of Activision's Pitfall [9], [10].

2.3 Packaging and Distribution

This segment takes care of bundling or selecting game titles from among, massive arrays of available content, and the addition of integrative and presentational functionalities to create a finished product for consumers [11]. This relates to, for example, localization of games to different markets, and linking of content to the respective distribution channels that reach the consumer. This role group acts as a link between the large amount of games produced by content providers and the different channels where they are made available to the consumer. The segment also includes the retail channels through which the games are actually purchased by consumers. The main actors in this space consist of publishers, content aggregators and online portals for digitally delivered goods, as well as physical distributors and retailers for cartridge based games.

2.3.1.1 Publishing

Publishers are involved in the funding, marketing and IP sourcing for mobile game titles. Their most important role in the mobile space deals with the acquisition and control of rights over the IP used in the project, as well as being the lead in consumer marketing efforts and assuring the game's presence in the retail channel [5], [12]. As few publishers in the mobile space own their distribution channels, they rely on partners to deliver the games to the market. Publishers also tend to be involved in localization of games for their distribution to different markets and in porting the games to support a wide range of mobile terminals.

Publishers' involvement in the funding of mobile game titles has been limited due to the low development costs for mobile games. It is still possible for developers to self-fund and part self-publish. Cartridge-based mobile games have been the exception as they have higher financial requirements. The publisher funds the development of such titles by providing an advance on royalties to the game developer [13]. This means the developer doesn't earn any income from the game until the advance is recouped through accrued royalties from game sales. The role of publishers in the funding of downloadable mobile games is increasing, as the financial requirements for developing a mobile game rise. When funding the game development projects, the publishers are, albeit to different degrees, involved in the production of game titles and play a crucial role in determining the target platform for the game.

2.3.1.2 Aggregators

According to MGAIN content aggregators are defined as an "*entity that sources and purchases content form a number of channels, structure and bundles it and sells it for delivery over mobile networks*" (2003). In some cases aggregators also offer service and content hosting for the content they aggregate. It is importance for aggregators to provide a large variety of games and general entertainment applications in their content packages. This implies the need for aggregators to maintain relationships to a large base of game developers or publishers. Aggregators do not have a direct access to the final consumer.

2.3.1.3 Portals

Portals act as a conduit between a mass user base and multiple content providers, by aggregating content from a variety of sources [5]. Currently the portals act as the main channels for the online distribution of mobile games to consumers, although mobile games are but one of the content types portals distribute. They form the retail channel for digital distribution. Portal providers form relationships with games content aggregators, publishers and individual games developers in order to secure games content for their portal. In some cases the portals are seeking to secure exclusive gaming content for their user base [14].

Portals reach the consumer through different media channels, as they are accessible via the mobile device as well as over the Internet. In some cases portals also use different media such as TV and print, to display their offerings to consumers [3]. The most widely used mobile portals are owned by the mobile network operators [15]. Ease of use, accessibility and consumer awareness are the key factors in determining a portal's success.

2.3.1.4 Physical Distributors

Physical distributors are present when mobile games are distributed in a physical medium. They take care of warehousing game titles from publishers, taking orders and delivering the games to the retail points [1], [2]. In the case of cartridge based games this would refer to the physical distribution of the memory cards that contain the actual games. Although there are independent distributors, large publishing houses often have their own distribution organizations. Physical distributors can be considered to be the equivalent of aggregators in terms of their function. The key difference is their focus on the actual physical nature of distribution and lack of packaging related activities.

2.3.1.5 Retailers

Retail stores form the most common distribution channel for traditional video games as well as for cartridge based mobile games [1]. Retailers source games from publishers or distributors in bulk, and the games are then sold to the final consumer [13]. There are both general retailers that sell a wide variety of assorted goods as well as specialized retailers that focus on more specific niche areas such as games, electronics or mobile phones. Retailers can be either brick and mortar or online operations. The allocation of shelf space is an important resource in brick and mortar retail operation. This has been a problem the games industry has had to face as the amount of games published for the different platforms has dramatically increased whereas the amount of shelf space allocated to video games has not increased at the same rate.

2.4 Service Platform

The service platform refers to the running of multiplayer gaming services and related infrastructure. This includes the running of billing platforms, game servers, as well match making users for participation in multiplayer gaming and facilitating community infrastructure. The main actors in this role are service infrastructure providers, service hosting providers and service application providers. Service infrastructure develop the required infrastructure solutions, service hosting takes care of hosting and running the required infrastructure and service application providers develop the actual entertainment service and package it for consumption by the end user.

2.5 Access

Access refers to the enablement of customers to access the physical network. In the case of mobile multiplayer gaming this last mile consists of the air interfaces through which users connect to the network. Mobile network operators (MNOs), as well as mobile virtual network operators (MVNO), represent the key actors within this role. Their networks are used for OTA distribution of mobile games and for playing connected games. Both of these actors tend to be restricted to local markets [1]. Vodafone is an exception to this, however it lacks a dominant market share in any of the markets in which it operates. Different enabling technology providers act within this space, by providing the actual network infrastructure and related platforms.

Mobile telecommunications in Europe follows the Global System for Mobile Communications (GSM). Most GSM operators have deployed the Global Packet Radio System (GPRS), to allow for packet-based data traffic on their networks. Europe has standardized on W-CDMA for third generation systems (3G). 3G is intended to bring higher data rates as well as higher network capacity.

The literature, however, is slanted towards a telecommunications industry perspective on mobile gaming. As mentioned earlier the upcoming offerings from Nintendo and Sony rely on unlicensed spectrum for providing end customer access. In the case of offerings that rely on unlicensed spectrum technologies the wireless part of the last mile can be provided by any commercial entity or even by the customers themselves. However, these base stations are actually linked to the network by through the use of commercial Internet service providers (ISPs). This is radically different from the situation in mobile networks, where MNOs have a monopoly over the air interface.

2.5.1.1 Mobile Network Operators

MNOs can be divided into technical and commercial roles [3]. They act as technical service providers by taking care of the deployment of the technical infrastructure required for mobile service provisioning, this includes the mobile network and related transmission infrastructure [1], [3], [6]. As technical service providers MNOs are the only players with the rights to use the radio spectrum required to run mobile networks. Their role as commercial service providers is related to the market related aspects of providing access to consumers. They are concerned with functions such as billing and customer care, as well as sales and marketing activities. The leading European operators, based on market share across the different member states of the European Union, operators are: Deutche Telekom, Orange, mmO2, Telenor, Telia-Sonera, TDC and Vodafone [16]

According to Frost and Sullivan, network operators have traditionally controlled the development and delivery of mobile content. A shift is happening as data services gain in importance and operators engage third parties to provide enhanced content such as games. Operators rely on revenue sharing agreements for premium content, while getting the bulk of their revenues from network usage and subscription services [4.]. Gear et al emphasize the operators billing relationship with the end-user, as the operator can bill the user for their content purchases directly on their regular phone bill (2001). This highlights the importance of the customer relationship, as access to the end-user is placed on the same level of importance as that of providing the required infrastructure for content delivery.

Besides their monopoly on spectrum, mobile network operators are the only ones that have been providing a service component to the end users, thus they are the only players with a billing relationship to the consumer. They have the ability to conveniently bill the customer in their general telecommunications bill for purchases of downloadable games under different revenue models, such as pay-per-download or subscription based.

In many markets operators subsidize the end-user price for the mobile terminal as it is bundled to the end-user with a mobile service package. As operators subsidize the handset they have the ability to preload software into the device. Mobile operators also have a privilege position in terms of their access to information about the end-user such as the users position.

2.5.1.2 Mobile Virtual Network Operators

MVNOs are a special subset of network operators. Ulset defines MVNOs as "radio-less operators that own and control at least some part of the mobile network, while contracting out to regular radio-based mobile network operators the radio part along with all the remaining complementary network facilities and service applications that are necessary to provide mobile services to end users" (2002). In this sense they are essentially resellers that buy capacity in bulk from infrastructure providers that they then repackage into smaller bundles that are later sold to third parties [17]. Although MVNOs do not necessarily have control over the network they do have control over the customer relationship. In this sense MVNOs only perform the commercial service provider role of a traditional MNO. To date no single MVNO has attained dominant position in any of the European markets. A comparison of the roles performed by MNOs and MVNOs in providing access is illustrated in Figure 1.



Figure 1. Comparison of MNO and MVNO roles in access provision (adapted from Olilla et al, 2004)

For the remainder of the study the term Operator will be used to refer to both MNOs and MVNOs unless otherwise stated.

2.6 Device Platform

The American Heritage Dictionary defines a platform as "The basic technology of a computer system's hardware and software that defines how a computer is operated and determines what other kinds of software can be used" [18]. We define device platform, as the combination of a mobile device's hardware and software for which mobile games are developed. Example device platforms are Nokia Series 60, the Nokia N-Gage, and devices incorporating Sun's Java 2 Micro Edition.

Developers are both technically and business-wise dependent on the platform they choose [1]. On the technical side, the platform capabilities and limitations constrain the games that can be developed. On the business side, the platforms market adoption essentially determines the potential size of the market the game can target. An example of these can be seen by contrasting two versions of Sun's Java 2 Micro Edition (J2ME): Mobile Information Device Profile (MIDP) 1 and MIDP 2. MIDP 1 has an extremely large installed based which makes it highly attractive for developers; however MIDP 1 poses severe limitations in terms of the access it provides to the phone's functionalities. The newer MIDP 2 on the other hand has, as of now, a low market adoption but gives much more freedom to developers.

The key players in the device platform space consist of device manufacturers and software platform providers. Device manufacturers provide the hardware side of the device platform and integrate the software side of the platform into their devices. The enabling technologies in this sector relate to the component suppliers for the device, such as 3D accelerators, digital cameras, and color displays, as well as suppliers of software components such as development tool providers.

