The Activity-Flow Co-Design Game: Designing for scheduled and unscheduled use situations

Julia A. Garde*, Mascha C. van der Voort**

** University of Twente, The Netherlands, j.a.garde@utwente.nl*
*** University of Twente, The Netherlands, m.c.vandervoort@utwente.nl*

Abstract: Designing high quality procedures and products for dynamic use situations in professional environments is a challenge for designers since they lack the crucial understanding of the work practices involved in the field. While stakeholders have this knowledge and experience, they are unfamiliar with co-designing hypothetical future concepts. In this paper we present the Activity-Flow Co-Design Game as a means to elicit knowledge from stakeholders and enable them to design concepts for professional use situations. Our game is a combination of a miniature role playing board game and a task-flow analysis that is played by different stakeholders in a group setting. A crucial feature of the game is that it allows us to address two different types of use situations: [a] work processes which follow a predefined procedures (scheduled) and [b] situations that cannot be planned in advance (unscheduled). After a discussion of the types of stakeholder knowledge that can be elicited, principles behind the game, and how scheduled and unscheduled use situations can be tackled with our game setup, we present two real-life case studies from the healthcare sector. Due to its flexible approach, our game may be useful for designing for various dynamic use situations beyond the healthcare context.

Key words: co-design, participatory design, design game

1. Introduction

The design of products for professionals that are to be used in dynamic use situations, as described by van der Bijl-Brouwer and van der Voort [1], forms a challenge for designers or development teams: the designers and teams usually do not have personal experience with professional dynamic use situations, hence, they miss a frame of reference. Furthermore, how things are intended to be handled by the people who organize processes or design products, and the way things are actually done do not always match, especially when the decision makers are not the same as the users. To deal with this challenge and to design products that fit professional practice; knowledge and experience from the professional world need to be captured. These are available in future product users and stakeholders who are participating in the current practice. However, applying their expertise to evaluate or co-design hypothetical future concepts is a challenge for stakeholders who are not used to design in terms of developing diverse solutions for an uncertain context and using designer tools to express their ideas. To enable stakeholders to design and evaluate concepts for future use situations, these use situations must be made accessible by providing the context of a concrete use scenario with actors, goals and the use environment.

In dynamic use situations a product is used by different people with diverse capabilities and goals in various situations. For instance, software to access and edit digital patient data might be used by doctors in a different

way than by nurses. It might be used in the patient room or in the staff room, as well as at the doctors home office. The goal of the user might be to either insert blood pressure measurement numbers or descriptions of the patients behavior. Furthermore, nurses and doctors might be using the software simultaneously and be looking at the same screen when doing the ward round together. Professional products are usually used in two different types of situations that must be addressed in the design process: (a) work processes which follow a predefined procedure (scheduled use situation), and (b) situations that cannot be planned in advance (unscheduled use situation). The software from the example is used during the scheduled ward rounds to find information and to edit it, but there might also be an unscheduled emergency situation, when patient data must be quickly accessible to find a specific bit of information.

In order to deal with the complex design problems described above and to be able to design products that will work in practice, stakeholders can be included in the design process. In hospitals, in e.g. the Netherlands, there seems currently to be made little use of knowledge that is available within the organizations [2]. Including stakeholders in the design process can make this existing knowledge available for a design project, and can even help to directly utilize the knowledge by having stakeholders come up with- and evaluate new ideas. However, including (non-designer) stakeholders in the design process demands for an adapted design process in order to enable stakeholders to participate in the designer world and enable designers to participate in the practical work sphere. Most people, even designers, find it rather difficult to come up with ideas in discussions or when there is a white piece of paper in front of them. In order to make possible future situations imaginable and evaluable, specific tools are needed, preferably tools not requiring designer skills. Design games are such tools, that can support creating and imagining hypothetic situations and negotiate them. They are supposed to give participants an holistic insight into the consequences design decisions have on different aspects of the organization.

Many people have an attitude against change. However, this attitude usually concerns changes that are imposed by others, but do not concern changes that people come up with by themselves. The felt ownership of ideas when one has been included in the design process can therefore change processes.

