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# The Challenge of Designing Gestures for Interaction



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*Dear Anette and Caroline*

It has been a great pleasure to work with Anette and Caroline during their time in Australia. They have approached their work with great sensitivity and maturity, resulting in a reflective user-centred exploration of the gesture project which I regard as a fine example of reflective practice and participatory design. They have always been good humoured and great pleasure to be with in spite of some adversities they have faced while living and working away from home. Their work has inspired me to introduce some of their practices in a new subject on Interaction Design that I will teach next semester.

As a little history and context for their work, let me explain that the gesturing device project was born of one mother's frustration. I work part time. As I chatted with my toddler who was helping make dinner, I was also needing to check email to see if I had any meetings to attend next day, so I would know which campus to go to. Checking email should be pretty easy, but with gorgeous baby on one arm and with beloved toddler hovering at my kneecaps I was doing focussed cursor directions towards explicit pixels, and coordinating to click the mouse at the right time, simply to select a menu item. It struck me that there had to be a less focus intensive way that fit more easily into the pattern of natural human interaction to do all these simple operational tasks that suck us into acting like computers in order to work with computers and the information infrastructure, whether at home or work.

Anette and Caroline have embraced the project from a humanist point of view to investigate how real people, doing real tasks, might feel about gesturing to interact with computers. I wish all designers would work in their way. What a different world we might live in then.

Finally I wish to humbly thank them for their work and for bringing their great human warmth and spirit of endeavour to our community.

Thanks mates.

*Margot*

## Preface

From the 15<sup>th</sup> of January until the 4<sup>th</sup> of June 2001 we have carried out this project in Australia to get our Bachelor's degree. It has been a challenge in more ways than one. Mostly this journey has contributed the conviction of that we have a good foundation to take further steps into the future.

We thank Michael Docherty, Program Director at the Information Environments Program for welcoming us to visit the University of Queensland "the Uni". Dianne Poke, Administrative staff at the Uni who has become a good friend and a helping hand during the whole visit. Margot Brereton, PhD, our supervisor in Australia, she introduced us to the interesting area of gestures and supported and helped us create a feeling of certainty. Yvonne Dittrich, PhD and Sara Eriksen, PhD from Blekinge Institute of Technology who has supervised us through this project from Sweden. Special thanks to all the participants of the gestural workshops; Daniel, Ben McG, Ben M, Margot, Garth, Rebekah and Arthur.

Mostly we like to thank our partners, Matti Volanen and Robert Abraham that have supported us from the very beginning of this journey.

Last we want to thank each other for the friendship that has grown during the journey and contributed to an everyday joy for carrying out this project.

*Anette Eriksson and Caroline Svensson  
Australia the 25<sup>th</sup> of May 2001*

# The Challenge of Designing Gestures for Interaction

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# Abstract

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**Keywords :** Gestures, Natural Gestures, Designed Gestures, Interaction, Gestural Interface, Power Point, Presenter, Presentation, Gester, Naturliga Gester, Designade Gester, Interaktion, Gest Interface, Presentatör.

**Abstract:** The main interfaces for interaction with computers today are; keyboard, mouse and remote control. In order to interact with the presentation software Power Point, the presenter has to focus either on the computer or the buttons on the remote control. By doing this, the presenter often loses the contact with his audience and his or her flow of speech gets interrupted.

This project has researched the possibility of using gestures for interaction with Power Point, by using an appliance that detects gestures. The purpose was that the interaction should be possible to realise by software, which we have done an introductory design of. We have focused on assisting presenters when they use Power Point and other applications when delivering presentation.

To collect data and get an understanding of presenters, presentations and gestures we have observed presenters in action, done workshops together with future users and tested some gestures in real life. These are methods inspired from approaches such as ethnographic fieldwork and participatory design. During the whole project we have used video recording to collect and save data. To create an understanding and clear picture of what the future software should include UML-diagrams were used.

We have separated gestures in two categories; natural and designed. The natural gestures occur naturally during speech and social interaction, while the designed gestures are gestures that you learn to use and express, often to perform a task. We discovered that it was the designed gestures that are best suited for gestural interaction with computer.

Since the designed gestures are close to the natural way of gesturing we see them as easier to learn, remember and also more comfortable to use. We think the designed gestures have the potential to become second nature, therefore they are good to use for interaction with computers. Our research work led us to realise a need for an on/off function, to distinguish the designed gestures from the natural ones.

By using a gestural interface during a presentation, the presenters can keep the focus on the audience and the message they want to convey. When gestural interfaces become reality they will introduce a paradigm shift in the way that people interact with computers and information.

# Table of Contents

|          |                                                                                  |           |
|----------|----------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>INTRODUCTION.....</b>                                                         | <b>1</b>  |
| 1.1      | CASE IN AUSSIE - LIVING AND WORKING TOGETHER.....                                | 1         |
| 1.2      | OUR PROJECT .....                                                                | 2         |
| 1.2.1    | <i>Aim of the Project.....</i>                                                   | 3         |
| 1.2.2    | <i>Delimitations in our Work .....</i>                                           | 3         |
| 1.3      | WHY THIS FOCUS? .....                                                            | 3         |
| 1.4      | THE STRUCTURE OF THE THESIS .....                                                | 4         |
| <b>2</b> | <b>OUR PRACTICE AS DESIGNERS .....</b>                                           | <b>6</b>  |
| 2.1      | THE KIND OF ARTEFACT WE WILL DESIGN.....                                         | 6         |
| 2.2      | THE JOURNEY TOWARDS THE ARTEFACT .....                                           | 7         |
| 2.2.1    | <i>The Future User our Foundation Stone .....</i>                                | 7         |
| 2.2.2    | <i>Ethnographic Fieldwork .....</i>                                              | 7         |
| 2.2.3    | <i>Participatory Design .....</i>                                                | 8         |
| 2.3      | DESIGN-PROCESS - A REFLECTIVE JOURNEY.....                                       | 8         |
| 2.3.1    | <i>Conversation with the material.....</i>                                       | 8         |
| 2.3.2    | <i>The Power of Working in a Group.....</i>                                      | 9         |
| 2.3.3    | <i>Supporting Elements to Create an Dynamic Design Process.....</i>              | 10        |
| 2.4      | BENEFITS OF METHODS AND TECHNIQUES.....                                          | 10        |
| 2.5      | CONCLUSIONS.....                                                                 | 11        |
| <b>3</b> | <b>HELPFUL LIMITATIONS.....</b>                                                  | <b>12</b> |
| 3.1      | GESTURE PROJECT AT THE UNIVERSITY OF QUEENSLAND.....                             | 12        |
| 3.1.1    | <i>The Gesture Based Input Appliance.....</i>                                    | 12        |
| 3.1.2    | <i>The first Experiment.....</i>                                                 | 15        |
| 3.1.3    | <i>How the Gesture Based Input Appliance Project has Affected our Work .....</i> | 16        |
| 3.2      | POWERPOINT .....                                                                 | 17        |
| 3.2.1    | <i>Power Point Affected on our Work.....</i>                                     | 17        |
| 3.3      | THE SURROUNDING PARTS' INFLUENCE ON OUR WORK.....                                | 18        |
| <b>4</b> | <b>THE NATURE OF GESTURES.....</b>                                               | <b>19</b> |
| 4.1      | WHAT ARE GESTURES?.....                                                          | 19        |
| 4.2      | BRIEF BACKGROUND TO THE RESEARCH AREA FOCUSED ON GESTURES.....                   | 20        |
| 4.3      | THE NATURAL GESTURE.....                                                         | 20        |
| 4.3.1    | <i>The Kind of Illustrator Gestures that Exists .....</i>                        | 21        |
| 4.3.2    | <i>Growth Point – where the Gestures Start.....</i>                              | 22        |
| 4.3.3    | <i>The Relation - Gestures, Speech and Thoughts .....</i>                        | 23        |
| 4.4      | THE DESIGNED GESTURES.....                                                       | 23        |
| 4.5      | THE CHALLENGE OF DESIGNING GESTURES FOR COMPUTER INTERACTION .....               | 24        |
| <b>5</b> | <b>OBSERVING PRESENTERS IN ACTION.....</b>                                       | <b>27</b> |
| 5.1      | WHY PRESENTERS?.....                                                             | 27        |
| 5.2      | STUDY WITH A PURPOSE .....                                                       | 27        |
| 5.2.1    | <i>Our first subject - Ben.....</i>                                              | 28        |
| 5.2.2    | <i>Trying ourselves – to get our own feeling.....</i>                            | 29        |
| 5.2.3    | <i>Our second subject - Margot.....</i>                                          | 30        |
| 5.3      | REFLECTIONS ON THE ETHNOGRAPHIC INSPIRED FIELDWORK.....                          | 31        |

|           |                                                                         |           |
|-----------|-------------------------------------------------------------------------|-----------|
| <b>6</b>  | <b>GESTURAL WORKSHOP.....</b>                                           | <b>32</b> |
| 6.1       | OUR THOUGHTS BEFORE THE WORKSHOPS TOOK PLACE !.....                     | 32        |
| 6.1.1     | <i>The Structure of the Two Workshops.....</i>                          | 33        |
| 6.2       | THE FIRST WORKSHOP.....                                                 | 34        |
| 6.2.1     | <i>Things the Participants Perceived During the Presentations.....</i>  | 34        |
| 6.2.2     | <i>The Different Gestures the Participants Designed.....</i>            | 36        |
| 6.2.3     | <i>How the Presenter Experienced to Use Gestures.....</i>               | 37        |
| 6.2.4     | <i>Interesting Thoughts and Issues Arising During the Workshop.....</i> | 38        |
| 6.3       | THE SECOND WORKSHOP.....                                                | 39        |
| 6.3.1     | <i>Things the Participants Perceived During a Presentation.....</i>     | 40        |
| 6.3.2     | <i>The Different Gestures the Participants Designed.....</i>            | 41        |
| 6.3.3     | <i>How the Presenter Experienced to Use Gestures.....</i>               | 42        |
| 6.3.4     | <i>Interesting Thoughts and Aspect Arising During the Workshop.....</i> | 43        |
| 6.4       | REFLECTIONS ON THE WORKSHOPS.....                                       | 45        |
| 6.4.1     | <i>The Structure of the Workshops.....</i>                              | 45        |
| 6.4.2     | <i>The Choice of Participants.....</i>                                  | 45        |
| 6.4.3     | <i>The Choice of the Rooms.....</i>                                     | 46        |
| 6.4.4     | <i>What did the Workshops contribute to our work?.....</i>              | 46        |
| 6.4.5     | <i>Thoughts to Work Further with from the Workshops.....</i>            | 47        |
| <b>7</b>  | <b>TESTING THE GESTURES.....</b>                                        | <b>49</b> |
| 7.1       | AN EXPERIMENT WITH GESTURES IN REAL LIFE.....                           | 49        |
| 7.1.1     | <i>Why Daniel?.....</i>                                                 | 50        |
| 7.1.2     | <i>Making Naturalistic Gestures.....</i>                                | 50        |
| 7.1.3     | <i>Acting the Ring.....</i>                                             | 51        |
| 7.1.4     | <i>The Students Reaction.....</i>                                       | 51        |
| 7.1.5     | <i>Daniel's Experience.....</i>                                         | 52        |
| 7.2       | WHAT THE EXPERIMENT CONTRIBUTED TO OUR WORK.....                        | 52        |
| <b>8</b>  | <b>FROM GESTURE TO AN EVENT IN THE COMPUTER.....</b>                    | <b>54</b> |
| 8.1       | A FICTIONAL STORY ABOUT THE PRESENTER TOM.....                          | 54        |
| 8.1.1     | <i>Tom is Preparing the use of GNA-system.....</i>                      | 54        |
| 8.1.2     | <i>Tom is Delivering the Presentation.....</i>                          | 54        |
| 8.2       | THE GESTURAL NAVIGATOR APPLICATION.....                                 | 55        |
| 8.2.1     | <i>Choosing Gestures in the Customised System.....</i>                  | 56        |
| 8.2.2     | <i>Navigate through Applications.....</i>                               | 57        |
| 8.3       | REFLECTIONS OF THE SOFTWARE DESIGN WORK.....                            | 57        |
| 8.3.1     | <i>The Complexity with Finding Solutions to Problems.....</i>           | 58        |
| 8.3.2     | <i>Make the User Feel Smart – by Hiding the Complexity.....</i>         | 59        |
| <b>9</b>  | <b>THE END OF THE JOURNEY.....</b>                                      | <b>60</b> |
| 9.1       | THE CHALLENGE OF DESIGNING NATURALISTIC GESTURES.....                   | 60        |
| 9.2       | OUR PRACTICE - DESIGNER OF THIS JOURNEY.....                            | 62        |
| 9.3       | IN CONCLUSION.....                                                      | 65        |
| <b>10</b> | <b>REFERENCES.....</b>                                                  | <b>66</b> |
| 10.1      | INTERNET REFERENCES.....                                                | 67        |
|           | <b>APPENDIX A – SCHEDULE OF THE WORKSHOP.....</b>                       | <b>69</b> |
|           | <b>APPENDIX B – USE CASE DESCRIPTION.....</b>                           | <b>70</b> |

# 1 Introduction

This thesis is the result of a five month study in Australia. Our work has been done as part of the requirements for a Bachelor's degree, during our third year of the People Computers and Work-program<sup>1</sup> at Blekinge Institute of Technology in Ronneby, Sweden. Our education has given us a wide platform to start from with a focus on the areas of computer science and human work science. We have chosen to begin this thesis with a brief description of what we feel has been one big factor during our work; about that we have worked and lived close together in a foreign country far away from our normal lives. We left Sweden for five months at the University of Queensland<sup>2</sup> in Australia with hopes to learn and experience a lot. Therefore we want to start by writing about some parts of our life in the wonderful country "down under". Then we describe our project, its aim point and limitations, followed by why we chose this focus. Last in this introduction we describe the structure of this thesis.

## 1.1 CASE<sup>3</sup> in AUSSIE - Living and working together

Our work on this thesis started about one year before we actually went to Australia. We both wanted to do something special and different during our work to get our bachelor's degree. Both of us wanted to travel to an English-speaking country to get a better understanding of the language and to get to speak English more fluently. Since we both are very interested in travelling we decided that Australia was the perfect place to get all of these visions fulfilled. Our journey to Australia began through a contact that we got from Yvonne Dittrich, PhD senior lecture at Blekinge Institute of Technology. She suggested we contact Geraldine Fitzpatrick. This began our process of organizing our journey to Australia. This process took us a long time and much energy, but when we finally arrived and looked back we saw that every minute we spent on planning and organising was time well spent. We ended up in a beautiful country totally unknown to us with lots of challenges to "throw" ourselves into. We also got introduced to an interesting project that made our visit and work even more memorable.

As we see it, there are a lot of differences between doing a "normal" bachelor's thesis back home in Sweden compared to doing it in Australia. Our experience of study and life in Sweden is like this; you go to work during the weeks in the morning, meet your working partners and do what you have planned for the day. After a day of work you return to your respective homes and mostly do

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<sup>1</sup> People Computers and Work, are the English term for the Swedish name of the education; Människor Datateknik Arbetsliv - MDA.