2.6.1.1 Device Manufacturers

Device manufacturers refer to the companies that deal with the development and marketing of the endconsumer mobile gaming device. As mobile devices are changing from a voice-centric handset to devices that allow for the consumption of content-based data in a user-friendly way, there are different types of devices aimed for the gaming market. The devices with mobile gaming capabilities can be categorized into a) mobile phones b) gaming centric phones and c) dedicated devices. Mobile phones are general-purpose communication devices with the ability to play games. Game centric phones, are hybrid devices that combine game-optimized capabilities with the application of a mobile phone From a device perspective the boundary between mobile phones and gaming centric devices will be blurred, as features such as 3D acceleration are included in mainstream mobile phones. Dedicated devices are optimized for gaming and although possessing mobile connectivity they do not have the non-gaming capabilities of a mobile phone. For example Tiger Telematics' Gizmondo offered GPRS connectivity but no voice capabilities. Figure 2, shows the main players for each category, as well as videogame industry players active in the portable gaming market.



*Announced Q3 2004

Figure 2. Device manufacturers: key players by device category [19], [20], [21].

Device manufacturers possess strong technological capabilities for developing the devices as well as for integrating components from a wide array of enabling technology providers and software platform providers. Brand image and the ability to deliver aesthetically attractive handsets are also important aspects for device manufacturers.

Frost & Sullivan poses the challenge of mobile gaming for device manufacturers as that of providing devices that deliver a user-friendly environment and an enhanced visual gaming experience [4]. In the case of devices with phone functionalities, device manufacturers have strong relationships to operators, as the majority of handsets are purchased at discount, or provided free as part of phone service contracts. Operators primarily own handset retailers, although there are also independent players.

2.6.2 Software Platform Providers

These actors provide the required software for running applications on mobile devices. The software can be either native platforms, which represent operating systems for the mobile devices or application platforms on which applications are executed, but which run on top of the operating system. There are four major players in the mobile operating system space: Palm OS, Windows CE/Pocket PC, Symbian OS, and Linux. The major application platforms adopted in the mobile space are Sun's J2ME and Qualcomm's BREW.

3 Conclusions and Discussion

The mobile multiplayer gaming industry is dependent on the coordination of a wide range of players in order to deliver value for consumers. Although the different parts of the offering are highly interrelated, mobile gaming does not face the traditional problems of core product adoption faced by products that depend on their complementors for delivering value. This is due to the core parts of the offering, the device and the mobile network, having intrinsic stand-alone value disregarding mobile gaming. Furthermore, these parts of the offering are already widely adopted, their communication capabilities being the "killer application" driving their adoption.

This is not to say that network effects are not present in mobile gaming. Nevertheless, the requirements for virtuous positive feedback to start are already in place. The challenge for driving market demand is shifted, from that of building a large install base for the core products, to that of turning the existing install base into active consumers of mobile games. The availability, quality, visibility and pricing of mobile games are some of the most important factors in diving mobile game demand. Availability refers, to mobile games being made available for a wide range of handset, and in different variations to satisfy different user tastes. Availability also encompasses, the channel through which games as sold, in that mobile game

must be offered in such a way as to be easily purchased by consumers. Visibility refers, to consumer awareness of mobile gaming, both about the games being offered and of the fact that mobile games can easily be purchased. This is linked, primarily, to the marketing and promotion of mobile games. Thirdly, quality refers not only to the actual quality of the game when its consumed, but also the perceived quality of mobile games even before they are purchased. An example of these is, when a brand is attached to a mobile game, which leads consumers to form an image of the game's quality before the game is purchased. Finally, the price of mobile games must remain competitive, when compared to alternative entertainment offerings, particularly to the price of richer video games available in other mediums. N-gage is an example, the device and its distribution channel for N-Gage games allows for richer mobile games to be developed. However, the price point of N-Gage game puts them in a hard position, as they enter into direct competition with the offerings from the video games industry.

Positive feedback dynamics, both at the industry level, and at the level of individual firms, were found to be affecting the availability, quality and visibility of mobile games. Overall, positive feedback dynamics were found to raise the barrier to entry for smaller players, as they drive up the investments required to compete in the industry. For example, in the case of game developers more resources are required to create games of a comparative quality to other games in the market, to support a large amount of handsets and to effectively co-promote games. The position of different actors in the system plays an important role in determining how much they can internalize the benefits from mobile gaming. Operators are an excellent example. Over-the-air distribution and operator billing are likely to remain the main distribution and billing methods for mobile games. Through their control over end-user billing, the mobile network, and handset retailing, operators have been able to internalize a large part of the benefits from the sale of downloadable mobile game sales to their subscribers.

Concerning the software platform for downloadable mobile games, the European market is dominated by Java. Mobile devices, however, in many cases support multiple software platforms simultaneously, with Java usually being the common denominator. Nevertheless, unless alternative platforms provide game developers a significant way to differentiate their games or, pose an attractive market opportunity that cannot be addressed through Java, developer support will likely remain centered on Java. Even though Java itself is standardized, the functionalities of different mobile devices are likely to remain heterogeneous, as device manufacturers continue to add features in order to differentiate their offerings, and their will likely still be differences among the different Java implementations found in different device models. This is likely to continue to put strain on developers, as they need to support a wide variety of different handsets. Harmonizing Java would make huge strides in increasing the availability of mobile games across different device models.

At their onset, mobile multiplayer and connected games are likely to be hindered by the inability of users to play with each other across service providers. However, the need for users to play together, and the need to reach a critical mass of users for such games to be appealing, will likely drive the service part of the game to be provided by the game's developer or publisher removing these problems. Communities form an important part of the value of connected and multiplayer games for consumers. User communities in mobile gaming are most likely to form around the games themselves, and will be run primarily by the parties most familiar with the game's content. It is likely that there will be multiple overlapping communities around one game. There are different levels in which communities can be leveraged in mobile gaming, depending on how central the community is to value creation:

- Communities as customer relationship management.
- Communities as part of the offering.
- Communities as the core offering.
- Communities as the source of the offering.

The level of importance placed on the communities is entirely case dependent. However, it is likely that a higher emphasize will be placed on user communities as the medium matures.

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Virtual Consumerism

Vili Lehdonvirta

vili.lehdonvirta@hiit.fi

Abstract

During the recent years, a phenomenon has emerged where users of massively-multiplayer online games and other "virtual worlds" spend significant sums of real money to obtain game items and other "virtual property". This has had significant ramifications for user communities as well as game operators, altered the value chain of online gaming, and provoked discussion concerning the legal status and future of virtual property. This chapter summarises the phenomenon and presents the results of research conducted in MC2 regarding a) the impact of real-money trading on user experience and b) the strategies available for virtual world operators in relation to real-money trade of virtual assets. The results help operators deal with the phenomenon in a sensible and structured manner and open up avenues for further research in the emerging field of "virtual consumerism".

1 Introduction

According to Steve Salyer, CEO of IGE, approximately 880 million U.S. dollars' worth of virtual assets were traded for real money in 2004 [8]. IGE is a privately held 150-person company specialising in virtual asset trade. Virtual assets, such as clothes, money or realty, are intangible valuables that exist in so-called virtual worlds.

Virtual worlds are interactive models that are to some extent designed to resemble the real world. They physically exist in the databases of dedicated server computers maintained by companies acting as virtual world operators. Users access them through the Internet using specialised client programs that are capable of presenting the worlds visually and aurally. The most popular virtual worlds exist for the purpose of providing a setting for a massively multiplayer online role-playing game ('MMORPG'). Others exist simply as a platform for social interaction. Users typically participate in a virtual world by controlling an avatar, a character that represents them in the virtual context. A key feature of virtual worlds is that they are persistent: they continue to evolve even as the user logs off [4].

Ultima Online, released in 1997, was the first highly successful MMORPG. In its heyday it had about 250,000 players who paid Electronic Arts a monthly subscription fee to access the world [25]. The game was designed to have a realistic economy. Players could trade with other players to exchange their virtual assets for other virtual assets, like castles for gold. It was meant to be like Monopoly: no real money would change hands. But in 1999, some Ultima Online players began putting gold pieces and complete accounts on auction at the popular Internet auction site eBay [11]. One early seller described his motivations as follows: "I'd spent more than a year building up [the avatar's] online assets and felt there was value in those assets."[11] The word spread and the sellers received bids from other players. When an auction was completed, the payment was carried out using ordinary means such as credit card or cheque. Assets were then handed over in the virtual world. In this way, Ultima Online players were able to liquidate their virtual holdings into real money.⁴¹

The practice quickly spread into other MMORPGs and gave rise to the phenomenon known as the 'secondary market' for virtual propery, or 'virtual consumerism'. At any given time there are thousands of accounts, virtual items, currency packages and realties on sale at eBay (Figure 1). Data collected by economist Edward Castronova shows that in the six-month period from January to June 2004, eBay's North American service carried more than 800 000 such auctions [9]. Not surprisingly, the market soon attracted a cottage industry around it. In 2001, so-called 'pharmers' were reportedly making two thousand

⁴¹ This was actually not the first time in history, though. Account and item sales were already taking place in a smaller scale in the early online games of 1980's. But it was not until eBay and Ultima Online that virtual item trading reached such phenomenal volumes.

U.S. dollars per week by harvesting valuable items from the virtual worlds and selling them off at eBay [5: 31]. Wired Magazine [12] describes how virtual arbitrageurs reached similar earnings by buying undervalued virtual assets from eBay and selling them on for profit.

Item Title	Bids	Price* 🔺	Time Left
LOOK Habbo Furni Package - Rares + Norms 🛱 🖻	14	\$40.08	2d 23h 12m
UO Ultima Online Europa LUNA House ***INSIDE WALLS*** 🛱 📫	5	\$152.50	2d 12h 24m
Eve Online GIST X-TYPE X-LARGE SHIELD BOOSTER 🖻 🛤	=Buy It Now	\$239.99	5d 01h 12m
Maple Story MapleStory LVL85+ PRIEST BROA OFFICIAL MS	21	\$560.00	5h 53m

Figure 1. Virtual asset auction listings at eBay.

