Visualizing Context, Mobility and Group Interaction: Role Games to Design Product Concepts for Mobile Communication

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Abstract. In this paper, we describe how role games could be used in concept development of mobile cooperative systems. The design of such systems needs to take into account the mobility of users, various contexts, activities and group interaction. We claim that role games can be organized to visualize all these aspects to better envision new devices and services for mobile communication. Role games as a technique in concept generation were experimented with and developed in six games sessions within two product development projects. We propose two features that seem to be critical for using role games to achieve our objectives: the preparation of a rich and detailed environment, and a good flexible game structure and set of rules.

Keywords: HCI, CSCW, wireless systems, case study, games for design

1 Introduction and Motivation

Mobility has been the object of field studies, attempts have been made to understand its nature and the implications for the design of cooperative systems [17, 1, 2, 8]. The studies show that designing mobile cooperative systems requires a new way of understanding the practices. According to Luff and Heath [17] there has been a tendency for developers of CSCW systems and workplace studies to overlook important aspects of mobility. This may have led to a tendency to "conceive of technology to support workplace activities as constrained to particular locales and thence to particular fixed devices". To explore mobility, one has to understand "activities in which people engage, with others, when they are mobile, and how various tools and artifacts, feature in those activities" [17]. In other words, design has to take into account three aspects simultaneously: group activities and interaction, the mobility of participants in the interaction, and the context of each participant in term of artifacts, tools and environment. We believe that visualizing these three aspects provides an appropriate platform to generate product concepts. In this paper, we show how role games can be organized to provide a good tool to visualize the different contexts, the group interaction and the mobility. The role games serve as platforms for the players (users, experts, and

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designers) to envision and act out new product concepts taking into account the three aspects mentioned.

In concept development, we carry out information gathering (user and products studies), interpretation, concept generation and prototyping. Role games were experimented with and developed as one of the activities to generate product concepts and act them out in six games sessions within two projects.

In section 2, we give an account of related work in three chapters: participatory design and information systems development, simulation games for organizational development, and the use of theater techniques and drama. In section 3, we describe the projects and the research methodology. Section 4 contains a description of the six game sessions. In section 5, we discuss the features of role games we developed to achieve our objectives. Section 6 summarizes the contribution.

2 Related work

2.1 Experiences from Participatory Design and IS

The most serious work on games comes from Participatory Design and has been presented by Ehn and Sjögren [6]. Their objective in using games "is neither to encourage competition nor to teach a theory from above, but support situated and shared action and reflection." (p. 254) Moreover, games are a way to "create a common language, to discuss the existing reality, to investigate future visions, and to make requirement specifications on aspects of work organization, technology and education." (p. 252) In their work, Ehn and Sjögren [6] present different games. We discuss here the first two: a game of the late '70 in the woodlands of Scandinavia and a game used for design of Desktop Publishing. The game was organized to explore the effects of different business strategies for the design of technology and organization. Three design games were used to develop an action program for changes in their workplaces: Carpentrypoly (a game similar to monopoly), the Layout Kit, and the Specification Game. The Layout Kit consists of a collection of cards representing machines and accessories. The cards were used on a large sheet to lay out existing shops, identify problems, and sketch new alternatives supported by a shared understanding. Carpentrypoly was used to investigate market relations and business strategies. The results from the first two games were later structured in the Specification game.

The dramatic design context of the Desktop Publishing Game was based on six concepts. The *Playground* is the subjective and negotiated interpretation of the context. The *professional roles* were in role scripts. The *situation cards* are examples of breakdown situation. *Commitments* as actions made by players in relation to situation cards. *Conditions* for these commitments are negotiated, and an action *plan* formulated. These concepts were used through four steps: Prologue where the game is explained and playground designed. The first Act is a session in which, situation are played and commitments made under certain conditions. The Second Act is based on an updated playground where work with real publication is played. The third Act brings back to reality the participants with a formulation of an action plan for negotiation with surrounding organization.