<sup>2</sup> <http://www.uq.edu.au>

<sup>3</sup> CASE; acronym for Caroline Anette Svensson Eriksson

no work related tasks. In Australia we have done our work in a totally different way. We have gone to school together in the mornings and done the things we have planned for that day. After school we have not stopped working, often continuing to discuss our work even when we have reached home. Since we have been living together here in Australia the project has been a natural part of our lives. We have had many interesting discussions and reached many important decisions during late nights and weekends. We also feel that these discussions have brought us a deeper understanding of our work and its related area. This we believe would never have happened if we had not lived under the circumstances that we have. These circumstances have allowed us to spend time on discussions and think about aspects that we normally would not have the time or strength to do. Sometimes the discussions have not reached any important decisions, sometimes they have. What we feel that they have most brought in to our work is a deep understanding for the area of the project, but also for each other and our thoughts and opinions. Knowledge that we believe you otherwise only could get if you have worked together with your working partners for a long time, during a “normal” project. During this project we have not even had to think of working to get the same inner picture of the project. It has come naturally to us during our 16 hours of daily discussions.

We understand that the way we have been working and living together in Australia is not the “normal” way of carrying out a project. With the result in hand, we believe that our living and working conditions have had a big effect. Living and working in a foreign country has both advantages and disadvantages. For example, being a novice in a new country, not knowing anyone or being able to express your self in words that you are used to, have made us feel vulnerable in many ways. However thanks to this experience we feel that we have learned a lot and got stronger self-confidence. We think that even these conditions have contributed a special strength to our project.

## 1.2 Our project

During these five months we have been working with gestures as our main focus. We have researched the possibility of using natural gestures as an interactive tool in communication with computers during a presentation done using Power Point. The purpose was that this interaction should be possible to realise by software, which we have done an introductory design of. The design is mostly expressed in UML-diagrams. We have also looked at whether it is possible for a presenter to use gestures without interrupting the flow of the presentation. We have studied presenters when they delivered presentations, with a focus on the natural gestures they used. This was done to get a deeper understanding of the area and the literature that we had read. We have also, together with the future users, designed possible gestures to use during presentations and trialed them during a live presentation.

### 1.2.1 Aim of the Project

The aim of this project has been to research the possibility of using gestures during a presentation to interact with a computer and do an introductory design of future software. Another aim of the work has been to develop a deeper understanding and skill for the English language that we did not have before we began.

### 1.2.2 Delimitations in our Work

In the beginning of the work we defined some limits that we thought were necessary for our work. Limitations are something we believe all projects need. We felt that the area that we were working on had potential to growing to something very big and unwieldy. Therefore we needed to put up some limits to be able to perform a software design; to choose a user focus and decide where to use gestures within that focus.

The first limit we defined was the domain of use. We chose to design our system to aid presenters using Power Point. We understood that we had to choose one focus since the project had to be done in a period of 20 weeks. Many people use Power Point in different professions, hobbies and activities or as students. We also decided to limit the range of tasks when using Power Point that we would design gestures for. The task corresponded to the Power Point commands of; moving to next, previous, first, last slide and move to another application.

## 1.3 Why this focus?

In the beginning of our stay in Australia we had a meeting with our supervisor Margot Brereton. She told us about a research project that she is taking part in, *Design of a Naturalistic Gesture Based Input Appliance for Ubiquitous Computing*. The aim of that project is to design a set easily remembered gestures that you can use to control computer applications. This was our first contact with the thoughts of using gestures as an interactive tool with computers, which turned out to be the main focus in our project. We found these thoughts very interesting because it suited our way of thinking. We believe a software designer, who is designing a tool for people to use to interact with computers, should take advantage of the natural way that people act. Our picture of the future is that computers are going to play an even bigger part in people's daily lives than they do today. People are going to use computers more in their homes as well as at work. We think a way of supporting people, in their use of computers, is by using people's natural way of acting and make the computer support that, instead of introducing more unnatural artefacts to people, which we think computers already are.

We had the opportunity to take part in the Australian User Interface Conference<sup>4</sup> at Bond University at the Gold Coast from the 30<sup>th</sup> of January until the 1<sup>st</sup> of February 2001. During the conference we discovered a common

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<sup>4</sup> [www.cs.adelaide.edu.au/ASCS2001/](http://www.cs.adelaide.edu.au/ASCS2001/)

phenomenon. We realised that the researchers, who delivered presentations about their work, had to interrupt their talks when they switched slides or moved to another application. Almost every seminar room was furnished in the same way. The audience sat in front of the presenter who had a desk behind the podium where the computer was placed. The room layout meant that the Presenters had to move around and turn their back to the audience to press the keyboard. After three days of looking at the same behaviour it became very obvious that this was an interruption worthy to work with to find a better way.

At this point we felt that we had a problem to solve and an interesting technique to work with, so we decided to bring these two parts together. We came up with the idea of using gestures as an interactive tool for a presenter to interact with Power Point. We also chose gestures because they are one of our most essential ways of acting and communicating, and therefore a real challenge to work with. Our goal has been to design a product that lets a presenter interact through gestures during a presentation, while not letting his or hers focus be distracted by having to operate the keyboard of the computer. A question occurred and it became the one we wanted to work with; - Is it possible to design a gesture set, that a presenter can use to interact with the Power Point material during a presentation, without interrupting their natural presentation styles?

## 1.4 The Structure of the Thesis

We have chosen to write this thesis in a way that lets you as a reader follow our work step by step. How we started and what our next step was. We believe this is a good way to get you to understand our work. To give you a first glance of the content we have collected each chapter's most fundamental parts. This collection is thought of as a mind map, that we think can be a help to go back to and then more easily find the parts that are searched for. Chapter 2, 3 and 4 are chapters that give you an understanding of the most fundamental parts, which have been the boundaries of the project. Chapter 5, 6, 7, 8 are chapters where we write about the practical parts, which shows what we have done and the different ways we have taken for continuing the work. In chapter 9 we highlight the result that we have found and tie the whole work together.

Chapter 2, *Our Practice as Designers* is a chapter where we describe our way of working as designers. A practice that has one fundamental element; we work together with the future users for the entire duration of the design process. The future user helps us to understand the environment in which context of the user's activity takes place. Ethnographic studies and Participatory Design are fundamental approaches to our practice, they help us understand the activity and bring the user into the design process early on.

Chapter 3, *Helpful Limitations* is a chapter where we describe the two parts of the project that served as important limitations. The first part is the research project at the University of Queensland, where we got the idea of using gestures as an interactive tool. The second part is the Power Point program, which is the

presentation program we have focused on. These parts were fundamental because they were foundation stones in our project and have affected our work in many ways.

Chapter 4, *The Nature of Gestures* is a chapter where we are describing gestures, what they are and the different kind of gestures that exist. We explain the natural gestures that are gestures that occur naturally during speech and social interaction, and the “designed” gestures that are gestures that you learn to use and express to perform a task.

Chapter 5, *Observing Presenters in Action* is a chapter where we describe why we chose presenters to be the future users – our foundation stone, and how the presenters we observed delivered their presentations. We describe the difference between listening to a presentation and observing a presenter who delivers a presentation. This part was our ethnographic inspired fieldwork, we have personalised the original ethnographic methods to fit our work.

Chapter 6, *Gestural Workshop* is as chapter where we describe the two Workshops we held together with some future users of the conceptual device, which formed a key part of our work. The goal was to capture the participant’s ideas about gestures to use for communicating with Power Point presentations on the computer. We looked for gestures that were both usable and so easy to use during a presentation that they would become almost subconscious.

Chapter 7, *Testing the Gestures* is a chapter where we describe the test we did through using the gestures from the first workshop in a real classroom situation. We tried the designed gestures to see them in a realistic environment, for experience their usefulness and suitability.

Chapter 8, *From Gesture to an Event in the Computer* is a chapter built upon our basic thought that the interaction should be able to realise through software. We show our work for creating the understanding of how to realise the concept of gestures for interaction. This understanding has developed during our design work of future system, which we call *the Gestural Navigator Application*. We visualise the design of the system by; an overview of the concepts and the inputs; the support for the user to understand the different gestures; the different actions within the application. We are discussing the complexity we have discovered in the meeting between the two worlds, “real” and “computer”, and how to hide this complexity for the user to give them a feeling of smartness.

Chapter 9, *The End of the Journey* is a chapter where we close the circle and tie together the elements that create this thesis. We do this by revisiting the main question and discussing it. The elements that are discussed are; our practice as designers, the different kinds of gestures and their usage, together with the fact that we have done our thesis in Australia. This chapter can be read for getting an overall picture of the thesis content.

## 2 Our Practice as Designers

In this chapter we describe our way of working as designers, as we have learned from the education program we have studied at. We see ourselves as designers of an object that can be a concept, an artefact or a system. The object will be realised through software and sometimes even through physical materials. This chapter describes our work practice, which has one fundamental element; we work together with the future users for the entire duration of the design process. We believe that the process will produce a good design that fits the user's work practice. Our goals as designers are to make useful things. The future user helps us to understand the environment in which context of the user's activity takes place, with the aim to get an understanding of "the-real-world". Ethnographic studies and Participatory Design are fundamental to our practice. These approaches help us to understand the activity and bring the user into the design process early on. We choose between lots of methods to fulfil this mission.

We start writing about the kind of artefact we will design, then fundamental parts to reach the final artefact, thereafter our view of the design process and how we act within it, followed by our reflections of the methods we employ, finally how we think the practice will influence a design process.

### 2.1 The Kind of Artefact we will Design

In our future role as designers of new technical artefacts, we see that our way of acting and designing can make a big difference. Our goal is to design artefacts that suit the users and make their activity easier. In the beginning of the book *Through the interface* Susan Bødker writes; "... when the artefact is good I am able to forget that I actually work with a computer between the document and myself." (Bødker, 1991, p. 1) When you are able to forget and do not have to think about what you are doing, then you know you are using a well designed artefact. She writes further in her book that an action you are performing can become operationalized. This occurs when you no longer have to think about every step in your action to perform a task. For example if you are an experienced car driver, you do not have to think about what to do when changing gear. You are just doing it without any reflection, but you need the gearshift in order to perform the task. "... the user operates through on other objects or subjects." (Bødker, 1991, p. 1) This is what we want to achieve with our work, designing artefacts that the user uses and make their activity easier. The user should not have to think about how they are interacting with the object, instead concentrating on their main goal or activity. We want our artefact to mediate the work that the user seeks to perform. Instead of artefacts that are thought of as support that do not necessary make the user feel good about themselves, we want to design artefacts that both support the user and make them feel smart.

## 2.2 The Journey towards the Artefact

### 2.2.1 The Future User our Foundation Stone

The most important and fundamental part of our practice as designers is to work together with the future user. This practice is grounded in the Scandinavian Approach of participatory design. The goal is to design systems that both help the user to focus on their work and fit the environment in which the activity occurs.

*“The user-centred approach attempted to bring people back into the picture, putting emphasis on the need to develop systems that worked in practice, ...”* (Greenbaum, 1993, p.30)

There are many reasons for bringing the user into the design-process. The user is the source of the knowledge within the domain where a new system is to be introduced in the future. There are alternate exchanges of knowledge between the people who will use the system and designers.

*“... user’s gain more experience and knowledge about technology ... system developer and users get better at designing and working with appropriate prototypes; ... system developers do learn from the expertise of users – learning that in fact results in more workable prototypes and products.”* (Greenbaum, 1993, p.35)

The design has to fit in to the world in which it is supposed to live. A designer seeks to get an understanding of reality, which is the best possible basis for a design. (Löwgren & Stolterman, 1998) We believe this understanding has the potential to grow best with the user through direct contact, resulting in a design that fit the user’s practice. To be able to do this work it is necessary to find a representative user group. When working with a specific workplace it is easy to find a user group. However when working with a concept that has a wider user group, it is more difficult to reach users to work with. We have to get a group of possible users.

### 2.2.2 Ethnographic Fieldwork

To find out about users and their activities we use ethnographic fieldwork techniques derived from the social science, in particular anthropology. We start by going out to the place were the activity is performed, and communicate directly with the users. To get an understanding of the users activities there is a variety of methods, for example being a “fly on the wall”, participating observations, field notes, interviewing, video recording, documentation etc (Ely, 1993). A combination of these different methods helps us to create a good picture of the activity and the users within it. Just being in the environment gives designers a feeling for and understanding of the activities that cannot be created if they do not experience it.

### 2.2.3 Participatory Design

The fundamental principle of participatory design, is to let the users take an active part in the design process and let their voices be heard. They play a part in the decision-making regarding their future lives in a work place, instead of having other people make these decisions for them (Greenbaum, 1993). Several techniques have been developed to involve the user in participatory design, for example; Workshops, mock-ups, scenario building etc. (Holtzblatt & Jones, 1993). We see participatory design as an approach that includes different techniques to use to involve the users in the design process.

## 2.3 Design-Process - a Reflective Journey

The design-process starts when a designer is first briefed upon a new area to work within. A designer often begins with a vision of what to design. The vision grows to a picture of what to design. However it is important to remember that early visions of the design are just starting points. The formulation of the problem and the solution must grow parallel. (Löwgren & Stolterman, 1998) Even though early visions of the design are more fictive than reality, they have a big influence on the artefact that will be designed.

From a traditional software development point of view there are four phases that designers work with. These are roughly described as; analyse, design, implementation and testing. As the iterative system development methodology implies, the different phases recur throughout the whole design process. (Blum, 1996) We use these phases only as a framework to guide our process. Our approach is to see the design process as a fully dynamic process. It is not a linear process. The design-process is influenced by the future user, the environment in which the future product will work and by the prototypes developed along the way. “... *design as a process where we change our actions as we interact with the material world.*” (Bødker, 1991, p. 5) We believe the early picture of design shapes and reshapes during the whole journey. From the beginning designers have to refine, change and question the picture during the design-process. We describe this reflective phenomenon more in the next section.

### 2.3.1 Conversation with the material

Design processes are very complex. To get a result you have to try different moves. Sometimes your move gives you consequences that you did not expect or intend. This forms your next move and gives you new understanding. Donald Schön calls this *back-talk*, the situation talks back to you and you respond to it. You are having a conversation with the material. (Schön, 1983) Schön’s expressions of the concepts of “backtalk” and “conversation with the material” help us to achieve the dynamic design process that we strive for. We “take in” the surrounding and the things that happen around us. Further Schön says that as an answer to the situation back talk the designer does a *reflection in action*. We understand his expression as;

you are thinking about what you are doing while you are doing it, in such a way that it influences further doing. He also uses the expression *reflecting on* actions. By this he means when you stop and think back over the things you have done and try to understand what made you act like you did and what you have learned from it (Schön, 1996). We feel that it is important to reflect within our work. We see this approach as a foundation to be able to work in a dynamic process. Reflection involves both reflecting in a design process, but also stopping to think to get a new understanding and to learn from your way of acting and the result it conveyed. As designers we believe that a designer should ask questions of oneself and ask towards the answers. We find the suitable questions to ask during our conversation with the material.

The authors Löwgren and Stolterman describe design as a dialog with the situation and as an experiment in which we as designers must be good listeners and readers of the situation. In a process you must stop now and then and look at the material you have and assess that instead of just running ahead. Sometimes you even have to get back to the starting position to get new angles of approach. These thoughts help to create a dynamic design process, instead of a linear one.

To be able to let the material grow and be something useful it is important to get the user into the conversation with the material. It is good to create a possibility for the user to try the artefact, not only to reflect on it. (Bødker, 1991) In that way you can inspire new thoughts and identify important issues that can give your work a new direction.