1.1 Third-party business

Today the secondary market is no longer centered exclusively around eBay. A story in Newsweek International claims that there are over 200 companies working in virtual asset trade in Korea alone, with total yearly turnover somewhere between 83 and 415 million USD [21]. Newsweek's claim seems rather bold, especially as it does not cite sources, but it may be indicative of the scale of the market today. The Western market has seen a similar proliferation of commercial activity, though exact numbers are hard to come by. Alternative marketplaces started appearing when eBay banned the sales of some virtual assets following requests from certain operators.⁴² For example, there are no EverQuest-related virtual assets currently on sale at eBay, while a search on one of the alternative marketplaces called PlayerAuctions.com yields 1 229 results.

In addition to the player-to-player marketplaces, there are also virtual asset trading companies, which buy virtual assets in large quantities and sell them out with a markup. IGE, founded in 2001, is probably the biggest one. There are also numerous smaller ones. Most of the traders seem to focus on trading in virtual currency (Figure 2). The shift from sales of virtual items to sales of virtual currency can perhaps be explained with the fact that currency is a perfect commodity. In contrast, a MMORPG might have tens of thousands of different item types⁴³ and the attributes of each individual item may vary for various reasons, resulting in information asymmetries. Trading in currency is therefore less risky than trading in items and results in smaller transaction costs. Currency can of course then be exchanged for items in ingame markets.

IGE and the other trading companies are rather restrained when it comes to disclosing financial figures, but IGE does say it has "thousands of transactions per day" and that it has "served hundreds of thousands of customers" [13]. IGE seems to be enjoying a healthy margin on its currency sales: for example, at the time of writing, the IGE web service⁴⁴ offered to buy ten million pieces of Ultima Online gold on the Atlantic server for USD 30. At the same time the service offered to sell the same amount of gold for USD 74.99. That is a gross profit margin of 60 %.

⁴² Referred to as the "embargo strategy" in section 3 below.

⁴³ For example, at the time of writing, <http://www.thottbot.com/> lists 26 629 unique item types that exist in the MMORPG World of Warcraft.

⁴⁴ <http://www.ige.com/>



Figure 2. Virtual "Linden Dollars" (SLL) being traded for U.S. Dollars.

The demand for virtual assets has naturally attracted producers to the market. According to reports from players and the popular press, numerous "virtual sweatshops" have been set up in low-wage countries: "The people working at this clandestine locale are called 'gold farmers.' Every day, in 12-hour shifts, they kill monsters and harvest 'gold coins' and other virtual goods that they can sell to other online gamers. From Seoul to San Francisco, gamers who lack the hours or patience to work their way up to the higher levels of gamedom, are hiring young Chinese to play the early rounds for them." [1]

More elaborate virtual assets that cannot be mass-produced may be produced by Western players: "Mark (aka Marcos Fonzarelli in [the virtual world called] Second Life) has turned himself into a 'robot tailor', designing robot costumes that characters can wear. Admittedly, it is a niche market, says Mark, but he still earns \$250 a month. [...] One player he met in the virtual world, Second Life, earns \$70,000 a year creating female avatar clothing, he says." [24]

In Finland, the biggest purveyor of virtual assets is Sulake Oy. According to Johnson and Toiskallio [14], around 25% of Finnish teenagers visit Sulake's virtual world Habbo Hotel on a regular basis. Access to Habbo Hotel is free, so Sulake makes most of its approximately 30 M \in global revenues by selling virtual furniture to the users. For example, the latest sofa and a pair of matching chairs can cost around five euros. Various methods can be used for payment, including SMS, credit card and "Habbo-seteli", a code card available for purchase at R-kioski retail stores. Avid users can easily have hundreds of items.

In summary, there exists a growing trend where people invest not only time but also money to obtain "virtual property", which is essentially a database entry in a computer system. This "virtual consumerism" gives rise to scores of questions ranging from the practical to the philosophical. In the context of MC2, we approached two problem areas: a) how does this phenomenon affect user experience, and b) how should MMORPG and virtual world operators react to it. The research and its results are summarised in the following sections. More details can be found in the original reports [15, 16, and 17].

2 User perceptions of real-money trade

Real-money trade ('RMT') of virtual assets, especially MMORPG property, is controversial. Many players feel strongly against it, and several virtual world operators have taken measures to curb it. Yet despite the criticism and various legal threats, RMT along with the auction sites and trading companies seem to prosper. Clearly there must be some players who experience RMT in a positive way and wish to keep on doing

it. To cater for this audience, designers and business planners are starting to think about new strategies towards RMT. Yet at the same time, they run the risk of angering another part of their audience. Navigating these conflicting preferences is challenging. A clear understanding of how RMT affects user experience is missing.

One research problem addressed by the virtual consumerism related research in MC2 was therefore this: how do players perceive the real-money trade of virtual assets? The method used comprised a literature review and case studies to identify various existing perceptions. A model of player motivations [26] was then used as the framework in which the various perceptions were placed. This exploratory method was motivated by the lack of previous models in this area. A follow-up study should seek to test the results using e.g. a user survey. The study was reported in detail in [17], but a summary is provided below.

2.1 Perceptions expressed in literature

Many different views regarding RMT have been expressed in previous literature. Bartle [3: 13-16], Castronova [7: 192-196] and many others are keen to preserve the "magic circle" in virtual worlds. Magic circle is a concept in game studies that refers to the artificial context created by the rules of the game, a "frame" that separates the game from the real world [22: 94]. Like suspension of disbelief in film, the magic circle is considered by some as vital for enjoying a game. In virtual worlds, there are rules that regulate how players accumulate virtual assets. If players are able to obtain assets outside of these rules by purchasing them for real money, the argument can be made that the magic circle is broken. Real-life economic structures and hierarchies may "seep" into the virtual world, making it impossible for players to enjoy a truly parallel life online.

It is also often reported that players consider virtual asset purchases as being cheating [3: 7][5: 31][23: 231]. Those who buy powerful assets for real money are seen as gaining a competitive advantage which they have not truly earned. They are therefore viewed with apprehension and disdain. It is common for opponents of buying practices to make analogies to sports and board games: e.g., nobody likes those who cheat in sports, and nobody would play Monopoly if you could buy Boardwalk with real money [3: 4].

Real-money buyers are also seen as violating the "achievement hierarchy" of a MMORPG [3: 16][5: 31]. An important aspect of MMORPGs is character development: the skills and abilities of one's avatar improve with play. Those who have developed their avatars into powerful, skilled, "high-level" characters pride themselves with the achievement and enjoy the recognition of others. The ability of players to obtain high-level avatars by spending money instead of playing is said to disrupt this achievement hierarchy, making the hierarchy less meaningful and any advancement on it presumably less rewarding. "Allowing players to buy high-level characters from one another is like allowing athletes to buy world records from one another," opines Bartle [3: 16].

On the other hand, Bartle discusses three reasons why many MMORPG players do feel compelled to make virtual asset purchases. They are all related to the character development aspect of MMORPGs. Firstly, experiencing all the content programmed into a world requires players to develop their characters to the highest level. This takes lots of time, which not everyone has. Buying a high-level avatar is a convenient shortcut that gives immediate access to more content [3: 7-8]. Secondly, some parts of the content may be so unappealing that even players with enough time would rather skip them [3: 15]. Virtual asset purchases are a way to "pick and choose" which content to experience. Thirdly, MMORPGs are usually designed in such a way that players who wish to play together in the same group have to have avatar s of approximately the same level of prowess [3: 17]. As a rough generalisation, it is said that older players with jobs to go to have more money than time to spend on a game, while younger players with no jobs have more time than money. If older players wish to spend time playing with younger ones (e.g. family members), then they must make purchases to keep up with the younger's pace.

Whether or not players should be allowed to sell their assets also divides opinions. In a survey conducted among Korean players, as many as 78% of the respondents felt that they had the right to own the items earned during play [18]. Players often justify this claim in terms similar to Lockean labour theory of ownership: "we have invested considerable labour (i.e. playing time) into obtaining our assets; therefore we are entitled to exercise ownership over them." Echoing this Lockean theory of virtual property, many of those who sell virtual assets on eBay and other marketplaces claim that what is actually being sold is not the virtual asset itself, but the time it took to acquire the asset [23: 232]. MacInnes [19: 2727] also notes that real-money virtual asset trade, both buying and selling, is a form of entertainment in itself for some players.

2.2 Perceptions identified in case studies

In addition to the literature review, case studies were carried out on four virtual worlds. The purpose of the studies was to confirm perceptions found from literature and to identify additional ones. The cases cover Sony Online Entertainment's EverQuest, Electronic Arts' Ultima Online, Sulake's Habbo Hotel and MindArk's Project Entropia. They were selected to represent somewhat different styles of MMORPG and virtual world content. In the interest of brevity, the case studies will not be reproduced here, but the most critical findings are summarised below.

Across the cases, one enduring theme was taste and fashion. Users expressed a desire to customise their avatars, rooms or other virtual possessions through the careful selection and display of virtual assets. I interpreted this to reflect the fact that users see the avatars and personal spaces as representations of their own identity, and wish to develop that identity through selective customisation, similar to real world style and fashion. As far as RMT makes it easier to obtain a set of assets that correspond to the player's taste, RMT is perceived in a positive light.

Other perceptions identified in the case studies included the following: For users who engage in roleplaying (pretending to be some fictional character), RMT maybe a useful possibility as it allows players to obtain the props that are needed for their chosen fantasy. As regards teamwork, RMT may be seen to provide additional incentives for teamwork and motivate efficient organisation. Finally, some players seem to enjoy examining and analysing the logic and mechanics of the virtual world, often with a view to optimising their own performance. For such players, RMT makes it easier to obtain different asset configurations to examine.

2.3 Synthesis: perceptions and player motivations

The material acquired in the literature review and the case studies suggested that users perceptions of RMT are actually contingent with their motivation for participating in the virtual world in the first place. Some people seem to consider their virtual world a game in which opponents can be beaten, just like in Monopoly. For some it should be an immersive experience, perhaps similar to a good movie or a novel. For some, it is about self-expression. The perceived impact of real-money virtual asset trade varies according to how and why the person uses the world.

