Video Card Game: An augmented environment for User Centred Design discussions

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ABSTRACT

In User Centred Design, the integration of knowledge of users work practice, preferences etc. into the design process is crucial to success. For this reason, video recording has become a widespread tool for documenting user activities observed in field studies, usability tests and user workshops. To make sense of video recordings - though a rewarding experience - is time consuming and mostly left to experts. Even though developers may ask for expert advice on usability matters, chances are that they will not follow it, given the technical and commercial trade-offs in every project.

In this paper we will argue that, to achieve user friendly products, working with user video should be an integral part of the activities of the design team, not a specialised task of experts. To support this, video must be made available as a resource in design discussions and developers must be allowed to form their own understanding and conclusions. This paper presents a technique for turning video into tangible arguments to support design teams work. Furthermore it discusses how this technique can be improved with Augmented Reality and presents an augmented prototype session.

Keywords

User centred design, video analysis, collaborative design, augmented reality environment.

INTRODUCTION

Video analysis is widely employed as a tool in User Centred Design for analysing use situations and improving the usability of new designs. It is common for usability labs to summarise observations in highlights tapes for the benefit of the design team requiring a usability test. However, as usability work moves in the direction of active participation of users in design rather than testing [1], it is no longer evident that video should be analysed and interpreted by experts, with the results then being handed over to a design team. Rather it seems that the success of a user interface project depends on the willingness of the developers to work with the video material themselves and draw their own conclusions.

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On the other hand, video analysis requires some training and experience, so we started experimenting with new techniques for involving developers in the process. As usability professionals we wanted to contribute with what we are good at (analysing for breakdowns, focus shifts, etc.) while still leaving the material open enough for the rest of the team to participate when selecting which video sequences are important and interpreting what they would mean to the design.

The Video Card Game facilitates this process by turning video into tangible arguments. Since we use physical artifacts (cards) to represent digital resources we are particular intrigued by the concept of Augmented Reality. One of the strengths in Augmented Reality is that users can use real world tools to manipulate digital representations of information instead of virtual tools. Augmented Reality tries to augment the way users already work instead of replacing it with virtual tools [8]. Consequently it is believed that augmented objects can be more intuitively integrated in the environment along with other physical elements such as notes, images, objects and the like that people use to support their work and communication.

This Augmented Reality thinking has lead us to experiment with the Video Card Game towards a seamless augmentation of the physical cards and the game environment.



Players arranging video card families

COLLABORATE VIDEO ANALYSIS

In the User Centred Design Group at the Danish component manufacturer Danfoss A/S we have had positive experience with Interaction Analysis [2] from an ethnographic tradition. In this, a group of participants build a shared understanding of what the video recordings tell through collaborative viewing and through discussing the material without imposing analytic coding categories.

But the level of detail exercised in interaction analysis is seldom feasible in industrial usability practice, so we wanted to come up with something that could cover much more video material in a short time, and which would work with novice video analysers.

We found it useful to work with the metaphor of the Happy Families children's card game both to develop and to explain this technique. In this game the players collect families of four cards by asking each other in turn for cards.

The basic idea of the Video Card Game is to turn video segments into artifacts (cards), which the developers can refer to and handle in a design discussion. With the cards the developers create new understandings of the design directly in the video media. To make this succeed the developers need to work sufficiently with the artifacts to appropriate them for their design practice. Mogensen [5] suggests three key aspects of this appropriation process:

□ Seeing what is and is not important in the artifact,

□ Recognising the artifact as relevant to one s practice,

□ Coming to "own" the artifact.

These aspects can easily be recognised in the Video Card Game set-up. The design of the game was inspired from the KJ-method, an information structuring method proposed by a Japanese anthropologist [3]. With this method, the anthropologist builds an understanding of field observations by writing each piece of information on a separate card, and by grouping them through several rounds in a bottom-up process.

Techniques like PICTIVE and CARD [7] used in participatory design sessions served as exemplars to create a social process, in which participants use cards to turn their ideas into tangible arguments.

At Danfoss we have tried the Video Card Game on a dozen of occasions with different design teams and varying types of video resource. It has been highly successful but we are still experimenting with the set-up to understand and gain control of all the factors that make it a successful experience. We will use one particular design case to describe the technique.

THE VIDEO CARD GAME

The design team was engaged in the development of a new pump for domestic heating systems. Midway through the development process the User Centred Design Group was asked to assist in involving users to evaluate and improve A video card with designer's annotations

33. Lars mounts the motor



- he screws the ring one way, then the other
- he looks concerned about it

the usability of the new design concept. We chose a participatory user workshop format with six heating system installers and six developers. The users were asked to install, wire and adjust the prototypes in a working heating system and to suggest improvements to the design. Both the use activities and the discussions were video taped.