The work of Ehn and Sjörgen [6] helped us in understanding games as a way to create a common language in design (their approach is influenced by the language games of Wittgenstein). Moreover, they provided us with some ideas for organizing the games. Examples are the role scripts, the playground (in our games the situation), the situation card (the incident cards), the lay-out (maps and environment). Our perspective differs

from the participatory design games because we deal with potential users and we do not attach to design political meanings (for example democracy in the workplace). Moreover, we research benefits of games for the special case of design for systems supporting mobility. Finally in our projects, we are not constrained by the work boundaries but we design devices and services also for personal use or entertainment.

Other games in the in participatory design literature include interface metaphors games [20], games to analyze and design work [21]. The latter includes two techniques that look at work and systems at macroscopic (CARD) and microscopic (PICTIVE) level. In CARD the focus is on the overall task flow. Each screen image or task component is represented as a playing card. Participants describe and analyze the task at a macroscopic level by playing and manipulating the cards and by creating new ones. PICTIVE technique focuses rather on detailed design. It uses familiar office materials, to represent the components of computer systems often at the level of detailed screen design. Color pens, Post-It notes, highlighters, colored paper, and tape. Large papers represent screen or windows etc. Another contribution [33], explores role game for information system development based on an act-oriented notion of role.

2.2 Using tailored Simulation Games in Organizations

Simulation games have been used in learning and developing of processes in organizations. In a simulation game the players act and "talk through" activities, which they do in real life by following a visualized flow chart of the process and by using game material (e.g. real documents related to the process) [29]. The simulation game illustrates well to all participants with different backgrounds the state of a process. Moreover, it shows the interdependencies between different actors and activities, and stresses the importance of cooperation and communication [7].

A good example of using tailored simulation games in organizations is described in [26] who used simulation game in developing an administrative work process in a service organization. First the simulation cases was planned together with representatives of the organization. The cases were created by using wall diagram techniques and work flow charts. Then a one-day game session was organized with 27 members of the service organization. The players conducted their ordinary tasks and handled the original documents while talking aloud. The simulation proceeded in the same manner as the events of the real work process. The 16 observers followed the game session making notes about problems and ideas for improvement. The role of customer was acted by a service employee. The researchers were game facilitators. After the game session a debriefing was organized. In the debriefing the game participants reflected their experiences in the game. The results of the game were very positive. It helped to visualize the process in a concrete way, it facilitated interaction between different parties, and it helped to gain common understanding about development needs.

Simulation in organizational development differs from our perspectives because it aims at simulating reality, whereas we use games to envision the future.

2.3 Theater techniques and Drama

Drama and theater are called into this discussion, because like in role games the performers engage in playing a role. Drama is also not new to design [16]. In her book Computers as Theater, Brenda Laurel shows how the design of a computer game or application can benefit from the theater and drama techniques. An example of recent application of drama in design is Focus Troupe [27, 28], where dramatic vignettes are presented to an audience of potential customers. The vignettes feature the product

merely as a dramatic element and not as a piece of technology. Focus Troupe [27] is a way to use drama to elicit "contextually relevant, personally experiential user feedback" for products that do not yet exist. The use of theater techniques in this sense differs from our perspective because we seek the product idea rather then just feedback on it.

3 The Projects and Research Methodology

As mentioned earlier role games were developed in two separate product development projects. We describe in this section the two projects, Maypole and GO PROD, and our research methodology.

3.1 The Maypole Project Mobile Communication for Children

The role playing with Playmobile toys was first taken into use in a research project called Maypole. The aim of the project was to explore and create new ideas for communication products for children age 8 to 12 years and members of their social networks. It followed the principles of the user-centered concept design phase of product development but was a research project of six different European industrial and academic partners (see more [32, 22]).

According to Mountford [18] besides brainstorming role-playing might help designers to create, evaluate, and develop ideas by assuming different point of views. The reason why the role playing with the toys was taken into use in Maypole was that human factor researchers and designers needed concrete ways to discuss about how new product concepts would be used by the users in their own environment. The playing method was never developed further in Maypole since the project moved to prototyping of the product concepts, and field trailing the prototypes.

3.2 GO PROD: User Aspects in Future Mobile Communication

Role games were further developed in GO PROD (Product Concepts and User Aspects) a subproject of GO at the Helsinki University of Technology. The objective of the GO Project is to implement a wireless network and investigate mobile communication of the future. One of GO PROD objectives is the development of use scenarios and prototypes of services and products as seen by the end users. A lot of effort in GO PROD is spent in investigating support for mobile groups. Concept development is carried out by studying user groups in iterative cycles. The cycles include information gathering (user study and current products), generation of concepts, validation and refinement. Role games have been chosen as one of the activities for the generation of concepts. Some of the situations or roles in the games are taken directly from the user studies.