2. Design games

A design game is a setting in which one or more persons are given the assignment to achieve a specified design goal, means to use in achieving this goal and rules to play by. Whereas this description might be valid for any design approach, in design games the used tools are usually more elaborate, often scenario based, and designed for non-designers to participate in the design process. The difference between leisure games and design games is that the latter aim at serious outcomes, outcomes the players might be affected by in real life.

2.1 Stakeholder knowledge

When including stakeholders in the design process, the goal of using design games is to introduce and apply specific types of knowledge only the stakeholders have to the design process. However, including stakeholders can also have more “political” goals such as conforming to the democratic ideal of self-determination in a way that everybody should have an influence on his or her own work environment (participatory design) or gaining commitment for an organizational change in order to enable an easier implementation of solutions and a better work climate. These three possible goals are not always compatible and in this paper we focus on design games in favor of the end result and thus on the benefit of the knowledge that stakeholders can bring into the process.

When designing for use situations the designers are not familiar with, as in the presented cases from the healthcare sector, practical knowledge needs to be introduced to the design process from the outside, in order to decrease the number of use problems in the resulting products [3]. *"Practical knowledge is knowledge about how things are currently done and about use problems, based on a repertoire of experienced and memorized use situations. This knowledge can be accessed by the users to foresee problems and opportunities which a designer, without this repertoire, cannot anticipate."* [3]

Besides eliciting practical knowledge, techniques such as design games with stakeholders aim at gaining access to participants tacit knowledge. Tacit knowledge is a part of the practical knowledge, but cannot be very well articulated in words or writing, and comes only forward in the "doing" of people. *"Tacit knowledge is 'what people know without being able to articulate' [4]". "Compared to explicit knowledge, tacit knowledge provides a holistic view of, for instance, the usage or use context of a product, rather than an explicit functional definition of a particular product or activity. Tacit knowledge cannot be transferred in writing, it can only be experienced by 'doing', for example by experiencing an activity. Specific design techniques help with utilizing this type of knowledge in the design process by letting participants 'do' things, i.e. build, and test new designs instead of describing them."* [3]

2.1 Underlying game principles

In this section we present seven game principles that must be considered in the design of a game; (1) group activities VS. individual activities, (2) game activities, (3) properties of use situations that need to be covered, (4) how to foster innovation, (5) the use of boundary objects, (6) the role of the facilitator, (7) preparation of guiding questions.

(1) Design games are mostly group games in order to benefit from the discussion between participants with different backgrounds, but can also be individual games. Studies show, that in brainstorms individuals pooling their ideas come up with more results, than a group working together from the beginning [5]. It is likely, that group games - in order to prevent that good individual ideas get lost in the group discussion process- benefit from an individual part as well. However, this is only advisable if participants are self-confident enough to contribute individually.

(2) Design games can comprise different types of activities, activities aiming at mimicking situations, prioritizing, inventorying, weighing alternatives, negotiating, finding relations, and creating- and evaluating scenarios. These activities can be realized by the use of different tools and techniques, ranging from cards to miniature environments and for techniques from card sorting to roleplaying.

(3) The various activities can cover different properties of a use situation or a product; when looking at a use situation roles, time (chronology, duration, parallelism of events and scheduled- and unscheduled events), space (location, distances and size), information flows and physical appearances of things, surroundings or people, are the properties that a design game could cover. When looking at the product the properties are functionalities, behaviors and appearance (e.g. topology, size, color, feel, smell and sounds).

(4) In order to stimulate participants creativity in a session and obtain more innovative (yet maybe less readily applicable) ideas, one or more of the properties from the use situation can be left out in order to decrease the design boundaries, or can be transported to a different context in order to remove existing limitations from participants heads, e.g. ask participants to design the ideal situation for 2050 or design for an airport instead of a hospital.

(5) Design games benefit from the use of physical game elements. These enable participants to demonstrate things to each other, instead of explaining them in their individual professional language. This way the physical game elements work as "boundary objects" [6]: they make it easy to exchange information between professionals and ensure that everybody is "talking" about the same thing. Furthermore, showing things by the use of physical representations (e.g. puppets, building blocks, cards) has a much lower threshold than drawing or using other representative techniques from the professional design sphere. Putting hands on physical game elements enables every participant to take part is the game, influence the outcomes and thereby gain ownership of the outcomes. Independent physical objects can be arranged and rearranged very easily, while providing a good overview for a whole group (in the same way "post-its" are superior to writing notes on a flip-over). Finally, there is the learning theory of constructionism that says that hand-activity supports brain activities, meaning that e.g. building things with one's hand helps to learn and structure and make sense of the world (see e.g. [7]).