The Video Card Game took place as a full-day event one week after the workshop. In preparation, the User Centred Design group worked through eight hours of video recordings and selected 60-70 short sequences, which seemed significant. The sequences were digitised on the video-editing computer and a key-frame from each was used to create cards for playing the game.

Participating were four engineers and two usability staff, players from now on. All participated in the user workshop. The game took about six hours in total.

Step 1: Dealing the cards (30 min)

Cards were divided randomly in three stacks with duplicates of each. We explained the rules of the game and ran a short training exercise in video analysis (what is observation, what is interpretation?) The duplicate cards would allow for different interpretations of any video sequence later on.

Step 2: Reading your cards (1 hour)

The players then split into three pairs to watch their video sequences. The players used the cards to take notes of what they observed.

By annotating each card in their own handwriting the developers came to "own" the card. At this stage we encouraged the players to work individually and not to discuss what they saw with their colleague. A designer tries to reproduce what a user does in a video clip to identify a usability problem



Step 3: Arranging your hand (30 min)

Together again we asked the players to group their cards openly in front of them on the table. Each player around the table then briefly described their structure.

There are no restrictions on how players group their cards as long as it makes sense in terms of the design activity (e.g. user tasks, design problems). During their presentation, developers will recognise which clips are relevant to their design activity. Nuances in the problems at hand will become apparent.

Step 4: Collecting card families (1 hour)

Each player was then asked to choose a favourite family of cards. One after another the players described as precisely as they could the theme they had chosen and invited the other players to contribute with cards, which seemed to fit into the same theme.

Each trick was glued onto a separate poster with a heading denoting the theme. The video sequences were also rearranged on the computer to allow for easy access for the next step.

By selecting their favourite themes, the developers take responsibility for relating the design to the user input. Often duplicate cards will figure in the same family, but sometimes a video sequence will give meaning to more than one theme, so the duplicate may appear in a different family too.

Step 5: Discussing the card families (3-4 hours)

Following a brief discussion of priorities (where should we start?) the players spent time discussing one family after another, trying to understand what the video clips said and what this family would mean to the design. Since none of the players had seen all clips, they each showed their clips to one another and explained why they thought them relevant.

We find that developers come to use the video again and again throughout such a discussion. We make sure that prototypes and relevant hardware are readily available on the table to point at and think with .

AUGMENTED REALITY - A WAY TO IMPROVE?

Compared to previous design discussions based on highlights tapes, the video card sessions took on a new quality:

Through the structuring of video clips, the developers designed hypotheses about user work practice and a product with improved usability. In the discussion they checked if the family of clips made sense and if it moved the design process on. In contrast to reports and memos, the team s new design understanding had direct links to the original video from the user s world.

In spite of the success, we didn t yet feel quite in command of the outcome: A great number of factors seemed to influence the progress and results of the design discussion. We felt there would be a great prospect in somehow improving the Video Card Game.

Seen from an Augmented Reality perspective there are two interesting aspects at stake in the Video Card Game. Firstly, the card as a physical object representing the video clip, and secondly, the physical set-up of the room as an environment supporting the design discussion. Before moving on to augmented solutions, we will try to analyze more carefully, what actually goes on in the current setting.

VIDEO CARDS SUPPORT DESIGN DISCUSSION

In the way the game is currently played at Danfoss the card is only a physical representation of a video clip, i.e. players cannot manipulate the clips directly through the cards. So far we have chosen to let a skilled operator who works a standard video editing system (Media 100) follow the motions of the participants. As in the Video Mosaic system of Mackay and Pagani [4], a major challenge in the Video Card Game would be to provide speedy links between the paper representation of a video clip and the actual video sequence.

Physical limitations of the card

It is beyond any doubt that the players associate meaning to each card. They finger them as reminders of things to say and



The 'meeting room' set-up: The boards on the walls carry the structures, cards and video-displays

show, and they wave them to attract attention to particular arguments. But there are some physical limitations of the card. When a card is placed on the table the players sitting opposite will see the card upside down.

The size of the key frame is another limitation. When a player wants to show the others a key frame while explaining a problem noticed in the video clip, the players holds the card facing the others, but those seated at a distance are not be able to see it clearly.

The size of the key frame is also a limitation in step 5 when the players discus the card families. Card families taped to posters and placed on a distant whiteboard are not easily legible.

The nature of the video material

The nature of the video material - which again relates directly to the object of design and to the stage in the design process - has strong influence on the flow and outcome of the design discussion. We have gained experience with video material from several types of user involvement:

□ Field studies (users working in their own context),

□ Situated interviews (users explaining in their own context),

 $\hfill\square$ User workshops (users discussing design ideas in a meeting room), and

□ Usability evaluations (users performing work-like tasks with prototypes in a staged environment).