Research concerning player and virtual world user motivations was then reviewed, including Caillois's [6] classical work and Bartle's [2] seminal work in the multi-user domain. Out of all the work reviewed, the model with the best granularity and strongest empirical support was Nick Yee's MMORPG player motivations model [26]. The model has three main components, labeled *achievement, social* and *immersion*.

	- I - J -		
Achievement	Social	Immersion	
Advancement	Socialising	Discovery	
progress, power, accumu- lation, status	casual chat, helping others, making friends	exploration, lore, finding hidden things	
Mechanics numbers, optimisation, templating, analysis	Relationship personal, self-disclosure, find and give support	Role-Playing storyline, character history, roles, fantasy	
Competition challenging others, provo- cation, domination	Teamwork collaboration, groups, group achievements	bs, appearances, accessories style, colour schemes	
		Escapism relax, escape from RL, avoid RL problems	

 Table 1.
 Yee's MMORPG player motivations model

Each of Yee's main components consists of a number of subcomponents, shown in Table 1. The subcomponents were identified through an iterative process involving open-ended player survey questions, and then verified and grouped using factor analysis on responses to a multiple-choice survey. Yee's player motivations differ from Bartle's player types in that they are not mutually exclusive: a player may have multiple motivations for playing a MMORPG, none of which are in diametrical opposition to each other. In contrast to Caillois' play types, Yee's motivations provide a relatively fine-grained typology for categorising player needs.

Achievement	Social Immersion		
Advancement	Socialising	Discovery	
If RMT enables status to be bought,	RMT allows players to express themselves	RMT breaks the magic circle, but gives	
it violates the achievement hierarchy	through their buying behaviour	more choice over which content to experience	
Mechanics	Relationship	Role-Playing	
RMT makes it easier to obtain different	RMT allows those with less time to catch up	RMT allows players to obtain the props	
asset configurations to examine	and play together with their friends	that are needed for their chosen fantasy	
Competition	Teamwork	Customisation	
RMT is cheating if it can be used	RMT provides objectives for teamwork and	RMT makes it easier to obtain a set of assets	
to obtain competitive advantages	motivation for effective organisation	that correspond to the player's taste	
		Escapism	
		RMT breaks the magic circle, introducing	
		real-life worries into the virtual world	

Table 2. User perceptions of RMT mapped to user motivations

Finally, the user perceptions identified in literature and case studies were mapped onto Yee's model to produce the model presented in Table 2. It describes ten different ways in which users may perceive realmoney trade of virtual assets, and explain why a player might hold a particular perception by referring to her motivations for participating in the world.

The result is consistent with some of the earlier research referenced in section 2.1, in part because the model was partly based on that work. On the other hand, the results indicate that even achievement- and immersion-oriented players may see RMT favourably in some circumstances. This is in slight contrast with Bartle's [3] and Castronova's [7] views, which suggest that the existence of RMT is undesirable for such players.

This study was exploratory in nature, identifying key issues from literature and case materials without attempting to quantify them. The result is an internally consistent model with links to previous research, but with weak verification of external validity pending a follow-up survey. It could be used as a design aid or a tool for segmenting users when planning RMT strategies, as it identifies a wide range of possible perceptions.

In addition evoking contrasting views among the users and players of MMORPGs and other virtual worlds, the virtual consumerism phenomenon also elicited various reactions from companies operating the services. The next section summarises research carried out on the corporate stances towards real-money trade of virtual assets.

3 Strategies for virtual world operators

Ultima Online was the first service where real-money trade of virtual assets reached significant volumes. Electronic Arts ('EA'), publisher and operator of Ultima Online, was enthusiastic about the phenomenon. EA's press release dated 13 April 1999 proclaims that it "redefines the meaning of online trading" [11]. EA let players trade their virtual wares freely on eBay and elsewhere. Other operators reacted the opposite way: Sony Online Entertainment ('SOE'), the operator of EverQuest, moved to suppress virtual asset trade. It asked eBay to take down any auctions concerning EverQuest assets [10].

As reflected in section 2, the phenomenon is controversial. There is a debate going on concerning whether or not there should be RMT, that is, whether virtual economies should be integrated with the real economy [20] or remain isolated from it [7]. But in reality the choice is not simply between two competing models. Non-interference and outright trade embargo are not the only possible strategies for a virtual world operator.

In some services, real-money trade is built into the design. Sulake, operator of the popular teen virtual world Habbo Hotel, prohibits players from trading – but is itself selling virtual items to players. MindArk, operator of virtual world Project Entropia, seeks to integrate the virtual economy with real economy by guaranteeing a fixed currency exchange rate of ten Project Entropia dollars to one U.S. dollar. Later even EA and SOE jumped on the bandwagon: EA is offering semi-powerful pre-made characters for sale, while SOE provides a safe marketplace for player-to-player transactions.

There is a whole variety of ways of building links between a virtual and a real economy. What these ways are and how can they be described and their characteristics examined are questions not addressed in previous literature. A research question thus presented itself: what strategies are available to virtual world operators for dealing with real-money trade of virtual assets? The study was reported in detail in [15], but a summary omitting case studies is provided below..

3.1 Virtual asset market structures

The common arguments presented against RMT, as summarised in section 2.1, are actually targeted against the so-called secondary markets, that is, markets where virtual world users buy and sell virtual assets between each other freely, without the operator's involvement. Some of the arguments were targeted against the players' ability to buy virtual assets, while other arguments were targeted specifically against the players' ability to sell them. What if RMT took place on a market where buyers and sellers were organized differently?

Some scholars have begun applying traditional economics to examine virtual world phenomena [16]. As with real-world phenomena, the results are valid to the extent that the assumptions behind the theories are met. Save for certain information asymmetries, transaction costs and entry barriers, secondary markets for virtual assets are an approximation of *perfectly competitive* markets in the microeconomic sense. There are plenty of buyers and plenty of sellers, and prices are determined freely by the market mechanism.

Perfect competition is not the only possible market structure, however. A field of microeconomics called industrial organization studies the structure of markets especially when they are not perfectly competitive. Common market structures identified in the field are monopolistic competition, monopoly, monopsony, oligopoly and oligopsony. A key criterion for distinguishing between them is the number and size of buyers and sellers in the market. What if a virtual asset market was organized according to one of these structures?

Indeed, this is sometimes the case. For example, Habbo Hotel has no perfectly competitive secondary market where players could buy and sell virtual assets between each other. Instead, there is a market with only one seller: Sulake, the operator. Sulake maintains a monopoly over the real-money market of virtual assets in Habbo Hotel, and thus controls the prices.⁴⁵ Stretching ones's imagination, one could also imagine an arrangement where the players would be allowed to sell freely, but where the virtual world operator would be the only party allowed to buy. In microeconomic terms this would be called a monopsony: many sellers, one buyer. In both monopoly and monopsony, the operator is free to dictate the prices.

The operator can also be a seller without being a monopolist. For example, Electronic Arts has taken up selling avatars with advanced attributes directly to players. Similar and better avatars are also being sold by non-operator parties (i.e. players and trading companies). Since the operator can create assets at no cost, its supply can be perfectly elastic, meaning that it can sell any quantity of assets at a fixed unit price. In such circumstances no seller should be able to sell above the operator's price, although they are free to

⁴⁵ Although a tiny secondary market for Habbo Hotel assets has emerged, on which more details can be found in [15].

sell at a lesser price. In effect, this creates a price ceiling on a market that is otherwise free and competitive.

In a similar way, one could imagine a market where the operator acts as a perfectly elastic buyer, creating an effective price floor on the market. If the operator acts as both a seller and a buyer, there is in effect a price window inside which the market price must fall.

Six possible market configurations can thus be identified for real-money virtual asset markets: perfect competition, monopoly, monopsony, price ceiling, price floor and price window.⁴⁶ In addition, there may be a situation where no market exists, either because there are no buyers or because there are no sellers. Table 3 displays this set of possibilities as a function of the buyers and sellers operating in the market.⁴⁷

			Buyers		
		All parties	Non-operator	Operator	None
	All parties	Price window	Price ceiling		
	Non-operator	Price floor	Perfect competition	Monopsony	
Sellers	Operator		Monopoly		
-]	None				No market

Table 3. Possible virtual asset market configurations

A virtual asset market is the interface between a virtual economy and the real economy. It is by influencing this interface that operators can influence how the economies interact. By allowing trade to go on unabated (termed a "laissez-faire" approach), they can promote interaction and integration (i.e. perfect competition). By enforcing a trade embargo, they can promote isolation. By asserting a monopoly, they can exercise control over the interaction. The choice of approach could be called their "economic integration strategy". A classification of seven generic economic integration strategies, based on the market configurations identified above, is presented in Table 4.

Strategy	Description
Laissez-faire	Operator does not get involved with RMT nor prohibits it
Price floor	Operator enters the market as a supplier
Price ceiling	Operator enters the market as a buyer
Price window	Operator enters the market as a supplier and a buyer
Monopoly	Operator seeks to be the sole supplier
Monopsony	Operator seeks to be the sole buyer
Embargo	Operator seeks to prevent all RMT

Table 4. Economic integration strategies for virtual world operators

⁴⁶ Monopolistic competition, oligopoly and oligopsony are slightly more advanced concepts that have to do with differentiation and entry barriers, and are outside the scope of this paper. For example, virtual assets often have the qualities of "perfect commodities", so that differentiation may not be possible. A further study could examine the possible role of oligopolies in virtual asset markets, but at the level of abstraction sought here the distinction brings no added value.