Among others, two principles influence our approach to design in Maypole and in GO PROD. Firstly, the primary focus of design should be on the *use* of the system and its *context*. Scenarios have been recognized as the right way to represent design issues and ideas, as they situate the system in its use and provide rich information about the context [13]. Scenarios provide a common language for all stakeholders in the design activities. This facilitates the cooperation with users, which is considered a privileged way to inform design [14]. Scenarios can be act out in games or theater techniques opening up new opportunities for design (see section 2). The importance of the *context* in the design of cooperative systems has a long tradition. A good example is the success of ethnography and field studies [15] brought into the field by anthropologist (see the influence of Suchman's "Plans and Situated Action" [30, 31]).

The second principle is the unpredictability that characterizes the introduction of cooperative systems. Past research shows how the use of such systems is difficult to anticipate [5, 25]. Moreover, the introduction process is open-ended [24, 23, 3], and requires user involvement [9, 12]. Acknowledging also research results for the reasons why the introduction might fail [10, 11], we believe in iterative and use oriented design. Moreover, the influence of lifestyle and social behavior on the acceptance of new interactive systems [19], have led us to consider new ways for cooperating with potential users in design.

Games help designing under the two above mentioned principles providing ways to consider the system into the context (with various representation of artifacts and environments see section 2.1). Moreover, they involve the enactment of scenarios and provide a good way to cooperate with potential users.

3.3 The Research Methodology

The type of methodology adopted was case study [34]. The data collection was multiple: to evaluate the role games we videotaped and analyzed all sessions, we participated and observed, and each game ended with a discussion where the players were asked to comment on the game. The discussion, which we also videotaped, was an important step towards the preparation of upcoming sessions. It provided us game designers with participant's opinions and a first analysis. In the videotape analysis, we wrote transcripts of the unfolding of the game. We created storyboards describing the product concepts and the scenarios as they were played in the game. Before each game, we wrote a document containing the guidelines. After the six game sessions, we analyzed the overall process to concretize the findings. The next section first explains the basic game settings, then the games are described following their chronological order.

4 The game sessions

The basic principle of our games is to let participants play roles or act as themselves in given situations. The situations and the roles are either taken from the user studies or invented. The players imagine what kind of devices or services could support their mobility and communication, discuss, and act out the ideas in the given situation. Such a game can be organized in different ways. The number of the players or *group size* varied from 3 to 7 participants. The *Story structure* also varied in the games according to the presence of the following: initial scenario or situation, plot or event lists, incidents, roles and goals of players. In other words, the group interaction can be organized around an initial scenario letting the players free to improvise, or can be influenced by predefined information.

Inspired by the role games (like Dungeons and Dragons) in some of the games we introduced the game *master*. The master guides the unfolding of the game introducing incidents and deciding who plays. As in role games (like Dungeons and Dragons), the master is the interface to the environment representing the world with its opportunities and constraints. In this way, a designer has a direct influence in the game's unfolding.

Game rules were also different in all games. In some games the group interaction was improvised and not guided by rules. In other games, rules defined the order for players to speak or act; how ideas are developed in teams, in a group or individually; when to throw the dice; to pick up a card with an unexpected incident.

Environment and toys were present with different levels of advance preparation in the games. Each game situation was situated either in the *present* or in the *future* according

to our objective towards understanding current operation and problems or initiating a very innovative atmosphere. Each session was opened by an introduction to state goals and to inform the players with game material. All the games lasted from 1:30 to 2:00 (also including a 10-20 min introduction). The time is not considered to be one of the variables in the game design.