(6) During a design game there is usually a facilitator, whose tasks comprise asking guiding questions, explaining the game if needed, ensuring that everybody feels at ease, taking care that every participant gets heard, keep the group focused on the actual problem (preventing digression) and keeping track of the time.

(7) Design games need thorough reparation, beyond selecting activities, tools and techniques, gaining clarity about the questions that the game should answer and the degree of freedom for the participants (the size of the "solution space") is important in order to gain relevant outcomes. This means that the designer of the game must anticipate in which direction to look for possible outcomes of the game. Furthermore, most games benefit from good guiding questions that come from the facilitator, which must be prepared beforehand.

3. The Activity-flow Co-Design Game

Activity-flow oriented contexts are use situations in which several activities are executed and form sequences in order to complete tasks of a higher order. For example, "buying groceries" is a sequence of activities such as grabbing a bag, driving to the store, fetching a shopping card, putting groceries in the cart, waiting in line at the cashier, putting groceries on the counter, paying etc.. The Activity-flow Co-Design Game has been newly developed to explore future use situations with many consecutive activities that take place in different locations. It has been applied to sixteen workshops in three different real world project, as well as one workshop with fictive case. Two cases from one of the projects will be presented in this paper. The reason to look into a future use situation could be the idea to introduce a new product or a new technology, a new location or building where activities would take place, a wish or need to change the activity-flow or responsibilities, or a combination of these. The results that the Activity-flow Co-Design Game aims for are opening up a dialogue between different stakeholders about the new situation, exploring current or future problems, and finding requirements and concepts in an iterative process that is organized by guiding questions and mimicking scenarios including all the elements in the use situation: product or technology, location, the activity-flow, roles and responsibilities.

Figure 1: Game board ("miniature environment") with game pieces and mock ups of possible solutions

The Activity Flow Co- Design Game consists of two major components, (1) a miniature roleplaying game board (see Figure 1) and (2) a task-flow. The scenario playing is enabled by the miniature roleplaying game components of the game. This component was inspired by the pivots Urnes et al. employed [8] as was earlier described by Garde and van der Voort [9] and is similar to the "living blueprint" by Dalsgaard [10]. The miniature role playing board game is a small representation of the environment the use situations take place in, with game pieces representing characters or products which can be moved through the environment in order to act out scenarios. A miniature environment with game pieces representing different roles has two advantages compared to real "full body" role-playing: First, it has a lower threshold for participants, moving figures is less intimidating, than having to play theater. Second, environments comprising large buildings or even whole cities can easily be depicted in the miniature environment. However, in design cases where the emphasis is on the specific movements in a use situation (embodiment) a whole body roleplaying technique would be more suitable. The miniature environment in the Activity-flow Game comprises a two dimensional representation of a building or location (a "map") that is preferable designed to be easily interpretable for game participants (e.g. by the use of color, pictograms and other visual cues). On this representation of the location the use situation takes place, game pieces representing people, interior and products can be moved in order to play out scenario's (see Figure 1). What these pieces should represent, depends on the goal of the design game in the specific project. Playing out scenario's in the miniature environment helps participants to envision the future use situation because it provides the concrete context of space, people and products to explore and to react to. The game pieces are "*physical, symbolic representations that allow a person to move back and forth between a figured (imagined) world and the real world*" [8].

However, the situations that can be acted out in the miniature environment need guidance, which can be provided in the form of scenarios. This scenario guidance consists on the one hand of a main scenario, represented by a task-flow that depicts the ideal activity-flow situation and on the other hand of interrupting mini scenario's or events that conflict with the ideal situation. The first represents the scheduled use situation, the second the unscheduled ones. The ideal situation is represented by task cards, that resemble the Collaborative User Task Analysis cards developed by Lafrenière [11]. These are cards, which can be filled in to each represent

a task or activity (or on a more detailed level an action) and can be sorted and placed into the preferred order of execution. The information that must be filled in on the cards should at least be a short description of the activity, the actor (who is performing the activity) and the location of the activity. These task cards can be filled in and arranged by the participants during the game, or can be prepared (partly) beforehand and customized by the participants during the game. The interrupting events can also be prepared beforehand and completed by the participants, or can completely be filled in by the participants themselves. These events can also be represented on cards, which should preferably have a different colour from the task cards. The game session follows 4 steps:

(1) Introduction: The goals of the session are presented to the participants and if participants do not know each other, they should introduce themselves and the design game session should start with an activity to "*break the ice*" in order to help the participants to feel comfortable talking about personal matters with people they might not know [12].

