

Developing a negotiation simulator with focus on Fidelity, Transfer and Cognitive Involvement



Paul Andreas Lundeby

Master of Philosophy in Psychology

Department of Psychology, University of Oslo

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Paul Andreas Lundeby

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Abstract

Motivated by the challenge of combining psychological theories and methods with high-tech gaming and simulating technology, a project was carried out to develop a simulator that could train people in the skill of negotiation. An analysis of the existing theory, interviews with experienced negotiators and observations of negotiation in action formed the basis for a User Centred Design process. Through the application of Contextual Design methods, traditional qualitative methods, and a Usability test, this process has currently resulted in the overall design of a training program and an early design prototype. This work is described in the following document.

The second document of this master thesis is a review article called - *The role of Fidelity, Transfer and Cognitive Involvement in learning - A review of Simulator Training*. This article explore the role of simulator training in relation to different levels of human cognitive functioning, pointing at the importance of having a differentiated view of such training, and that there exist a reciprocal relationship between levels of cognitive functioning and different kinds of simulators. This is done in part by using the SRK taxonomy by Rasmussen (1983) and by discussing the relationship between fidelity and transfer in order to gain a broader and deeper understanding of this relationship. Last, it will lay forward some principles of design in relation to functional simulator training. As well as this a review of simulator training is presented with focus on the role of fidelity, transfer and cognitive involvement in learning.

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Simulating Skills

—exploring skill development through the design of a game-based
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Benedicte Biørnstad

Kjell-Are Furnes

Paul Andreas Lundeby

Ina Kook Rambøl

Kjell-Morten Bratsberg Thorsen

Department of Psychology, University of Oslo, Norway

Preface

This document is the end result of a research project conducted by five master's students in Psychology. As individuals we were united by the common wish to use the thesis as an opportunity to produce something other than the traditional research we had worked on earlier in our academic careers. We saw a need for a more practical approach to research within the field of Industrial and Organisational Psychology at the University of Oslo, a need we strongly wanted to address. Doing research that would apply psychological theory to an everyday work situation was something that was important to us, as well as developing a product that could benefit an end-user.

There are many areas where this type of research is needed but seldom carried out, which served as an inspiration for us. It is not difficult to speculate as to at least one of the reasons why this type of research is so seldom done. The level of innate insecurity is high, demanding that any researcher throws him/herself out into the unknown without a safety net. For us this knowledge served not as a hindrance but as something exhilarating. Knowing that we would be able to carry out exploratory research and break new ground within our academic field was an inspiration to all of us. In addition to breaking new ground theoretically, embarking on this journey as a group was an innovation in itself. We knew that this would allow us to acquire skills within the area of teamwork and at the same time to develop and grow as individuals.

In the document "Simulating Skills—exploring skill development through the design of a game-based training simulator" the group's work is described, giving a detailed picture of both what we did, how we did it, and why we chose the methods we did. The document is divided into two, with the first section detailing our activities in chronological order. In the spirit of Action Research this part is important in order to fully comprehend our focus on the procedural aspects of our work. The processes were in and of themselves considered part of our project and therefore explaining them is of central importance. The second part of the document is dedicated to presenting the methods we used in the development of our product. The User Centred Design process that was gone through is described, as well as the methodological choices we made throughout the project period.

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From idea to simulator

Initiating the project

On February 8., 2006 a group of seven master's students were presented with an idea for a possible master thesis project at a meeting at the Department of Psychology, University of Oslo. Associate professor Thomas Hoff initiated this gathering, having met the students through his work as a lecturer in Work- and Organizational Psychology on the master's degree. At the meeting he presented the concept of developing a game-based work simulator founded on relevant psychological theory, through User Centred Design methods¹. On the basis of this raw sketch six of the students committed themselves within a few weeks to this project, and formed the group MOP (Master Oppgave Prosjektet)². During this spring the students met regularly as MOP in addition to finishing their obligatory courses in Work- and Organizational Psychology and Quantitative- and Qualitative Methods. The students met again after summer break and early that autumn we decided to change our name to Simoveo, which is the name of the group today.

At the first meeting we were presented with the idea of developing a work simulator based on gaming technology. The question in focus was whether it would be possible to combine high-tech simulating technology with basic organisational theory, cognitive psychology and human factors. In his presentation Hoff used as examples large international companies as potential users of such a simulator. It was suggested that the simulator could be sold to the end users in the different firms. After extensive simulator training the employees would develop skills they could use in their professional lives. This concept was presented both as a research project and as a potential business idea.

Three ideas as to the content of the simulator were introduced; negotiation technique, decision making, and conflict management. At the group meetings of spring 2006 additional ideas were developed and worked on. The concept of making a simulator in order to learn or practice on different skills was the foundation for the group's further work on developing and brainstorming new ideas. Spanning as wide and broad as possible the group wanted to

¹ These methods are described in a later section of this document.

² The group was later reduced to five students and this will be elaborated on later in this document.

explore the academic and business potential of the different ideas and also explore the excitement the different ideas evoked in the group.

Additionally and in parallel with developing different ideas concerning the simulator, the group members started to orientate themselves towards different areas of individual focus. This process started off with a workshop in mid-April 2006 where the group members were invited to reflect upon their possible future roles in the project. Three main focus areas were outlined; business, management, and sales; design and development; and the theoretical and scientific content of the simulator. This workshop put focus on important topics and aggregated questions that the group had to spend time discussing and working on during this spring. It was important to decide what roles the different members should have, and how and in what ways the different group members could complement each other. Should the different theses be dependent or independent of each other, dependent or independent of the product? Who wanted to write about what? The dynamics of this process developed over time. The result of this is reflected in the individual sections of the theses.

Deciding on an idea

The group had its first official meeting in the middle of August. We picked up on the work we had started before the summer break and continued the process of developing ideas for the simulator and individual suggestions for master's theses. (For a detailed plan of our work, see Appendix A.)

During the summer the University had made a decision to allocate one of its rooms to innovation, and they put this room at our disposal for the duration of the project. The innovation lab contained working areas for all of the group members, presentation and technical equipment, as well as plenty of wall space suitable for our creative processes³.

A workshop was arranged in order to focus on the process aspects of the groups' work. It was important to reach a decision concerning the roles of the different members of the project, as well as spending time on deciding on rules for intra-group interaction. In order to facilitate this work, our focus was to compose a group statement that included this information as well as decision-making protocols, visions and future goals.

³ An illustration of the importance of the walls will be given in a later section of this document.

In the process of developing ideas for the content of the simulator, the group made a list of different criteria regarding the development of the simulator. Our goal was to attempt to develop a product within an area that would not be considered controversial in the sense that psychological theory would be used to take advantage of or manipulate specific groups. In addition, the developed product needed to be firmly grounded in academic theory. The project had to be manageable within the scope of the project period and within the existing knowledge in the group and/or the knowledge within the reach of the group for instance through the network of personal contacts of each group member. It had to be manageable regarding technology as well, and the use of technology should be looked upon as valuable in itself. There also had to exist a demand in the marketplace for the simulator and a potential for profit. Additionally, it was important for the group to carry out a project we believed in and one on a topic we considered fun. We wanted the project to be meaningful both for each of the group's members but also serve a greater purpose. The reason for this list was to ensure that we at all times focused on what we regarded as important and that we continuously included these reflections in our work.

As already mentioned, the group had taken on a broad perspective and aimed widely in their work on developing ideas for the simulator. To this end the group had several brainstorming sessions where lists of potential ideas for the simulator were the end product. From this list that at one point contained over twenty ideas the group considered each idea thoroughly in order to eliminate the ones that were of least interest. This elimination process resulted in a list of eight ideas. At one point it was decided that the group should split into three teams and rotate the different ideas between them. Inspired by parallel design (Nielsen, 1994), this was carried out to expand on the different ideas as effectively as possible, and also to avoid anyone having personal favourites. In order for the different teams to inform each other about the different findings and developments of ideas, the group had dedicated meetings where we all gathered and new material was presented, evaluated and elaborated on with pros and cons. The different ideas were also evaluated against the list of criteria already mentioned. The goal of this process was to eliminate ideas or try to incorporate parts of the eliminated ideas into new ones. The core activity was consolidating ideas with the ultimate aim of ending up with three main ideas. These three would represent an aggregate of the best of the whole pool.

At the same time as the group developed the different ideas they continuously consulted research literature and different references and Internet sites in order to find out what had already been done in the different areas and on the different topics. This included a presentation of a similar project conducted by a research group in the U.S. (Aldrich, 2004).

In parallel with the work detailed above, each group member worked on his or her individual project description that was to be handed in mid-September. The members presented their outlines to each other in order to coordinate their writings with the group.

Early in September, three weeks into the semester, the group was reduced from six to five members as one of the students decided to quit the project. It was then up to the rest of the group to make a decision on which one of the three remaining ideas to move forward with. A panel of in-house experts was invited to give us input on the remaining ideas and comment on which of the three was the one with the greatest potential. The panel's evaluation coincided with the evaluations of the group itself, and when choosing which of the three ideas to develop, the decision fell unanimously on the negotiation simulator. Developing a negotiation simulator was from now on the main focus of the groups work.

Exploring the idea

Different topics and questions emerged as the group started working on the negotiation idea. Important questions were how many users should be able to play the game simultaneously—one or many users at the same time, whether the user(s) should be alone in the game or interact with some of the other users in order to achieve a common goal or not, or just play against the machine, or perhaps both? The group discussed the possibility of making different versions of the negotiation game implementing different alternatives to the issues that were discussed. Additionally the question regarding whether we should have one or more moderators and the degree of their involvement, was addressed. We also focused on what the main learning outcome of the simulator training would be, and brainstormed ideas regarding the best technical solutions. As well as that, we decided to implement some of the most promising features of one of the other ideas that we had already eliminated. Our aim was to implement as much psychological theory as possible both in the simulator itself and in the training course package.

The group then repeated the successful method of dividing itself into smaller groups in order to work on different topics regarding simulation and negotiation in parallel. One group focused on negotiation and explored the literature in order to gain an overview of the main theories and research. The other group researched the topic of simulation and learning effects of using simulators in training. An extensive literature search was needed in order to gather information about these topics. Evaluating these searches as well as identifying literature of particular interest was focused on (Aldrich, 2005; Allen, 2003; Balachandra, Bordone, Menkel-Meadow, Ringstrom, & Sarath, 2005; Max H. Bazerman, 2006; Cohen, 2002; Dreyfus & Dreyfus, 1986; Florea, Boyer, Brown, Butler, Hernandez, Weir, Meng, Johnson, Lima, & Mayall, 2003; Gentner, Loewenstein, & Thompson, 2003; Gillespie, Thompson, Loewenstein, & Gentner, 1999; Hunsaker, Whitney, & Hunsaker, 1983; Poole, 2004; Quinn, 2005; Reeves, Wellman, & Grosz, 2002; Reilly, 2005; Schweitzer & DeChurch, 2001; Stark, Fam, Waller, & Tian, 2005; Suchman, 1987; Vecchi, Hasselt, & Romano, 2005; Watkins, 1999). Several books were also summarised in presentations, in an attempt to discover the overreaching themes and directions within negotiation (M. H. Bazerman & Neale, 1992; Fisher & Ury, 1981; Karass, 1970; Kochan & Lipsky, 2003; Kremenyuk, 2002; Marsh, 1984; Plous, 1993; Pruitt, 1981; Raiffa, 1982, , 2002; Rubin & Brown, 1975; Steele, Murphy, & Russill, 1989; L. L. Thompson, 2001; Von Neumann & Morgenstern, 1953; Walton & McKersie, 1991). The results of these searches were presented to the group with the aim of keeping all the members fully apprised of each other's findings. Several presentations were held by the group members, for instance on the topic of the McGill Negotiation Simulator used at the University in Canadian by the same name (Rosser, Lynch, Cuddihy, Gentile, & Klonsky, 2007; Roston, 1994) and articles or books considered to be of particular interest to the group at the stage we were; trying to introduce ourselves quickly to the central themes in negotiation research (Boven & Thompson, 2003; Brett & Gelfand, 2004; Loewenstein & Thompson, 2000; McAndrew & Phillips, 2005; Nadler, Thompson, & Boven, 2003; Poitras & Bowen, 2002; Shapiro, 2002; L. Thompson, 1990a, , 1990b). Literature searches, reading and updating on articles, books and journals were part of ongoing processes that involved all members of the group.

As well as familiarising ourselves with the literature we needed to get to know the future users of the simulator. In accordance with the User Centred Design paradigm, we carried out a workshop in order to define our typical user. Our target user was defined as male/female and of 25 to 45 years of age. Nationality would be primarily Norwegian and he/she would

speak both Norwegian and English, having completed high school. His/her field of occupation would be as a professional, primarily but not exclusively within the field of advertising, consulting, telecoms, accounting, law, sales, media, IT, or human relations. The relevant segments would be management, employees and even whole departments. Regarding experience with the domain of negotiation, the user would not need to have any academic background and could have varying practical experience. In the area of technological skills the user would need some basic computer skills and need to be familiar with the Windows and/or Macintosh interface. S/he would not need experience with games.