⁴⁷ The gaps in the matrix are places where the operator would be transacting with itself or where there is no market.
Later, this classification was applied in four case studies concerning the strategies applied by virtual world operators in relation to RMT. The cases were the same as described above in section 2.2: Sony Online Entertainment's EverQuest, Electronic Arts' Ultima Online, Sulake's Habbo Hotel and MindArk's Project Entropia. It was found that the companies were indeed attempting to influence the configurations of their virtual asset markets in manners described by the model. Using the market configuration matrix introduced in Table 3 as a basis, Table 5 shows which virtual asset market configurations each of the case companies were attempting to achieve for their virtual worlds. Based on these findings it is possible to say that each of the operators was implementing one or more of the seven generic economic integration strategies, shown in Table 6.

			Buyers		
		All parties	Non-operator	Operator	None
	All parties	Project Entropia	Ultima Online characters		
	Non-operator	-	Ultima Online other assets	-	
Sellers	Operator		Habbo Hotel		
	None				EverQuest

Table 5. Examples of virtual asset market configurations

The main contribution of this study was the classification of "economic integration strategies" as presented in Table 4. It was provided as an answer to the question, "what strategies are available to virtual world operators for dealing with real-money trade of virtual assets?" The question itself was motivated on the basis that current discussions concerning RMT tend to focus solely on two extreme strategies, full integration and complete isolation.

Strategy	Description	Implemented in
Laissez-faire	Operator does not get involved with RMT	Ultima Online (other assets)
Price ceiling	Operator enters the market as a supplier	Ultima Online (characters)
Price floor	Operator enters the market as a buyer	-
Price window	Operator enters the market as a supplier and a buy	yer Project Entropia
Monopoly	Operator seeks to be the sole supplier	Habbo Hotel
Monopsony	Operator seeks to be the sole buyer	-
Embargo	Operator seeks to prevent all RMT	EverQuest

Table 6. Examples of economic integration strategy implementation

No similar analysis or categorization can be found in the previous literature. The work of MacInnes [18, 19] is perhaps closest, examining how secondary markets affect virtual world operators' business models. However, MacInnes's investigation is limited to what I referred to as "perfectly competitive" virtual asset markets, that is, markets where non-operator parties trade amongst each other. This study has a wider scope, also considering the situation where the operator becomes an active participant in the market. The

results are consequently applicable to a larger variety of business models and services, reaching beyond the archetypal fantasy MMORPG.

Despite the lack of earlier examples, the classification presented in this paper is obviously not the only possible way to map operators' approaches towards RMT. This classification was derived from one theoretical analysis of virtual asset markets, and subsequently applied in a few case studies. One alternative approach would be to start with a large sample of companies, examine each's strategy, and derive a model or a classification. This way, the result would be empirically grounded and thus more valid, better guaranteed to reflect reality. However, in this study, the objective was not to describe current reality, but to map the whole variety of possible ways of linking virtual economies with the real economy. This implies also identifying hitherto unused strategies, which suggests the use of an inclusive theoretical construct.

This study identified two new economic integration strategies that were not observed in use in any of the case companies. In fact, I am not aware of any operator currently utilizing said strategies. The strategies are Monopsony and Price floor.

Under the hypothetical Monopsony strategy, the operator seeks to be the only buyer in the virtual asset market. Players are allowed to sell virtual assets, but only to the operator. If successful, this leads to a strictly unidirectional relationship between the virtual economy and the real economy: virtual holdings may be liquidated into real money, but real money cannot be used to purchase status or power in the virtual world. This strategy could therefore conceivably serve at least two useful purposes: it could provide incentives for user-created content while simultaneously defending the integrity of the achievement hierarchy and the magic circle. Whether it could be implemented in practice is of course another matter. It would obviously need to be supported by a revenue model such as monthly subscription fees.

Price floor is similar to Monopsony in that it involves the operator buying virtual assets from the players. The difference is that players would also be allowed to buy assets from each other. The model could perhaps be applied to an Ultima Online style open virtual economy, if for some reason the operator wanted to guarantee a certain "minimum wage" to all players.

Swedish virtual world company MindArk's Project Entropia could signal a new way of leveraging interaction between a virtual economy and the real economy. The media has reported widely on two significant virtual property purchases in Project Entropia. In the first one in 2004, a user acquired a section of the virtual landscape (a "treasure island") in an auction from MindArk in exchange for approximately USD 26 500. In a second one last year, a space station was sold for around USD 100 000. In effect, these transactions shifted a part of the financial risk of content development from the operator to the user. While the sum is negligible compared to MindArk's total development budget, it could exemplify a future model: users fund the development of parts of a world in exchange for an in-game ownership interest. This could be termed "user-funded content" ('UFC'). Suitable economic integration strategies for pursuing a UFCbased content development model would be those that allow users to place investments directly into the hands of the operator, such as the Price window and the Monopoly.

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Open content licensors and business models

Herkko Hietanen

herkko.hietanen@hiit.fi

Abstract

The format and licenses that govern the distribution of open content works favour wide distribution. Open content licensors can be divided to four groups. 1) The casual users participate to open content projects that require the use of such licenses. 2) Public bodies use the licenses to disseminate works that are paid by the public. 3) Ideologists who value the freedom that the licenses give to their peers. 4) Business oriented group sees that the licenses enable them to reduce producing, marketing and distribution costs and create additional value to users with open content licenses. This paper analyses open content licensors, their motives and the business models that open content licenses enable.

1 Open Content Licensors

The Open source initiative has formalised a process that open source license has to go through in order to get OSI certification mark. The OSI's ten point definition [1] is accepted as the community norm. Open content on the other hand doesn't have a clear community definition. Wikipedia list two requirements for open content; format that enables copying and permission to do it.

Open content, coined by analogy with "open source" describes any kind of creative work including articles, pictures, audio, and video that is published in a format that explicitly allows the copying of the information. [2]

Open content has several similarities with the open source and commons. Benkler sees that the relevant characteristic of commons is, that "no single person has exclusive control over the use and disposition of particular resource in commons". [3] He divides commons into four types. Whether they are open to anyone or only to a defined group and whether they are regulated or unregulated. Open content can be either in the public domain or under a license like the Free Software Foundation's GNU Free Documentation License [FDL].⁴⁸ This article concentrates on content that is within the property system but licensed as limited commons. General property- and especially copyright-system enables licensor to maintain some control over their otherwise open content. The control can help to organize peer production and to base businesses on openly available content. The first part discusses different groups that license their works with open content licenses while the second part describes some of the business models that the licensing enables.

Creative Commons⁴⁹ -licenses have grown to be the most popular open content licenses. In fall 2005 Yahoo indexed⁵⁰ over 53 million links back to CC licenses[4] and just six months later Google's queries for CC-content returned over 140 million pages. [2] The licensed works range from classical music to sci-fi movies and from MIT courses in electronic engineering to governmental reports and publications. 68% of the licensed content included non-commercial clause that reserves commercial use. [5] Online photo service Flickr⁵¹ alone hosts over 10 million photos that are licensed with CC-licenses. CC-licenses are not the only popular open content licenses. FDL has been used extensively to license software manuals and collaborative online encyclopaedia Wikipedia⁵² that has nearly 1.5 million registered user accounts and

52 http://en.wikipedia.org

⁴⁸ http://www.gnu.org/copyleft/fdl.html

⁴⁹ http://www.creativecommons.org

⁵⁰ http://search.yahoo.com/cc

⁵¹ http://www.flickr.com

over three million articles. 2005 the number of articles doubled and there were 70% more contributors than in 2004. [6]

By examining individuals and projects, it is possible to understand, who the open content licensors are. The users can be roughly divided to four groups; 1) Drifters 2) Public producers 3) Commonists 4) Commercial users.

1.1 Drifters

The first group of users are often amateurs or professionals who participate in non-commercial projects. Drifters don't typically make a conscious decision to use open content licenses. Wikipedia users are typical drifters. They get carried away to projects that use open content licenses. Participating to these communities' work requires accepting the social norm of open content sharing. None of the traditional copyright incentive models explain why Wikipedia authors have helped to create one of the biggest online dictionaries. There are no economic incentives to donate the work to community. Financial value may have significance only in cases where licenses are used to block others from taking commercial advantage of distributed works. Moral rights and especially attribution right doesn't count either as motivation because the authors of the articles are typically not visible. Wikipedia would certainly exist even without exclusive copyright system.

1.2 Public producers

Second group of licensors depends also on community resources. Public entities and tax funded organizations like libraries, archives and public broadcasting companies all produce content using public money. Their content is either paid by general public or service users. Providing online access to content for the public means small additional cost compared to original production costs. Most notably BBC has opened its archives and licensed their programs with open content licenses for British TV-viewers. [7] This is because "the member organisations who supply the content are funded with public money to serve the UK population".

While some of the information (laws and court decision) that is produced by public bodies are public domain in most countries, a lot of publicly produced content is copyrighted. Typically public content produced by public bodies is meant to be shared as widely as possible. The Finnish Information Society Council, lead by the prime minister, recommended [8] that public entities would adopt CC-licenses in order to encourage the flow of publicly produced information.

1.3 Commonists

The third group of users sees copyright system as cultural lock that limits their creativity and human's natural need to help their neighbours. They fight the enclosure by licensing their works with open content licenses. I call this group *Commonists*. This group sees Internet as final frontier where humankind should share rather than create another area of exclusivity.

The ideological need to share could also be limited, as it is with sampling community. Sampling community sees that transforming **pieces** of works should be allowed but copying and distribution of the **entire work** should be up to rights owner to decide. CC sampling licenses enable use of samples but reserve other rights. Creative Commons also helped to create *CC-Mixter⁵³* website that helps remixers find and share songs and samples. Sampling licenses are targeted especially to hip hop's remix culture that has been borrowing riffs and beats with out asking permission for decades.

CC-Mixter enables remixers and authors to share their works and build upon other users' works. CC-Mixter has placed emphasis on letting users to see how the songs are build of different samples. Users can find other artists who have used same samples and artists can see who has used their samples.