(2) Warm-up: As a first step in the Activity-flow Co-Design Game, participants explore the premises by playing out a current use situation on the game board, with one new element in it. If e.g. the building is new, participants will be asked to play out the current procedures with the playing figures. This approach leads to discovering possible problems, that might guide the further design process, and as Jalote-Parmar and Badke-Schaub state with respect to the surgical workspace; "*visualizing the changes that will occur in the future workflow while linking them to the current workflow can avoid solutions that do not fit […]*" [13].

(3) Step by step determination of a new scenario: The problems found in the previous step must be solved. In order to achieve this, participants can change the processes and decide upon what kind of product or material they want to use and repeatedly play out situations on the game board. The ideal product or material can be chosen from game pieces, depicting a number of alternatives. Furthermore, participants can introduce new ones, using blank game pieces and "property cards" on which requirements for the products or materials can be described. Participants use the task cards to fixate an ideal task-flow proposal. When creating the task-flow, participants can also set-up new rules and assign responsibilities. In order to get this process going, the problem must be divided into smaller portions, for instance starting with the kind of technology one wants to use. This division in smaller portions is facilitated by the guiding questions, the facilitator has prepared. However, one needs to be aware, that dividing the problem into very small pieces leads to an rather inflexible set-up.

(4) Finally, interrupting events get introduced as a stress-test to assure flexibility and feasibility of the created set-up. The events must be dealt with in the context of the self-created set-up, and if needed, the set-up for the use situation must be adjusted.

Participants do not take turns in the game, but can be assigned roles of the actors in the scenario and given the game piece depicting the role and the assignment to play out the actions of the actor in the game. Such a task division is especially advisable, if there are lower and higher ranking, or shy and overpowering people in one group, because it reassures that everybody can provide input to the game. A group playing the Activity-flow Co-Design Game does not need to have a specific number of participants. Most important is that people with diverse backgrounds are present. However with more than six people present, the effective time for every participant to contribute becomes too limited when planning for two to three hour sessions.

The Game covers the following properties of a use situation: chronology (in the order of the task cards and hence also in the roleplaying), parallelism of events (in the role playing, and the task-flow) , scheduled events (in the task-flow), and unscheduled events (in the event cards), and space (location of people, products and material in the game board). Information flows and roles can be accessed by additional game material, as will be shown in the cases. Duration of tasks, distances and the size and appearances of products, people and interior are not taken into consideration, because the game is aiming at designing an ideal activity-flow and finding functional product requirements. The advantage is, that in this case the miniature environment does not need to be precisely to scale. When looking at the product the included properties are the functionalities and behaviors; appearance is left out.

The set-up of the Activity-flow Co-Design Game has several strengths, that were described earlier by Garde and van der Voort [9]: (1) it enables the users to invent and design a new procedure, (2) it includes all different users at the same time, so that it can be discussed immediately what a change in one user's domain of responsibility means for the domains of others, (3) it gives a clear overview of a procedure and the consequences that changes to this procedure have, (4) it triggers the participants to empathize the new situation, (5) it includes all possible appliances that could be involved in the procedure and (6) it is time efficient. Additional advantages are that the mimicking and showing with physical playing pieces (1) supports accessing tacit knowledge, (2) helps participants to think and form a mental model of the future and (3) works as boundary object. Furthermore, the scenario approach provides a concrete context to explore scheduled as well as unscheduled use situations. Finally, the playful approach is attractive to most workshop participants, it is "more fun" than normal brainstorms or meeting discussions.