When it comes to the motivation for wanting to use the simulator, our main group of users would most likely participate in order to learn skills they consider to be useful and important. Some participants, however, would be there because their employers would send them. The group had a discussion regarding how to best balance the pure entertainment effect of playing a game with the seriousness of a scientifically developed training device, and consequentially how to best ensure an optimal learning effect combining these two. All these needed to be continuously taken into consideration at all times during the development process. Additionally the group decided not to develop a game that necessitated a heavy manual in order for the user to master it—we wanted a game the user could simply sit down and start playing with minimal instruction.

This focus on the user made it necessary for us to consider the marketplace. We considered whether our end-user was in a position where he/she would be interested in, and willing to pay for, a product such as ours. We investigated whether similar products in the area of simulators already existed and found very few that could even be said to resemble what we were developing. At the same time we looked into different training alternatives in the area of negotiation. Here we found that there were many different alternatives, although most of them seemed to be different versions of the same idea. In most cases lecturing about the topic of negotiation was interspersed with group exercises and role-playing activities. We considered our product to be different enough from these that there could be a market for it.

The contours of a simulator emerge

At the end of September the group started planning and making the necessary preparations in order to conduct interviews with professional negotiators. This was done in order to gain

access to practical information that would complement the theoretical information the group already had. The interviews were carried out over a period of six weeks. This included identifying potential participants, recruiting them, developing an interview guide, and analysing the results⁴.

The group had to consider whether the design of the project would call for an application to the ethical committee REK, in order to get an approval of our research. However, we found this not to be necessary. The primary reasons for this were that the research would not target any vulnerable groups, and would not entail misleading or manipulating the participants. The decision was made in close cooperation with academic advisors. This process lead us to be more aware of this topic area and spend a substantial amount of time developing detailed consent forms as well as briefing and debriefing the participants thoroughly.

In addition to looking at literature on the topic of negotiation the group decided it was important to immerse ourselves in gaming. To this end the group obtained an X-box game console, taking time to familiarise ourselves with the different types of game categories available. We got a hold of the simulator game developed by Aldrich and his colleagues based on their research mentioned earlier. It was our goal that the whole group would familiarize itself with this game. As well as this we had a workshop with an avid Internet gamer in order to gain insight into massive multiplayer online role-playing games (MMORPGs) that are gaining ground globally.

Over a period of a few days the members had presentations for each other of the different individual literature reviews⁵ and at the same time did a recap of the knowledge the group had on negotiation theory and research, gaming-, simulation- and learning theory.

January 2007 started off with a period of design and paper prototyping based on the findings of the interviews conducted in November 2006, in accordance with User Centred Design

⁴ For details see the specific section later on in this document

⁵ These literature reviews are a compulsory activity in the master's degree, and must be approved in order to successfully complete the degree. It is expected that the students hand in approximately 40 pages detailing the literature that makes up the theoretical background for their theses. These documents are considered separate from the thesis and are therefore not included in this document. The literature reviews were to be handed in at the beginning of December.

(Beyer & Holtzblatt, 1997; Faulkner, 2000; Nielsen, 1994). The group worked on designing low-tech parts of the simulator and simultaneously wrote scenarios in order to be able to test the usability of some main ideas. The result of this work was a cardboard mock-up. Using this mock-up, the group conducted a series of Usability tests that provided useful feedback. At the same time, a second period of data collection was prepared. This was an observational inquiry into how professionals actually negotiate. In the same way as our earlier experimental enquiries this entailed designing the experiment from scratch, with participant recruitment, script development and data analysis⁶.

⁶ Both of these experiments are detailed in specific sections later on in this document

Development through User Centred Design

Two iterations of development

A premise for this project was that the simulator should be developed through User Centred Design methods. We based our analysis and design process on *Human-centered design processes for interactive systems* (ISO-13407), which describes four phases in an iterative and incremental development process (fig. 1): Understand and specify the context of use,

specify the user and organizational requirements, produce design solutions, and finally evaluate designs against requirements. The four phases are repeated in an iterative process until the result of the evaluation phase is that the design fulfils the requirements.

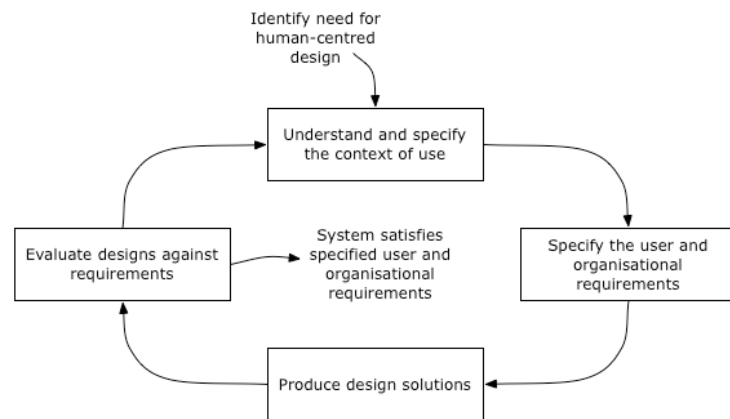


Fig. 1: The Human-centered design process for interactive systems.

Reproduced from ISO-13407

Within this framework, we based our activities on general methods from Usability Engineering (Faulkner, 2000; Nielsen, 1994) and, to a greater extent, on specific techniques from Contextual Design (Beyer & Holtzblatt, 1997). Contextual Design (CD) is an approach to User Centred Design, developed and refined over many years as a response to difficulties faced when working with design teams. Our reason for choosing CD was mainly that it offers specific techniques for analysing user data for the purpose of design, as well as an approach to the entire design process. We wanted to gather data about how people negotiate and base our design on this, so CD was a natural choice. In such an analysis, where the goal is well-grounded ideas for design, and not statistical significance or external validity, CD is better suited than more conventional research methods. Furthermore, CD is developed with teamwork in mind, and the results of its analysis and design methods are both produced and presented in ways that supports collaboration—its artefacts are mostly large and tangible. We also considered other methods, like Cognitive Work Analysis (Vicente, 1999), but we saw CD better suited for an innovative group effort like ours.

We considered that a project of this size could not be completed within one year, but we planned to get through at least two iterations. In this section, each of these two iterations is described⁷. Within each of the iterations the activities of the four main phases are outlined, as well as descriptions of the different techniques we used.

First iteration

Understand and specify the context of use

We discussed three possible ways of getting data from negotiations. In CD, data are gathered from the context of use through the technique Contextual Inquiry, where members from the design team observe the relevant tasks being done and ask questions to understand what the involved people do and why. In our case, this would imply that we had to get access to real life negotiations, or we could also set up our own constructed sessions with experienced negotiators as participants. The third possibility was to conduct more conventional interviews where we got negotiators to tell us about their experiences.

At this point, we concluded that it would be better for us to get access to negotiators for interviews than asking to observe them. Also, conventional interviews could give us a broader understanding of the topic, and a chance to compare the views of real life negotiators with the theories we have found through literature search. We could instead consider doing observations in the next iteration.

Getting participants. The process of getting participants for the interview started with a brainstorming session with the purpose of mapping potential negotiators. This mapping was done without any form of restriction such as availability, status or such of the participants, and the list contained names of lawyers, brokers, politicians, peace mediators, and representatives from both unions and employer organisations, some of whom were well known figures in Norway. The only requirement for getting on the preliminary list was that they had negotiations as an integrated part of their work. We composed a joint e-mail that we sent out to a group of the people on the list, made up of the professionals that we considered most attractive. The e-mail gave a brief description of the project we wanted them to

⁷ To clarify, the iterations mentioned here are full iterations around the cycle of *The Human-centered design process for interactive systems* (ISO-13407), not the design–test cycles mentioned in literature on Usability Engineering (Faulkner, 2000; Nielsen, 1994), which are a part of the *Produce design solutions* phase.

participate in. Of the 35 professionals we e-mailed, 26 were willing to take part in our study. We got almost only positive feedback, and those who did not participate did not do so more as a result of other obligations than lack of interest.

Preparing the interviews. The interview was designed and conducted using several methods, such as Contextual Interview and Cognitive Interviews, along with suggestions from qualitative methods in general. We worked out some overall goals and lay down a plan for the structure of the interview to ensure that we touched upon all the different aspects of the predefined goals. This was a dynamic process where both the overall plan for the interview was embedded, but also more specific questions. The interview guide (see Appendix B) went through several rounds of testing and critical evaluation by the different group members. On the one hand we wanted the questions to be as broad as possible in order for the participant to freely express their thoughts on the topics without being tied to a specific context or without being lead by us. On the other hand the questions had to be specific to the degree that they gave us information that was not solely on a meta-level, but include details on topics we wanted to explore further. This is the reason we selected a method that included a semi-structured interview.

We prepared an interview guide that started with a section constructed with the purpose of “warming” up the participants, and to put them in the right state of mind for reflecting on their overall relationship to negotiations. Here we included questions on their background in terms of negotiation experience, their overall education, and what the participants found interesting and intriguing by negotiations, but we also wanted them to give us their definition of negotiations. Our reasoning behind asking them for their definition was to be able to find potential differences between the definitions provided by theory and the definitions provided by experience, and therefore have a more applied approach to negotiations. Through this we would also be better able to understand the interviewees’ background and point of view.

Contextual Inquiry inspired the next section of the interview guide. As we obviously would not be able to observe negotiations in an interview, we included a question instructing the participants to visualize and verbalize a newly experienced negotiation they had participated in, and to be as detailed and specific as possible. In the next step, the participants would “walk us through” the negotiation all over again, equally detailed and specific, but this time with the perspective of another participant. This technique was influenced by the Cognitive

Interview (Memon, 1999), with the intention of getting as close as possible to actual negotiation experiences. Our role as interviewers would be to ask questions on what they did and why, to get to details on how they negotiated, as we would have done in a Contextual Inquiry.

The next section of the interview guide focused on the participants' own reflections on different areas of negotiations such as – *in your opinion, does there exist a core in negotiations?* Along with – *are different strategies used deliberately?* These questions were broad and non-specific in order to encourage them to think freely on these topics without facing the risk of anchoring the participants to any specific mindset.

The next questions in the guide encouraged the participant to continuously reflect on negotiations per se, exploring their thoughts and experience concerning group size/group composition and the use of mediators in a negotiation. The final section concerned whether or not negotiations can be taught, with questions such as - *what makes a good negotiator? Are there in your opinion expert negotiators? Do you consider yourself an expert?* These questions were included in order for us to get the participants to reflect on the questions as to whether or not it is possible, or to what extent it is fruitful to combine theory with practice.

We did one pilot interview in order to ensure the logical structure, and to get some feedback on questions that the participant had a hard time understanding. This input led to some small adjustments to the original interview guide.

Conducting the interviews. The interviews were conducted “on site” at the interviewees’ work place, with two interviewers. The latter was done to ensure a natural flow, to minimize the risk for interviewer errors, and to be better suited to ask follow-up questions. These two interviewers alternated between asking the questions so that when there was a change in interviewer there was also a change in the topic or focus in the interview. The interviews lasted for about one hour, and the few times the interview exceeded this length, we asked the participants if it was ok for us to finish the interview. Every interview was, for several reasons, recorded after getting the participants consent. First, we wanted to be able to go back and listen to the tapes in order to for us to clear up any potentially misunderstandings. Second, taping gave us the ability to fully direct our attention toward the participant without

being preoccupied with taking notes. Finally, recording ensured us a degree of detail richness we otherwise would not get by simply taking notes.

At the start of the interview the participants were given general instructions where we repeated the reason we wanted to interview them. They were told that we already had a theoretical approach to the study of negotiation, and that we wanted a more applied approach. We then tried to put the interview in a broader context in order to make them understand that we were interested in their input in light of their practical experiences with negotiations. We told them we were not interested in testing their knowledge or comparing their knowledge to any of the other interviewees'. This was done to put the interviewees at ease and lessen any possible evaluation anxiety.

According to proper conduct regarding ethical issues, we then informed the participant that they were free to terminate the interview at any point without any explanation, and that we, if they allowed us, would tape the interview. Finally we asked them to sign a document to this effect.

This way of conducting an interview demanded that the participants were able to verbalize different settings and to walk us through a negotiation setting they had been in recently. Our participants displayed this ability in various degrees—some had little to say, while some talked mostly in general terms about what they *usually did* in negotiations. In addition, this way of conducting an interview required, to a great extent, that the participant was conscious about his or her own negotiation skills, and further that they felt secure enough to reveal their thoughts on the various topics to us. Many of our participants were able to do just that, to be specific, and they were eager to share their experiences with us.

After the interview was completed we debriefed the participants, told those who were interested more thoroughly about the project, and opened up for any questions they might have. Finally, we asked the participant if it was ok for us to contact them again for follow up questions. This gave us the opportunity to maintain the good relationship we had established, and have access to participants at a later occasion. We also followed up the participants through e-mail, thanking for their participation.

Analysing data. After conducting all interviews, data was analysed in order to use it in the design process. CD proposes two conjunct techniques for this: Interpretation Sessions and Consolidation Sessions. In the former, each interview is analysed individually and summarised in several models and a list of key statements. Through Consolidation Sessions, all interviews are compared, leading to models expressing commonalities across interviews and an Affinity Diagram where all key statements from all interviews are grouped and structured hierarchically to give a comprehensible picture of the data.