### 2.3.2 The Power of Working in a Group

In a design process we usually work together with other designers and professionals. This creates the opportunity to share and even create new knowledge. It also gives us an understanding of the different professions. As group members we learn to show respect to other people and their knowledge. We create communities of practice in a team consisting of design professionals as well as users. A community of practice is a group of people possessing different levels of knowledge and skills. The group members' knowledge can also be of different kinds. Inside these groups knowledge is shared.

*“A community of practice is a set of relations among persons, activity and world, over time and in relation with other tangential and overlapping communities of practice. ... is an intrinsic condition for the existence of knowledge” (Lave & Wenger, 1991, p. 98)*

A person has different levels of status within the different groups to which he or she belongs. This status depends upon place and other members. Working together in a group helps facilitate the communication, which is very important in a process. Good communication prevents misunderstanding and makes the process proceed more easily. We believe that working together with different people gives you a better chance to create something good, as it increases the knowledge level. One person alone is powerful but two persons are together even more powerful.

### 2.3.3 Supporting Elements to Create an Dynamic Design Process

To collect the knowledge within an activity we consider video recording a good method to use, and a good way of taking notes. Video recording allows a designer to experience a situation more than one time, we have the opportunity to look at the same sequences as many times as we wish. It is possible to find new information each time the tape is being watched. It also gives the opportunity to alternate between macro and micro level of activity so that we as observers can concentrate and get deep into the parts we finds most interesting. In the normal life you do not have that opportunity. We see and hear what we do, the things we cannot understand or catches are things we will miss, unless we have other people to ask and discuss the subject with and maybe these people can explain it to us. By using videotape we have both these opportunities, to experience the activity via the “video-life” and the “normal-life”.

*“video provides access to conversation, gestures, expressions, actions and the immediate workplace context... It allows repeated viewing of the original data...this research technique supports the formulation of our understanding of natural activity.” (Jordan & Henderson, 1995)*

The content of the videotape can be used several times during the design process. The same tape puts on different ”faces” during the different phases within a process.

To concretize abstract thoughts writing, making documentation, scenarios, UML-diagram (Unified Modelling Language), working with pictures and figures are good and important ways to work with the material you have collected on your way through the design process. By reflecting on all the things you have done and putting them down on paper you increase your understanding of the work. You experience your work once more, and see the words grow on the page. (Ehn, 1994)

We see limits as positive. Constraints give the designer something concrete to work from. They help us constitute our starting point. Within work in real life there are always time-, costs- and frame-aspects that we never can change. These are nothing to blame, rather we should see these as things to work from and seek to do the best design as possible from the frame we received. (Löwgren & Stolterman, 1998) We have called this phenomenon *Trampoline*, because we see this as a take-off for further work.

## 2.4 Benefits of Methods and Techniques

*“A method provides a set of rules and guidelines that establishes a routine sequence of activities for accomplishing some task. It provides a direction for activity, it suggests paths for progressing from step to step within the method, it offers a model for organising knowledge and it constrains the activity.” (Blum, 1996, p. 274)*

We do not believe methods and techniques themselves are doing the work. They are "just" tools to use during a design-process, tools that help designers to establish what to strive for. We do think methods are useful, but the importance is how they are used and in what context. Whether designers prefer to use one method to another does not matter. We think it is possible to achieve similar result with different methods. The importance lies in knowing why we chose one specific method over another. There may be some methods that fit better in to some phases of design than others. But still, it is not the methods themselves that have these values, they are dependent on the context and how they are used. The methods are there to support the problem we want to solve. Their impact on the design process cannot be underestimated. They help us designers understand the environment we are supposed to work in, further more as they constitute the discourse within the design-process. The methods have even a bigger impact than appears at first glance.

## 2.5 Conclusions

There are many aspects of design practice to consider in order of achieving a good design. There is much to think of and to consider from different angles. In this chapter we have described elements of design practice that we are applying to achieve our goal, a good design. These are also the elements that make our practice special. It is important to realise that the use of the elements is dependent on the situation, sometimes you use all of them, and other times you just choose some. Every design process is unique in its own way. The users are not the same and maybe you are working in a new design team. To have many different elements to choose between and find strength in, gives us the opportunity to find a custom made solution.

Our practice gives us an understanding of what it is possible to achieve with computers and at the same time meet the users on their level and include them in the process. We believe that this will help us make usable objects that will fit both different purposes and situations.

During our project we have used different methods to understand and find a conceivable solution to the problem we have been working with. Later in this thesis you will be able to read exactly how we have used them and how they have helped us. It is important to clarify that we have personalised all of these methods, so that they fit our project. We have also used the information we got from each phase dynamically, which means that we for example used the material we got during the ethnographic inspired fieldwork during both the analysis and design phases.

## 3 Helpful Limitations

In this chapter we describe two of the fundamental parts of the project that served as important limitations. They were parts that we did not have any influence on as they were not within our control. These parts were fundamental because they were foundation stones in our project that affected our work in many ways. We start by describing the research project at the University of Queensland, where we got the idea of using gestures as an interactive tool. Afterwards we briefly describe the Power Point program. Finally we explain the connection between these fundamental parts and our project.

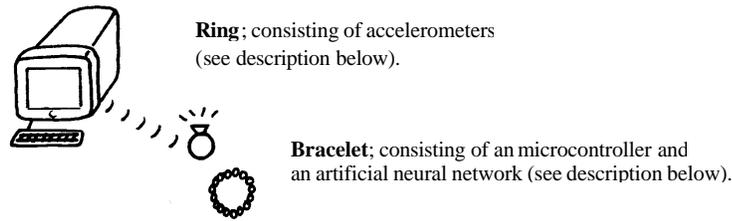
### 3.1 Gesture Project at the University of Queensland

We had the opportunity to accomplish our work at the University of Queensland. This chance led us to an interesting research project with the title “*Design of Naturalistic Gesture Based Input Appliance for Ubiquitous Computing*”. The research was within an area of new software architecture and interfacing devices. The research team members were building a unique wireless gestural input appliance that fitted into a wearable ring and bracelet. The test application for this gestural appliance would be a new type of navigation and selection tool. In a traditional graphic user interface (GUI) a mouse is used to open applications and drive menus. In their project one would use the gestural appliance to select another information appliance by touching or pointing, and make simple gestures in order to control the operation of the selected appliance. The gestural appliance was going to detect and cooperate with other input appliances such as speech and with outputs such as screen, printers, speakers and variety of other specialist appliances in the environment in an ad hoc network. When a valid gestural input had been detected, the appliance was going to select and control output appliances, such as screens, printers or smart custom devices. To fulfil this project there were researchers from three disciplines within the School of Computer Science and Electrical Engineering along with the School of Architecture. This combination gave the team members a wide range of disciplines from human interaction design to machine learning, product miniaturisation and software architecture development.

Their aim was to design and prototype a unique gestural input appliance for Ubiquitous Computing. The gestural input appliance was going to be a small, wearable device and take the form of a ring and bracelet.

#### 3.1.1 The Gesture Based Input Appliance

The gesture based input appliance aimed to be a simple wearable device that could be used for interfacing with various electronic appliances. The interaction between the user and the device was going to arise through a simple set of gestures. The user was going to wear a ring and a bracelet. The device was going to “communicate” to the computer that would then perform the event the user wished.



**Figure 1.** A simple sketch of the Ring and Bracelet device and a main computer

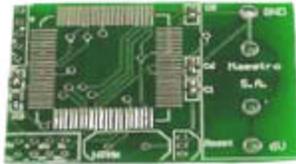
The appliance will only attempt to detect a small range of gestures from a gesture set (up to 7), reducing the complexity of the device. Importantly the gestural appliance would not rely on external devices such as cameras or target screens in order to detect gestures, meaning that the appliance could be used anywhere in wireless range, without regard to the human body's position or orientation.

### 3.1.1.1 Accelerometer, Microcontroller, Artificial Neural Network

We will continue by describing the different elements of the device; accelerometer, microcontroller and artificial neural network. All these elements are required to build the device system. We will then describe exactly how the system worked.

It was possible to use other types of elements to realise the system. In this thesis you can read about the parts that the University of Queensland research team has decided to use.

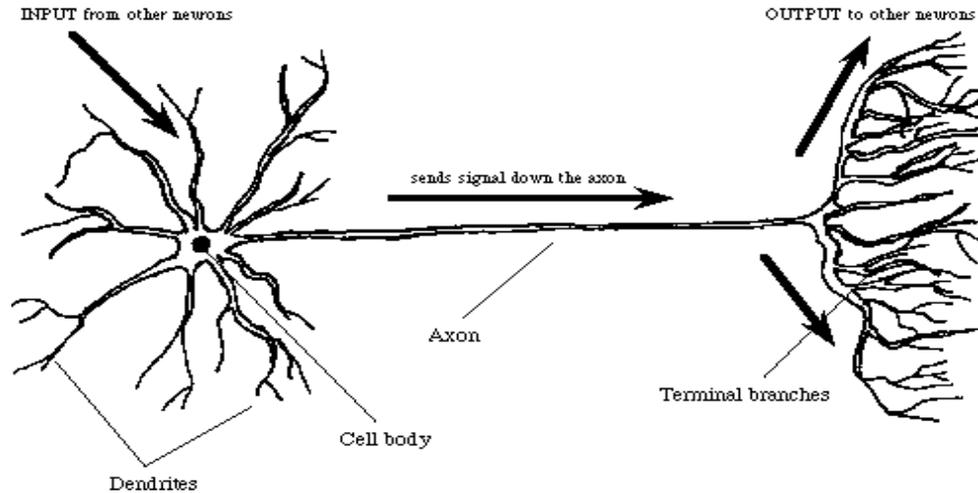
**Accelerometer**; an accelerometer is a sensor that measures acceleration in various directions. An accelerometer produces an output proportional to this measurement. One accelerometer can presently only produce measures in one or two dimensions.



**Microcontroller**; a microcontroller is a small computer with a variety of functions that allow a user to input signals from sensors, process them and output them to a range of sources. The microcontroller used in the project executes a program that inputs data from the sensors, performs gesture recognition calculations and then sends an output to the main computer.

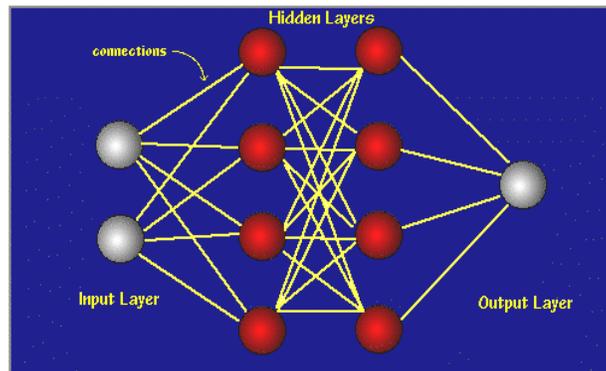
**Artificial neural network**; an artificial neural network is a mathematical paradigm created in an attempt to imitate the learning ability of the human brain. In biological systems, learning occurs through the adjustment of the synaptic connection between neurons, to increase or decrease in strength. The picture below is of a single human neuron; a simple model of this neuron is to view it as a unit that accepts various inputs, sums these according to a set weighting system and

produces an output relating to this. Some inputs are given more weight than others depending on their importance, these weights can be adjusted to allow the output produced by a particular set of inputs to be changed and hence the neuron to 'learn'.



**Figure 2.** Simple neuron, (Loder C, [01/05/01]).

Neural networks attempt to imitate the human brains method of learning and are hence used in a number of areas including pattern recognition for their ability to 'learn' and 'generalise'. A neural network consists of a number of layers, an input layer, an output layer and usually multiple hidden layers in between, which you can see in the figure below.

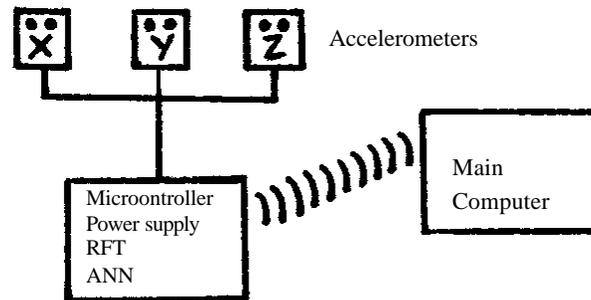


**Figure 3.** Neural Network block diagram, (no author, [19/04/01]).

### 3.1.1.2 How the Device System will Work

The physical device has the form of a connected ring and bracelet and will communicate wirelessly with surrounding electronics. The system was designed to consist of two accelerometers, one microcontroller, a power supply, Radio

Frequency Transmitter (RFT) and an artificial neural network (ANN). The accelerometers detect each gesture as 3 dimensional acceleration data. The output of the accelerometers is then connected directly to a microcontroller that reads the signals. Using a neural network this data is then processed and the corresponding gesture identifier produced. After the gesture identification is processed within the network a wireless signal is then sent to the main computer. This process takes a few milliseconds.



**Figure 4.** A model of the parts within the future system

Due to the limits on communication between devices it was not feasible to send all the information back to the computer to be processed. Instead, if the aim was to achieve a real time response it was necessary to do the majority of processing on the onboard microcontroller using the neural network. The microcontroller therefore needed to be fast, small, low powered, have lots of memory and to have the fast multiply instruction necessary to implement an artificial neural network.

Gestural data is widely varying amongst different people and even amongst that person themselves. When asked to wave a person never manages to wave exactly the same way twice. The neural network is ideal for generalization purposes as it ignores small errors in inputs, making it ideal for gesture recognition purposes.

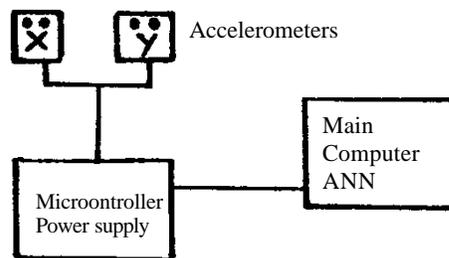
### 3.1.2 The first Experiment

A first experiment was done at the beginning of the project. The experiment-prototype contained one accelerometer, one microcontroller with power supply and one artificial neural network (ANN).



**Figure 5.** The first experiment-prototype of the Ring and Bracelet device

A hardware prototype was made, code to interface the sensors to the microcontroller written, and neural network learning begun. In the first experiment-prototype design the future ring and the bracelet device were connected via a 5-wire cable through which power and acceleration data was passed, and there was also a wire connection to the main computer.



**Figure 6.** A model of the parts within the first experiment-prototype.

The first step was to provide a solution to the problem of obtaining and transferring gestural data to a computer where it could be processed. To accomplish this step the neural network and the wireless part of the project were ignored to simplify the problem. As the device was meant to interpret naturalistic gestures rather than require the user to make precise movements, the level of accuracy in each movement was limited even before the data was measured.

The difficult part of the first experiment-prototype was designing a microcontroller board small enough to fit into a wearable watch while containing all the functionality needed to develop the device.

### 3.1.3 How the Gesture Based Input Appliance Project has Affected our Work

It was from the *“Design of Naturalistic Gesture Based Input Appliance for Ubiquitous Computing”* project we got the idea to research the possibility to use gestures as an interactive tool.