In the first game within the Maypole project we explored the technique and discovered its potential. In this games roles and starting situations were provided. The second game was part of the GO PROD project. It introduced successfully the game master and a plot with events with benefits to the unfolding of the game but it was a step backward because the toys and the environment where not used. In the third game, a new map and new toys inspired the players that were organized in two teams of three players. The fourth game experimented without success with seven players an improvisational approach without roles and events (just the starting situation). In the fifth game the number of player was again reduced to three and we introduced a list of incidents and reintroduced the plot with events. After trying out different approaches in the first five games, we felt confident enough to spend some days preparing the sixth game. In the sixth game, the environment was prepared carefully with many details. Tools and rules were introduced to help the players to act out their ideas and play with the toys. There were three users playing and two designers had side roles (one of them being the game master).

Game 1: map and toys

Since the product concepts generated in Maypole were mainly mobile, there was a need to illustrate several use contexts at the same time. Therefore, the role playing with the toys happened on a map of user environment (see figure 1).

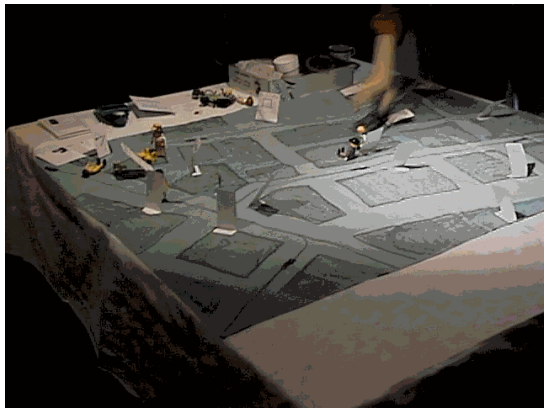

Figure 1. Map of user environment used in Maypole.

The user environment on a map, roles and scenarios to play were all based on user studies done earlier in Maypole. The players who were human factors researchers and designers, liked the method since it helped them to see all the user environments at the same time, and consequently helped to discuss about the good and bad aspects of the developed product concepts. However, the participants felt that playing should have been somehow more structured. It was not enough to have the map, the roles and the scenario. The mobility and the various places where made visible and the group activities and interaction.

Game 2: the game master and goals for players

We organized the second game in the GO PROD project. As the first game was lacking in structure, we introduced the *game master*. We interviewed two game masters of role

games to understand the practice and seek further inspiration. In this game, three potential users were invited as players. There were five players and one master. We prepared a starting situation along with roles and goals for each player, which we distributed in the beginning of the game session. The master also had prepared incidents for each player. The idea was that each user would try to achieve his/her goals in the situation caused by the incident described by the master. The player was supposed to imagine services and devices, explain them and act them out with the others players. After that, the other players would discuss the ideas and give points. It was tacitly assumed that the game was played in the present.

The game unfolded as expected except for two aspects. First, the map and toys of the previous game were placed on the table but they were not used. Second, the goals given to the players were not of relevance compared to the incidents proposed by the master. Analyzing the video recording, we were able to extract five different product concepts already in form of scenarios. Current products and current technology limitations influenced the product concepts contained in the scenarios. The game made visible only the group interaction.

Game 3: two teams, incidents, situation in the future

In the third game, we were aiming at using the toys and a new map to help the players explain less and act more and avoid long explanations and discussion. Moreover, we organized two teams of three players to have ideas that were more thoughtful and innovative as they formed the combination of brainstorming of several players. In addition to the initial situation, roles and goals for each player, the master described an incident to each team and then gave them some time to discuss and develop product concepts. We then expected each team to present the products concepts acting in scenarios. Two teams then discussed services and devices and the other team gave points according to the quality of their ideas. As current products and technology influenced the scenarios produced in the previous game, we explicitly situated the game in the future in year 2010.

The game was very fruitful in term of number of generated concepts. Eight product and service concepts were developed using the map and toys. The toys available directly inspired four of the product concepts. The organization in teams on the one hand seemed to increase the productivity and quality of the concepts, on the other hand made it difficult for the participants to act out the scenarios. After developing the scenarios, the teams were explaining rather than acting. The master was taking a great portion of time explaining the roles, goals, and incidents. The game helped visualize and use the artifact and tools but the different contexts appeared only in a limited way. The organization in teams seemed not to encourage group interaction.

Game 4: improvisation and different contexts

We organized the fourth game to tackle two issues. Firstly, to get the players to act more and explain less. Secondly, get the players use the environment and be more context aware. We decided to experiment the game without the game master to encourage the players in acting in the story without interruptions. Moreover we thought of giving very little information to start, letting the players choose their own goals. The players started by choosing a toy character (from play-mobile) to represent themselves in the environment.