We have observed two effects:

(1) In early phases of the design project (field study and interview video), the team focuses mostly on making sense of the material and forming early ideas in the design discussion. In later phases, when prototypes exist (workshop and usability evaluation video), the focus will be on identifying problems, prioritising them and finding solutions. In the first case, the card groupings represent different understandings to be negotiated. In the second, each family represents a problem to be solved or rejected.

(2) Video material which is non-verbal (field study and usability evaluation video) is much more likely to be brought into the design discussion than clips that are dominantly verbal (interview and workshop video). Once a player has heard the words of the user, it is much faster to repeat them verbally in the discussion than to play the video clip.

Here the cards serve as associations in two distinctly different ways. The non-verbal clips are mostly identified by the key-frame picture or the headline (what did the user do?); the verbal clips by the notes scribbled underneath (what did the user say?). For design objects, which are non-physical or virtual, we will not be able to obtain non-verbal video material that makes any sense. Then the game rather turns into a simple card sorting exercise.

Challenges for augmentation:

 $\hfill \square$ Players should be in control of the video without any mediators

□ Players should be supported in showing and pointing to cards for everybody else to see

- □ Players should be supported in showing card families.
- □ The game works best for visual (non-verbal) material

IMPACT OF THE ROOM SETUP

We have noticed that the way we arrange the room and the equipment has a remarkable influence on the dynamics and outcome of the design discussion: How do we position the table, chairs, boards, and screens? In the course of our work with video card game sessions we have experimented with three main forms (or metaphors) of the physical set-up:

The meeting room: The participants (4-9) are seated at a large round table with video and computer screens placed like whiteboards on the walls. To engage with the video cards or to document decisions, one has to step up to one of the boards and point or write.

The cinema: The participants (20) sit in a forum like row arrangement - like the audience in a cinema - and watch the boards and screens in front of them. To engage with the video cards, a participant needs to step up on the stage in front of the rest of the group and point to the screens.

The design desk: The participants (4) sit around a square desk with computer and video screens at one end of the table. All artifacts are within reach on the desk: cards, paper to write upon, video clip lists, design prototypes. To engage video, a participant picks up a card from the table.

The critical factors for a successful session is to find a layout where participants feel comfortable and on equal terms, and to diminish the distance between participants and cards to be manipulated. 'Cinema' set-up: Staged discussions between the 'actor' on the stage and the 'audience'



We observed that in the meeting room set-up the large round table worked fine for communication, because the players can make eye-contact easily and clearly follow the hand movements that the other players use when illustrating different problems and opinions. But during the discussion, the monitor for displaying the video clips and the card families were placed along the walls of the room so that not all the players were optimally seated. Some had to turn their heads to see the monitors. Some seated at a distance from the card family posters had difficulties in reading them and in getting to the monitor. Consequently not all players played as many clips as those players seated closer to the posters and the monitor.

In the cinema set-up, the role of the monitors was even more pronounced, as everybody faced them. Unless challenged to take responsibility for their card family, nobody would step up in front of the audience. Discussions felt — though lively due to the challenge of the material — somewhat uneasy in the row seating arrangement, as players had to turn around in the chairs to face each other.

In the design desk set-up we observed another aspect. During the discussion when the players were seated closely around the small table, they placed the card family currently discussed in the middle of the table rather than using posters on the whiteboard. Every player was now within close range of the cards and this affected the way they discussed the design solutions. They went through each card one by one and discussed design solutions for each problem in the video clips. In the meeting room set-up the players had discussed the design solutions from a more general perspective and they mostly discussed those cards that represented the overall problem in the card family. When the players used the monitor in the meeting room set-up they often walked up to it to point out things. This did not happen in the design desk set-up. Here, the monitor was placed without immediate reach of the players.

We have learned that the players won t include video in the discussion if the spatial barrier to grab the card and play it is

too big or if they have to stand up in front of the group whenever they want to make a point. The players need to be seated within reach of both the cards and the monitor.

Challenges for augmentation:

□ Players should be able to discuss face to face without obstructions in the line of sight.

□ All players should have equal access to cards, video displays, and card family overviews.

□ Players should be supported in pointing out things on video, cards, and family overviews.

AN AUGMENTED GAME EXPERIMENT

In collaboration with a group of multimedia students at the University of rhus and rhus School of Architecture we have experimented with augmenting the Video Card Game. Our intentions were not only to augment the cards but also to make them work together with the set-up of the room so that



The 'design desk' set-up: Intimate discussions with cards close at hand



The workspace of a player at the augmented game table

they would mutually support each other and the dynamics of the game.