Early in our project we had a meeting with other members of the development team of the gestural identifier appliance. We got to see the first experiment-prototype they had built. They also explained to us the future design of the device. Ever since that meeting we have had that picture of the device in the back of our head. During our design process we kept this picture in mind. We did not feel that

it in any way restrained us; we saw it more like a guide on our way of designing the gestures. The fact that the device had a predetermined design supported our practice as designers. As we have described earlier, limitations can increase the creativity and help a designer to think more widely within the focus and concentrate on the important design issues of the time (chapter 2). The fact that the device was a ring and a bracelet made us focus on hand gestures. We used the predetermined design as a “trampoline” to start our work with gestures. (Löwgren & Stolterman, 1998) During the whole project we were aware of the devices’ technical performance capability. This gave us a feeling of security and helped us focus on the designing of gestures. We knew that it technically would be possible to perform gestures to interact with computers.

We thought that the ring and the bracelet would be finished to use within our visit in Australia. The fact that this not became reality has affected our work in that we never had the opportunity to try the device during our work.

## 3.2 PowerPoint

PowerPoint is a software program from Microsoft Corporation. It is one of the programs from the Office package. To be able to use the program a license or the program must be bought.

The main purpose of PowerPoint is to show slides during a presentation. It is similar to the older technique with overhead slides. The big difference between the two techniques is that PowerPoint is computerised. The users can choose between designing their own presentation or taking advantage of the already existing templates that come with the program. There are a lot of different functions and layouts to choose from. The users have the opportunity to design their own layout. In both cases the user writes the text and eventually puts in some pictures and/or figures. The more experienced a user is, the easier it is to choose from all the different possibilities that PowerPoint offers.

The slideshow must be turned on at the time when the presenter delivers the presentation. The presenter can choose between many different ways to change slides, e.g. by using a remote control, wireless mouse or the keyboard. Pressing the space key or the keys with arrows changes the slide. There are also more alternative ways to change slides in Power Point by using other key combinations.

### 3.2.1 Power Point Affected on our Work

In the same way as the gestural device hardware affected our work on designing gestures, Power Point framed our usage domain. Within this frame we found a user group and a context in which the device would work. The structure of Power Point contributed to our choice to design gestures for the interactions to change slides, because the program is built upon using slides during a presentation. The frame also conveys that some people have been excluded. These are the people that never use Power Point because of, for example; different computer brands or personal opinions about how a presentation should be performed.

Power Point seems to be a closed system, from a redesign point of view. We searched technical solutions to manipulate the application, but could not find any low-level solution for interacting with the Power Point application. This fact has also affected our work and put up a limit that we unfortunately could not get through. Because of this we were not able to implement our introductory designed software. Even though we did not have the time to work further with this matter, we do have a design that can be used for realising the system (chapter 8).

### 3.3 The Surrounding Parts' Influence on Our Work

Knowing that we worked with a real concept, that in the future could lead to new interfacing devices and software architecture, influenced on our way of acting as the designers in our project. The real concept gave us a feeling of security, knowing that the gestures that we would design would be recognisable for the device and would enable it to interact with computers. It also raised curiosity into our minds. We felt that gestures were something interesting to work further with and we wanted to do some more research in the area. The fact that we saw the first experiment-prototype of the gestural based input appliance and got introduced to the technical elements that would create the device, gave us a practical understanding. We got a physical picture of the ring that stayed in our minds and helped us during the whole project. Regarding Power Point we already had this practical knowledge and a picture of the software and its usage area.

## 4 The Nature of Gestures

In this chapter we are going to describe what gestures are and the different kind of gestures existing. Our focus is on natural gestures and “designed” gestures. Natural gestures are gestures that occur naturally during speech and social interaction, while the designed gestures are gestures that you learn to use and express, often to perform a task.

First we describe what gestures are, followed by a brief background of the research area, thereafter we describe the natural gestures and the designed gestures. Finally we will give you our view of how gestures are connected to our project.

### 4.1 What are Gestures?

*“... by gesture I understand a conscious or unconscious body movement made mainly with the head, the face alone or the limbs, learned or somatogenic<sup>5</sup>, and serving as a primary communicative tool, dependent or independent from verbal language; either simultaneous or alternating with it,...”* (Poyatos, 1981, p. 375)

This quotation describes Poyatos explanation of gestures as a body movement, which can be expressed in many different ways and be used in many situations. The movements expressed can be either extensive or minimal, depending on the situation. An extensive gesture is wide and large compared to a minimal gesture that is a smaller one.

Some gestures are used consciously and it is often obvious from the way that they are expressed. These gestures can for example be sign language or a sign that a cyclist does to interact with others in the traffic. They can be both extensive and minimal. Meaning of these gestures is commonly understood from the gesture itself in the appropriate context of use.

Other gestures are simple movements of hands and arms that you see when people are talking. Although these gestures may appear to simply be arms waving around, movement that does not mean anything on its own. If you look a little bit closer you discover that this is not the case. Gestures have a deeper meaning and symbolise things on their own. The gesture is a symbol that represents something – the hand can take the role as a character. For example if you talk about trees, the hand can take the role as a symbol for the tree. The listener can see when the hand “becomes” the tree rather than just a hand. Another example is that when you tell someone that everything is okay, often putting a thumb in an upright position can do this. These are examples of minimal movements, the actor is just using the hand to express him or herself.

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<sup>5</sup> **Somatogenic**; arising within the body, comes from Greeks *soma* that means body. Originating from the cells of the body, originating from the inherent capabilities of the body.

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## 4.2 Brief Background To the Research Area Focused on Gestures

The interest and studies in gestures are very old. The earliest literature found in the area goes back at least two millennia. The original interest was mainly in rhetoric, not with the gestures as the main focus. The first book with focus on gestures as a part of the rhetoric was written in 1644 by Bulwer. After that more and more authors became interested in the area of gestures, but still the focus was on gestures that could be designed in advance to accompany rhetoric. It was not until 1941 when David Efron described his research in spontaneous gestures accompanying speech, that the research area took another direction. His work observed gestures in “real life”, when people were talking. Unfortunately his work was limited by technical factors so the results were presented in hand made sketches and therefore the linkage to the speech was both hard to observe and achieve. (Kendon, 1981 and McNeill, 1992)

Scientific interest in communication between people took a new turn after the Second World War. The inspiration came partly from the information theory<sup>6</sup> and cybernetics<sup>7</sup>. During this period communication was distinguished into two parts, the linguistic and the paralinguistic. Gestures were part of the paralinguistic, and stood beside the language. In 1974 McNeill made a great discovery when he was watching his three year old son and realised that our language is both verbal and gestural and instead of standing beside language, gestures are a part of it. (McNeill, 1992)

David McNeill has done a lot of research and publishing in this area. We find his thoughts about gestures and speech coming from the same process and being closely related to each other very interesting, and we agree with him. We have therefore used his book, *Hand and Mind* as a starting point in our own work with gestures. We are using other authors’ work as well to get a wider perspective and understanding.

## 4.3 The Natural Gesture

We will continue with describing the natural gestures by writing about Illustrators and Emblems, which are an old classification of natural gestures, these classifications are used by many writers, e.g. Efron; Ekman & Friesen; Kendon and

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<sup>6</sup> **Information theory**; a theory that deals statistically with information, with the measurement of its content in terms of its distinguishing essential characteristics or by the number of alternatives from which it makes a choice possible, and with the efficiency of processes of communication between humans and machines.

<sup>7</sup> **Cybernetics**; the science of communication and control theory that is concerned especially with the comparative study of automatic control systems (as the nervous system and brain and mechanical-electrical communication systems).

Morris. Illustrators are gestures that occur during speech to strengthen your message both for yourself and the listener. Emblems are gestures that occur in a non-verbal communication, e.g. you shake your head to say no. Morris describes emblems and illustrators in the following way:

*“Illustrators are those actions which accompany verbal statements and serve to illustrate them. Emblems are actions which replace speech and can act to substitute for verbal statements.”* (Morris, 1979. p. xx)

As we have stated, some gestures occur during speech and others exist in a non-verbal situation. McNeill has discovered that gestures most commonly occur during speech. He has about 100 hours of recorded narratives, and during these tapes only one listener made one gesture. Further McNeill has discovered that 90% of all gestures that a speaker does occur when the speaker is actually talking. The other 10% of the gestures the speaker does are, for example, to answer a question just by moving the head up and down, or by pointing towards a place to answer a question about where something is located.

In the beginning we focused on the Illustrator-gesture and used McNeill’s way of describing them. He has separated these gestures into five different categories. There are other authors that have chosen other categories of Illustrator-gestures, but their explanations are very similar to McNeill. We chose to focus on his five categories of the Illustrator-gestures to provide a deeper understanding of the natural gestures that occur during speech. In the next part we describe his classification.

### 4.3.1 The Kind of Illustrator Gestures that Exists

According to McNeill you can group Illustrator-gestures into five different categories. This means the gestures that we use during speech occur in five different ways, even though some of the gestures for the eye tend to be the same. The categories he talks about are; Iconics, Methaphorics, Beats, Cohesives and Deictics. We explain each of them below and give a short example of their meaning.

**Iconics:** these gestures bear a close formal relationship to the semantic content of the speech. *Example:* You talk about a special subject and use gestures to strengthen or emphasize some of the things in your discourse. E.g. when the word background occurs, you do a movement backwards with your hand.

**Methaphorics:** these gestures depict your discourse in more than words. The hands often present an abstract idea. *Example:* You talk about a house that you like and to elucidate your image you gesture the house with your hands.

**Beats:** During these gestures the hand moves along with the rhythmic pulsation of the speech. These gestures have two different states, e.g. in/out, up/down. *Example:* You do a counting movement with your hand and fingers, one, two three, four ...

**Cohesives:** These gestures tie together thematically related but temporally separated parts of a discourse. *Example:* Two parts in a story are connected but

occur on different occasions. You describe your house and all the different rooms that you have in it and where you keep your favourite possessions.

**Deitics:** These gestures are used to point out something or somebody, either abstract or concrete. *Example:* You use your index finger to point out a spot on a whiteboard.

### 4.3.2 Growth Point – where the Gestures Start

*“It is, theoretically, the utterance’s primitive stage, the earliest form of the utterance ... The growth point is the speaker’s minimal idea unit that can develop into a full utterance together with a gesture.”* (McNeill, 1992, p. 220)

McNeill uses the Growth Point to describe the beginning of the speech-process, which starts when a person begins to think of what to say and ends when the expression is made. The Growth Point is not something that we think of consciously in our daily life. The Growth Point is an expression McNeill uses to describe how speech starts and grows together with gestures to a full utterance. It is a theoretical way of describing the process. McNeill intends that words and images is the Growth Point of the speech-process. The utterance is complete when the words and sentences are expressed together with gestures.

People who intend to talk always have to think first, even though you not always are aware of it. In some way you have to “organise” your thoughts before you start to speak. The speech is not necessarily uttered in the same order that it has been developed. These are underlying thoughts for McNeill’s expression the growth point.

*“The concept of a growth point arises from the realization that a given utterance does not just ‘snap on’ with all its structural details fleshed out. It develops in a certain order. This order is not necessarily the order in which the words appear in the surface utterance, and the starting point is not necessarily the first word to be uttered. The underlying starting point of the sentence is what I refer to as the **growth point**.”* (McNeill, 1992, p. 219)

A person does not think about what has to be developed first, the sentence or the gesture. Nor does he think deliberately about the growth of speech or having to use gestures to accompany speech. People just act the way they do, in a way that feels natural. For example, there is a lot of work done before you can deliver a presentation. The presenter has worked with the material before a well-performed utterance can be given. It does not just come to you during your presentation. The work starts at one point and grows until the speech has been uttered. The gestures are different in that they are situated and come to the presenter when he or she is speaking. A presenter expresses herself with both words and gestures. She thinks about what to say, but in general without preparing the gestures.

### 4.3.3 The Relation - Gestures, Speech and Thoughts

The different gestures just described are an integral part of language as much as the words, phrases, sentences and thoughts. If we just saw the gesture we would probably have difficulty understanding what the speaker wanted to convey. We need speech to understand gestures otherwise the gestures can lack an outer kinesics<sup>8</sup> form. Different kind of gestures can support the same sentence, because the gestures are schematic, reflective of context. Without thinking people choose the most proper gesture. At the final stage, when there also is speech, the gestures takes on theirs kinesics form. (McNeill, 1992)

As gestures and the language are one system, it is understandable that they are developed from the same thoughts. They have the same origins. They work well together, and when speech and gesture differ, they complement each other rather than clash with each other. For example, when a person is uncomfortable their posture and facial expressions portray that they are uncomfortable about the words that they are speaking. Gestures and speech express different dimensions of the same thought. (McNeill, 1992) In the end, when a person is speaking, the utterance becomes a combination of thought, speech and gesture. *“The sentence structure is the verbal version of the gesture thought.”* (McNeill, 1992, p. 250) Further he writes that gestures occur because they are part of a persons ongoing thought process. He argues that gestures affect thoughts in particular because thoughts are shaped by the context. Gestures help the speaker to convey the message, as the gestures also make it clearer for the speaker. They help the speakers to shape their thoughts. *“Gestures do not just reflect thought but have an impact on thought. Gestures, together with language, help constitute thought!”* (McNeill, 1992, p. 245) It is common to use gestures when you a talking in the phone. We see these gestures mainly as gestures that occur to shape ones thoughts.

As a speaker actually conveys messages; the thought, speech, and gesture has been developed during a temporally extended interval. The structure of the thought, language and gesture changes during this interval from internal to external. How it changes depends upon what happens during the speech.

## 4.4 The Designed Gestures

We have chosen the expression “designed” gestures for the gestures you use to perform a task. These are the pre-determined gestures that you have to learn. You are always aware of when and why you are using the designed gestures.

Sign Language is one example of designed gestures. Sign Language is an old way for deaf people to communicate and make them selves understood. They use their hands to form signs or gestures of different kind depending on what they want to express. One hand posture can signify a letter or a whole sentence. You shape your hand in a way that gives utterance to what you want to say. The audience or listeners understand you because they know the signs. Sign Language works well and is used all over the world in different ways. The sign languages are well-

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<sup>8</sup> Kinesics; body movements which convey information in the absence of speech.

elaborated expressions that you have to learn how to use. (Kendon, 1981) In the American Sign Language the prevalent form of signing consist of a unilateral or bilateral series of movements usually involving the whole arm. (Mulder, 1996) A conversation in Sign Languages can be understood simply by looking and interpreting the gestures, whereas a conversation with natural gestures is predominantly understood by listening and further augmented by looking. (Armstrong, 1995)

Other examples of designed gestures are; when you are out cycling and plan to turn you use your arm to signal to the other road-users. This is a learned gesture that you express to perform a task. A similar example is when police officers stands on the road and give signals to car drivers. This actually happened during our visit in Australia, when we had been to an Australian football game. Policemen stood in a traffic crossing and directed the car drivers on the road, with a special torch while we together with 25 000 other people walked from the arena on the footpath towards the train station. They used designed gestures for a specific purpose, and the drivers could understand them simply by watching.

Designed gestures can be both extensive and minimal. It depends on the situation. Sign Language can both be expressed with one hand or by using almost the whole body. This way of acting can be found in most peoples' way of using designed gestures. When a police officer is gesturing toward car drivers there would be more extensive gestures, than if the same officers are writing a bill and wanted the driver to sign a document. The latter gesture would probably be a more minimal one. It is the situation and the person that determine whether an extensive or a minimal gesture is most appropriate.