The game started as expected with players using the environment and toys. Unfortunately, because of missing rules, the game soon transformed itself in a brainstorming session. The players were not contributing in an equal way. Nevertheless, the group developed eight well-defined product concepts and four vague product ideas.

The game started visualizing mobility, different contexts, and group interaction but soon turned into brainstorming.

Game 5: list of incidents and back to plot with events
After the partial failure of the fourth game, we decided to try a game with just three players. The objectives were the same as the previous game: to get the players act out and use the toys and the environment. We prepared a starting situation and a list of incidents. One of the players decided when to introduce the incidents. The environment was not prepared with details of different places. Only the map and one place were prepared with details.

The list of incident proved to be a good invention providing a good flexible game structure. However the situation and incidents prepared for the game did not encourage the players to use the environment. The story that was created during the game was poor in action and included only limited mobility. The map and the toy characters were not regularly used. Paper and colors were used to represent feature of the product in action. The session mainly focused on different features of the same product concept. Four features of the product were discussed in terms of different design options.

Figure 2: partial view of the environment of game 6

Game 6: detailed contexts and flexible game structure
After five different games approaches we decided to invest more time in the preparation of the sixth game. We decided to prepare a more detailed environment and to introduce tools and rules to help the players to act out their ideas.

We designed the game for five participants. Three users were the actual players and the two designers of the game played *side roles*. They were not contributing to the development of the product ideas but helping to keep the action in the game moving. One

designer also acted as *game master* monitoring the game and seeing that the rules were followed.

As to the *contexts* and environment, we prepared five different places that players would probably visit with their toy characters during the game. The places were prepared around the room on bookshelf and tables. Some of the places contained rooms and other facilities to reflect the function of the place. In the central table a street map connected all the places and was also filled with toys such as a bus, taxis, bus stops, devices, toy characters and many other little toys. Each place had a printed sign showing its name and a graphical symbol and was filled with as many contextual characteristics (artifacts) as possible.

We prepared an *event list* for the players to go through during the game. We hung the list on the wall to help players be aware of passing time and planning how to carry out all the events within the playtime. We had a box with *incident cards* to introduce some surprises and dynamism into the game. During the game, the master could ask one player to pick up a card describing an upcoming incident. There was an initial schedule for the timing of the incidents, however, it was varied according the unfolding of the game. To improve usage of toy objects and help players to be innovative, we had a *magic box* containing different toys and inspiring objects like glasses, gloves etc. A *micro magic box* contained inspiring objects the same size as the toy characters.

The following rules were also hung on the wall:

1. Always use the toy character
2. Act the use of the device/service
3. Use the dice to decide none predefined aspects
4. Everyone should choose a toy character and picks a "mobic" a mock-up representing a magic mobile device
5. Now and then a player is asked to pick an *incident card*
6. The most creative player wins a bottle of wine

Instead of losing time in long explanations, after a brief introduction the two designers played a little game of five minutes demonstrating all the game rules and tools. This would not only effectively explain the game but also encourage the players in acting and using the toys. The game unfolded successfully meeting our expectations. The players acted through their toy character moving around in the different places. The environment helped the players to become context aware. In several occasions, it helped the players in considering which artifacts might be part of the environment. It helped the players throughout the game to be aware of when they where changing the context. Moreover, the players were aware of the activities and contexts of the others. The *magic boxes* provided twice inspiration when players picked objects from them. The dice was thrown six times providing an additional game elements and fun for the players. The game was the most productive with ten different ideas acted out in scenarios. The action in the game was kept going thanks to the seven incident cards. During their side roles, the designers could also improvise. One of the designer improvised an incident that led to a new product concept and scenario proposed by one of the players. As the designers were playing side roles, they could help the rest of the player to overcome their inhibitions in the game by giving examples of how to use the toys. The game showed the importance of a fluent flow of the story and stimulating setting that allows the players to be living their roles in a inspiring and innovative atmosphere. Finally, the game provided support for a shared understanding of the scenarios and made the player context aware and aware of other's contexts and activities.