4. Cases

The cases presented in this paper are part of a hospital renewal project. The hospital in the project will move from the old building to a newly-built 620 bed hospital, in 2015. The moving entails several changes that heavily effect the workflow of the nursing staff, as has been reported by Garde and van der Voort [14], three of these changes are relevant for the presented cases: (1) while in the current building there are one-, two-, and four-person rooms in the new building will only be single-person rooms, (2) while currently several wards still work with paper patient record and lots of the communication goes by phone and paper, the new hospital will become nearly paper free and (3) while currently the hospital employs limited visiting hours, the concept of single-person rooms offer the possibility to receive visitors 24/7 and let family stay overnight, because visitors do not interfere with the rest of other patients. The new building and the additional changes have an impact on the way nurses and ward assistants work. They influence not only how their shifts, material logistics and communication are organized but also the rules and responsibilities concerning the visitors policy. In order to develop the best possible work flow and technological support for the nurses, a co-design project in co-operation with the laboratory of Design, Production and Management of the University of Twente was set-up. The project involved the redesign of work organization concepts with regard to four topics: (1) ICT, (2) supply logistics, (3) catering and (4) nursing tasks and visiting policies for the general wards. For all four topics, design workshops with different participants were organized, employing the Activity-flow Co-Design Game. In this paper we present the case of (1) ICT, which comprises scheduled – and unscheduled use situations and (4) nursing tasks and visiting policies, whilst the part visiting policies is dealing mainly with unscheduled use situations. The point of

departure for both cases was that the plans for the building and thus the ward facility design were already completed by the architects. The project was guided by a steering group consisting of representatives from different staff groups (ICT, nursing, business process redesign, quality management, and building project). In both cases, the design game workshops were preceded by a so called “visioning workshop”, which is meant to discuss personal visions and concerns with respect to the new hospital and formulate a joint vision for the project. After the design workshops discussed below, each case ended with an evaluation workshop were different concepts were united in one and evaluated.

4.1 Case 1: The concurrent design of a nursing workflow and the ICT application

In this case two questions had to be answered: (1) With what kind of tool and where will digital patient records be consulted and edited? And (2) What would the ideal, smart call-, alarm- and communication system on the wards be like and with what kind of facilities, products and software could this ideal system be realized?

Two Activity-Flow Co-Design Game workshops were organized, each dealing with one of the two questions. The goal was to first determine a new, more ideal workflow and then derive product requirements for ICT products and systems from this new workflows. The technical framework that had already been defined for the new building was used as a point of departure for the game: In the new building there will be a wireless network for data transfer, telephone and tracking and tracing of Radio Frequency Identification (RFID) tags, which means that all digital information can be made wireless available anywhere in the building and there is a possibility to trace goods and people. The patients can access facilities such as internet, TV and hospital intranet by a so called smart TV. The four game steps were implemented as follows:

(1) The first workshop was introduced by a presentation by a staff member of the ICT department about the technical possibilities in the new hospital, and some practical examples of the use of ICT for patients and staff in other hospitals.

(2) Then, the participants explored the new premises by playing out the current task-flow of the morning nursing shift on the game board, which was a plan of the ward, with playing figures and noted possible problems.

(3) The third step is the heart of the game and a step by step determination of the new scenario. In this case the steps roughly consisted of: (a) Adapting the task-flow of the morning shift to the new building situation and visualizing it by playing it out with playing figures and creating a new task card flow for the morning shift, (b) marking tasks for which patient information needs to be consulted or edited with a red dot on the task card flow, (c) determining the ideal location for the task, (d) deciding upon the means that should be used to consult and edit patient data by playing around with different real size mock-ups of smart products (e.g. smart phones, smart tablets, see Figure 1), (e) adding product requirements to the means, and (f) repeatedly mimicking parts of the morning shift on the game board. Even though this is presented like a straight-line approach, in practice it consisted of several iterations and steps sometimes blended with each other naturally whereas they at other times they needed extra pointing out by the facilitator.

(4) Finally, the interrupting events got introduced as a stress-test to assure flexibility and feasibility of the chosen set-up. The events were predefined by the steering group.

In this first workshop, participants were asked to look at routine, scheduled situations, in order to define with what kind of tool and where digital patient records will be consulted and edited. Therefore the focus in the

session was on step 3. However, during the second workshop in the case the focus was on the design of a call-, alarm- and communication system, which by itself –dealing with patient calls and alarms- is more related to unscheduled events. Therefore in the second workshop there was much more emphasis on the fourth step. The task-flow that was a result from the first workshop was adopted and thereby step 1 and 2 could be skipped.