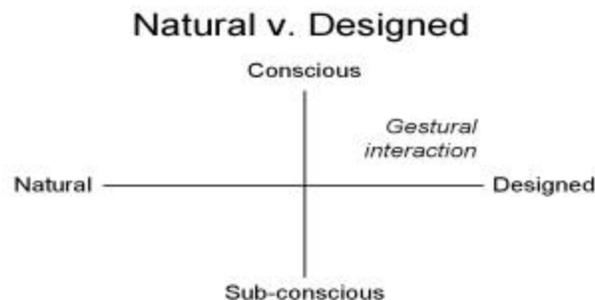
## 4.5 The Challenge of Designing Gestures for Computer Interaction

As we have described in this chapter, we have separated gestures into two kinds, natural or designed. The figure below summarises the differences. Natural gestures occur during communication between people. They help the speaker to be understood as well as helping the speaker to develop what they want to say. Gestures usually occur within a conversation, but can also occur during non-verbal social interaction. Natural gestures are learned in a social context, and they are enculturated. Designed gestures are the ones that people are aware that they are using. They are expressed with a specific purpose. They allow people to perform tasks such as; communication in sign language or directing traffic. Designed gestures are conscious actions, in the beginning when you are learning them. However, with practice they become "second nature", such that you do not have to think when using them. This is what Susan Bødker refers to as actions that have become operationalized. (Bødker, 1991)

| A Table of Gestures              |                                    |
|----------------------------------|------------------------------------|
| The Natural                      | The Designed                       |
| Arise in speech                  | Pre – meditated                    |
| Communication with people        | Communication to perform a task    |
| Not “learned”                    | Learned                            |
| Variable/ad hoc                  | Repeatable                         |
| <b>Socialised – Enculturated</b> | <b>Conscious – Operationalized</b> |

**Figure 7.** Table of Natural verses Designed Gestures

If a computer could be programmed to interpret and understand naturally occurring gestures, it might be possible to use these natural gestures in communicating with computers. An alternative approach is to design a set of gestures to be used to direct the computer to perform specific tasks. If the designed gestures are similar to naturally occurring ones, then the interaction design problem that arises is how we can distinguish the designed gestures from naturally occurring gestures. This is one of the design issues in our project. We also studied if it is possible to design gestures that people can use and still find them so easy that the gestures become almost second nature, like changing gear in a car, a movement that you do without being aware of doing it. We are curious of the future users’ opinions of what are most useful and suitable for Power Point presentations.



**Figure 8.** Axis of Natural verses Designed gestures and their consciousness

In the beginning of our work we thought that the gestures we were going to use for interaction would be natural. Along our journey we found that it was more designed gestures than natural ones that we would work with. We also found that they were more conscious than sub-conscious. The designed gestures are used intentionally to perform a task, compared to natural ones that most often occur when accompanying speech. These are the reasons that we have chosen to focus on the designed gestures. This was not totally clear in the beginning, it grew during the whole work.

Although there is quite a lot of literature on gesture detection devices, little attention has been paid to how to design gestural interaction for communication with computers. In spite of this we found it very interesting to do this kind of project and research the possibility to use gestures within the computer world. We have kept the information from the entire literature that we have read so far in our mind, while we design gestures that feels natural for people to use during their presentations.

## 5 Observing Presenters in Action

In this chapter we describe why we chose Presenters to be the future users – our foundation stone, and how the presenters we observed delivered their presentations. We describe the difference between listening to a presentation and observing when a presenter delivers a presentation. This ethnographic inspired fieldwork, has its basis in qualitative research methodology (Ely, 1993). We have personalised the original method to fit our work. This chapter presents our observation and analysis of three presentations. It also describes how this work contributed to the project.

### 5.1 Why Presenters?

Our curiosity was aroused during the Australian User Interface conference where we saw many different presentations. The researcher talked about new technology and they talked very quickly, often with an Australian accent. As a result we did not understand all the information they presented, which instead led us to observe their way of interact with the computer and information material.

Of the 17 different presentations we saw, almost everyone had prepared the information using PowerPoint software. Only one person did not use PowerPoint, instead choosing to use overhead slides. The room where the presentations took place looked like most seminar and lecture rooms do. There was one screen at one side of the presenter, in front of the audience who could easily see the screen. In the front of the room there also stood a table. A desktop computer was placed on the table, and every presenter that used a laptop placed their laptop on the table as well. The fact that the computer was placed behind the presenter meant that they had to turn around in order to interact with the computer. We saw that different presenters had their own ways of interacting with their material. The most common behaviour was Presenters having to turn around to press the keyboard when it was time to change slides or move to another software application. This movement resulted in interrupting the presentation and the flow of speech.

When we returned to the University after the conference it felt like a seed had been sown. It did not take long before we decided that this was something we wanted to work with. We had talked about a lot of different ways to solve the problem. The presenter could easily use a wireless mouse to minimise interruptions. The room could also be furnished in another way. We felt like there were a lot of solutions, but none felt like “the best” solution to support the presenters.

At this time we decided, that this was the problem we wanted to work with and also that we wanted to research if it could be solved with a gestural interface.

### 5.2 Study with a purpose

Our next step was to bring different observational methods to the study of presenters delivering presentations. We wanted to develop a descriptive understanding of the presenter’s way of addressing a presentation and how they

interacted with their computer. (Blomberg, 1993) We think that one good way to get a deep understanding of what the presenters are doing is both to watch them and also to be a presenter on your own. Blomberg describe two extremes of observations. You could take the role "*the fly on the wall*" or be a "*participant observer*" (Blomberg, 1993, p. 130-131). Our focus was on how the presenter interacted with the material, computer and the audience. We looked to see which gestures they expressed themselves with. This was to understand the Nature of Gestures, to see gestures in a real world situation. We hoped for a deeper understanding of all the literature we had read about gestures. We deliberately chose not to focus on the content of the presenter's speech. This was necessary because it is not possible to do everything at a time. As Blomberg has written " ... *must decide what to observe, ... when, ... where, and when it is enough ...* " (Blomberg, 1993, p.132).

### 5.2.1 Our first subject - Ben

Ben McGarry was our first study subject. He delivered a presentation about his PhD-work *Developing a Descriptive Framework of Design Interactions*, it was the presentation he would later do as his PhD confirmation seminar. We wanted to videotape the whole presentation, which was possible because Ben had nothing against us videotaping him. There were many reasons that we used video as a tool, e.g. it gives us an opportunity to afterwards clarify misunderstanding after the event (Blomberg, 1993). Video can also introduce problems as well, e.g. the subject that is going to be videotaped may feel uncertain when the camera is focused on him. We do not think this was a problem with Ben. He seemed to be totally relaxed and did not get disturbed by the video camera. The presentation took place in a conference room. The room is designed for 20 people and has an oval table, a screen at one end and a computer beside the screen. We placed the camera beside the table on the right side (outside the picture).



**Figure 9.** Conference room

We took field notes about the different gestures that Ben used during his presentation, and his way of interacting with the computer.

Ben expressed himself with a lot of different gestures. He also used the same gestures several times. During his presentation he switched between holding a paper report in his hand and putting it on the table. Whether he held the paper or

had it placed on the table affected his way of expressing himself. The gestures turned out to be wider and bigger when he had the hands free. When he held the paper he gestured with the paper report. Ben moved a few steps forward and backward during the presentation. He interacted with the material both with words and gestures. Most of the gestures Ben used could be placed in any of McNeill's categories (chapter 4). We will give some example of the gestures Ben expressed himself with using McNeill's categories.

Ben often used the so-called *Beats*-gesture. He did it by using the paper-report, which he snapped towards the other free hand. He used a *Metaphoric* gesture to describe a two dimensional graph. Ben used his index finger to illustrate a visual graph, by moving his finger in the air – upward and towards the sides. The *Iconic*-gesture occurred a lot during the presentation. Once when he talked about philosophical verses phenomenological perspectives, he moved his right arm together with the paper report widely reaching from one side to the other. You could “see” the visual axis in the air. The *Deitic*-gesture occurred when Ben talked about his research work and had a timescale in the Power Point presentation on the screen. He pointed towards the screen with his hand. Finally he also used the *Cohesive*-gesture, like all of the others, more than one time. Ben shaped both his hands into a ball and moved his thumbs towards each other alternating with moving his little fingers in the same way. After this gesture he moved his right arm towards the side. This gesture was made to describe a designer using a gesture that was supposed to be captured by a design tool. While Ben did the gesture he said: “*designers ... the way they sculpt the air with their hands has a direct correspondence to the features with the object for the product to the designer ...*” (McGarry Ben, Videotape 2 at the 16<sup>th</sup> of February 2001) It looked like Ben was thinking when he explained this, and it seemed to us that he used the gestures both to help us in the audience to understand as well as to strengthen his own thoughts.

### 5.2.2 Trying ourselves – to get our own feeling

We felt it would be useful to deliver a presentation ourselves. This would help us to think about the new knowledge that we had read in the literature and what we had seen from the other presenter, Ben and the presenter at the Conference. We developed a small presentation in PowerPoint. The subject we talked about was picked from David McNeill's book *Hand and Mind* and Caroline Hummels' PhD-work titled *Gestural Design Tool*, books about their work with gestures. We presented together. This was one of the first times that we delivered a presentation in English. The presentation was in the same conference room as Ben used (see the picture in the previous figure). We did not have any audience. We saw this as a way to get a deeper understanding of how people use and express themselves with gestures. We videotaped the presentation as a way for us to look at our way of acting, to have the opportunity to analyse our way of expressing our self with gestures and how we interacted with the computer and each other. One difference between the other presenters and us was that we delivered our presentation together and we did not have an audience.

During the presentation we mostly used the gestures that McNeill calls *Deitics* and *Iconics*, e.g. Caroline used the *Deitic* gesture once when she talked about the two of us, she pointed to Anette when she said her name and vice versa when she said her own name. Anette used the *Deitic* gesture when she talked about the two books the presentation was about, she pointed towards the screen where the titles and authors name stood. Anette used an *Iconic* gesture when she was talking about McNeill's research that speech and gestures are one together with the thought process. When she said "*thought process*" she gestured towards her head. Caroline used the *Iconic* gesture when she talked about the experiment that the researcher Hummel did. The experiment was about people making gestures without speech to get themselves understood. When Caroline said, "... *sketches things with your hand ...*" she did some gestures in the air that could be understood as sketches.

At one time Caroline made an emblem gesture, when she wanted Anette to change slide on the computer. Caroline did a sign in the air, unfortunately Anette did not see that sign. She understood it first when Caroline was on her way to walk to the computer, then Anette looked at her and noticed the sign. It was a movement with the hand in the air.

We did not use all of the gestures that occur during speech. This could be due to the fact that we delivered the presentation in a second language and not our first language.

### 5.2.3 Our second subject - Margot

We watched Margot once when she talked mainly about "*Design of Naturalistic Gesture Based Input Appliance for Ubiquitous Computing*". The presentation was delivered during a research seminar in the same conference room as Ben and we used (see layout earlier in this part). She did not use Power Point. Instead she used the different programs she had on her laptop. She moved from an e-mail program to Photo shop and Internet during her speech. Her interaction with the computer felt natural. She had the laptop at the left side almost behind her and that made her walk back and forward.

It was interesting to see her presentation as it was very different from the "normal" way of delivering a presentation, when using a computer. By normal we mean the way we have mostly seen presentations, the material being collected in a PowerPoint presentation. Even though her way of putting together the information material was atypical, her way of delivering the presentation was very typical. She used the same gestures and expressed herself with the same body language as we have seen with the other presenters, e.g. Margot used her left arm and pointed at a document on the screen, while she was reading the content of the document. This is the gesture that McNeill calls *Deitic*. Margot used the gesture McNeill classifies as *Iconic* a lot. For example, she moved her hands and snapped her fingers in the air as she typed in text on a keyboard, as she was discussing the problems of interacting with computers simply to do mundane tasks. These are some examples of all of the different gestures that Margot expressed herself with during her presentation.

### 5.3 Reflections on the Ethnographic Inspired Fieldwork

The ethnographic inspired fieldwork gave us a foundation to continue our work. The fact that we observed presenters after we had read about gestures gave us a deeper understanding of gestures. We see this as our basic foundation. It was our starting point to understand what kinds of gestures presenters are using and how they act. In the same way that McNeill's express how speech, gesture and thoughts starts from the *Growth Point*, we see the ethnographic inspired fieldwork together with the literature as the Growth Point for this project.

It made a big difference to watch a presentation with a chosen focus compared with listening to a presentation to understand the message that the presenter wants to convey. Our focus was to see how the presenter interacted with the computer and how the presenter expressed herself with gestures. Our choice to observe presenters and act as presenters ourselves turned out to be a good choice. It gave us material we had not thought of before the observation, e.g. that Margot used the gestures in a similar way even though she delivered her presentation without using Power Point.

Our choice to deliver a presentation with the goal to understand the literature and other presenters way of acting, did not give us result that we can clearly articulate. It gave us an understanding and feeling of the area. It is possible that the fact that we held a joint presentation influenced our experience of how a presenter acts and expresses them self with gestures. We do not think this is any problem though.

By Margot's way of acting we got insight into one different way of delivering a presentation, and that is something we would like to support. We would prefer not to design a device that forces a presenter to use Power Point. It would be good to be able to support Margot's way of delivering a presentation. This was not possible for us though, because of the 20 weeks limit we had to carry out our project, we had to put up some delimitation.

During this fieldwork we started to think that maybe it would be necessary for the Ring and Bracelet-device to have an on/off-function. Otherwise the presenter might feel inhibited from expressing herself. As an example of this we will describe two extreme scenarios; imagine a presenter that stands still and only gestures in order to interact with the computer, for fear that the computer could misunderstand. Such a device would not be very much help to the presenter, and just imagine how it would feel for the audience. The opposite scenario is that a presenter gestures normally but the Ring has difficulty discerning the different gestures. The result could be a slideshow you would never forget!

It became even clearer that the room layout has a big impact on a presentation. It influences the presenter's way of acting and moving. This is one interesting aspect that we had to decide not to study, because it is a big problem of its own and it would widens the scope of the project too much.

## 6 Gestural Workshop

We held two Workshops together with some future users of the conceptual device, which formed a key part of our work. The goal was to capture the participant's ideas about gestures to use for communicating with Power Point presentations on the computer. We looked for gestures that were both usable and so easy to use during a presentation that they would become almost subconscious. At this stage we did not know where on the Natural versus Designed axis the gestures would be (chapter 4). In this chapter we are going to describe the two workshops we carried out. We begin with a description of our preparation before the Workshops, our thoughts in choosing the participants and room. Finally we describe the result from the workshops and highlight the most interesting parts.

### 6.1 Our thoughts before the Workshops took place!

The most important reason for choosing to have Workshops was that we wanted to give the future users of our concept a voice. We wanted them to play a big part in the design process. The future users are important and to get as much as possible from them, we planned and discussed the Workshop beforehand in detail. The purpose of a well-planned Workshop was to make it easier for us by having a structure to rely on, and to limit discussions to fit our project as best as possible. We know that discussions other wise can stray off the point. Because of the time constraints we had to limit the content, even though these kinds of discussions are often very interesting.

We thought the three most urgent and important parts for a well-conducted workshop were; the schedule and plan of the Workshop, the choice of the participants and the choice of the room where it took place. These are parts that we have chosen to describe in more detail in the following sections.

For each workshop we chose to have one group with about 3-4 people participating. Gender or age did not matter. We thought it was good to have three or four participants in each group, not too many and not too few. Everybody should have a chance to speak and express his or her opinion. If we made the groups too big, the chance that not everyone would talk would be greater. Three to four people would be a good group for the discussions we wanted to achieve.