5 Discussion

We will now discuss how role games helped us to visualize simultaneously mobility, different contexts, activities and interactions during the game sessions. Analyzing the sessions presented, we found the presence of two features that help this simultaneous visualization. First, the game should provide an environment with different relevant places completed with artifacts and details. Second, the game should have an appropriate structure and set of rules.

Considering the first feature, the game should provide an environment with different places relevant to the unfolding of the game, enriched with artifacts, details, and various toys to represent the players and their tools. We noticed that when the environment was not carefully prepared with sufficient details, it was not used, like in game 2, hence the contexts visualization failed. On the contrary, if the places had enough consistency and details for the game's unfolding, the settings encouraged the player to use the toys and move with the toy character from one place to another (games 1, games 6). In these cases, the players seemed to be supported in their playing by *context awareness*. The players become aware of the contexts they are in and in which context other participants were engaging in activities. In the remaining cases (games 3, 4, 5) the use of the environment was more discontinuous but also inspired the generation of concepts with toys. This feature provides not only a good platform for *context awareness*, but also for maintaining during the game a *shared understanding* (like the Lay-Out Kit of Ehn and Sjörgen [6]) among the players. Finally, the toys and artifacts contained in the contexts provide direct *inspiration* for the players.

The second feature addresses the need of keeping the players interacting together in the environment. The game structure consists of a good plot of planned events, incidents, a set of rules, and roles including both player roles and external roles such as a game master or side roles played by game designers. A plot with events (games 2,3,5,6) gave the games a basic structure. The structure became more flexible with the introduction of an incidents list (game 5) or incident cards (game 6) similar to the "situation cards" of Ehn and Sjörgen [6]. We believe roles to be relevant in their absence in the game of potential users (game 1). In this case, the designers need to play the roles of users and project themselves on the user's view of the world. When potential users are participating in the game as players, it is no longer necessary to take into account the users perspectives. In this case, roles can support the unfolding of the game providing the right characters for the story (games 2,3). The game master (games 2,3,6) improved the structure of the game also helping to keep a focus (games 2,6). In game 3 the acting was disturbed and interrupted by too much explanation, this suggests that the game master should be trained to help the flow of the game rather than disturb it. The side roles were a good invention in game 6, providing an additional way to improvise creating new opportunities and to help players overcome their inhibitions. The *set of rules* in game 6 was an important inventions encouraging the players to use the toys and act through their toy character. In conclusion, this feature provide a flexible structure that can be adapted during the playing of the game to keep the action going or to change direction after reaching a cul-de-sac (game 6).

Finally, we want to list some of the limitations of our study. First, a successful application of games as presented appears to be critically influenced by the engagement and commitment of the participants. Another aspect concerns the fact that some participants played more than twice. In the six games session 14 persons were involved and summing up the players of each game, they included 31 players. According to the opinions of some player during the discussion after the games, the creativity and numbers of new ideas decreases after a couple of games.

6 Conclusions

In this paper, we describe how games can be used in concept development of mobile cooperative systems. As shown from previous field studies [17,1], the design of system for mobility requires understanding of aspects previously overlooked when designing for desktop applications. One needs to take into account the mobility of users, the various contexts in terms of artifacts and tools, the activity, and the group interaction. We showed that game can be organized to visualize simultaneously all those aspects to better envision new communication systems.

Playing games as a technique in concept generation, was experimented and developed in six game sessions within the two projects Mypole and GO PROD. Both use role playing as part of a larger framework for concept and prototype development. The previous work, especially of Ehn and Sjögren [6], influenced us in understanding the potential hidden in games, despite their very different context. They provided us also with a valuable source of inspiration in setting-up the games. In describing the game session settings, organization and outcomes, we found different approaches for using the technique.

We proposed two features that seem to be critical to use the role-game for our objectives: the preparation of a rich and detailed environment, a good flexible game structure and a set of rules. Together they enable design in action visualizing simultaneously the mobility, the contexts, and the group interaction. They provide a good platform for investigating new systems in use while keeping context awareness and a shared understanding for all players. These features and their ingredients have provided us with means for planning future games and according to the set objectives. In further studies in GO-PROD, we will apply a game template (similar to game 6) for new user groups to gain further experience.

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