The free sharing ideology has used "sharealike" and copyleft licenses [9] to further advance their purposes. Copyleft licenses make sure, that if the changes to the work are distributed they must use the same

⁵³ http://www.ccmixter.org

copyleft license terms. The free software community is using copyright licenses to preserve the freedoms they value. Preserving property in order to advance the greater good of the community resembles foundation institute. Instead of investing the property to stocks, free software is investing it to free software products that further benefit the community. While free software-movement has greatly influenced the whole software ecosystem, the second part of the paper concentrates to the fourth group's commercial motivations of using open content licenses.

2 Open Content as a business model

Open content licensors share some of the motivations with free and open source programmers. Eric Raymond wrote in his essay "The Magic Cauldron" [10] about the open source software's indirect sale value models. He identifies models to capture the value of open source software. Open content shares most of the models but has several others.

The paper identifies seven open content business models:

1) Loss leader 2) Sell the software/service 3) Free the content sell the platform 4) Sell the basic product, let users enhance it 5) Activate Influentials in politics 6) Wrap open content to advertisements 7) Outsource advertisement or advertisement distribution to users.

2.1 Loss leader

"Loss leader" is a strategy where items are sold or given away below cost in an effort to stimulate other profitable sales. [11] Most of the open content business models utilize loss leader strategy in some way or the other. Open content is used to generate demand for other content or rights that are not granted with the license. The latter strategy is called dual licensing. Releasing content may serve as advertisement. This may be especially beneficial in entertainment industry where typically half of the production costs are used to promotion.

Loss leader resembles Raymond's "Sell it Free it" business model where a company's content's product life cycle start as traditional commercial product but then it is later converted to open-content products when appropriate. Releasing part of back catalogue that is in the end of its commercial life cycle may help to create demand for other content and commercial rights. This is true especially if the content is distributed in physical form and the edition is sold out.

Loss leader strategy has been used in several music and photo services and lately with Internet movie distribution. A science fiction motion picture Star Wreck: In the Pirkinning, [12] used teams of volunteers, digital sets, guerrilla marketing, and the Internet to produce, promote, and distribute the film to a global audience. Creators minimized the overall costs of production while producing a professional quality feature-length movie that reached over 5 million viewers within its first 6 months. Even thought the movie is distributed freely online using a Creative Commons license, it has sold thousands of copies of DVDs, and the TV broadcast rights alone have covered the production costs of the movie. Star Wreck showed how readily available digital technology and fan communities can be used to reduce considerably the cost of movie making. Furthermore, the movie's success also proved that Internet distribution does not preclude financial success, but on the contrary may open international markets for amateur producers.

2.2 Sell services

Content creators need several tools to create and distribute digital content. Authoring tools, hosting services, and community websites are all part of the chain from creators to consumer/users.

Flickr photo hosting service is targeting heavy users who want to share their photos online. Pro users get unlimited storage capacity on Flickr servers for 25\$ annual fee.⁵⁴ Flickr's advantage to its competitors is a simple user interface and wide range of options. Flickr provides access to its application programming

⁵⁴ http://www.flickr.com/upgrade/

interface (API) even to its competitors if they also have open API. [13] Open interface enable users to easily switch to and transfer their files to a new service. Openness enables competition but also complementary services that create value to Flickr users. Flickr enables users to set their sharing level from strict private access to generous CC-licenses. On June 2006 15 million of Flickr's photos out of total 180 million were licensed with CC-licenses. Users can search photos by tag names and used licenses.



Figure 1. Flickr's Creative Commons page

Online record label *Magnatune⁵⁵* distributes its artists' music with non-commercial CC-license. Magnatune makes its profit by selling physical CDs, high quality audio downloads and licenses to commercial use. Buying a license is made easy. Licensees can use a website to calculate license fee and after the fee is paid the license is valid. Magnatune's music licensing contract is the same for all buyers, which removes legal fees as a built-in cost. While the model is a good example of loss leader strategy, Magnatune is also an excellent illustration of services sold to content producers. Unlike regular record companies that share percentage of their *profits*, Magnatune shares 50% of the licensing, CD-sales and merchandise *revenue* (not profit) with artists. [14]

Magnatune also acts as an intermediary guaranteeing that the content is licensable. Traditionally collecting societies have sold licenses to users. Open content risk management can provide business to private warranty services who track down the rights holders and validates their licenses. The risk of accidental infringement and damages could mean that indemnity- and copyright insurance services could become profitable. Software industry uses indemnifying clauses as common practice when dealing with free and

⁵⁵ http://www.magnatune.com

open source software. In 2005 insurance company *Lloyds* started selling special policies targeted to open source software users. [15]

2.3 Free the content, sell the platform

Raymond's second model "widget frosting" generates business to hardware manufacturers who distribute preinstalled open source software with their hardware. [10] Software is given away in order to generate market for special hardware and services. In a way selling books works the same way. Content alone is not generating profits. The user interface of a book is still superior to e-paper and to laptops, and people are willing to pay for it. I call the model, *free the content sell the platform*.

Science fiction writer and activist Cory Doctorow released his first novel "Down and out in Magic Kingdom" [16] with CC-license. Online version of the book helps the audience to find the author and gives it a chance to preview the book before purchase. The book was remixed, translated, podcasted and downloaded 75.000 times during the first month of its release. [17] The online availability generated buzz around the book and by July 2006 the hard copy had sold three print runs and over sixty five thousand copies. [18] According to Doctorow book sales were secondary compared to paid speaking appearances that the attention generated. Hearing Doctorow live and owning his book are the experiences that reading audience buys.



Figure 2. Down and Out in the Magic Kingdom book cover. Original cover on left and user created alternative covers next to it. [19]

2.4 Sell the basic product, let users enhance it

This model is closely related to the previous one. Users who enhance the basic product bring added value to the original without the burden of development costs to the product manufacturer. This has been noted especially in computer games. The Sims computer game is a good example of a basic product enhanced by consumer created content. The Sims game enables users to modify game characters and environments.

Participating to open source software project requires at least basic coding skills. Sourceforge.net is an open source software development site that has 1.3 million registered users. Open content has even more potential contributors if necessary tools are provided with content. The Sims comes with modification tools that enable players to create their own stories, characters, lots and objects and their website has an exchange area for sharing the player created content. Players can mix their own parts with official content and other player created content. For example "Lingerie model 10" -character uses eye brows and lips that were created by other players and skin tones created by a female character designer SharpeiVampire. [20]



Figure 3. On the right is a model that inspired Lingerie Model 10 character design

2.5 Activate Influentials in politics

Political ideologies have used peer to peer distribution long before Internet. Pamphlets and little red books helped to distribute communism and C-cassettes helped the Islamic revolution in Iran. Today Internet plays an important role when spin doctors battle for voters' attention. Harnessing political activist online means wider visibility and more campaign contributions.

According to Keller and Berry, Influentials are people who tell their neighbours "what to buy, which politicians to support, and where to vacation."[21] A report by the Institute of Politics, Democracy, & the Internet [22] found that 69% of Online Political Citizens (OPC) are Influentials while according to Keller and Berry only 10% of the Americans qualify as Influentials. The report also found out that OPCs are significantly more likely to donate money to candidates. At this early stage of the 2004 campaign, 46% of OPCs have donated to a candidate or political party in the last two to three months, compared to 10% of the general public.

MoveOn.org⁵⁶ has used Internet to "bring real Americans into the political process". The movement has over 3 million members who contributed 9 million dollars to progressive candidates and campaigns.⁵⁷ MoveOn.org has arranged video contest and raised money to air them in mainstream media. During the 2004 US presidential elections MoveOn tried to buy Super bowl advertisement time for the winner of bushin30seconds contest⁵⁸ winner. CBS refused to sell the spot claiming that the ad was too controversial to be broadcasted. [23]

⁵⁶ http://www.moveon.org/

⁵⁷ http://www.moveon.org/about.html

⁵⁸ http://www.bushin30seconds.org/



Figure 4. Video contest on Bushin30seconds website

Licensing the content with open content licenses has two benefits. Firstly the content gets a wide spread. Secondly getting the information from reliable source, by reading the story from a blog or seeing a video clip on a homepage of a trustworthy person, helps people to trust the information more than, if the information is on a organizations website.

2.6 Wrap open content with commercials

Revver⁵⁹ is a video sharing service that hosts over 25.000 video films. Revver enables rights owners to make money by sharing their films. Revver dynamically serves one frame advertisement to the end of the video. The films can be super distributed through various channels and users don't have to download any additional software. Rights owners can control what kinds of advertisements are attached to their videos. They can for example opt out of tobacco or government ads. Because ads are dynamically delivered, rights owners' preferences take effect instantly. Revver enables right owners to monitor where the content is viewed, how many people have watched it and how many people click the advertisements. Advertisers can buy their slots to individual films, by keywords, services and by popularity of films. Advertisers only pay for served ads. The revenue from the advertisement is shared 50/50. Revver is nonexclusive, hosts films for free, but also encourages other services to do the hosting. Websites hosting the videos get 20 percent of the ad revenue. The films are distributed with by-nc-nd CC-license. [16] In addition right owners grant Revver commercial rights to serve ads and other people to host the content.

Two amateur movie makers at Northern Maine shot a video⁶⁰ of extraordinary fountains they made by dropping Mentos mints to Diet Coke bottles. The film quickly became viral and the couple made twenty five thousand dollars from Revver advertisement and sold thousand CDs of the background music they used for the video.

2.7 Sell the product let users advertise it

Habbo Hotel [24] is a virtual meeting place on the Internet where the gamers can create their own characters and a hotel room where characters can visit. Habbo Hotel is owned and developed by Sulake Inc, and it currently has 3 million monthly users worldwide.

⁵⁹ http://www.revver.com

⁶⁰ http://www.eepybird.com

Habbo Hotel has a devoted fan community that publishes their own fan web pages that are graphically and thematically similar to the Habbo Hotel game. Sulake encourages the gamers to create their own fan sites but keeps control over the created content by having strict terms of use for the copyrighted Habbo images and other material [25]. For example, the fan sites that use copyrighted material must have original Habbo content that does not promote any adult, illegal, or hacking websites or websites that conflict with Sulake's interests. Also, by leveraging its copyright to the Habbo-related material, Sulake uses licensing terms that are somewhat unfamiliar to regular copyright licenses. For example, official Habbo fan sites are required to be updated at least once a month. Sulake has been also enforcing its licensing terms by forcing the closing of inappropriate fan sites.