We thought that the percentages of male or female in the groups would not make any difference since the groups were small. All we wanted was to have both genders in each group. With respect to age, we wanted to have both younger and older people, which we expected would lead to wider ranging discussions. Older and younger people have different experiences and different ways of looking at things.

The purpose of having two workshops was to get different people to participate each time. We wanted one group of researchers and one group of students. Our thought behind this was that researchers usually have more experience in presenting compared with the students. We wanted the difference

between more and less experienced presenters. We also thought that this grouping would make all the participants in each group talk more. If the other persons in your group were on the same level as you in work and education, you would probably feel more comfortable to talk. You would not feel that your thoughts or opinions were not as good as the others. We do not think it would have made any difference if we had told them that we would listen to all of the participants opinion, because the difference in status is there already. (Nyce, J.M. 19/09/2000)

In the choice of room we first thought of having a small conference room with a screen in the front and a table with chairs for the participants to sit around. We thought that the room would heavily influence the Workshop and the action that was going to be taken in the room. We thought that a small and pleasant room should result in a more inspired Workshop and give the participants a more relaxed attitude, compared to a bigger room that we anticipated could result in less activity. During one of our discussions we realised that it would probably be better to choose a room that is more like a room typically used during presentations, instead of develop a “nice” environment. We decided to choose a bigger room to create a more “realistic” environment. Further more a bigger room would also have space for the presenter to move around when delivering his or her presentation. The two different workshops took place in two different rooms. Our first workshop was in a seminar room. The second was in a conference room.

### 6.1.1 The Structure of the Two Workshops

We planned and discussed the schedule<sup>9</sup> in detail to have something “well – organised” to start with. We understood that during the workshop we would adjust the schedule as appropriate. We sent the schedule to the participants before they took part in the Workshop, and will describe the parts one by one.

During the introduction we told the participants that we think a workshop is one good way of bringing the future user early into the design process. And, further that we think it is very important to have the future user of a system or device as a central participant during the design process. For us the design process starts as soon as you start designing a new system until the system is obsolete and will no longer be re-designed. We think it is important to do the design work together with the people who are going to use the system, because they look at things in different ways, bring in different issues, and have different knowledge than a designer.

The workshop was going to be split into five different steps, separated into two parts, one before and one after the gestures had been developed. In the first step participants would act as presenters. They were asked to deliver a pre-prepared presentation and use the mouse and keyboard to interact with the computer. During the second step we would analyse how the presenter had interacted with the computer and their presentation material. The third step was the most creative part, the design of the different gestures. During the fourth step some of the other participants would deliver their presentation (not the same ones as during the first

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<sup>9</sup> See Appendix A - Schedule of the Workshops

step) and now they were going to try the designed gestures in order to interact with the computer and the material. Finally in the fifth step we would summarise the whole day and analyse what it was like to see a presenter using gestures and what is was like for a presenter to use them.

## 6.2 The first Workshop

This first workshop was done with four people. Three of them are PhD students that do their research in the areas of affective computing and situated cognition. The fourth participant holds a PhD. She is a project leader of the “gesture ring” project that provided the context for this work. She is also working as a lecturer at the Information Environment Program. This was our group with the more experienced presenters.

For this workshop we booked a big room that we thought was going to make the participants get the feeling of a real presentation situation. The day before we had organised the tables and chairs in a square in the centre of the room. Around this square we had put the tables and chairs so that the “audience” were looking towards the screen and the presenters. The square in the centre was intended for the participants and on the chairs around the square we had placed paper dolls, mostly for fun and “fill up the space”. We had 20 dolls in the pretend audience and we were 6 real persons.



**Figure 10.** Picture of the Room and the Paper Dolls

### 6.2.1 Things the Participants Perceived During the Presentations

In step one, two of the participants had delivered their presentations as a basis for discussions. One of them gave a brief introduction to the area of situated cognition and the other one gave a talk about herself and her life. In step two the discussions were many and interesting but sometimes they intended to stray far from the subject and we had to stop the discussions because of the time aspects.

Many interesting thoughts came up during the discussion about what they saw and the way they interacted with their material. They initially wrote down their thoughts on post-it notes, which they then handed in to us, which we together organized into different categories. We went through the notes one by one and it seemed that many of them had seen or thought the same things. Often we started to

discuss issues in detail and if we had not had to follow the time schedule we could have discussed many of the things even more than we did. All of the participants took part in the discussions and brought different issues to light. The things that they saw were:

**Walk to the computer:** The first thing that all of the participants had seen and that we started to discuss was that they saw a disturbing element in the need to walk to the computer to change slides. Many of them felt that the focus was more concentrated on the computer than on the audience. They felt like the presenter lost eye contact with the audience and that was very disturbing. They wanted the presenters' complete concentration to be focused on the audience and the subject that he was talking about and not on the interaction with the computer. They felt this was an interruption in the presentation, that the flow of speech got interrupted and that this was something they did not like.

**Natural break:** On the other hand and as a contrast to the problem they saw when walking to the computer, they said a natural break comes in the change of slides. The pause when the presenters walk to the computer to press the keyboard is a good natural break in the presentations and it also indicates that something new is coming up or that the presenters is going to start talking about something new.

**The natural gestures:** During the presentations they also noticed that a lot of natural gestures are used while a presenter is speaking. They used their arms and hands a lot. It was not so often that they just hang along side the body. One of the presenters thought that he himself remains very still and does not move a lot during a presentation. Even though he did not move a lot he used his arms sometimes while he was speaking. The group thought and agreed that it could be hard for a gesture device to separate natural gestures from the input gestures to the computer.

**Lack of freedom:** When the computer is placed in the corner of a room, which they often are, they felt a lack of freedom of movement. Many of them felt that they could not move too far away from the computer. If they have to change slides they have to get back to the computer and do this interaction and so they cannot be too far away. The bigger the room the greater this issue becomes. Most of them felt that they would like to be able to move more free in the room during a presentation. It should be possible for a presenter to be on the left side of the room even though the computer is stationed on the right side.

**Lots of text on slides:** One participant wrote that, maybe today we tend to put a lot of text on our slides to minimise returning to the computer because of the placement of the computer in the room. They all felt that it is not easy to read a slide with a lot of text and that they prefer slides with just a few sentences or statements. If there is a lot of text on the slide the focus is moved from the presenter to the screen. They all wanted it to be the other way around; the focus should most of the time be on the presenter and not on the screen.

**Make it fun:** One of the participants said during the discussion that we should not make the device and interface “*yet another boring Microsoft application*”. *If you make it fun people will at least try it.* (Daniel, Workshop 1, 07/03/01) This lead

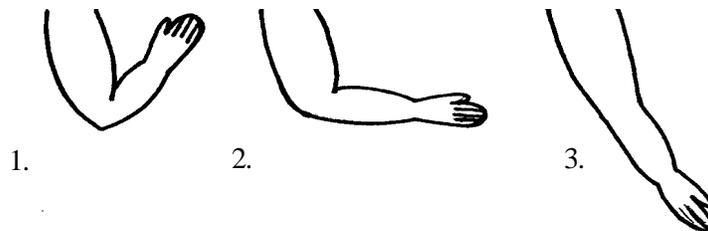
them in to a discussion about making fun gestures to e.g. make the office wizard (or equivalent) go away. Someone said that it would be fun *‘to be able to punch the wizard and it would feel good to see it curl up in pain and die’*. (Margot, Workshop 1, 07/03/01)

**Customised system:** They wanted to customise the system in two different ways, to be able to choose between different interfaces and gestures for example. If you wanted to use one gesture to move to the next slide maybe someone else wanted to use that gesture to move backwards.

### 6.2.2 The Different Gestures the Participants Designed

Step three in the workshop was the creative part where they designed the gestures. The result in this workshop was big gestures that the audience could see that the presenter was performing. They could not be done behind your back or any other place where the audience could not see them.

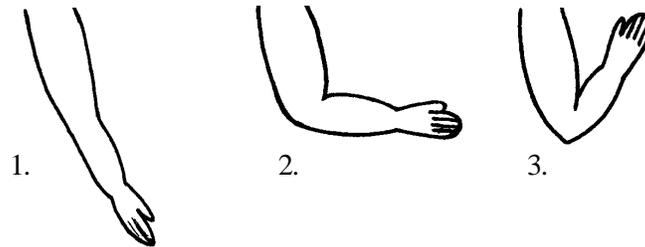
We started by designing the gesture for moving to the next slide. The participants quickly found a suitable gesture. The gesture that they decided to use was a big arm movement in the direction forward. The arm had a starting point up close to the chest, then it would make a stroke forward until the hand palm is turned face up towards the ceiling. They all agreed that this would be a good gesture for the purpose, it indicated that something was going forward, that something new was coming.



**Figure 11.** Gesture for moving to the next slide

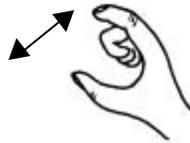
The next gesture that they designed was the one for moving backwards, to the previous slides. Here they did not agree so quickly. They found one gesture that they could use, but some of them did not think that it was the best gesture for the purpose. The gesture that they discussed had a starting position with your arm hanging down alongside the body. The hand palm was turned face up towards the ceiling. The gesture started when the arm moved up towards your shoulder. The gesture ended when the hand had reached the height of the shoulder.

They decided to try this gesture for moving backwards even though they were not satisfied with it. They wanted to try and see if the gesture felt good during the next step of the workshop. With hope to find a different gesture that suited the purpose better when they were actually giving their presentations.



**Figure 12.** Gesture for moving to the previous slide

The last gesture that they designed was for moving to another application or to another program. Here one of the participant's immediately thought about doing the movement that you use on the keyboard for switching between different programs that you have open on your computer. The alt + tab movement. Like a gun gesture, you use your thumb and your index finger on the keys and press the tab key, with the index finger, the number of times you need to get to the program you want.



**Figure 13.** Gesture for moving to another application

They could not see any use for moving to the first and last slide, which was the reason why no gestures were designed for this purpose.

### 6.2.3 How the Presenter Experienced to Use Gestures

In step four, two of the participants delivered their presentations by using the groups designed gestures. Caroline and Anette acted the ring, and the presenter addressed the gestures to one of us.

Daniel was the one who started presenting. During the presentation he acted very naturally and walked a lot in front of the screen while he was talking. He used all of the three gestures that we had designed beforehand. Afterwards we asked him what it felt like to do his presentation in this way by using gestures. He was very positive about the gestures, he thought it felt good. He was able to walk around in the room as much as he wanted to. He said that is something he likes to do when he delivers presentations. The freedom to stand wherever you want in the room and still be able to interact with your computer means a lot to him. It was very convenient. He also felt that the gestures that they had designed were good. Before the presentation he had been a little uncertain about the gesture for moving backwards, but it felt better when he tried it. He also said that he would like to use this kind of gestural interface in the future if it became reality.

The second presenter was Ben. During his presentation he moved a lot between his slides, backwards and forwards. We really got to try these gestures a

lot during his presentation. Afterwards we asked him the same question that we had asked Daniel. What did he think about using gestures? He was also positive about it. To have that freedom to stand wherever you want in the room was very good. You do not have to think about returning to your computer all the time. Since his presentation contained a lot of moving between slides, he would have had to stand next to the computer during his whole presentation. Moreover he felt that changing slides was not easy to do with the “previous slide” gesture. When he wanted to move four slides backwards he had to do the gesture four times. Maybe we would consider finding another gesture for moving through a lot of slides. He felt that the gestures were good for the particular purpose of moving one slide, but that maybe we needed more gestures for things like moving many slides in one direction. He thought that the gesture for moving to another tool was good.

#### 6.2.4 Interesting Thoughts and Issues Arising During the Workshop

In this part we will present things that we took notes on during the workshops or saw when we watched the videotape from it.

**Impact on the way that we present:** One thing discussed was a question about whether or not a gestural device would change the way we deliver presentations today. Most of them thought that if this device became reality, our way of delivering presentations and the different medias or material that we use during presentations would change. Today we build presentations in a way that suits Power Point or other applications that we use to deliver presentations. Will a gestural device result in new software applications and maybe, as well, different designs of conference rooms and classrooms? Today the rooms are designed to have the presenter and his computer in the corner or in the front of the audience. With a gestural device you do not necessarily need this place.

**Not knowing what is on the next slide :** Some of the participants felt that it was good to see what was on the next slide on your portable computer when you change slides. They feared that by using gestures you would maybe not know what was on the next slide. When you have to change this manually by using keyboard you get a preview on your computer and can get prepared for what you are going to say, and maybe with gestures this element will disappear.

**Observable or Unobservable :** The Participants also discussed whether or not the gestures should be observable by the audience. One of the participants said, *you don't want the gestures to be too smart so that you don't see that the presenter is using them. If you are, then maybe the audience will just concentrate on what you are doing and not listen to what you have to say.* (Ben McGarry Workshop 1, 07/03/01) They thought the risk they saw was something very interesting. It raised many questions, like what is the advantage of having a gestural interface if you cannot see the gestures, or how do you make a gesture intrusive, but not too intrusive so that the audience cannot figure out what you are doing? The big question is; do we want to make the gestures so natural and unnoticed that the audience does not see them? Or maybe it is good to make them in such a way that

the audience see that something is happening? One participant thought that maybe if we made the gestures too close to natural behaviour that people would have to unlearn how they use their natural gestures. They are now associated with something different, some other behaviours or contexts. For example if you use a gesture to change slide, that is used for something different in “real life” it would disturb your natural gesticulation.

**Satisfy all Users :** Another interesting thing that came up during discussion is that you can never satisfy all users needs. Even though we design and build an application with the thought of what it should be able to do and what purpose it is going to serve there will always be people who find another way to use it and find other purposes for it. It is not easy to get all perspectives and requirements included in a product.

**Feedback:** They talked about the importance of getting some kind of feedback from the ring. If the ring could indicate that the gesture had been recognised, they felt that this would give the user confidence.

**The Use of Both Hands :** Finally there was one opinion that all of the participants agreed on. When you talk you use both of your hands. Maybe it would be good to have a ring on each of your hands during a presentation at the same time. They thought that the ring should be independent; you should be able to wear it on any of your hands. Depending on where you are in relation to the screen you may want to gesture to change slides with your left or right hand. When you are giving a presentation you usually do not know how you are going to move and behave. You maybe have a plan for what you are going to talk about and some things that you are going to do, but most of the time you improvise and move in rhythm to the situation.

### 6.3 The second Workshop

The participants during the second Workshop were three undergraduate students from the Information Environments Program. These students had recently started their third year in the program and had delivered some presentations before during their education. This was our group of less experienced presenters

The Workshop took place in a conference room for 20 people. It was not as big as the room where we held our first workshop. There was one big oval table with chairs in the centre of the room. We had placed papers with the schedule at some seats in order to in some way control where they sat. We wanted them to spread out in the room. In the front of the room there was a big moveable screen and a computer placed on a table in the right corner of the room. You can see the layout in the picture below.



Figure 14. Picture of the room

### 6.3.1 Things the Participants Perceived During a Presentation

During this second Workshop only one person presented during the first step. It turned out this way because there were only three participants. The presenter stood almost still during the whole presentation and he chose to stand close to the computer. The presentation was about computers in 1968 and he pretended that the presentation took place that year.