In the spirit of CD—the design team using the method is encouraged to adapt the techniques as needed in its design process. We decided to use two of CD's models to analyse our interviews, namely the Sequence Model—in our case used to describe the steps taken through a negotiation, and the Culture Model—describing the actors involved and their influences and attitudes towards each other.

We started out with an Interpretation Session of the first of 26 interviews with the entire group present, as is recommended in CD. One group member talked us through the interview, two asked questions, one wrote down key statements, and one drew models. This first session with the whole group was an important way of getting everyone familiar with this method of working, but we could see that it would not be an efficient way of analysing all of our interviews. On the other hand, an important effect of using this technique is to let all team members get an insight into and a common interpretation of all interviews. Our solution to this was to do Interpretation Sessions in the dyads that had conducted each interview, and then present the models and the key statements to the entire group.

After writing our individual Literature Reviews, we started up the teamwork again with Consolidation Sessions in the beginning of December. Our first task was to organise all key statements from the Interpretation Sessions on our walls in an Affinity Diagram.

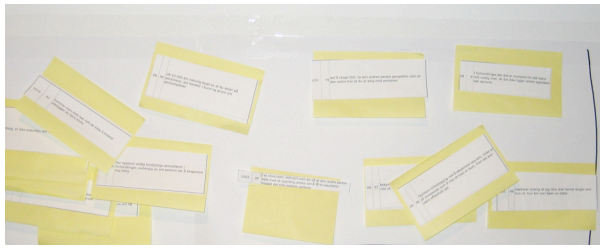


Fig. 2: Grouping statements

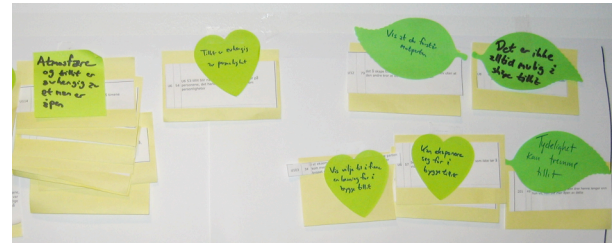


Fig. 3: Summarising groups in one sentence

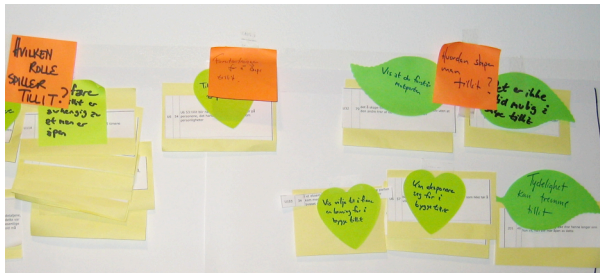


Fig. 4: Formulating questions for the green post-its to answer

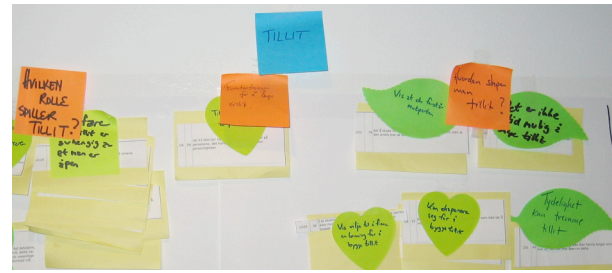


Fig. 5: Organising groups under themes

We printed out all the key statements and glued them onto post-its, and then tried to find those that said something similar about negotiation and put them up on the wall together (fig. 2). As groups of statements were formed, we wrote green post-its that summarised each group in one sentence (fig. 3). We then organised these groups again under orange post-its with questions that the green post-its answered (fig. 4). Finally, we organised groups of orange post-its under blue post-its, which named the theme of the groups (fig. 5). As an example, the blue post-it named “Trust” spanned the orange post-its “What part does trust play in negotiations?”, “How to create trust?”, and “[What are the] preconditions for creating trust?”. Under the second one of these were the following green post-its: “Show that you understand your opponent”, “Show that you are willing to find a solution”, “You can expose yourself to build trust”, “Clarity can promote trust”, and “It is not always possible to create trust”. And under these were the original key statements from the interviews that led us to create this hierarchy.



Fig. 6: Part of the finished Affinity Diagram.

Our initial goal was to do this rather quickly—CD recommends doing it in one or two days because this process can be taxing on the group when drawn out over a longer period of time. But with more than 1500 key statements, many of these rather general or fuzzy, and only five people to organise them, the process lasted for eight working days. This was an intense process that gave us a good foundation for the design process as well as an intimate understanding of the interviews (fig. 6).

The next three days were spent on consolidating the Sequence and Culture Models. Similarities in the accounts of negotiations given by the different participants in the interviews resulted in a consolidated Sequence Model (fig. 7). The Culture Models were a bit harder, as the different negotiations involved very different configurations of people and groups, but we managed to condense and combine these into one Cultural Model (fig. 8).

Specify the user and organisational requirements

At this point we had the Affinity Diagram on our walls, as a picture of what our interviews had revealed about negotiation, the Sequence Model describing the general phases and steps in negotiations, and the Cultural Model showing the influences and attitudes that may exist between persons and groups involved in negotiations.

Together these formed a description of the main aspects of the field we were going to develop a simulation of, and were therefore a set of requirements for our simulator. We also had the user profile created earlier.

In addition, each team member made a list of requirements for his or her area of focus, and this resulted in a tentative list of requirements to be explicated in the further process.

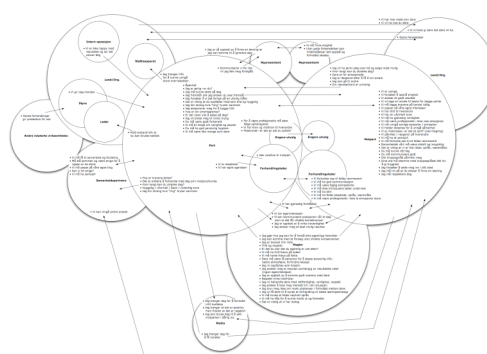


Fig. 8: The consolidated Cultural Model

Aktivitet	Intensjon	Abstrakt steg
Opprette og vedlikeholde kontakter og kunnskap	<ul style="list-style-type: none"> For å kunne holde seg oppdatert på hva som skjer 	<ul style="list-style-type: none"> Opprettholder og pleier personlige relasjoner Oppsøkende kundesøking Vedlikeholde faglig innstekt
Ser behov/mulighet for forhandling		<ul style="list-style-type: none"> Trigger: Ser behov/mulighet for forhandling - Skal i forhandling - Ser en mulighet - Vil bli enige - Det kommer et krav - To interesser står opp mot hverandre (konflikt) - Det kommer en forespørsel - Avtale utløper
Forberedelse	<ul style="list-style-type: none"> Vite hva man snakker om Være forberedt for å ikke la seg lede vekk fra de viktige punktene Faglige forberedelser for å se om man kan løse noe for kommandigang—hva kan man bli enige om og ikke enige om Finne løsninger hvor begge parter er litt fornøyd og litt misfornøyd Finne deling for analysens sine et eller annet sted i det store systemet 	<ul style="list-style-type: none"> Finner ut hvem inntert som skal være med Kartlegging <ul style="list-style-type: none"> - Kartlegge fakta - Sjekke historien - Undersøke markedet Sondere relasjonskontakter Analysere seg selv og motpart Finne konflikten Sørge for at alle positive/relevante kommer

Fig. 7: Part of the consolidated Sequence Model

Produce design solutions

Design. This phase of the process involved creatively producing design solutions as a response to the data we had gathered. We continued to use the methods proposed in Contextual Design, in which the next step is to create a common vision for how our simulator and training course could be. In CD, a “vision” is a drawing of the product to be designed and the way it would be used. The focus is not on details, and the overall picture is drawn in simple sketches. It is important in CD not to design a product only, but to design a new way of working, and that should be reflected in the vision. In our case, we were not just designing a simulator, but a new way of learning to negotiate, and our vision should include the design of the simulator and the entire training course.

We started by “walking the wall” (Beyer & Holtzblatt, 1997, p. 275), i.e. going through the hierarchy of the Affinity Diagram to remind ourselves of what we had found. As we got ideas or questions from the data, we wrote them on post-its and put them next to the data that had triggered them. We did the same with the Sequence and Culture Models.

Then we went through the ideas and wrote a list of the most central ones. With these ideas as starting points we drew different visions of the simulator and training course. We brainstormed and drew sketches on a board. Some visions incorporated several ideas, while others were based on only one. When all ideas had been drawn out, we went through them again, writing positive and negative aspects for each of our 27 different visions.

Our next task was to incorporate these into a common vision. In fact, it was decided to make two visions—one for the training course and one for the interaction with the simulator. As suggested by CD, we tried to combine conflicting visions by using the positive aspects from both instead of picking one vision over the other. For example, in one vision a training course included several different negotiation exercises based on the same scenario, and would then allow us to use this scenario as a theme for the day, where the participants could really get into their roles of for instance being employees of an imaginary firm, wearing t-shirts with the firm’s logo etc. On the other hand, we had a vision that made a point out of having different scenarios for each negotiation exercise, to give us more flexibility in tailoring scenarios to the specific learning outcomes of each exercise. Instead of choosing one of these, our common vision consisted of independent negotiation exercises, to give us the flexibility

of the second vision, while at the same time allowing us to make a set of exercises that fit together as a theme course as in the first vision.

The next step in Contextual Design is to draw out storyboards based on the vision. A storyboard is in essence a sequence of drawings visualising one possible trajectory through the system being designed. We wanted to get through at least two iterations before the end of the project period, and at this point in the project we knew we were running short on time. Therefore, we decided to do only one storyboard on the simulator to elaborate on our vision and generate more specifics for Usability test. We also chose to focus on the simulator and not the entire training course to limit our focus in the first test. We spent the next two days on this, with an imagined case of an employee negotiating a contract with his potential new boss. We drew the interaction between a user and the simulator as it could play out in this scenario like a cartoon, where each frame represented an action from the user or a response from the simulator. At each frame we asked ourselves what actions the users might take, how to make the interaction natural, and how the simulator would respond. We tried to incorporate several of the ideas from our common vision, and ran into issues that we had not thought of in the visioning process and also came up with solutions to a lot of them.

After only one storyboard session we had a sketch of a user interface for the simulator and a much clearer idea of how the interaction could work, and we decided to make this the object of a usability test.

Usability test. Since our first prototype was more concerned with the user interface than with the simulated negotiation, we reasoned that it was not important for the participants to have any formal negotiation experience, and we recruited five master students for a usability test. This was considered a large enough sample to discover usability problems and to get an impression of whether the participants understood the general concept. Again our aim was to generate inputs to the design process, not to design an experiment with validity or statistical significance in mind.

We spent the day before the test making a cardboard prototype of the simulator interface as we saw it at this point. The prototype consisted of a main screen showing the opponent on the other side of a table, and a smaller screen with controls and buttons for interacting with the

simulator. The screens were going to be touch screens, so the user would interact by pushing the controls directly, as opposed to using for instance a mouse, a keyboard, or a stylus.

The prototype was based on a scenario similar to the one in the storyboard, where the user was to negotiate a contract with a potential employer. We wrote a script for the test (see Appendix C), and in order to limit the number of sentences and interface parts we had to prepare, we chose a set sequence of events through the negotiation. We printed out the sentences of the possible dialog and other interface parts, and glued them onto cards.

As the prototype was made out of paper, one of the team members would have to act as the “computer” and manipulate the prototype in response to the participants’ actions—a technique known as “Wizard of Oz” (Faulkner, 2000). The participants would be instructed to treat the mock-up in front of them as an actual computer screen.

Before the test, we conducted a pilot test with one of our team members, who had had limited contact with the mock-up, as the test subject, both to test the script and the mock-up and give the test leader and the one acting as the computer a chance to practice.

We used a very simple test setup. The participants were presented with the prototype in a room with a table and a video camera, and in the adjacent room the team members not conducting the test observed the events on a TV screen while taking notes of the problems discovered and other interesting incidents. The tests were recorded so that we could look at the tests later, if needed.

After an introduction, each participant was shown the screens and asked to tell us what they thought of the screens and what they believed they could do with them. They were then asked to use them as they would have had it been a finished computer-based simulator (fig. 9). Most



Fig. 9: The Usability test

participants hesitated in the beginning, but after a little while, they pressed the buttons on the control screen and waited with interest while the “computer” laid out the interface parts representing the response of the simulator. In accordance with User Centred Design methods,

they were continuously asked to think out loud and explain their actions and reasoning as well as they could. At each point in the dialog they would tell us what they wanted to do, complete that action, or if they sketched out an action that had not been completed in the mock-up, the test leader sitting next to them would direct them to the choices that had been prepared.

The test gave us the impression that our design worked rather well—the participants quickly understood what was going on and how they could manipulate the interface, except for some confusion with minor parts of the interface. Also, it seemed that they got an experience of having a conversation with the virtual opponent in the prototype, but they reported that the conversation was too much to the point—they wanted to involve more small talk with the opponent. This is a potential by-product of us not having had the opportunity to develop all the alternative statements the participants could choose.