From the fan sites point of view the strict terms of use and respective enforcing of the terms can be seen limiting the creativeness of the fans – one of the main advantages associated with user created content. [26] Also, the creation of Habbo-related content by users is dictated by the terms of use given by Sulake. This contractual binding imposes the issue of liability to the people behind the fan sites, and in the potential case of copyright infringement the problem of responsibility among the content creators. From Sulake's perspective enforcing the terms of use and disclaimers on fan pages are critical in maintaining its brand image as a virtual world suitable for children and not allowing the dilution of its trademark by letting fans use it freely. By limiting the use of their copyrighted material Sulake is able to control the content re-use.

Using user generated content in advertising can go awry. March 2006 General Motors launched do-ityourself ad contest to promote the Chevy Tahoe SUV. The contest challenged people to make their personal SUV commercial by combining GM provided video clips and sound tracks with their own texts. Many of the entrants used the ads to criticise the company and its products. The spots showed the car, against a backdrop of rugged glaciers and melting snow while messages appeared onscreen accusing GM of contributing to global warming. According to a GM spokeswoman Melisa Tezanos [27] consumers submitted more than 21,000 ads. While more than 80 percent of the commercials depict the Tahoe in a favourable light, the negative ads got the biggest coverage in the media backfiring GM's viral marketing effort. Many of the negative ads kept living long after the competition at video sharing services.



Figure 5. Chevy Tahoe commercials on YouTube.61

3 Conclusions

The motivations to license content with open content licenses vary. Open content may serve ideological ends, public sectors goals or it can give advantage in marketing and distribution of digital goods. Choosing suitable license terms and business model that goes with it help right owners to keep control of the use of the content.

Commercial licensors use open content licenses to advance their business. Rights holders can choose to license their works to public with open content license because the market a) has dried, b) it has never existed c) it is somewhere else than in limiting access to the content and wide distributing of the content helps to reach it or d) right holders want to outsource development and marketing to users. Open content licenses enable rights owners to stay in control compared to releasing the works to public domain.

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⁶¹ http://www.youtube.com/watch?v=XA6dLFrAFII&search=chevy%20commercial

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Legal aspects in mobile community scenarios

Olli Pitkänen

olli.pitkanen@hiit.fi

Abstract

This chapter presents the legal analysis of the MC2 scenarios. It illustrates the legal issues that are likely to come up in relation to future mobile content communities. Each scenario is analysed to find out what sort of legal issues are likely to appear. It should be noted that the scenarios do not describe, for example, the market situation. Respectively, issues related to, for instance, the competition law remain unnoticed. However, the analyses expose several important legal challenges that the developers of mobile community technologies and services should take into account. Especially, based on the scenarios, it seems that the legal areas including most challenges to mobile content communities will be

- privacy and data protection,
- intellectual property rights, and
- contracts.

1 Scenario 1: Creating a story from mixed-reality game session

1.1 Synopsis

Two players, Jake and Samuel, spend their evening in a hockey game they have placed bets for in a company facilitated betting community website. During the game they buy a new bet and combine it to their old ones. After the game they re-experience the winning goal from video, and in the end create a memorabilia artifact, i.e. a video, and share it with other people.

1.2 Legal Analysis

1.2.1 Betting

Betting is a highly regulated field. Most countries seem to have laws that regulate betting. In Finland, the Lottery Act applies to betting. Betting is typically subject to license, often monopolized by law, and in many jurisdictions even totally prohibited. In Finland, in accordance with the Lottery Act 6 and 11 , betting is the monopoly of Oy Veikkaus Ab, the government-owned pools company. In addition, marketing laws often include rules that limit the use of lotteries.

1.2.2 Liability for incorrect information

"Hot tips", if they are incorrect, may cause liability. However, that is unlikely, if their authoritativeness is not emphasized and the user is able to understand their nature from the context – that they are only suggestions and can be incorrect. Obviously, other incorrect information (e.g. a game report claiming that somebody was in a game although he/she actually wasn't) could cause liability for damages, but because there doesn't seem to be any special concerns of that kind in this scenario, it is not necessary to discuss them further here.

1.2.3 Intellectual Property Rights

Creating a multimedia show on a hockey game is legally interesting. From the copyright viewpoint, nobody owns the copyright in a hockey game. How the organizers of games and other events of that kind get the huge televising fees, if they do not actually have any televising rights to sell? Why cannot anybody just walk in a game and televise it?

A sport performance is not a work protected by the copyright law. However, it is a quite established custom to state that the game organizers have an exclusive right to televise the event. Although this viewpoint is hardly supported by the copyright law or any other intellectual property law either, some indirect support can be found. For example, Directive 97/36/EC acknowledges that there can be exclusive rights in sports events:

"(18) Whereas it is essential that Member States should be able to take measures to protect the right to information and to ensure wide access by the public to television coverage of national or non-national events of major importance for society, such as the Olympic games, the football World Cup and European football championship; whereas to this end Member States retain the right to take measures compatible with Community law aimed at regulating the exercise by broadcasters under their jurisdiction of exclusive broadcasting rights to such events".

The organizers typically claim that they have an agreement with the audience that forbids unauthorized televising, video recording, photographing, etc. This argument is not always very strong. It may be challenging to show that there exists a binding agreement between the game organizer and each person in the audience. In the USA, for example, there is also a law that prohibits trespassing, i.e. unauthorized entry on another's real property. This law allows the game organizer to define the rules to enter the place. The game organizer can prevent a TV company from entering the event. However, it is not self-evident that the game organizer may stop a person from taking pictures or video-recording if he/she has entered the property lawfully. Therefore the legal basis of the right to restrict photographing in an event is not very strong. The televising companies do not usually want to challenge that conception, because they also benefit from the rules that guide the business, although the rules are probably not grounded on law – but merely on soft law, i.e. on codes of conduct. Instead, ordinary people, Jake and Samuel, who spend their evening in a hockey game, do not necessarily benefit from the status quo of game organizers and televising companies. They may want to take pictures, create multimedia shows, and publish them. As long as they just take a couple of pictures for their own albums, it does not probably matter the game organizer. However, if they create and publish a multimedia show that competes with the television programs, the game organizer or the broadcasting company is likely to react.

1.2.4 Privacy

The scenario involves some privacy issues. Some of the pictures that Jake and Samuel take of audience can be governed by data protection law. It does not make the pictures illegal, but it may restrict the usage of them.

1.2.5 Right in portraits

In addition to photographer's rights, the one that a picture shows may have rights in the picture. As discussed above, the rule of the thumb is that a picture that presents a person may not be used for commercial purposes (especially in advertisements) without the consent of the person. Instead, the person does not have right to forbid others to use the picture within normal freedom of speech or communication (e.g. news). Yet, the publishing of a picture may never be insulting to the people that the picture presents and the picture must not infringe their privacy.

2 Scenario 2: Player-created mobile games

2.1 Synopsis

A player wants to make a *mod* (a modification, a change to a published game) but needs help from other players in technical issues.

2.2 Legal Analysis

2.2.1 Intellectual Property Rights

A game can be protected by various intellectual property rights. First, the implementation of the game can be *copyrighted*. Thus the copyright-owners have an exclusive right e.g. to prohibit others from "making it available to the public, in either the original or an altered form, in translation or adaptation, in another literary or artistic form or by other technical means". In other words, an adapted game cannot be distributed without the consent of the copyright-owners. If a mod can be distributed separately independent on the game itself, the distribution of the mod usually does not infringe the copyright in the game. In some cases, the copyright-owner might argue that the mod's sole purpose is to help players to alter the game illegally. At least in some jurisdictions that could make the mod illegal. Of course, many authors of games and computer programs have accepted also the distribution of an altered game in advance by using specific license terms. The implementation of the mod, on the other hand, can also be copyrightable. In this scenario, the design of the graphics, photos on the mission locations, and the program code are copyrighted works while the mission structure and tags are probably not. Note that a modified game is a derivative work in which both the original authors and those who have modified it have copyright. That is, the players need a license from both the copyright-owner of the game as well as the mod to be able to play the modified game. The copyright in the mod belongs to the modders jointly. That is, it might be difficult to agree on license terms afterwards, if they have not agreed on them in advance.

Second, in Europe, some games can be partially protected by *database sui generis right*. It provides the maker of a database with the right to prevent extraction and re-utilization of the whole or of a substantial part of the contents of that database. In accordance with the EU Directive on the legal protection of databases, a database is a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means. To be protected, there needs to be a substantial investment in either the obtaining, verification or presentation of the contents. In principle, the database of the tags within a game could be protected by database sui generis right if the game developers have invested substantially in it.

Third, a game may include *patentable* inventions. Both the original game and a mod may have them. There are limitations on the patentability of games. Schemes, rules and methods for games as such are not patentable. However, an invention related to an implemented game is hardly a scheme, a rule or a method *as such*.

Therefore a novel invention related to a computer-implemented game, including an inventive step (being non-obvious), and having industrial applicability, could well be patentable. However, the invention is no longer novel, if it has been published. Everything made available to the public in writing, in lectures, by public use or otherwise shall be considered as known and not patentable. When Janet presents her idea to the community, she is likely to lose the patentability of the invention unless the community is very limited and bound by a non-disclosure agreement. On the other hand, patentability also requires that the invention must be technical. As long as Janet's idea is rather abstract and not defined in terms of the technical features of the invention, it is hardly patentable. To patent the invention, Janet should be able to develop the idea and describe it in technical terms with a limited group of people. A game that includes a patented invention cannot be distributed without the consent of patent-owners. Fourth, a game can be *trademarked*. The names of games are often trademarked. If a trademark protects e.g. the name, then a modified game cannot be distributed using the same name without the consent of the trademark-owner. Note, however, that trademark is related only to business: it is usually not applicable to hobby communities that do not make money.