During the second step the participants were given some time for composing their thoughts, as we had planned. They wrote their thoughts on yellow post-it notes. When everybody was finished, they started to describe to each other what they had seen. Caroline and Anette collected the yellow notes and tried to organise them in categories.

**Computer location:** The most common thoughts were about the computer's location in the room. The computer was placed in the upper right corner of the room. That location meant that the presenter had to turn around to change slides, because the computer and its keyboard and mouse were behind the presenter. They thought that this was disruptive and something they wanted to change. One note said: *"Constantly reaching back to move slides forward"*. They talked about this and thought that it resulted in interrupting the presenter's speech and they as an audience also felt like they were being interrupted. Sometimes they saw that the presenter managed to change slides without making a break in his speech, but it was rare.

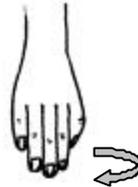
**The natural gestures:** Another thought discussed at length was that they discovered how often the presenter naturally uses gestures to express and emphasise what he was talking about in his presentation. Their thoughts about using gestures were both positive and negative. They did not seem to draw any attention to gesturing behaviour being natural. Rather they observed how the gestures occurred and how they felt when they saw the gestures. Sometimes they felt that the presenter's gestures drew the attention away from the slide and towards the presenter and sometimes the opposite. *"Hand movement redirected focus from slides"*, and *"Hands showed size – helped perspective"*. They talked a lot about the difficulty of designing gesture sets that are unlike normal gestures. In the beginning they looked for unnatural gestures.

**Not knowing what is on the next slide:** Almost all of them felt a “fear” of not knowing what is on the next slide. During this presentation the presenter stood with his back turned away from the screen and sometimes he had to turn around to see what was on the slide. One participant said after the presentation *“that it could be both an interrupting and difficult thing to turn around to see what was on the next slide”*. This concerned both the audience and the presenter, as it interrupted the flow of speech.

### 6.3.2 The Different Gestures the Participants Designed

All of the participants were active in the discussions. During this workshop the participants decided to use small gestures, almost invisible. They talked a lot about the possibility of doing the gesture behind the back, so that no one could see them. They talked and designed different gestures almost directly. The participants preferred to sit down around the table as they discussed and that made us, Caroline and Anette, stand up and try their designed gestures. They said what they meant and we tried out their thoughts. If we did it the wrong way they told us how to do it. Later on they got more active and tried the gestures on their own

We started with designing the gesture for moving to the next slide. In this workshop the participants found two totally different gestures for this purpose. The first was a circle movement with the hand in the right direction, clockwise with the wrist in 90 degrees pointing down against the floor.



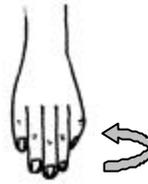
**Figure 15.** Gesture for moving to the next slide, gesture 1

The second gesture for moving to the next slide was a very small gesture. It was like a snap with the fingers towards the palm of the hand. This gesture can be done very discreetly. You can do it behind your back so that the audience does not see it or you can do it in front of them.



**Figure 16.** Gesture for moving to the next slide, gesture 2

For moving to the previous slide they designed one gesture. This was also a circle movement with your hand. This time it was done anti clockwise. This movement was the opposite of the first one that they designed for moving to the next slide.

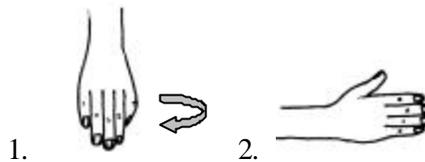


**Figure 17.** Gesture for moving to the previous slide

Concerning the gesture for moving to another tool they had one suggestion but they did not think it was good. It was a kind of beat-gesture, using both hands. The index finger “snaps” on the other hand, as many times as there are applications to change. Moreover they did not want to use this gesture, instead they tried to do their presentations without a gesture for moving to another tool. They planned to do this interaction manually if they needed it. We will therefore not show any picture of this gesture.

### 6.3.2.1 A Gesture Designed in Action

A gesture for moving to another application got designed in action, during a presentation when one participant needed to do this interaction. It had the same start position as for the gesture for moving to the next and the previous slide that we have presented earlier, circle movements with the hand. When the presenter wanted to open up a program he just lifted up his thumb.



**Figure 18.** Gesture for moving to another application, designed in action

### 6.3.3 How the Presenter Experienced to Use Gestures

It felt to us that this group had not really decided what gestures they would like to use during their presentation. They had discussed different gestures and thought that some were better than others. We did not push them to decide, because we wanted to see what they ended up with. We had hoped that something unexpected could happen during their presentations.

Before the participants started to try the gestures we gave them a “toy” ring made of tape to put on any hand or finger they wanted. We wanted to see if they acted differently with a “device” on their hand that they had to think about during their presentations. It also had a purpose of letting the participants try a fictive on/off function, which they had decided the device needed.

The first presenter decided to do the “snapping” gesture for moving to the next slide. He did not need to move backwards in his presentation so he never tried the

backwards gesture. Nor did he have a gesture for moving to other applications. During his presentation he did small movements with his hand and he did them fairly naturally. He also stood almost still during his whole presentation and did not move his arms very much. It was close to his body the whole time and he only moved it when he did the gesture. This phenomenon got named “dead arm syndrome”. At first he tried moving to another application by gesturing, but then he did it manually instead.

We let him deliver the presentation twice to try the ring on both hands. This was not something we had planned, it was a decision taken in the moment. He had to choose on his own on which hand he wanted to wear the ring the first time and then we switched the second time. We wanted to see if he used his arms differently if he put the ring on the other hand. The second presentation was more relaxed and confident than the first one. He used his arm with “the ring” a little bit more, but his arms were still not moving much. During the second presentation he naturally did a designed gesture for moving to another tool. He started to try the gesture that they had talked about, but he did not like the gesture the interaction was made manually instead. Later on he did a gesture for moving to another tool without really thinking about it. We did not say anything about his way of acting during his presentation, we just let him continue without interruption. Afterwards when we asked him about his way of gesturing to change applications, he could not give us an explanation. He did not remember what he did or how he did it! We think that the gesture was good and we want to present it here as a natural gesture designed in action.

When we asked him after the presentation what it felt like he was uncertain. He liked being able to do a small gesture but it felt unnatural to interact via gestures. He said *“It feels strange to use gestures ... towards the computer.”*(Garth, Workshop 2, 13/03/01)

The second presenter decided to try the circle movements for both moving to the next and the previous slide. She did not decide upon any gesture for moving to another application. When she started presenting and came to the point where she needed to use a gesture she stopped talking and had to think at first about what she was going to do. During the whole presentation she stood very still and did not move her arms very much. After the presentation when we asked her what it had felt like she said that it was not too bad, it was not so natural yet, but maybe it could be in the future. She thought that moving to another application would need to be done manually.

#### 6.3.4 Interesting Thoughts and Aspect Arising During the Workshop

In this part we will present things that we took notes on during the workshops or saw when we watched the videotape from it.

**On/Off:** During the second workshop all the participants agreed that the device would need an on/off button. They all felt that if they could control the device and only activate it when they wanted to use it they would feel much more comfortable

using it. They felt that during their presentations they did not want to move their arms too much, because we might understand their movements as a gesture for performing a task. More confidence in the ring and maybe the “dead arm-syndrome” could be prevented with an on/off. They thought that although the feeling would not be the same with a real device, an on/off control button would be good.

One participant’s explanation of why we needed an on/off button was that, otherwise we had to find gestures that were out of the standard normal subconscious movements that we usually do, so that there is no chance of you unconsciously doing the designed gesture.

**Looking for Unnatural Gestures:** In the beginning they wanted to find unnatural gestures that you almost never use, but during discussions they realised that this would be too hard for the presenter. The presenters would not only have to learn the gestures, they would also have to remember them. If they designed gestures that were too extreme this could be unnecessarily hard. One said, “*It is going to stand out and look weird*”. (Garth, Workshop2, 13/03/01) They decided to do easier and more comfortable gestures instead. One of the participants said “*if you are going to do it a lot during a presentation it is better to make it comfortable.*” (Garth, Workshop2, 13/03/01) The same participant also thought it was distracting to see the presenter walking over to his computer to press a key, and he also thought that it would be distracting to see the presenter do the gestures. Therefore he thought it was better to find a gesture that the audience could not see.

**Keep it small and simple:** The group talked about other interactions they wanted to be able to do with the computer through gestures, such as scrolling up and down in a Word document. Some wanted to keep the device concept small, just limited to a few gestures. This would be easier for the users. One pointed out that it is better to make the system simple and useful. If we manage to do this it would be much easier for the people that are going to use the device. It would also be less frightening if it were small and simple. To manage to do that they believed the system should not have to many options. They also said that if we managed to make a simple successful device then there would always be room for the things you have in mind. You can always expand it and build in more functions.

**Customised System:** To make the product more interesting for the users they wanted to have a customised system. If there were a few gestures to choose between for a particular purpose it would be more attractive for the user. It would make it more fun to use and not just something that some people find easier to use. If there were three or four gestures to choose between it was going to be easier to find one that suited you and your way to behave and interact with computers. They also said that it is hard to satisfy everybody, there will always be one or two that do not find the device good, and the gestures suitable for them. But if we made it customisable maybe more people would try it.

**Feedback:** Feedback relates to the on/off problem and the problem of not knowing what is on next slide. All of the participants said that in some way it would be good

to get some kind of feedback when you perform a gesture. In that way you would know that you are on the right slide and that your gesture has been recognised.

## 6.4 Reflections on the Workshops

In this part we will describe our reflections on some aspects of the workshops. We will reflect on the concept of the workshop and what we see that this method contributed. The structure, the choice of participants and the room will also be reflected upon. In the beginning we saw these elements as important in the planning of a workshop. We will therefore concentrate on how we think they have affected the workshop and our work.

### 6.4.1 The Structure of the Workshops

We had planned the workshops in detail and thought a lot about every step that they contained. We had thought about questions that could come up and alternative activities if the ones we had planned were not enough. We had our plan to follow during the whole workshop but still we realised that things could happen that we could not predict. This is what Lucy Suchman (1987) refers to as plans and situated actions. She argues that in situations you have plans of how to solve things, but within every situation there will always be different elements that make you deviate from your plan. Maybe you will encounter things that were not included in your plan and to get through them you have to act spontaneously. You can never know before a situation occurs how it will turn out. This was something that we had in mind during the whole workshop. We came to situations where we found it hard to know how to act. For example, when was it good to end a discussion and continue to the next step? The limit of when a discussion was not going to contribute anything to the work was hard to find. We also deviated from our plan to make the workshop better and give the participants a better understanding of the concept we wanted to design. To give them a more realistic feeling of the device we decided to let them try a “toy” ring to put on any finger they liked. This contributed a feeling of a more real situation. We also let one presenter present twice to see the difference in his way of acting. This was one of the side steps that we think spurred the presenter’s creativity. Afterwards he got more active in the discussions. The difference between the two presentations he did was not too great, but we feel that the second time his gestures were not as hesitant as the first time.

The well-planned structure of the workshop gave us the opportunity to relax more and focus on what the discussions were about. If the participants got stuck, we could raise some questions that we had thought about before, to give them some new ideas. This also gave us the means to limit the discussions when they went of the point and redirect them towards our work, even though some of the discussions were really interesting but just not useful for us in our context

### 6.4.2 The Choice of Participants

The idea we had, to try the concept on two totally different groups turned out well. It gave us two very different workshops. Regardless of our choice to use the same

plan and structure for both of them, the workshops took very different directions and conveyed different results. We feel that the different groups guided us to these results. This was what we wanted to achieve in the choice of having one group with more and one with less experienced people while using the same workshop structure. Since we wanted everybody to participate and talk we tried to achieve as small status difference as possible. We feel that we mostly achieved this. The discussions between the group members were good and we do not feel that anyone was left out too much. There was a difference in the age and background, but we could not feel that this had a negative effect, rather it made the discussions wider.

The difference between the two groups contributed many interesting and different results. We felt that it gave us a wider picture of the different aspects in the use of gestures. The fact that the groups were different in many ways gave us discussions that felt like they were on different levels. In the first workshop the participants discussed more design aspects, the use of gestures, the realisation of the concept and what it will contribute. In the second workshop the discussions were more fundamental, such as how do you solve the problems and what do you need. For example, during workshop one it was discussed what the introduction of a gestural device would contribute to the way presenters deliver presentations today. During workshop two they discussed, if people want to have unusual gestures that would not accidentally be done or if gestures should be kept easy and natural. Afterwards we have realised that this was one result that gave us a wider perspective of the area. The different views gave a deeper understanding for both fundamental questions and design choices. We need both in the development of a future system.

### 6.4.3 The Choice of the Rooms

We do not think that the different room affected the result so much, but that could also depend on the different participants. We feel that it was good to have the small and nicer room during the workshop with the participants that were not so used to the concept and were not such experienced presenters as the ones in workshop one. In that way the room did not “frighten” them in any way. The bigger room gave you a more realistic feeling and the smaller room gave you a more confident feeling.

### 6.4.4 What did the Workshops contribute to our work?

We feel that these two workshops have provided us a good opportunity to meet users and have a discussion with them. Within this meeting with the users we feel that many good things were created. We feel that we have achieved our main goal with the workshop, to capture the ideas from the users, design and evaluate gestures. We also feel that they contributed much more. They prompted us to think about things that we had not thought about before, and that we would not have otherwise considered. Before the workshop we had a feeling that we were going to design natural gestures. This thought was carried with us into the workshop. The workshops contributed to us questioning ourselves and asking ourselves the question of what kind of gestures we really wanted to use?

The structure that we used gave us a chance to design and try our concept in practice. This gave both the participants and us a practical understanding. In both the workshops we needed to try the designed gestures in order to understand that they were not suitable or that we needed more gestures. Trying the gestures also raised new questions and perspectives. The structure of the workshop was a good way to get this practical understanding. When we decided to start with doing “normal” presentations in the beginning it gave us a frame of reference in the back of our minds for the second presentation part, where we used gestures. This frame of reference was something to compare with and relate to, but also to use in understanding of the different problems that could occur during a presentation.

The workshop gave us a new understanding of the literature that we had read. Some parts of the literature became clear to us. For example we got to see the gesture categories in real life and we knew how to use them in context. The material we had worked with before and the knowledge we had created e.g. during the fieldwork was put into other perspectives. Because of the workshops it reached a new level of understanding again.

The workshops also answered questions and rose issues with which we could work further, like what kind of gestures are we going to use? Some of them made good bases for discussions, both within the thesis and outside. The workshops also gave us a better understanding for the problems that could rise when you introduce a new concept or device.

Organising a workshop was a good way for us to design and discuss together with the future users of our concept. We feel that we gave them a voice and a central role in the design process. The workshops were build upon their thoughts and ideas. We see them as the driving force during the workshops. Our role was as the organisers but we also acted as co-designers.

#### 6.4.5 Thoughts to Work Further with from the Workshops

During our work with the two workshops, ideas arose about other ways to carry out workshops. Many of the ideas had their origins in curiosity and would be interesting thoughts to work further with. In our workshops we let the participants design gestures without any restrictions. Afterwards we discussed how the results would have been different if we had put up more limitations. We could, as the organisers, be narrower in the choice of gestures. One way could be to decide that the gestures must be found within McNeill’s’ classification; *Iconic*, *Metaphorics*, *Beats*, *Cohesives* and *Deictic*. Yet another step could be to limit them to find gestures within only one of the categories.