Evaluate designs against requirements

This first iteration through the design process was ended on February 2., 2007 with an evaluation of our design against the requirements. We first went through the requirements we had written down for our different focus areas. For most of these we were either on track or at a place in the development where the requirement was not relevant, but we saw that we sooner or later would have to specify what the learning outcomes for the simulator and training course should be. We had implicit learning outcomes, but needed to get more specific and concrete in order to have a set of intended outcomes to evaluate against.

We also went through the Affinity Diagram, Sequence Model and Cultural Model, to see if there were central issues we had overlooked this far. We made a list of some topics that we would have to include when continuing the design in the second iteration.

This marked the end of the first iteration, with the conclusions from the above evaluation, the results from the usability test, and the current design of the simulator as outputs to the next iteration.

Second iteration

In the second iteration, we worked with three issues in parallel; preparations for an inquiry to observe negotiation in action, further design based on the inputs from iteration 1, and investigations on the business aspects of our project.

Understand and specify the context of use

In the second iteration we wanted to get access to, or arrange, a situation that would allow us to observe how professionals negotiate in practice. Through the interview data in the first iteration we had a substantial amount of information on how they represented their own negotiation skills in an interview, making it interesting for us to observe this behaviour as well. Also, the interviews had given us an overall picture and a framework for the simulator and training course, and now we wanted to fill this with more detailed data to base our simulation on.

Through planning this observation as part of an inquiry that also included a dialogue with the professionals about their behaviour we hoped to gain an even deeper insight into negotiation. Therefore the goal of the experiment became to design a method that would allow us to observe the professionals while they negotiated, and then follow that up with a Contextual Inquiry session.

Getting participants. It became clear early on in this process that in order to get as much information from the participants as possible the inquiry would take quite some time to conduct. Because of this the group decided to aim to conduct at least two sessions, each including two participants and lasting for about three hours. This meant finding professional participants that would put themselves at our disposal for three hours, allow us to film them as well as observe them while they negotiated something that we set up, and then let us interview them separately while taking them through the video of their negotiation. In the earlier interviews we had asked the participants if they would consider helping us in the future, and almost all of them had eagerly agreed. Three weeks before the inquiry we sent out questions to those that had agreed asking them whether they would be able to contribute their time, being specific about the time it took and what dates were scheduled. The immediate response was good in that two professionals volunteered to participate, which meant that we had one session covered. Two other professionals replied that they were unavailable but

could find someone with experience similar to their own from their own organisation that could take their place. This meant that we had reached the goal of at least two sessions.

Of the four professionals we recruited two were women and two were men. Based on their schedules each session ended up pairing one male participant with one female participant. They were all professionals in the field of negotiation, spending a majority of their workday honing their skills in the area, within law or unions.

Preparing the inquiry. Having a place in which to conduct this experiment was important. Even though the office at the University of Oslo could have been used, we approached NetLife Research; a usability company we knew had a lab in which this type of activity could more easily be carried out. They were kind enough to let us use their lab and offices for the entire experiment, which meant that we had the use of a lab in which the participants could negotiate while being videotaped, an adjoining room where the group could observe the negotiation on a TV, and two areas in which the participants could be briefed before each negotiation session (see script in Appendix D). In addition, the lab and offices are centrally located, making them easy for the participants to find.

Keeping in mind that the central focus of the inquiry was to observe negotiation behaviour it was important to the group to identify a subject matter that would bias or skew the results as little as possible. In order to find this subject matter for them to negotiate about we conducted searches in published literature. The goal was to identify potential negotiation scenarios that would allow the participants to feel that they were negotiating something meaningful while at the same time keeping the subject matter within an area that was equally unusual for them—we wanted to attempt to create a level playing field for the participants. Through literature searches conducted earlier in the project, as well as new ones, we were able to find 3–4 different articles that included clear descriptions of the scenarios that had been used as well as information about how they had been introduced and what tools the participants had been given (Gelfand, Higgins, Nishii, Raver, Dominguez, Murakami, Yamaguchi, & Toyama, 2002; L. Thompson, 1990a, , 1990b; L. Thompson & Hastie, 1990). The tools that were most useful to us in order to replicate the use of a scenario was the pay-off schedule; the tables the participants were given to illustrate their most desirable outcomes. In the source literature the scenarios had been used for differing purposes, purposes that left the scenarios secondary to what was being investigated. This gave us reason to believe that the scenarios could be used

without impacting the experiment, giving us an experimental setting where we could simply observe the negotiation itself.

From the group of scenarios we had found, we considered two of them to be best suited for the experiment. Due to the fact that all of the scenarios were taken from source literature that was in English and had been used in the U.S. it was important to have situations that could most easily be transferred to Norway. For example some of the scenarios we found had issues that we considered would have been too hard for the participants to relate to, focusing on American commodities brokering, while another introduced the participants to aliens on a different planet (Boven & Thompson, 2003; Mannix & Neale, 1993). Therefore, based on our understanding of the scenarios we attempted to select the scenarios we felt the participants would understand most easily. The scenario we decided to use in the first exercise in order to familiarise the participants with the method and each other was a negotiation of an employment contract between an employer and a potential employee. This scenario gave the participants five categories to negotiate. The second and main negotiation that would form the basis for the contextual interview, was based on the purchase of a car, and included the car-salesman and the potential buyer. In this scenario there were eight categories to negotiate. The reason for choosing two scenarios was that one of them would be a scenario the participants could practice with, something which would make it possible to increase the quality of the data collected in the contextual interview following the second negotiation. Having selected the scenarios we translated the pay-off schedules and wrote the scripts that we were to follow (see Appendix D). After we had finished the scripts and the pay-off schedules we piloted the observation and the contextual interview. The pilot lead to some minor changes to the scripts, but more importantly served as a rehearsal for the group, helping us become more prepared for the sessions with the professional participants.

Conducting the inquiry. On the two evenings when the sessions were held, a dedicated group member guided each participant through the evening. In this way we made the participants feel a little more secure, something which was considered important in case they were inexperienced with an experimental setting or with being filmed. The participants were introduced to the group and each other first and then briefed by “their” group member. They were shown the rooms they would be in for the brief/debrief and the negotiations, as well as seeing the observation room from which the group would observe them negotiating. This was done in order to put them at ease with the situation. In addition, the participants were given a

standard consent form to sign, detailing their participation as well as their right to terminate the experiment at any time and without giving any explanation. In both negotiations the participants were given time limits in order to motivate them to reach an agreement. After the first negotiation, which the entire group observed from the adjoining room, the participants were debriefed by “their” group member, and again briefed for the next negotiation. When the second negotiation was finished, the participants were taken through the film of that negotiation separately, each with “their” person and one other group member. In this way we were able to carry out the contextual interview successfully, making sure that the participants both felt debriefed and gave us an insight into their motivations and thoughts throughout the negotiation. Before the participants left we gave them a small gift as a thank-you for participating as well as the source articles for the scenarios, so that they would be able to see examples of how other research had been conducted. The day after the experiment the participants were sent a follow-up e-mail repeating our thanks and making sure that they knew they could ask us about the experiment or their participation if they should have questions at a later date.

Both the participants and the group seemed to enjoy the evening, as well as considering it a useful and educational experience. Some of the participants had situations where they were surprised by their own or their opponent’s behaviour, and this was an area we had to ensure that they felt debriefed on. However, the main impression was that they enjoyed themselves, forgetting the cameras within minutes of the negotiations starting. It was clear that some of the participants felt more competitive than others, and most of them were also concerned with the self-development they could gain from the experience.

The participants seemed to embrace their characters, easily becoming the car-salesman or potential employee. It also seemed as though each participant may have incorporated aspects of their beliefs about the role they had into their behaviour, and the group had a discussion when the observations were done as to whether that affected their behaviour in the negotiation. If the goal in this observation had been the reliability and validity of the experimental results we could have repeated the experiment and this time run the contextual interview on several of the scenarios, capturing the participants’ experiences across situations where they had differing roles.

Analysing data. In comparison with the earlier interviews, the data collected through this inquiry was much more concrete, just as we had anticipated, and we got more detailed and clear data about what actually happens in a negotiation situation. Both the data collected through the Contextual Inquiries as well as the wealth of impressions and knowledge the group gained through the observations will be put to use in the further development of the negotiation simulator.

As in the first iteration, we did Interpretation Sessions to analyse the data. First, the team members that had conducted the different Contextual Inquiries went through them, extracting key statements and drawing Sequence and Cultural Models. These were then presented to the entire team, before we went on combining them through Consolidation Sessions. The statements from all four participants were recorded on post-its and added to the existing Affinity Diagram. At a later stage of development this Affinity Diagram will be re-evaluated using these last results, refining the diagram yet again and confirming its existence as a living, changing tool for the product development.

Produce design solutions

Parallel with the preparations for the inquiry, some team members continued on the design of the simulator with the inputs from the first iteration. As mentioned, the first iteration had ended with an Affinity Diagram, two models, a vision, a storyboard based on this vision, a prototype, and inputs from a usability test, and in the evaluation we had written down some issues that we wanted to go deeper into in this second iteration. We started a new storyboard to investigate these issues as well as test some new ideas based on the results from the usability test.

In short, we worked with the storyboard just as we had done in the first iteration, but now we wanted to look at a slightly more complicated scenario, one that involved more issues than last time, so the process took a lot more time and we had longer discussions about each issue. We also felt that we generated more questions than we solved, but through this process we pinpointed a lot of challenges with our design that we did not see when we drew the visions. Some of these challenges were simply choices we had to make, while others were problems with our design that needed to be solved for our simulator to work. At this point in the project we recorded these issues in order to discuss them with the rest of the team later.

Wrap up of the second iteration

The second iteration was not completed in the time we had available in our project period, and the rest of the process will be continued if and when the project acquires further funding.

The design part of our project ended with a vision and a prototype of a training simulator for learning to negotiate, grounded in theories on negotiations, interviews with negotiators, and observations of negotiation in practice, and tested on potential users. This also includes a vision of a complete training course based on this simulator. Furthermore, the Affinity Diagram, the Sequence Model, and the Cultural Model will be an important foundation for further development of both the simulator and the training course.

Final thoughts

After having worked with this project over the course of two semesters it is clear to us that our expectations of what the year would include were somewhat correct. However, it would never have been possible for us to fathom the enormity of what we have been able to accomplish, both in our user-centred design process and as a group. This method has allowed us to gather and analyse data from our area of interest in a way that extracts information that is well grounded and rich in detail. This has provided us with an excellent starting point for the creative processes and a solid foundation for development of the product. In addition, the incremental approach has allowed us to immediately incorporate feedback from the user into the design process.

As a group, we have also experienced development. As individuals none of us could have foreseen how much we would mature as a group and perhaps as importantly how much we would learn as individuals. Working as intensively as we have done cannot be compared to anything any of us have done earlier, even in full-time jobs. This has demanded of us a greater insight into our own behaviour and ourselves than anything else could have, and through this we have grown.

We have been able to take the product development far enough to see the contours of a proper product, one an end-user could sincerely benefit from. The feedback we have gotten

from the end-users we have been in contact with has been more positive than we could ever have hoped for, confirming our belief in the need for the product, and the product itself. Based on this it is our genuine hope that this work can continue.

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Task	50	51	52	1	2	3	4	5	6
Design and prototyping									
User testing									
Evaluation									

Task	7	8	9	10	11	12	13	14	15
Preparations for negotiation experiment									
Contextual Inquiry—observing negotiation									
Interpretation Sessions									
Consolidation Sessions									
Writing of group thesis									
Writing of individual thesis									

Task	16	17	18
Writing of individual thesis			

Appendix B

Intervjuguide til bruk ved samtaler med Forhandlingsfolk

Intro:

Takk for at du har tatt deg tid til en prat med oss. Som studenter har vi kunnskap om forhandling gjennom det fagbøker kan formidle. Samtidig oppleves det intuitivt at forhandling er en kunst som beherskes på sitt beste ved/gjennom å samle seg erfaring. Vi er i gang med et hovedoppgaveprosjekt der vi skal skrive om forhandling, og vi ønsker med dette å få førstehånds (ekspertise)kunnskap og erfaring med hva nettopp du opplever å være essensen i forhandling. (det kan tenkes at noen av spørsmålene virker som om de gjentas, men dette er for å sikre at vi dekker alt vi kan).

Dataene vi samler inn i dette intervjuet vil bli anonymisert, de vil bli oppbevart etter gjeldende forskrifter sikkert, og de vil ikke brukes senere til andre formål i andre sammenhenger.

Er du komfortable med at vi bruker båndopptaker under intervjuet? Dette er for at vi bedre skal være i stand til å dokumentere gangen i samtalen og alt som blir sagt. Opptakene vil bli destruert før slutten av prosjektet vårt (dvs. mai 2007). Dersom du ikke er komfortabel med båndopptaker er dette naturligvis helt i orden.

Du står i tillegg fritt til på et hvilket som helst tidspunkt, å trekke deg fra intervjuet uten å måtte oppgi noen grunn, og be om at båndopptakeren stoppes og at dataene destrueres.

Før vi begynner kunne du tenke deg å signere på et informert samtykke der du bekrefter at du har blitt informert om hva som skal foregå, hvordan dataene vil bli behandlet, og at du er blitt fortalt at du på et hvilket som helst tidspunkt kan velge å trekke deg fra intervjuet, eller be om at båndopptakeren stanses og dataene destrueres?