(3) Step 3 was a very short recapitulation and check of the results of workshop 1. Furthermore, participants were asked if they, considering the topic of the workshop, immediately saw the need to introduce new means for the call-, alarm- and communication system.

(4) Step 4 consisted of three steps that were repeated until no new situations came up: (a) participants picked two cards from two different card stacks, one stack with events that described call or alarm situations (e.g. patient Miller from room 4 calls because he hears the patient in the room next to him crying) and the other with short descriptions of the ward situation (e.g. "nurse 1, responsible for rooms 1,2,3, and 4, is busy to change the bandages of the patient in room 1, nurse 2 ,responsible for rooms 5,7,9, and 10, is on her way to the operating room to pick up a patient," etc.), (b) participants discussed how to ideally deal with the call in the given ward situation, e.g. who should get the call (e.g. every nurse on the ward, only the responsible nurse or the secretary), in which way the call should be received (e.g. as a phone call with personal contact, as just a ring on the smart phone, or as a text message etc.) and what the follow up steps should be (e.g. should the call be forwarded if a call recipient does not react, and if so to whom, or if there is a need to update the doctor about a new situation, and how that should be done), (c) for each combination of a situation a specific call/alarm card had to be filled in with the information generated in step b.

The workshop ended when no more new situations came up and participants could not imagine any additional situations themselves. In summary, the outcomes of the case were as follows: Every staff member should have a personal smart pad in a size that would allow it to fit in a uniform pocket. This could be used to read out measurement instruments such as blood pressure instruments, fill in patient scores on specific tests, fill in patients food- and water intake and other patient related measurements. For writing longer passages docking stations with keyboards should be available. The smart tablets should function together with headsets as smart phones. A software application should ask nurses at the beginning of their shifts to confirm their linking to specific patients, they have to care for that day. Nurses wished to introduce a "buddy" system, where every nurse should have a nurse buddy in order to have one assigned partner to work together with and to take alternating breaks. This assures that patients do not see too many different faces a day, and that nurses can concentrate on a specific group of patients and do not have to delve into ever more patient records. However, some concerns were uttered in relation to the telephone function and the head set: the visual appearance of nurses would change, if they were wearing a headset, giving them the appearance of ever available service workers. Furthermore, the headset could lead to conflicts when a nurse is caring for one patient, while receiving a call from another one, or when personal issues must be discussed on the phone, while the nurse is walking down a hallway.

4.2 Case 2: The development of rules and facilities for a new hospital ward visitor policy

The second case dealt with the following two questions: (1) How will nursing tasks be carried out at a ward with only single person rooms? and (2) What are the consequences of the presence of family and other visitors at day and night and what kind of facilities and rules must be set for the visitors? The goal was to define rules,

responsibilities and facilities for- and with respect to visitors, based on an ideal workflow for nursing at single-person rooms. The point of departure in this case was that the visiting hours concept could be abandoned in favor of welcoming visitors 24/7, and that one family member of a patient could sleep in the patient room next to the patient on a camp bed. Furthermore the staying of other family members could be facilitated in the family room.

(1) In this case there was no special presentation in the beginning, only an introduction of the goals of the session and the general steps in the design game.

(2) The warm-up was the same as in case 1, the participants explored the new premises by playing out the current task-flow of the morning shift on the game board and noted possible problems.

(3) In step 3 participants were (a) asked to solve the problems found in step 1 and (b) adapt the nursing task-flow for working at a ward with single person rooms; special attention was given to the question whether the tasks should be handled per patient at once (e.g. washing, dressing, feeding patient one, the washing, dressing, feeding patient 2, etc.) or should split up into bundles (washing patient 1,2,3, and 4, then dressing patient 1,2,3, and 4, etc.). The task-flows were again visualized by mimicking them on the game board and filling in task cards to form a task-flow. (c) Then participants were asked during which of the tasks family presence would be acceptable (e.g. feeding) and during which tasks not (e.g. washing) and the tasks were no visitors were allowed were marked with red dots (see Figure 2). (d) As a next step, a discussion was initiated by the facilitator, about whether there should be "written" rules (visiting rules) about the situation, or there should be a responsibility to organize the situation for one of the staff members. For rules and responsibilities there were different colored cards to fill in, and to be placed next to the task-flow (see Figure 2). (e) Finally, the participants were asked to think about facilities that were needed for the visitors (e.g. a room stocking camp beds, extra coffee facilities, a sign at the door showing whether activities are going on inside at which visitors are preferred to not to come in).