The prototype focused on how the augmented card could support the game; how the players would use the card and how the card together with the set-up of the room would facilitate the game.

The prototype was build and tested in rhus using a co-operative prototyping approach [9] where the users played the game and afterwards discussed their experiences through the game and the possible changes they would want to make. The players were design students. They were asked to imagine themselves working on a redesign of a thermos bottle. We chose this subject to be sure that every participant could relate to it. We provided video material of thermos bottles in use and interviews with users. Wizard of Oz techniques made the playback property of the card possible.

Augmenting the cards

Since the card is a very strong artifact in the game and since an operator already controls it it is obvious to augment the card. An augmentation of the card could provide the players with the ability to manipulate the video clips directly through the card.

We chose to retain the shape of the physical card including the key-frame and the space for the developer s annotations. We made it possible to playback a video clip by placing the card on a slider. When a player pressed the key frame the clip would start playing and by pressing the key frame again the clip would stop. If the player wanted to scroll through a clip he or she could do so by dragging the card across the slider.

On a personal monitor each player had the possibility to look through their video clips individually using headphones. We introduced the monitors both to overcome the physical limitations of the card and to support the new playback property. We thus eliminated the problem of seeing the card up side down and the problem with the size of the key frame.

Augmenting the game table

The four players were seated around a square table. Every participant had an area of free space in front of them on the table. At their right was the monitor, embedded in the table so as not to interfere with face to face communication. The slider was placed in front of each player. The monitors served different purposes through out the game. In step 4 and 5 the card family currently discussed was represented on all the monitors. We did this by capturing the paper card family on the table with a video camera. The players were also able to show each other video clips if needed. When a player activated a video clip it was displayed on every monitor.

Every player could now see a virtual representation of the card family. The owner of the current card family of course had the physical card family by his or her side. We did not work with projections. Instead the monitors made it possible for us to keep the players seated around the table at all times.

DID THE AUGMENTATION WORK?

In the augmented game experiment the players started to use the card as a tool for manipulating video clips. They used them intuitively through out the game and they easily played different clips for each other whenever they wanted to describe the problems in a clip and enhance their arguments. Like in the versions of the game at Danfoss they associated meaning to each card.

The players started to work with cards and monitor in combination. When a card was placed on the slider the start up frame of the clip was shown in large scale on the monitor. The players used this when they wanted the other players to see just an image of the clip.

The participants liked that the cards were within the reach of the owner of the card family, so that the other players could not touch the cards. At the same time the other players liked that they could see the entire card family on their monitors.



Players discuss card families in the augmented video card game

In this way they were sure which individual cards belonged to the card family.

All these artifacts seemed to work very well one by one. However, when the artifacts had to work together to mutually support the discussion the impression was different.

The key element of the Video Card Game is the design discussion. Through discussion the players develop an understanding of all the available video material. Discussion is primarily verbal, but research in interactive argumentation shows that participants in face-to-face discussions use a range of non verbal actions like facial expressions, body movements, head- and hand movements, point of view, eye movements etc. to communicate their statements [10]. All the verbal and non-verbal actions work together in reducing the number of possible interpretations of statements, explanations, etc.

Even though the players were seated around a square table in direct view of each other, the discussion did not seem to flow easily. There were too many elements for the players to keep track of: Their private cards and notes, the other players non-verbal expressions, and the information displayed on the monitor. The players had to turn their heads back and forth between the monitor and the other in order to follow the discussion. If they watched the monitor they missed illustrating gestures used by the other players to explain a video clip. On the other hand if they watched the player only, they would not see the images that the other player wanted to show to enhance their argument.

PERSPECTIVES:

What started out as a funny little idea about turning video clips into playing cards has changed into a test bed for learning about design negotiations and for experimenting with ways of augmenting the design environment, making video resources available to the developers in a simple physical form.

Our goal is to gently move digital options into the social sphere of design discussions without restraining the dynamics. Through the work with augmenting the video card game, we have increased our knowledge about what actually goes on in the design discussion, and about which factors support or prevent an effective discussion.

In future sessions we want to work in the direction of combining active boards like the Collaborage Walls of Moran et.al. [6] with tagged objects on the working table.

ACKNOWLEDGEMENTS

We would like to thank the students at the University of rhus and rhus School of Architecture, who spent much effort at establishing the prototype of the augmented game table: Jan Ehlers, Morten Sch¿nau Fogh, S¿ren Madsen, Jens Maigaard, Christian Spliid and Ernest Holm Svendsen. Likewise all the members of the danfoss User Centred Design Group, who took their time to experiment and reflect.

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