- 1) I hvor mange år har forhandling vært en del av ditt arbeid?
- 2) Og primært innenfor hvilket felt?
- 3) Hva er, i følge deg, forhandling, kunne du definert det?

- 4) Hva liker du ved forhandling?
- 5) Tenk på en konkret forhandlingssituasjon du selv har vært i nylig:
 - a. Beskriv hvordan du forberedte deg, hva du tenkte på i forkant av forhandlingen
 - b. rapporter alt, fortell hele situasjonen, ta med så mange detaljer som mulig
 - c. beskriv situasjonen fra et annet synspunkt enn ditt eget
- 6) Vil du si at det er mulig å snakke om en kjerne i forhandling? Finnes det ulike komponenter/en struktur/matrise?
 - a. Hvis ja; hva tror du denne består av? Hvis du kunne beskrive kjernen i en hvilken som helst forhandlings-situasjon med kjerne begreper, hvilke ord/begreper ville disse være?
 - b. Hvis nei; hvorfor ikke?
- 7) I hvor stor grad tar parter i en forhandling bevisst i bruk ulike strategier?
 - a. Hvilke strategier har du erfart?
 - b. Gjør det da forhandlingssituasjonen forutsigbar?
 - c. Kan du beskrive et eksempel på dette?
- 8) Har du en fast forhandlingsstrategi?
 - a. En plan eller et format eller noen rammer som du alltid bruker?
 - b. Baserer du deg på noen former for teorier/metoder/strategier?
- 9) Innledningsvis sa vi at studenter kjenner forhandling gjennom teori og bøker de har lest, og i innledning til veldig mange av disse bøkene kommer man med utsagnet: ”Alle forhandler vi med hverandre hele tiden”? Er du enig i denne påstanden?
 - a. Hvorfor?
 - b. Hva er det da som skiller de ulike situasjonene fra hverandre?
(Egeninteresser/fellesinteresser/økonomiske interesser/andre hensyn?
Usikkerhet/kontroll/makt/historie (har man forhandlet sammen før/mot hverandre før, hvor godt kjenner man hverandre osv).)

10) Hva er dine erfaringer med gruppesammensetning i forhold til:

- a. Gruppestørrelse
- b. Antall (forhandlings)parter
- c. Bruk av megler

11) Hva gjør (noen til) en god forhandler? (egenskaper/trekk/personlighet)

12) Anser du deg selv for å være en god forhandler? Ville du anse deg selv som en ekspert?

- a. Hvis ja; hvorfor, og hva vil du si at disse egenskapene består i?
- b. Hvis nei; hvorfor ikke, og hvordan vil du i så fall definere ekspertisekunnskap om forhandlig? Kjenner du noen andre du heller ville karakterisere på denne måten?

13) Kan man lære noen til å bli en god forhandler?

Da er vi ferdige for i dag. Hvordan synes du at det gikk? (Gi personen anledning til å snakke om opplevelsen, en aldri så liten debrief).

Kunne du tenke deg å stille til nytt intervju dersom det skulle bli aktuelt? Eller bli kontaktet på en annen måte om vi har flere spørsmål?

Og kunne du tenke deg å stille til et eventuelt eksperiment dersom det blir nødvendig? Vi tenker oss da å invitere deg til å være en aktør i en forhandlingssituasjon der vi vil observere i den grad det lar seg gjøre, en virkelighetsnær forhandlingssituasjon med andre forhandlere. Disse seansene vil bli videotapet. Dersom du kunne tenke deg å delta i en slik situasjon, kontakter vi deg med ytterligere informasjon når tidspunktet nærmer seg.

Tusen takk for hjelpen! Ha en fin dag!

Appendix C

Script—brukertest 1. februar

[Video er av, prototypen ligger ikke framme]

Introduksjon

Hei og velkommen! Takk for at du tar deg tid!

Dette er en del av masteroppgaven vår. Vi holder på å utvikle en simulator for å lære forhandling, og dette er første test av hvordan det kan bli. Vi baserer utviklingen på psykologiske prinsipper og er veldig opptatt av å ha brukere med i hele utviklingen. Akkurat nå er vi midt i utviklingen, så det du kommer til å få se er litt halvferdig og enkelt, men det er meningen fordi du kan komme med innspill som vi kan ta med videre i prosessen. Det betyr for din del at du må bruke en god porsjon fantasi og innlevelsessevne og prøve å se for deg hvordan dette vil være som en ferdig simulator.

Evaluering vil ta ca. en halv time.

Kjell-Morten sin rolle: fungerer som datamaskin, prøv å lat som om han ikke er der ☺

Vi kommer til å starte med noen få spørsmål, og så vil du få se en skisse av simulatoren. Vi vil be deg tenkte litt høyt rundt det du ser, og så vil vi gi deg noen oppgaver underveis. Det er viktig at du sier hva du tenker underveis. Til slutt har vi noen oppsummerende spørsmål.

Vi kommer til å filme dette, slik at vi i gruppen kan gå tilbake og se senere. Vi vil ikke vise dette for noen utenfor gruppen, og noen av dem sitter ved siden av og observerer nå...

Så må du lese og signere denne consent-formen, for å bekrefte at dette er i orden for deg og at du har blitt informert om at du kan trekke deg når som helst.

[Video på]

Intervju

1. Hvilken erfaring har du med data-/tv-spill?
2. Hvis nei, du har aldri spilt noen sånne spill i det hele tatt?
3. Hvis ja, hva spiller du? Og hvor mye spiller du?
4. Hvilket forhold har du til databruk? Bruker du det mye og til hva?
5. Hva forstår du med begrepet "forhandling"?
6. Har du noen erfaring med forhandling? I så fall hva og hvor mye?

Oppgaver

Nå skal vi straks vise deg simulatoren, og det er da viktig å huske på at det er ikke deg vi tester, kun simulatoren. Det er ingen riktige eller gale svar, fordi vi er ute etter å se hvordan du oppfatter det. Du er i en gruppe potensielle fremtidige brukere for oss, så dine innspill er verdifulle! Det som er viktig nå er at du sier høyt det du tenker til en hver tid og forteller oss hvorfor du gjør det du gjør. Vær heller ikke redd for å si ting du synes virker rart eller om det er noe du ikke forstår. Tvert imot—det er slike tilbakemeldinger vi ønsker. Og også om det er noe du liker. Vær så direkte som du kan. Vi blir ikke lei oss ☺

Har du noen spørsmål før vi begynner?

Er du høyre- eller venstrehendt?

Førsteinntrykk

1. Hvis du ser for deg at dette er bildet på to dataskjermer, hva er ditt første inntrykk?
2. Disse skjermene skal være touch-screen (forklar hvis nødvendig), og tanken er at det som er uthevet på skissen kan trykkes på. Hva tror du du kan gjøre her? Hva tror du vil skje om du trykker på de forskjellige?
3. Vil du umiddelbart kunne tenke deg forskjellen på bruken av disse to skjermene?

Scenario

Se for deg følgende: Før du kom til bildet i simulatoren, ble du satt inn i ett scenario og fikk mulighet til å forberede deg. Kort fortalt spiller du en konsulent som skal forhandle sin nye stilling i Nova Consulting. Du har ambisjoner og tenker at du har et godt utgangspunkt for å forhandle dine personlige betingelser. Du har mulighet til å forhandle om lønn, arbeidstid, fri mobil, leasingavtale på bil og ekstra ferie. I tillegg kan du tilby firmaet deler av din kunderegister, og du har allerede en mulig avtale med et konkurrerende selskap.

Vi har ikke laget alle valgene, så noen ganger kommer vi til å be deg velge noe annet, det vi har forberedt.

Da setter vi i gang:

[Klistre opp første snakkeboble: “Hva slags avtale ser du for deg?”]

Kan du si noe om hva som skjedde nå?

Se for deg at du nå skal begynne å forhandle. Hva ville du begynt med?

Kan du fortelle at du ønsker deg 450.000 i lønn gjennom simulatoren? (“Jeg ønsker meg 450.000,-”)

Hva tror du skjedde nå?

[Legg på “Det synes jeg høres mye ut. Det forutsetter 45 timers uke.”]

Kan du si at du kan jobbe 42 timers uke? (“Jeg kan jobbe 42 timers uke.”)

Hva er det det nå forhandles om/hva er det som er på bordet? (450 000 og 42 timer)

[Legg på “Da må du bringe noe mer til forhandlingen.”]

Kan du si at du kan gå ned til 425.000 i lønn, men at du da vil ha en ekstra ferieuke? (“Jeg kan gå med på 425.000,-, men jeg ønsker meg én ekstra ferieuke.”)

(Ghaste knappen med lønn)

Hva skjedde nå?

(Du ønsker å binde setningene sammen...?)

(“Jeg kan gå med på 425.000,-, men jeg ønsker meg én ekstra ferieuke.”)

[Legg på: “Det er en avtale det høres ut som jeg kan leve med. Er vi da enige?”]

Kan du si at du godtar avtalen?

(Legg på: ”Jeg godtar denne avtalen”)

[Legg på: “Velkommen til oss”]

Debrief

Hva synes du?

Hva er inntrykkene dine av skissen?

Det som kommer til å skje nå er at vi skal teste noen flere som deg, så vil vi videreutvikle skisse og prøve å inkorporere dine innspill så godt vi kan...

Tusen takk for hjelpen!!

Appendix D

Eksperiment forhandlings simulering uke 8, 2007

Jobbsøker/selger

Velkommen og takk for at du tar deg tid til å delta på dette, det betyr mye for oss!! Det som nå skal skje er at jeg skal gi deg informasjon om det vi skal gjøre i dag, ca de neste 3 timene. Du skal altså forhandle med *NAVN* som du nettopp møtte, i et forhandlingsromm der det er satt opp to kameraer som gjør at vi kan observere dere. Dere vil bli presentert to forskjellige forhandlingsscenarier, det første vil være litt kortere enn det andre. Temaene vil også være forskjellige, men strukturen vil kanskje likne hverandre. Scenariene vil bli presentert hver for seg av meg, først det ene, så etter at dere har forhandlet det ferdig, det andre og du vil få muligheten til å stille meg spørsmål om innholdet før du begynner forhandlingen. Gruppen og jeg kommer til å sitte i et annet rom og se på, og samtidig tar vi det opp slik at vi i etterkant kan se på det sammen med deg og snakke om hva som skjedde.

Høres dette greit ut, har du noen spørsmål med en gang?

Her er en samtykkeerklæring på dette...

Scenario 1:

Hensikten med dette eksperimentet er å se på forhandlingsatferd. Du kommer til å forhandle med en annen i en oppgave der det er fem punkter som må avklares. I dette scenariet er du en jobbsøker hos Firmax og skal i ansettelsesmøte hos din potensielle sjef, *NAVN*. Tenk på at det er denne rollen du har når du går inn i forhandlingen. Som den gode jobbsøker du er har du gjort deg noen tanker om dine prioriteringer og de vil du straks se i en payoff oversikt (interesse oversikt).

Payoff oversikten (interesse oversikt) viser alle de forskjellige måter avtalen kan nås på, i tillegg til å gi en oversikt over hvor mange poeng du får for å oppnå hvert alternative resultat. Målet ditt er å få så mange poeng som mulig, men om dere ikke når en avtale i løpet av 25 minutter avslutter vi scenariet og dere vil begge få 0 poeng. Payoff oversikten er oversatt fra engelsk og det kan tenkes at noen av beløpene/begrepene virker sære på grunn av dette, men prøv å bruk dem allikevel ☺

NAVN får den samme instruksjonen som du får nå, men vil ha noen andre interesser enn deg, noe som vil reflekteres i hans/hennes payoff oversikt. Derfor er det viktig at du ikke viser din til han/henne også.

Spørsmål?

(gi ark)

Ta en titt på oversikten *(gi 2 min til det)*

Quiz for å sjekke om de skjønner payoff oversikt:

1. Kan du kort forklare kategoriene du ser?
2. Hva er det du får mest poeng for?
3. Hva er det du får minst poeng for?
4. Hva er ditt ideelle resultat?
5. Hvis du skulle forberedt deg og hadde dine vanlige ressurser tilgjengelig for deg, hva hadde du gjort nå? *(noter)*

Fint! Da skal du få møte din potensielle arbeidsgiver ☺ *(pass på at de har med seg oversikten)*

Alle 4 møtes foran forhandlingsrommet, de to ledes inn og Ina viser dem hvor kameraene står, Benedicte peker på vann/kjeks/evt. annen info.

Da kommer vi tilbake når tiden er ute. Lykke til!

25min senere...

FPene tas tilbake til hvert sitt rom og roses. Vi skal snakke mer om dette etter at neste scenario er ferdig, men hvordan synes du dette gikk? (KORT, noter)

Gi tom oversikt

Her ser du en tom payoff oversikt som likner på den som ble gitt deg på begynnelsen av denne øvelsen. Nå vil vi gjerne at du skriver inn tallene i denne oversikten for å fortelle oss hvordan du tror *NAVN* sin oversikt så ut. Du kan bruke din egen oversikt når du skriver inn i den under. Det eneste hintet vi kan gi deg er at det laveste tallet på oversikten deres er 0 og det høyeste er 400.

Fint, da går vi videre til neste scenario.