(4) For step four a number of critical events with respect to visitors were prepared on cards to be randomly picked by the participants. In discussion participants had to decide, whether the so far developed rules, responsibilities and facilities suffice to deal with the situation, or whether there needed to be additions or alterations.

As the nursing process was in the focus of the project, the visitors were introduced as "interruptions" to the nursing process (unscheduled events). Outcomes - besides the task flow - were that there should be a general restriction on visiting hours in the hospital during the night and a hour after lunch, allowing visitors only to be present in agreement with the responsible nurse, in order to keep the ward calm and allow patients to have their rest. Furthermore there were no specific rules written down. However, it was agreed that in this new setting the nurses would get a larger responsibility than in the current situation in managing the visits for the patients, and taking care that patients would have enough rest. It was assumed that the more open visiting rules might produce more conflicts with visitors (e.g. groups of noisy visitors camping at the bedside or in the hallway) and therefore the nursing staff should work out methods to approach these situations, in order to prevent that individual staff members feel lost in the situation, or that situations evolve that foster aggression.

Figure 2: Part of the task-flow with yellow task cards with red dots marking specific tasks and blue and pink rule and responsibility cards

5. Discussion & conclusion

Dynamic use situations for professional use are often complex due to the participation of different stakeholders in different places and with different goals in scheduled and unscheduled activities. The presented Activity-flow Co-Design Game has shown to enable non-designer participants to develop concepts for task flows, appliance use, rules and regulations for dynamic use situations. The game helps participants to tackle a complex use situation, as it makes its elements concrete and visual. Sitting around a game board with visible cues of the environment and using a chronological task-flow keeps participants focused and prevents inefficient discussions that jump between topics and loop unnecessary. The concrete scenario context of the game and the tangible game elements support the elicitation of practical as well as tacit knowledge. The basic set-up and underlying principles can form a starting point to develop various dedicated games for the co-design of products which have dynamic use situations. The following insights should be considered when applying the Activity-flow Co-Design Game and are also relevant for the use of other design games:

This research revealed that preparing the game for a specific design problem requires the division of the problem in several sub questions in order to get a step-by step approach. These questions might seem like a minor matter, but are actually the most relevant part of the preparation. If well prepared, the game develops a flow in which the next step always seems obvious to the participants. This brings us to the question to what extent the Activity-flow Co-Design Game is influencing the participants in the creation of solutions. Whereas unbiased solution creation out of the blue is impossible in general (we all are influenced by what we have seen and experienced), the game has some influencing aspects; the person preparing the game puts them in there, by the questions that will be asked, and the game elements promote a strong focus on roles, time, and place. However, a design game is always an act of balance between providing enough guidance for participants to enable them to come with solutions for the actual problem and asserting too much influence. This balance has to be found, factoring in the expected capabilities of the participants and can therefore not be answered in general. Furthermore, the level of detail in the game and the game pieces can influence the outcomes of the game. The more detailed the game pieces or mock-ups are, the more defined their functionality seems to be and the more participants may believe that the details represent the real future situation and stick to that. As the Activity-flow Co-Design Game focuses on functionalities and behaviors and less on appearance, it is advised to keep representations as generic as possible. One disadvantage of the game as it is presented here is, that there is no step in the beginning where participants are asked to come up with ideas individually. There are indications that in brainstorms this is an essential part in order to achieve a greater variety of ideas. In the presented cases it was

chosen to omit such an individual phase, because it was expected that this would put the participants under the stress of performance anxiety. For the future we suggest to test if the addition of an individual step to the game does lead to even better outcomes.

The Activity-flow Co-Design Game is not a game that is primarily supposed to lead to radical innovation, but is meant to attune a product idea (e.g. a new hospital with single person rooms or an app) to a complex use situation. It is very useful to examine the possibilities and implications of the introduction of new technology (ICT for the hospital, a smartphone app to support weight loss), and even though the consequences of the introduction are hard to anticipate fully, the game brings up social or behavior related aspects of technology (as was the case with the appearance of nurses when wearing a headset in the first case).

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