2.2.2 Labor and Tax Laws

As long as a game is developed in a hobby community and no-one gets paid, the labor and tax laws hardly play any significant role. Compensation even in a form of a "free cell phone" could introduce taxation questions, but would hardly bring up labor issues as far as the payer is not controlling the work. When Janet becomes a part-time employee of the game development company, the labor law is applied. The company may thereon control her work and is also largely liable for it. Also, during the employment, copyright, database sui generis right, and patents are usually transferred automatically to the employer.

3 Scenario 3: A visit to a mobile online roleplaying game

3.1 Synopsis

A player has communication problems in mobile game play.

3.2 Legal Analysis

3.2.1 Quality of Service

Communication problems may cause damage to users. By default, everybody is liable for his/her own damages. In certain cases, however, a service provider can be liable for the damages.

First, normally there is a contract between the user and the service provider. Liabilities are usually stated and strictly limited in the contract. Although contracts do not limit the liability based on deliberation or gross negligence, typically the liability of the service provider is quite limited.

Second, a special law may govern the situation. For example in Finland, the law stipulates that if a fault prevents the usage of subscription more than 48 hours per month, the operator must reimburse one monthly basic fee. In most cases, this is the total compensation regardless of the actual damages.

Third, tort and liability laws in general may be applicable. Especially, if the one, who has become damaged, is not a customer of the service provider or otherwise in contractual relationship with it, then the damages should be judged in accordance with general tort liability law. Then one should be able

- 1. to show that the service provider has done something wrong,
- 2. to show that the wrong is the cause of damages, and
- 3. to show the amount of actual damages.

These are hard requirements and they can only seldom be fulfilled. In conclusion, technical communication problems rarely lead to significant damages.

4 Scenario 4: Local super-distributed game and social acceptability

4.1 Synopsis

There is a wireless local network inside one shopping mall. To tempt new customers to come to shopping mall, the customers can play location-based mobile games with each other using the local network.

4.2 Legal Analysis

4.2.1 Intellectual Property Rights

In addition to comments about the previous scenarios, intellectual property rights would likely allow the pricing model described above: a user can first play with a free, crippled version, and then upgrade to a full product. More interesting questions would arise, if someone were able, for example, to crack the game and use the full product without paying anything. Could a user, for instance, win a prize with a cracked game?

4.2.2 Socially unacceptable behavior

Playing a game should not have an effect on person's responsibility to behave correctly. The store personnel have a right to chase away people who trouble others. An exception might be a situation in which the rules of the game that the store has organized or accepted allow or require certain behavior. This is hardly the case in this scenario. On the other hand, the game organizers might be liable for incitement if they intentionally have led users to break the law.

5 Scenario 5: Social pressure and conflicting moral codes in virtual worlds

5.1 Synopsis

Also in virtual communities, there may be a role conflict between smaller and larger scale social pressures. "Traffic' between these two levels might be used for enlightening or even educational purposes. Even if there wouldn't be any explicit moral code not to mention laws in a virtual community, the community itself will draw the borderlines between what is thought to be good and bad.

5.2 Legal Analysis

The scenario discusses moral and social rules. It shows the undeniable limitedness of legal rules. The questions arisen in the scenario are hardly solved with legal arguments.

6 Scenario 6: Challenges in managing player presence and context in a persistent mixed-reality game

6.1 Synopsis

Franck has forgotten that he is a member of a conspiracy game. He receives an upsetting call in the middle of the night, and is forced to ponder whether he should quit his participation in the game. The community tries to keep him as a member by showing him simple voting results of his popularity among other members of the community.

6.2 Legal Analysis

6.2.1 Privacy

As discussed above, the right to privacy is highly protected in many countries, but the rules are spread out in numerous statutes. In general, private information, such as salary or location, must not be disclosed without the consent of the person. However, some specific statutes may include rules that permit authorities to receive private information. For example, in accordance with Finnish Act on Charges of Social and Health Care Services, the authorities are allowed to get information on the income of kindergarten children's parents from other authorities, banks, insurance companies, employers and so on, but not from e.g. recreational communities.

Privacy is also protected by penal codes. For example, it can be a punishable invasion of domestic premises, if a person unlawfully disturbs the privacy of another by making calls (the Penal Code of Finland, Chapter 24, Section 1). In general, only intentional acts are punishable. Therefore, in this case, if the caller sincerely believes that Franck is willing to participate in the game, it is not an invasion of domestic premises to make the phone call.

6.2.2 Contracts and consumer protection

Consumer protection law permits a consumer to fairly freely terminate the subscription of services she or he might have ordered. The actual rules vary in different jurisdictions.

7 Scenario 7: Context sensitive advert gaming

7.1 Synopsis

On a visit to a movie theater two girls play a mobile game that has been released as part of a cross-media promotional campaign.

7.2 Legal Analysis

In addition to the above mentioned challenges with marketing rules, consumer protection, and privacy, this scenario does not represent any new legal issues.

8 Scenario 8: Company-community relations in controlling user-created content

8.1 Synopsis

When an online gaming community matures, there may be a change in power relations between different player groups with different gaming practices, like modding. What's suitable and right for some isn't for others, and one may ask: "whose game is this anyway?" The boundaries between fandom and corporate culture change, and there are increasing difficulties in considering different player groups when developing future versions of the game.

8.2 Legal Analysis

The question how intellectual property rights may protect games is already discussed above. In this scenario, IPR and license agreements form a tool to control the community. The "hole" in the license agreement highlights the difficulties in drafting good agreements. It is unattainable to prepare for all the possible situations.

The contractual framework for a gaming community is complex. It is difficult to build binding contractual relationships between all the members of the community. At least, it is laborious, transaction costs increase rapidly, and the management of contracts gets troublesome. In an unpredictable situation, the existing binding contracts hardly enable the community to sentence a rebelling member to sanctions. Therefore it would be better if the community could form a legal entity, such as a corporation, an association, or a cooperative, which has adequate bylaws, reasonably well-defined membership, necessary administration, clear decision-making process, and an accepted policy to settle disputes among members and between a member and the community.

In the scenario, the community is rapidly spreading all over the world. An internationalizing gaming community or company faces mostly the same legal challenges that any growing company heading towards international markets will meet. For example, differences between marketing, IPR, and competition laws are difficult to handle. Also, problems related to, for instance, international taxation can be severe. Some of these problems arise faster for a company or a community that operates on computer networks than for a traditional company providing material products. However, in addition to the issues already discussed above, the fundamental nature of those challenges hardly depends on information products and is therefore out of the scope of this analysis.

9 Legal Conclusions

Based on the scenarios analyzed above, it can be concluded that the legal areas including most challenges to mobile content communities will be

- privacy and data protection,
- intellectual property rights, and
- contracts.

Perhaps, the most important or at least very significant legal area will be *privacy and data protection*. Mobility, context-awareness, and ubiquity will bring computer networks even into the most intimate places and walks of life. Future computing and communication devices are not only capable of accessing people's private information but many useful services are highly dependant on it. There will an increasing dilemma: people are requesting and can benefit from services that jeopardize their privacy.

Probably, the opposite interests of getting useful services and protecting privacy tend to seek balance. People are willing to disclose reasonable amount of private information to get the services they need, but not more than that. Certainly some people are more cautious of their privacy while some others do not care even if quite a lot of information on them is available for others. It certainly depends also a lot on the situation, social context, the services, and other factors, how much somebody is willing to disclose. Privacy is most relative. In a business meeting everybody is expected to introduce oneself while in an anonymous discussion group it is acceptable to use a pseudonym. Usually, it is at one's own discretion how much personal information she or he is willing to reveal. Mobile content communities will likely have a variety of social norms in this respect.

On the other hand, for certain service providers there may be incentives to collect as much private information from people as they can, because that information can be worth a lot of money. Also, it is often more difficult and expensive to build technical systems that secure private information than ignore privacy needs. Therefore service providers easily disregard privacy unless customers insist it or a legal system forces them to honor people's privacy.

It seems that *intellectual property rights*, particularly *copyright*, will be another legal area where a number of challenges come up. Both the economic rights (right to make copies, right to make the work available to the public, and so on) as well as moral rights (right to proclaim or disclaim authorship, right to object any modification that would be injurious to the author's reputation, etc.) will be increasingly important. It needs to be noted that many of the scenarios are enabled by computer programs that are governed by special provisions in the copyright law. For a business entity providing services for communities, it is significant that the service provider as an intermediay can be liable for the content that infringes others' copyright. Copyright laws in many countries include safe harbor rules that discharge the intermediary from liability if the service fulfills all the mere conduit requirements. However, if the service for instance adapts or filters information, the safe harbor rules do not apply and the service provider can be liable. The scenarios also suggest that the importance of databases is increasing, which highlights *database sui generis right* in the European IPR law. Other IPR, like patents and trademarks may also have an important effect on mobile content communities.

There will also be major challenges related to *contracts*. First, especially on open mobile networks, i.e. the Mobile Internet, it is not always easy to find out, who the contracting parties are. Second, it will be sometimes difficult to state what the subject of a contract is. It can also be complicated to determine when the parties have committed to the contract. Moreover, on a mobile network it can be troublesome to decide which is the correct law to govern a certain contract as well as which authorities have jurisdiction over disputes concerning it.

There will be noteworthy challenges in other legal areas too. For example, tax law meet challenges because of new kinds of transactions, resources, and incomes as well as moving users, globalization, and changing work. International private law in general will be important, because of globalization and moving users. Labor law will face challenges because the mobile communities may represent new forms of gainful work. Criminal law will be challenged not only by new kind of international and computerized criminals but also because it will be difficult to decide weather some objectionable act in the new environment is punishable according to the existing law. Nevertheless, based on the scenario analysis, those other legal areas do not seem to bring forth as crucial challenges as the first three.