Scenario 2:

Hensikten med dette eksperimentet er å se på forhandlingsatferd. Du kommer til å forhandle med en annen i en oppgave der det er åtte punkter som må avklares. I dette scenariet er du en bilselger hos BESTPRISBILER og vil gjerne selge en bil til, *NAVN*. Tenk på at det er denne rollen du har når du går inn i forhandlingen. Som den gode bilselger du er har du gjort deg noen tanker om dine prioriteringer og de vil du straks se i en payoff oversikt (interesse oversikt).

Payoff oversikten viser alle de forskjellige måter avtalen kan nås på, i tillegg til å gi en oversikt over hvor mange poeng du får for å oppnå hvert alternative resultat. Målet ditt er å få så mange poeng som mulig, men om dere ikke når en avtale i løpet av 35 minutter avslutter vi scenariet og dere vil begge få 0 poeng. Payoff oversikten er oversatt fra engelsk og det kan tenkes at noen av beløpene/begrepene virker sære på grunn av dette, men prøv å bruk dem allikevel 😊

NAVN får den samme instruksjonen som du får nå, men vil ha noen andre interesser enn deg, noe som vil reflekteres i hans/hennes payoff oversikt. Derfor er det viktig at du ikke viser din til han/henne også.

Spørsmål?

(gi ark)

Ta en titt på oversikten *(gi 2 min til det)*

Quiz for å sjekke om de skjønner payoff oversikt:

1. Kan du kort forklare kategoriene du ser?
2. Hva er det du får mest poeng for?
3. Hva er det du får minst poeng for?
4. Hva er ditt ideelle resultat?
5. Hvis du skulle forberedt deg og hadde dine vanlige ressurser tilgjengelig for deg, hva hadde du gjort nå? (*noter*)

Fint! Da skal du få møte kunden din ☺ (*pass på at de har med seg oversikten*)

Alle 4 møtes foran forhandlingsrommet

Da kommer vi tilbake når tiden er ute. Lykke til!

35min senere...

Fpene vises observasjonsrommet og hilser på guttene igjen deretter tas de tilbake til hvert sitt rom og roses. Vi skal snakke mer om dette straks, men hvordan synes du dette gikk? (KORT, noter)

Gi tom oversikt

Nedenfor er en tom payoff oversikt som likner på den som ble gitt deg på begynnelse av denne øvelsen. Nå vil vi gjerne at du skriver inn tallene i denne oversikten for å fortelle oss hvordan du tror *NAVN* sin oversikt så ut. Du kan bruke din egen oversikt når du skriver inn i den under. Det eneste hintet jeg kan gi deg er at det laveste tallet på oversikten deres er – 6000 og det høyeste er 4000.

Fint! Det var de scenariene vi har forberedt, nå vil du få muligheten til å se gjennom opptaket sammen med Paul/KM og meg og samtidig snakke litt mer om hva du tenkte underveis.

Spørsmål? Vil du ha mer å drikke osv?

Arbeidsgiver/kjøper

Velkommen og takk for at du tar deg tid til å delta på dette, det betyr mye for oss!! Det som nå skal skje er at jeg skal gi deg informasjon om det vi skal gjøre i dag, ca de neste 3 timene. Du skal altså forhandle med *NAVN* som du nettopp møtte, i et forhandlingsrom der det er satt opp to kameraer som gjør at vi kan observere dere. Dere vil bli presentert to forskjellige forhandlingsscenarier, det første vil være litt kortere enn det andre. Temaene vil også være forskjellige, men strukturen vil kanskje likne hverandre. Scenariene vil bli presentert hver for seg av meg, først det ene, så etter at dere har forhandlet det ferdig, det andre og du vil få muligheten til å stille meg spørsmål om innholdet før du begynner forhandlingen. Gruppen og jeg kommer til å sitte i et annet rom og se på, og samtidig tar vi det opp slik at vi i etterkant kan se på det sammen med deg og snakke om hva som skjedde.

Høres dette greit ut, har du noen spørsmål med en gang?

Her er en samtykkeerklæring på dette...

Scenario 1:

Hensikten med dette eksperimentet er å se på forhandlingsatferd. Du kommer til å forhandle med en annen i en oppgave der det er fem punkter som må avklares. I dette scenariet er du en personalsjef hos Firmax og skal i ansettelsesmøte med en potensiell medarbeider, *NAVN*. Tenk på at det er denne rollen du har når du går inn i forhandlingen. Som den gode personalsjef du er har du gjort deg noen tanker om dine prioriteringer og de vil du få utdelt i en payoff oversikt (interesse oversikt).

Payoff oversikten viser alle de forskjellige måter avtalen kan nås på, i tillegg til å gi en oversikt over hvor mange poeng du får for å oppnå hvert alternative resultat. Målet ditt er å få så mange poeng som mulig, men om dere ikke når en avtale i løpet av 25 minutter avslutter vi scenariet og dere vil begge få 0 poeng. Payoff oversikten er oversatt fra engelsk og det kan tenkes at noen av beløpene/begrepene virker sære på grunn av dette, men prøv å bruk dem allikevel ☺

NAVN får den samme instruksjonen som du får nå, men vil ha noen andre interesser enn deg, noe som vil reflekteres i hans/hennes payoff oversikt. Derfor er det viktig at du ikke viser din til han/henne også.

Spørsmål?

(gi ark)

Ta en titt på oversikten *(gi 2 min til det)*

Quiz for å sjekke om de skjønner payoff oversikt:

6. Kan du kort forklare kategoriene du ser?
7. Hva er det du får mest poeng for?
8. Hva er det du får minst poeng for?
9. Hva er ditt ideelle resultat?
10. Hvis du skulle forberedt deg og hadde dine vanlige ressurser tilgjengelig for deg, hva hadde du gjort nå? *(noter)*

Fint! Da skal du få møte din potensielle medarbeider ☺ *(pass på at de har med seg oversikten)*

Alle 4 møtes foran forhandlingsrommet, de to ledes inn og Ina viser dem hvor kameraene står, Benedicte peker på vann/kjeks/evt. annen info.

Da kommer vi tilbake når tiden er ute. Lykke til!

25min senere...

FPene tas tilbake til hvert sitt rom og roses. Vi skal snakke mer om dette etter at neste scenario er ferdig, men hvordan synes du dette gikk? (KORT, noter)

Gi tom oversikt

Her ser du en tom payoff oversikt som likner på den som ble gitt deg på begynnelsen av denne øvelsen. Nå vil vi gjerne at du skriver inn tallene i denne oversikten for å fortelle oss hvordan du tror *NAVN* sin oversikt så ut. Du kan bruke din egen oversikt når du skriver inn i den

under. Det eneste hintet vi kan gi deg er at det laveste tallet på oversikten deres er 0 og det høyeste er 400.

Fint, da går vi videre til neste scenario.

Scenario 2:

Hensikten med dette eksperimentet er å se på forhandlingsatferd. Du kommer til å forhandle med en annen i en oppgave der det er åtte punkter som må avklares. I dette scenariet er du interessert i å kjøpe en ny bil og snakker med en *NAVN* hos BESTPRISBILER. Tenk på at det er denne rollen du har når du går inn i forhandlingen. Som den gode kjøper du er har du gjort deg noen tanker om dine prioriteringer og de vil du se i en payoff oversikt (interesse oversikt) straks.

Payoff oversikten viser alle de forskjellige måter avtalen kan nås på, i tillegg til å gi en oversikt over hvor mange poeng du får for å oppnå hvert alternative resultat. Målet ditt er å få så mange poeng som mulig, men om dere ikke når en avtale i løpet av 35 minutter avslutter vi scenariet og dere vil begge få 0 poeng. Payoff oversikten er oversatt fra engelsk og det kan tenkes at noen av beløpene/begrepene virker sære på grunn av dette, men prøv å bruk dem allikevel ☺

NAVN får den samme instruksjonen som du får nå, men vil ha noen andre interesser enn deg, noe som vil reflekteres i hans/hennes payoff oversikt. Derfor er det viktig at du ikke viser din til han/henne også.

Spørsmål?

(gi ark)

Ta en titt på oversikten *(gi 2 min til det)*

Quiz for å sjekke om de skjønner payoff oversikt:

6. Kan du kort forklare kategoriene du ser?

7. Hva er det du får mest poeng for?
8. Hva er det du får minst poeng for?
9. Hva er ditt ideelle resultat?
10. Hvis du skulle forberedt deg og hadde dine vanlige ressurser tilgjengelig for deg, hva hadde du gjort nå? (*noter*)

Fint! Da skal du få møte bilselgeren ☺ (*pass på at de har med seg oversikten*)

Alle 4 møtes foran forhandlingsrommet

Da kommer vi tilbake når tiden er ute. Lykke til!

35min senere...

Fpene vises observasjonsrommet og hilser på guttene igjen deretter tas de tilbake til hvert sitt rom og roses. Vi skal snakke mer om dette etter at neste scenario er ferdig, men hvordan synes du dette gikk? (KORT, noter)

Gi tom oversikt

Nedenfor er en tom payoff oversikt som likner på den som ble gitt deg på begynnelse av denne øvelsen. Nå vil vi gjerne at du skriver inn tallene i denne oversikten for å fortelle oss hvordan du tror *NAVN* sin oversikt så ut. Du kan bruke din egen oversikt når du skriver inn i den under. Det eneste hintet jeg kan gi deg er at det laveste tallet på oversikten deres er – 6000 og det høyeste er 4000.

Fint! Det var de scenariene vi har forberedt, nå vil du få muligheten til å se gjennom opptaket sammen med Paul/KM og meg og samtidig snakke litt mer om hva du tenkte underveis.

Spørsmål? Vil du ha mer å drikke osv?

The Role of Fidelity, Transfer and Cognitive Involvement in learning – A review of simulator training

Paul Andreas Lundeby
Department of Psychology, University of Oslo

Abstract

This article explores the role of simulator training in relation to different levels of human cognitive functioning, pointing out the importance of having a differentiated view of such training, and that there exist a reciprocal relationship between levels of cognitive functioning and different kinds of simulators. This is carried out in part by using the SRK taxonomy by Rasmussen (1983) and by discussing the relationship between fidelity and transfer in order to gain a broader and deeper understanding of this relationship. Finally, it will present some principles of design in relation to functional simulator training.

In the last decades the belief in the potential of gaming and the use of simulators¹ to facilitate learning has grown immensely (Ruben, 1999). The gaming industry has since its early start in the mid-1970s, grown to be multi-billion dollar business, with a revenue of USD\$31 billion worldwide in 2003 (Wikipedia.com). Financial growth is often accompanied by development and this very same development has contributed to making games and simulations into *the* solution to a wide range of learning objectives. However, to this day, few discussions have focussed on the fundamental issue of differentiating between different kinds of simulators in relation to different levels of human functioning.

¹ A simulation is an imitation of some real thing, state of affairs, or process. The act of simulating something generally entails representing certain key characteristics or behaviors of a selected physical or abstract system (www.wikipedia.com).

Discussions up till now have appeared polarized and narrow, treating simulators as a fixed concept or as a general category of learning resources rather than a dynamic framework which requires customisation depending on the area of use. In addition, the discussion has avoided addressing the fit between learning methods and skill acquisition. It is important to identify the skills in question before starting to address different kinds of simulators. Skills vary in complexity and degree of cognitive involvement. They range from simple motor movements and other routine tasks in everyday activities to high-level intellectual skills. It is the claim of this review article that a discussion without such a distinction is questionable for several reasons. First, simulators for one set of skills, such as negotiation, leadership or decision making, can not be seen simply as an adjustment of simulators for procedural skills, such as flight simulators, treating the differences between the two as simply content dependent. A simulator for negotiation would have to rely on different aspects of the user in order to enhance learning, such as strategic thinking, reasoning, planning, communication and reflection. Second, the degree of fidelity² also differs greatly between the different types of simulators. Traditionally flight simulators, and the like, have had a high degree of apparent fidelity. However, this is not the case in many simulators associated with the training of more subtle and implicit skills.

Furthermore, games and simulations can only be as effective as the pedagogical approach that is the basis of their design and development. This demands a thorough understanding of the processes behind both human cognitive functioning and for a design process that is associated with a high level of learning outcome. A paramount question then becomes; how can we design experiences that allow learners to experiment with knowledge in a setting or context that is controllable, encouraging them to form connections by experiencing a wide range of experimental possibilities around any given piece of information?

² Fidelity refers to how closely a simulation imitates reality (Alessi, 1988).

Today, gaming is by many seen as a media for pure entertainment purposes with few or no learning benefits associated with it, and something today's youth already spends too much time doing. Incorporating learning objectives may then be seen as a way of making gaming more socially accepted and a further excuse for engaging in the activity.

However, research has indicated that gaming, even without any explicitly expressed learning objectives, may have some potentially positive side effects. A recent study performed by Rosser (2007) showed that surgeons who played video games three hours a week had 37 percent fewer errors and accomplished tasks 27 percent faster. This even though the observation was based on the trivial videogame "Super Monkey Ball" (Rosser et al., 2007). If games produced for the sole purposes of entertainment have positive side effects associated with them when it comes to skill training, imagine what games tailored for skill training could do to this form of learning. This line of research also highlights a very important issue concerning gaming and simulator training, namely that there does not exist an easy relationship between simulator training and learning. Simulators can not in themselves teach - they have to be filled with knowledge and accommodated a specified group of users and even then there are no certainties concerning what people will learn. Humans are complex; some learn best while reading, some learn best by doing and some will have trouble learning no matter what learning paradigm is used. This just shows that there are few guarantees when it comes to this form of learning, or any other form, but trying to understand the underlying mechanisms of such training will surely lead to a higher probability of success.

This article will explore a more detailed picture of what simulator training entails in connection with the differentiation of various levels of human cognitive functioning. The Skills, Rules and Knowledge taxonomy (SRK) by Rasmussen (1983) is used as a framework for mapping human cognitive functioning and is introduced first in this review. A general discussion on the role of fidelity and transfer in simulator training is presented, in connection with both the distinction between "hard" and "soft" skills, but also through showing that different kinds of cognitive functioning requires different kinds of simulator interfaces and layouts. Finally, in light of the previous discussion, some key principles for effective learning design will be presented.

Different cognitive models

The distinction between the common understanding of the concept “hard” and “soft” skills has been made by several researchers on learning and cognition (Sun, Merrill, & Peterson, 2001). Anderson (1993), Keil (1989) and others, have proposed a distinction between procedural and declarative knowledge with the former meaning what is commonly referred to as “soft” skills or “know-how” and the latter with “hard” skills or descriptive knowledge. Smolensky (1988) propose a distinction between conceptual (publicly accessible) and subconscious (inaccessible) processing. Yet another distinction has been made by Dreyfus & Dreyfus (1986) between analytical and intuitive thinking. This paper will use the distinction between procedural and declarative skills.

Further, this paper argues for the use of the SRK taxonomy as a proficient tool for classifying different kinds of simulators. We do not need to know all the processes that underlie all human cognitive functioning in order to hypothesise about simulator training. In essence, we only need to know that the processes are there, and that they fill some sort of function. This means that we need a model³ which has a level of complexity that corresponds to the level of complexity of the phenomena we would like to say something about. Having a skewed relationship between the tool used and the phenomena we would like to hypothesise about will only add to the complexity and not necessarily add to the result. It is the claim of this article that the SRK taxonomy has the appropriate level of complexity that makes it the most proper tool for this line of argument.

Allen (1993) argues that there for too long has been a dichotomy between the providers of content and the providers of technology mediated learning environments such as simulators. The result of such a dichotomy may directly affect the quality of the product by loosing focus on what should be the most important aspect of such training, namely its ability to foster skills. However, arguing for a bifurcate between the content and the

³ Model: A representation that mirrors, duplicates, imitates or in some way illustrates a pattern of relationships observed in data or in nature A model becomes a kind of mini theory, a characterization of a process and, as such, its value and usefulness derive from the predictions one can make from it and its role in guiding and developing theory and research (Reber, 1995).

provider (in this case a simulator), it is not this articles claim that the SRK taxonomy provides a sufficient level of complexity for any and all sorts of content.

On the contrary, applying a structural model such as the SRK taxonomy to a complex skill such as for instance negotiation, would be to simplistic. The SRK taxonomy is not a model explaining complex psychological processes; it provides a useful set of categories of human performance. This will make the SRK taxonomy fall short in explaining underling processes of human performance. For making a simulator an appropriate tool for learning how to negotiate we need a more complex model for understanding the underlying psychological processes of human cognition. Such a model would need to be able to explain many of these processes in order for us to be able to simulate them. For an example of such models see for instance: Beer (1985), Broadbent (1977), Craik (1943), Michon (1985), Miller, Galanter & Pitbram (1960), Rasmussen (1983; 1986).

The skills, rules, knowledge taxonomy

The Skills, Rules, Knowledge taxonomy developed by Rasmussen (1983) is a suitable tool for mapping the different levels of cognitive functioning that has to be taken into consideration when designing and developing a training simulator. This taxonomy is useful not only for mapping cognitive functions, but also in defining different categories of human functioning and for understanding the different aspects of simulator training. Table 1 presents an overview of the relation between levels of cognitive control in the SRK taxonomy and the way in which constraints in the environment are represented and processed.

Table 1: Relation between levels of cognitive control in the SRK taxonomy and the way in which constraints in the environment are represented and processed. Adapted from Vicente (1999).

Behaviour	Representation of Problem Space	Process rules
Knowledge-Based	Mental model; explicit representation of relational structures; part–whole, means–end, causal, generic, episodic, etc. relation	Heuristics and rules for model creation and transformation; mapping between abstraction levels; heuristics for thought experiments.
Rule-Based	Implicit in terms of cue–action mapping; black–box action–responses models.	Situation-related rules for operation n the task environment, i.e., on its physical or symbolic objects.
Skill-Based	Internal, dynamic world model representing the behaviour of the environment and the body in real time.	Not relevant. An active simulation model is controlled by laws of nature, not by rules.

The SRK taxonomy consists of three levels, each defining a level of cognitive control (i.e. a different category of human action). At the top, knowledge based behaviour (KBB) of cognitive control is defined by analytical reasoning that is serial and based on a symbolic representation of the relevant constraint in the environment (Vicente, 1999). By representing the goal relevant constraint in the environment as a mental model, KBB guides action. The middle row in Table 1 shows the rule-based behaviour (RBB) level of cognitive control. This level is characterized by an if-then mapping between a familiar perceptual cue and the appropriate response. No reason is required and instead there is a direct link between the cue and the responses. RBB then guides actions by representing the perceptual constraints in the environment in terms of perceptually grounded rules (Vicente, 1999). The skill-based (SBB) level of cognitive control involves real time coupling to the environment through what Rasmussen (1983) refers to as a “dynamic real world model”, which is an implicit model of the environment (Vicente, 1999). Much like a physician learns through experience to recognize breathing sounds that indicate pneumonia without having to represent those sounds explicitly internally. SBB provides a

basis for direct coupling and parallel, continuous interaction with the world (Vicente, 1999). This three level taxonomy can graphically be represented as shown in Figure 1.

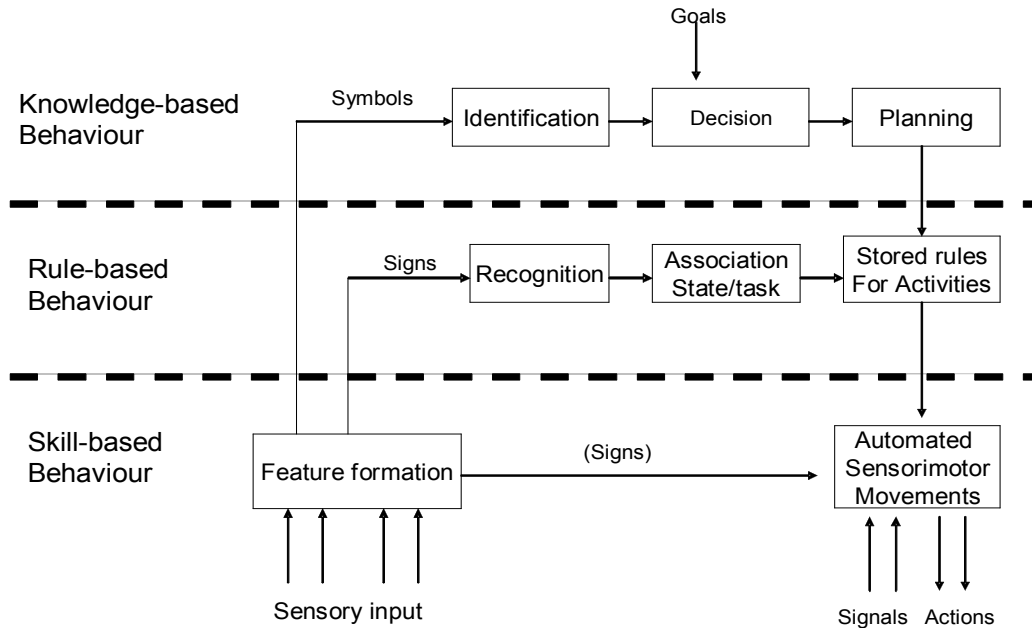


Figure 1: The SRK taxonomy of human performance categories. Adopted from Vicente (1999).

SBB consists of automated, highly integrated and smooth patterns of actions that do not need any conscious attention. A typical example is walking, which is an automated psychomotor activity driven by a continuous perception-action loop (Vicente, 1999). SBB consists of so called anticipated actions, meaning that SBB can initiate actions before the state of the world has actually changed. SBB cannot be verbalized because it does not require conscious attention, (Vicente, 1999).

RBB consists of stored rules that derive from procedures, experiences, instructions or previous problem-solving activities (Vicente, 1999). Action is goal-oriented but goals are not directly represented. Workers may know the goal that the rules can achieve, but they do not reflect on those goals when following the rules. In RBB mode people are not reasoning, they are merely following familiar perceptual cues in the environment which trigger action directly. In contrast with SBB, people in RBB mode are usually aware of their cognitive activities and can therefore verbalize their thoughts (Vicente, 1999).

Last, KBB consist of deliberate, serial-search based on an explicit representation of the goal and a mental model of the functional properties of the environment. Here, in contrast to RBB, the goals are considered explicitly rather than implicitly (Vicente, 1999). KBB is slow, serial and effortful because this mode requires conscious focal attention. KBB is often used in unfamiliar settings where previous experiences are no longer valid and solutions must be improvised by reasoning (Vicente, 1999).

The classification of simulators

There is at present day no paramount system for the classification of simulators, even though some have been proposed (Sulistio, Yeo, & Buyya, 2004). Simulators are in present discussions often treated as a unitary concept and as a tool for the facilitation of learning without a thorough understanding of the underlying structures that actually facilitate learning. Based on the distinction mentioned earlier it is possible to divide simulator training according to what form of skills they are mainly meant to foster, namely those simulators relying on declarative knowledge and those simulators relying on procedural knowledge. This distinction represents a major difference not only in terms of human cognitive processing, but it should also represent a huge difference when it comes to designing and developing the simulators.

As a representative for the former kind of simulators this article will use flight simulators as a basis for discussion throughout the article. This is in order to exemplify the differences between simulators appropriate for fostering rule based behaviour on the one hand and knowledge and skill based behaviour on the other hand. This does not mean that this article does not acknowledge that all three kinds of skills are present during flight, it is only meant to illustrate the difference of the rule based part of flight simulator training, such as e.g. the actual flight handling, and not the whole process from take-off to landing that would include procedures such as Air Traffic Control correspondence, weather considerations and such.

Aldrich (2005) divides computer-based⁴ simulators into four main categories based in part on their appropriateness for training in different kinds of business skills. In *Branching Stories* the user makes multiple-choice decisions along an ongoing sequence of events as to what to say to another person in a given situation. This interaction influences the decisions made under way and ultimately the outcome of the interaction. *Interactive Spreadsheets* focuses on abstract business school issues such as supply chain management, product lifecycles, and accounting. The task may be to either alone or as teams, allocate some sort of resources along a turned based and fixed interval, and then see the result play out on dense graphs and charts. In *Game-based Models* the user engages in familiar games such as solitaire or memory, but with important pieces of linear or task-based content replacing trivia or icons. In *Virtual Labs/Virtual Products* the players interact with visually accurate representations of actual products without the physical restrictions of reality. The interface aligns with the real functions of the object represented. The *Virtual Products* forsake some of the fidelity of *Virtual Labs* by focusing instead on the situation the product is being used in.

Alessi (1988) makes another distinction between situational, procedural, process and physical simulators. *Procedural* and *Situational* simulators refer to simulators which have as their primary objective to teach someone *how to do something*. For instance an example of a *Procedural* simulator is a flight simulator, while an example of a *situational* simulator may be simulations for classroom management. *Physical* and *Process* simulators are simulators that have as their primary objective to *learn about* something. An example of a *Physical* simulator may be a simulator that simulates a phenomenon or a physical object and their behaviour. In *Process* simulators on the other hand, the phenomena to be simulated are invisible processes such as genetics or population growth.

This paper will focus on yet another distinction namely the levels of cognitive functioning involved in mastering the simulator. Through identifying the level of cognitive involvement within the user, it is possible to develop and design simulators that

⁴ All simulators referred to in this article are computer-based.

are tailored for different kinds of users, in different kinds of environments and with different kinds of objectives.

The role of fidelity and transfer in simulations

A common misconception when it comes to fidelity is the belief that the higher the fidelity there is between the learning situation and the application situation the higher the transfer⁵. This notion implies that there exists some sort of linear relationship between fidelity and transfer. However, research indicates a more complex non-linear relationship (Alessi, 1988). Even if it does not exist a straightforward relationship between fidelity and transfer and that this relationship is difficult to describe, we cannot simply deny that such a relationship exists and from that conclude that this relationship is not important. On the contrary, fidelity is important, but sometimes less can be more in the sense that a higher degree of fidelity does not automatically ensure a higher degree of transfer. Previous research in the field has revealed mixed results when comparing fidelity and transfer. Some studies have even showed no differences in learning or transfer due to fidelity (Cox, Wood, Boren, & Thorne, 1965) in (Alessi, 1988). Other studies have shown that simulators can teach more effectively than real airplane flight, and that students training in flight simulators require fewer hours to reach the requirements needed than those who do not receive such training (Alessi, 1988; Povenmire & Roscoe, 1973; Roscoe, 1971; Valverde, 1973) Due to the fact that real flights have the highest fidelity, this must mean that lower fidelity sometimes is more effective.

The relationship between fidelity and learning is complex but there are some tendencies. For very high fidelity the amount of learning can decrease, and this is especially the case with less experienced students. Putting a novice in a high fidelity simulator or even in a real flight, the highest possible level of fidelity, would be too stressful and even confusing, producing no learning at all. At the other end of the continuum, putting an

⁵ Transfer of learning refers to an individual's ability to apply something learned in one situation and transfer that knowledge to another novel situation (Singley & Anderson, 1989).

experienced student in the same situation would produce more learning than presenting him or her for an instructional video or a written text on piloting.

So how does fidelity relate to transfer? One of the main problems related to the transfer of skills lies in the fundamental educational question, namely that it is rare that people learn things in school which apply directly to life and work. Transfer fails when knowledge required in one situation fails to transfer to another, and a major theoretical question arises as to why this is so. One plausible explanation is that it is the result of the inevitable consequence of the limited power and generality of human knowledge (Singley & Anderson, 1989). Just to have the knowledge that logically implies a solution to a task is not enough. One must learn how to apply that specific knowledge to a specific task in a specific situation. Furthermore, the probability of transfer decreases as the time interval between the original task and the transfer task increases (Singley & Anderson, 1989). This point is also likely to be connected to retrieval by the notion that information that has recently been acquired is more likely to be retrieved than information acquired further back in time (Ormrod, 2004). The concept of transfer is a complex one containing several aspects such as the similarities between the performance environment and the instructional environment, the perceived similarities between the performance environment and the instructional situation and the learner's level of overall motivation. These factors are not independent. Actual similarity affects perceived similarity which in turn affects motivation. In sum it seems we are at an impasse in simulation design (Alessi, 1988). Increasing fidelity, which theoretically should produce a higher degree of transfer, may on the contrary inhibit learning which in turn will inhibit transfer. On the other hand, decreasing fidelity would increase learning, but what is learned may not transfer to the application situation if those settings are too dissimilar.

Implications for simulator training

One of the main objectives for a flight simulator is to put the user in a life-like environment, in terms of visual and kinetic aspects of flight, where the pilots can train on different scenarios associated with piloting an aircraft (Farmer, Rooij, Riemersma, Jorna, & Moraal, 1999; Salas, Bowers, & Rhodenizer, 1998). This is not to say that a pilot does

not have to rely on knowledge-based skills. When the pilot encounters unforeseen events, he/she has to a great extent rely on his/her KBB skills in order to come up with a good solution for any given problem. This kind of simulator lies in the interchange between RBB and KBB.

When encountering a given problem the pilot's actions and responses often follow a strict and rigid pattern often sequential and deterministic in the sequence in which they have to be executed. When the pilot is confronted with the problem: "fire in the left engine" the pilot has to engage in a sequential pattern of responses in order to avoid a disaster. This pattern of responses is not open for much individual interpretation from the pilot in terms on what the best course of action is. The obvious reason for this is that it is both time-efficient and to a greater extent ensures a successful outcome to the problem. Due to safety reasons pilots do not have the luxury of considering multiple options to a problem, but have to act according to the sequence that has been tested and found to have the highest success rate. Different sequences to different problems are carefully described in manuals that the pilot must be familiar with.

Simulators for implicit or procedural skills are associated with behaviours such as KBB and SBB in the SRK taxonomy. Examples of this are negotiation, leadership and decision making. The traditions of simulating these types of skills have been less prevalent and have not been given the same attention up until now (Aldrich, 2004, , 2005; Crookall & Arai, 1995; Quinn, 2005). There are no clear-cut answers as to why this is so but some proposals will be presented here. To simulate for instance negotiation there can be no fixed pattern of responses to ensure a favourable outcome. In situations where the interaction with another person is the task, expecting uniform responses is intrinsically unrealistic. An almost infinite number of responses posted at almost an infinite number of places in the process could theoretically lead to a favourable outcome (Suchman, 1987). What is classified as a favourable outcome could also fluctuate greatly between players as they interpret different situations differently. KBB of cognitive control is defined by analytical reasoning that is serial and based on a symbolic representation of the relevant constraint in the environment. Negotiation is a highly dynamic process which focuses on

different aspects of cognitive processing. Unlike negotiation, SBB consists of automated, highly integrated and smooth patterns of actions that do not need any conscious attention such as walking, and they are often recognized by the lack of direct consciousness. This kind of psychomotor activity is driven by a continuous perception-action loop (Vicente, 1999).

In simulators focusing on RBB and SBB the learning benefits are to a large extent associated with the repetition of fixed responses to a number of problems that to a great extent can be revealed beforehand. Pilots are supposed to have “spinal reflexes” to a variety of problems that can come up during a flight. As well as that, simulating mechanical malfunctions is more transparent because machines are bound to certain rules. The range of possible malfunctions is limited and easier to simulate than human behaviour that is not bound by the same narrow set of rules and therefore much more complex. In a simulator for KBB and SBB such as negotiation, the number of possible responses exceeds the number that reasonably can be implemented in a simulator. Therefore the benefits of such a simulator depends to a large extent in the reflections on which course of action to follow, and reflections on what outcomes follow which courses of action more than in the repetitions of sequences.

One of the hypotheses on the learning benefits associated with RBB simulator training lies in the notion that life-like “micro world” simulators make the transition from a training environment to the real world easier and more trouble free (Singley & Anderson, 1989). The reasons for that is the belief that the more familiar the pilot is with the environment he or she is supposed to operate in, such as the cockpit, the faster he or she can adapt to a variety of different situations. The rationale behind this assumed relationship between familiarity and reality might in part be explained by a “situated” framework for learning, where some cognitivists have proposed that most learning is context specific and that it is “situated” in the environment in which it takes place. Such situated learning is unlikely to result in transfer to new contexts, especially when they are very different from the ones in which learning originally occurred (Lave & Wenger, 1991; Ormrod, 2004; Singley & Anderson, 1989; Suchman, 1987). As long as two tasks

have something in common, the possibility of transfer from one situation to another exists (Ormrod, 2004). But commonalities among tasks do not guarantee transfer and there is a wide agreement among scientists regardless of theoretical orientation that transfer does not occur as often as it should nor could (Ormrod, 2004).

This area of research indicates the importance of treating simulations as a dynamic concept and that each simulator needs a high degree of customization. This can be done in part by addressing and analyzing the individual user's level of competence, and varying the instructional level. Developing a simulator under the slogan "one size fits all" could fail to meet many desired criteria needed to obtain any preferred level of learning outcome.

When training in flight simulators pilots are bound to follow strict protocol and, for the most part, the skills that must be mastered can be expressed verbally or through guidance from a more competent person. This means that there is a fairly lucid relationship between the skills that have to be mastered and the degree of externalisation needed in order to master that particular skill, and the learning outcome is associated with repetition of these skills. However, in simulators where this relationship is not as straightforward, such as a simulator for negotiation, one of the challenges is to be able to make internalised skills externalised. This argument assumes that everyone, through human interaction, has some basic skills in negotiation, and that some are better and more experienced than others. The learning outcomes associated with negotiation training in a simulator are not closely tied up to actual motor performance, but lie in the interchange between being self-aware and being able to meta-reflect. There is no *one* correct way of doing things, and therefore the correctness may lie in the *awareness* of why you chose to act in the way you did as much as the act itself. However, in a flight simulator it is to a greater extent possible to pinpoint right from wrong lines of action. This constitutes a marked difference between simulators designed for declarative and motor skill training and simulators for procedural skill training and should be accounted for in the design and when deciding on the level of fidelity.

Design and implications for learning

When designing learning environments, such as simulators, a magnitude of design decisions have to be made. During such a process many of these design issues are made unconsciously along the way without a thorough understanding of what those decisions can lead to in terms of the trade-offs involved. One possible reason for this is that there may have been a dichotomy between the designers of simulator environments (often engineers) and those providing content (often educationalists) in the sense that designers and those in charge of the content may not necessarily have had concurrent goals or focus when designing such environments (Allan, 1993).

In designing technology-mediated environments the first thing designers should ask themselves is what the goals are. What explicitly is to be learned? The answering of these questions should, to a great extent, influence the design process, and there should at all times be a close link between the providers of design and the providers of content. More explicitly, in a design process the following, based on the work of Allan (1993), should be taken under consideration.

Memorization versus thoughtfulness: Should the focus lie on memorising certain traits/facts, or is the main goal to stimulate the ability to solve complex problems through the ability to reflect, communicate and to engage in cooperative behaviour?

Whole tasks versus component skills tasks: There is a trade off between having the focus on whole tasks and component skill tasks. Is the environment meant to stimulate the learning of whole tasks that require the integration of a variety of skills, or is the environment meant to stimulate the acquisition of simplified tasks and focus on particular sub skills?

Breadth or depth of knowledge: Is the primary focus of the simulator to stimulate the acquisition of a little knowledge of a lot of things, or is the focus the deep and thorough understanding of a few topics?

Cognitive versus physical fidelity: When designing and creating simulated environments a critical question emerges in the trade off between preserving physical fidelity to the environment and preserving only the cognitive fidelity. This difference can be illustrated by the difference of having a simulated control-room in scale 1:1, identically designed with buttons and flow charges, which has to be physically operated by people, or have the same configurations of the entire system and sub processes represented on a computer screen.

Incidental versus direct learning: When putting someone in a learning environment can what you want them to learn be taught directly, through the specific tasks they engage in, or can it be taught incidentally to the task?

Learner control versus computer control: There is a trade off between putting the learner in control of his or her learning versus letting the computer control the whole process of learning.

Another part of simulator training that has not been given much attention is that in designing simulators there has been little focus on designing environments fostering the collaboration of several people who are simultaneously interacting (Dalziel, 2003). One tradition within designing learning environments that has attempted to put focus on these topics is Learning Design.

Learning Design has emerged as one of the most significant recent developments within the broader e-learning paradigm (Dalziel, 2003). Learning Design's core principle put focus on the relationship between learner and content and learner and peer or instructor. There are several different definitions of Learning Design, but common to all is the greater focus on content, activity of the learner, and greater emphasis on the multi-learner as opposed to the single learner (Dalziel, 2003).

One of the problems concerning design has been that too often content has been considered to be the primary focus, thereby defining the course or the way content is

presented (Sims, 2005). The goal of Learning Design and simulator training should be to arrange for activities designed to engage, with key elements of the course content. This way the learner becomes integrated with a situated and contextualized environment, providing them with a level of control over that learning environment (Sims, 2005).

Summary

In search of a more even debate of the use of simulators for skill fostering, this review article put forth a possible way of viewing simulator training by arguing the need to start with classifying the skills we wish to foster in terms of cognitive functioning before going about hypothesising about what kinds of simulators that are best suited for the actual skill fostering. Applying the SRK taxonomy as a framework to such a classification is useful. The SRK taxonomy has a proficient and suitable level of complexity to function as a framework for such a classification in that it provides a functional dismemberment of human cognitive functioning. This possible classification is seen in close relationship with both fidelity and transfer in order to be able to draw some conclusions as to what kind of simulators are best suited to foster different kinds of skills. Finally, this article presented some general principles related to the design of such learning media, in relation to the principles discussed earlier in this paper.

Concluding Remarks

The acquisition and use of skill constitutes a major portion of human activity. As we develop as human beings our methods for skill acquisition evolve along with us. All evolution does not necessarily constitute improvement. Simulation training as a method for skill acquisition is an evolutionary improvement of modern time. However, embracing simulation without having a thorough understanding of the mechanisms involved can result in a false belief in the efficiency of this method. It is important to acknowledge that it is necessary to abandon the classical view of learning as the accumulation of facts and accept that learning is not about explicit knowledge but about getting people to understand what is going on, to reflect on different courses of action and to be able to act based on these reflections. Traditional teaching argues that we can only teach what we know, meaning we can only teach what is explicitly accessible from our

consciousness. This means that a great deal of what we know but not are able to express, cannot be taught in terms of traditional methods. This opens for a view of learning as something you have to engage in, using tools such as simulators.

People have some profound misconceptions about what it means to know (Schank, 2002). Those misconceptions come about because facts are what people believe it is to “know”. That is a grave misconception because we do not know what we know because so much of what we know is tied up in various schemas and in cognitive strategies making sure that our perceptual and cognitive systems do not overload. This enables us to function in a complex world rather effortlessly.

People do not know how they learn or how they understand or how they came about believing what they believe. We can at all times do things, perform and behave in our daily life without being able to explicitly state the rules that govern this behaviour, the knowledge concerning these domains is simply not in our consciousness. The questions then arise as to how we can exploit this “unknown”, implicit knowledge.

An important aspect of classical views of teaching is that you only teach what is testable and the question easily becomes a question of what we can test rather than what is the best teaching. Given the premises that we can only teach what we know, and that what we know in terms of explicit knowledge is just a very small part of what we can call overall knowledge, and the fact that classical teaching is viewed by many as being archaic, training in a simulator can surpass this problem by providing the learners with an environment that fosters the creation of their own learning experience. By the active manipulation of such an environment and by becoming their own teachers within a framework of learning by doing, I strongly believe that a negotiation simulator has the potential to be a useful tool for learning.

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