We thought of having a third workshop together with the participants in which we would conduct a video interaction analysis with selected parts of the videotapes recorded during the workshops. In this way it could be interesting to compare our way of understanding and looking at the actions taken place, to the participants experiences. This could also be done with people that did not take part in the any of the two workshops. A video workshop would also be a good way to further utilise all of the video material that we have collected.

## 7 Testing the Gestures

In this chapter we describe a test we did through using the gestures from the first workshop in a real classroom situation. The test was carried out together with Daniel Johnson, who is a PhD student and lecturer at the University of Queensland and was one of the participants during our first workshop.

We start by writing about the experiment, some of the thoughts we had before the test was carried out. Thereafter why it turned out to be Daniel, further about what happened during the test and the way he made the gestures. Next how it was to catch the gestures when acting the ring, the students' reactions about the experiment and Daniel's own experience to use gestures to interact with the computer. Finally we are summing up what this test has contributed to our work.

### 7.1 An Experiment with Gestures in Real Life

We decided to test the designed gestures in the real life to see how they would work. The experiment was to try the gesture set that the participants of our first workshop had designed. It was going to be done in a classroom situation with "real" students and a "real" teacher. The lecture was based on Power Point slides. Daniel found the idea to use gestures as an interactive tool very interesting and was willing to try them in his lecture to assist our project. Daniel was familiar with the gestures as he had taken part in the design process and tried the gestures during the first workshop. The interaction was going to be in the same way as during the workshop. Instead of walking to the computer and changing slides, Daniel was going to perform the gestures and we were going to take care of the computer interaction.

The students were not supposed to know that we were coming to their lecture and performing experiment with Daniel. The only thing Daniel was going to tell the students when we arrived was that we were participating in the lecture for our own research. Most of the students did not know anything about us or what our project was about.

We decided to start the experiment when the students had already had one hour of their lecture. Our plan was to sit in a place where they would not take too much notice of us. We wanted the students to focus on the lecture and the slides and not to think too much about us. Our goal was to let Daniel talk and act as normally as possible; the big differences were going to be when it came to the computer interaction.

Before the experiment started we had together with Daniel decided to only use two of the designed gestures, the gestures for next and previous slide. Usually he only uses the interaction for next slide, but he said he would try to find an opportunity to use both of them. This would give us the chance to see if they were good gestures for the purpose.

We also decided to videotape everything so that we could have a chance to look at the parts that we found interesting and evaluate the gestures.

### 7.1.1 Why Daniel?

The choice of using Daniel for the experiment was more like a coincidence. He was one of the participants of the first workshop and after the workshop we had a discussion about trying the gestures in a “real” situation. We asked Daniel if we could do an experiment with him, by taking part in one of his lectures with Daniel trying out the gestures. Daniel thought this would be interesting and he also finds the thoughts of using gesture to communicate with the computers very interesting, and he thought that he maybe could connect it to his own work.

We saw a good opportunity to try the gestures and the more we thought about it the more we saw Daniel as a good person to try the experiment on the first time. Daniel is a person who likes to try new things. Our opinion about him is that he is a very impulsive kind of person who needs lot of space when he is talking and moving. He often uses both of his hands a lot when presenting and talking. At the same times that we found these things good about Daniel, we understood that not all people are like him and that maybe the result would be totally different on a person opposite to Daniel.

It was going to be interesting to try the gestures on a person like Daniel. Maybe the gestures would “disappear” in his normal way of using his arms? Maybe “the ring” would have trouble to separate Daniel’s natural gestures from input? It would also be very interesting to try the same experiment on a person that does not use his or her arms during speech and that does not move much during a presentation.

### 7.1.2 Making Naturalistic Gestures

The thing we noticed during the experiment was that when Daniel did the gestures he did them in a natural way but still it was differently from the usual way that he gesticulated. Daniel did them more in a pronounced fashion in the beginning, but after a while he did them more relaxed but still in a pronounced way.

For someone who did not analyse and follow every movement that Daniel did it would be hard to see the difference in his way of gesticulating. That was the purpose for us to be there and maybe it was because of that reason we noticed it, but it is an interesting observation if you connect it to what McNeill says about gestures and when they occur naturally. According to McNeill (1992), gestures only occur naturally when they are connected to your speech. This could be one answer to Daniels way of doing the gesture. You could predict when he was going to do the gesture, he raised his hand up against his chest and placed in a starting position. This small movement lasted only for a few seconds before he did the decided gesture to perform his task, but you could still see it if you were observant. He also did the gesture in a more pronounced way than we think that he would have done the gesture if it had occurred naturally during his speech. An explanation to this could be that he wanted to be sure that we saw his movements and that we

could distinguish them from his natural gestures. We knew that there was a small misleading result in having a person as the ring.

### 7.1.3 Acting the Ring

One of the big differences that we see in a person acting the ring compared to a physical device is that we humans have the ability to use all our senses when we are communicating. Physical devices such as a ring only detect what you program them to detect. This was one of the things we noticed during the experiment with Daniel. Caroline who acted the Ring and Bracelet could feel Daniels next move by using the human senses. She saw him putting his hand in the starting position. She could hear his talk and guess what came next by his vocal pitch. This human ability is something that our ring is going to miss. It will not be able to see and feel in the way that humans do. The only thing that it will do is what you as a human tell it to do. It will only do what it is programmed to do.

We think that the awareness of us being in the room and taking action on Daniels movement had an affect on him even though he did not think about it. Therefore the result is not complete but we think it is as close as possible until the experiment can be done with the real ring.

#### 7.1.3.1 Problems with having things in both of your hands

We think that a ring on one of our hands can limit our way of acting and moving our hands. During the lecture Daniel did on one occasion have things in both of his hands. He held a paper report in one hand and a cup of coffee in the other. When he wanted to change slide he had to put down one of the things and make his gesture. Here we see a problem, if we want to get away from the computer and give the presenter more space in his acting during a presentation this could be seen as a limitation. The gestures could be done with paper in your hands, but if you have a glass of water in hand, it could be a problem to perform the gestures.

### 7.1.4 The Students Reaction

After the lecture we asked the students a few questions to hear about their reactions to what Daniel did during the lecture. We wanted to know what they saw? Did they think that Daniel behaved differently than he used to and was there anything good/bad in the way that he acted compared to his “normal” way of acting during a lecture?

Most of the reactions from the students were positive. They had seen that Daniel did some kind of waving with his arms and when he did the waving the slides change. Compared to his normal way of acting they only saw positive things. It was good that he did not have to walk over to the computer that was placed in the corner of the room. He was stationed all the time in front of the students. Maybe this made it easier for them to focus on his talk? They did not think that the waving with his arm was disruptive or disturbing in any way. One student said that he thought it “floated” very easily into Daniel’s normal behaviour.

When we talked with two students after the lecture they gave us a different reaction. For them the gestures felt more distracting than the walk to the computer. Doing the interaction in that way was something they were used to and they could not see anything distracting in it. We asked them if they did not feel that more concentration was put in the presentation and on the students by performing the lecture with gesture, but they did not see it that way. Doing the interaction by hand or maybe by a wireless mouse they thought of as the best way.

We also sent a mail to all of the students after the lecture with the same questions. We thought that maybe they needed to think about it before they wanted to answer. Or that they might come up with something new that they did not think about before when we asked them the questions. Unfortunately we did not get any answer from this.

To read from the student's answers during the lecture, most of them found using gestures to change slides during a presentation a good way to take care of the computer interaction. They did not find it disruptive or disturbing of Daniel's normal behaviour.

### 7.1.5 Daniel's Experience

When we asked Daniel about his feeling and thoughts he was mainly positive. He said that from a whole perspective it *"largely felt ok"*. He said that it made him slightly more conscious of the gestures he was using and he thought that it would take a while to get used to. He said *"I use a lot of gestures when I speak anyway so I was a little conscious of the fact that I could unintentionally make a gesture which' the ring' took to mean something."*

The positive thing he found using gestures during his lecture was that it gave him freedom to walk around in the room, as he liked. He did not feel tied to the computer. *"I really like the freedom it gave me to be away from the machine, that is invaluable. Not having to return to the machine when you want to input a command is a really big plus!"* (Daniel Johnson, inquiry 30/04/00)

## 7.2 What the Experiment Contributed to our Work

By carrying out this experiment we saw how the gestures fitted in to the way that people act, in a way that we could not see during the workshop. The fact that the experiment was tried during a lecture made this situation more "real". Daniel had to keep the flow in the presentation and could not turn to us playing the ring and tell us what to do if anything went wrong. He had to keep acting as normal as possible. His normal acting made us see the difference in his gestures. We got to see that even though he tried to do the gestures naturally it was still not natural. There was a small difference in his behaviour. This small difference made us think even more of what kind of gestures we were looking for.

Playing the ring during this experiment helped us to understand the effect a real person has compared to a device. We better understood the different senses a

device would be missing, and on account of that, the things that it would not be able to detect.

The experiment gave us an opportunity to try out the concept and get feedback from a real audience that did not know anything about our work or the ring project. Even though we did not get many reactions we got a feeling for what they thought.

## 8 From Gesture to an Event in the Computer

This chapter shows our work for creating an understanding of how to realise the concept. During the whole work the purpose has been to design an interaction that is possible to realise by software. This outcome named the introductory design is presented in this chapter. Our goal is to design a base for further developing, and not to show an exact solution.

We start by describing the use of the future system, in form of a fictional story. We call the system *the Gestural Navigator Application*. To be able to use the Gestural Navigator Application the user has to open up Power Point and the other application they will use during their presentation. We visualise the design of the system by; an overview of the concepts and the inputs, the support for the user to understand the different gestures, the different actions within the application. At the end we discuss the complexity by combine the problem found in the “real world” with solution in the “computer world” that fit both of these worlds. Finally we write about how to make the user feel smart, by hiding the complexity.

### 8.1 A Fictional Story about the presenter Tom

This is about Tom, he is working with the audio equipment at the University of Queensland at Ipswich Campus. Tom’s manager has asked him to deliver a presentation to the Staff at Information Environment program, about the new technology they just have bought. During the presentation Tom will use; Power Point for showing facts, the Ring and Bracelet Device for taking care of the performed gestures, the Gestural Navigator Application (GNA) for catching the signal from the gesture device to manipulate Power Point.

#### 8.1.1 Tom is Preparing the use of GNA-system

This is the first time that Tom uses the interaction devices. To begin with Tom has to choose the gestures that he likes to use during his presentation. This he is doing the evening before the presentation by watching the material enclosed with the GNA. The gestures are illustrated in; videotape, compact disc, flip cards and pictures. He chooses between the seven gestures that exist in the GNA system, by watching the videotape, and selects the ones that fit him the best. The next step is to register his choices in the GNA graphical user interface (GUI). When he does this he has the opportunity to watch the gestures ones more on the computer screen. The interface is very easy to use, he only marks the gestures he has chosen and clicks on select. His registration is now made and he gets the alternative to save his selection for future use. Everything is now prepared for his presentation tomorrow.

#### 8.1.2 Tom is Delivering the Presentation

In the morning, before the audience arrives, Tom has already prepared his presentation by opening up all the programs that he will use and put the Power

Point in slideshow mode. The programs he is going to use are Real Player for showing an information clip of how to use the new video equipment and a web browser to show the audience where to find the information about the new audio equipment on the Universities' homepage. During the presentation Tom is walking around to show the different equipment that he has placed along the walls in the room. When he is talking and wants to show the information from the Power Point on the screen he can do the gestures from where ever he is placed. Before every gesture that Tom is performing he has to activate the on/off function on the ring. When Tom is doing the gesture for **change to next slide** the computer responds by changing the slide on the screen. One from the audience is asking Tom to show the fact on the previous slide once more. When Tom is doing the gesture for **changing to previous slide** the computer is changing to the previous slide. In the end Tom shows the University of Queensland's homepage. For this he is using the gesture **moving to another application**, which the computer response to and shows the homepage on the world wide web.

In the beginning Tom feels curious about how the GNA-system will work, as the presentation is going to its end he feels more and more comfortable using the gestures and the devices. He feels free to walk around and the gestures are easy to use because there are close to his natural gesticulation. The audience found it good that Tom can show the equipment at the same time that he gives them the fact on the screen in front of them. His complete attention was laid on the equipment, the presentation material and the audience.

## 8.2 The Gestural Navigator Application

In this part we want to share how we created our understanding for the system that we have designed, and also explain how the system will work in the static world of computers. To create discussions during the design work we have used diagrams (Eriksson H-E, 1998) and pictures as a growth point. We started by creating an understanding for the real world where the system in the future would work. This we did by creating a conceptual model, which includes the important concepts and the ways of communication between them.

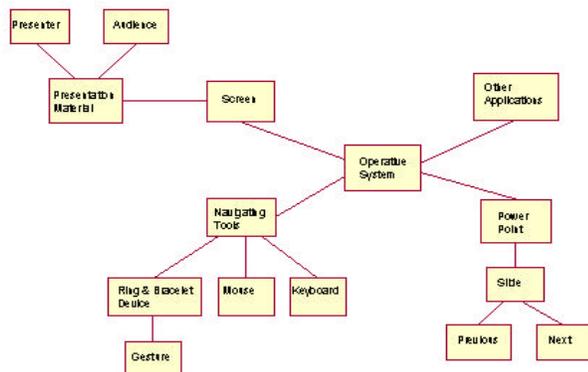
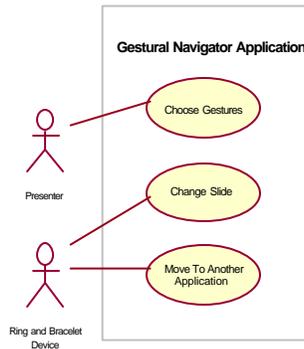


Figure 19. Conceptual model of the presentation domain

Thereafter we describe what a user should be able to perform with the system. To get an understanding we sketched the actions from the real world and the computer world, which we thereafter divided as inputs to and actions within the system. We transferred the sketches to a use case diagram that you can see below. This outline is included here to give an overall picture of the whole system.

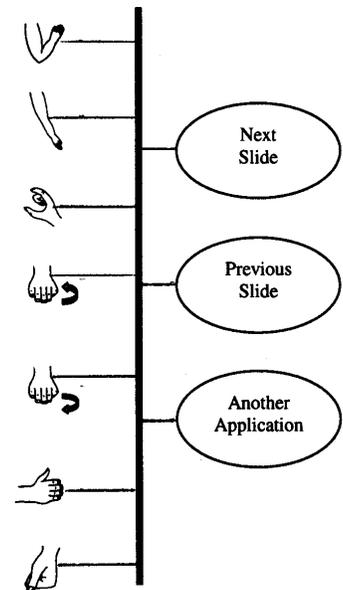


**Figure 20.** Use Case Diagram of the Gestural Navigator Application<sup>10</sup>

### 8.2.1 Choosing Gestures in the Customised System

We have designed a customised system, because we like to support the thought of giving the presenter the choice to decide what gestures to use and for what purpose. This thought is a result from the workshops (chapter 6), where the participants designed different gestures for the same purpose. We do not want to put narrow limits, because we like to support the variety among people.

There are 7 different gestures to choose between and 3 different usage function to connect them with, the choice is up to the presenter. As we described in the fictional story we are thinking of using different techniques to illustrate the gestures. Film sequences are thought of establishing a complete understanding for how the gestures should be performed, in form of a physical tape, compact disc and video clips in the software application. Flip cards are an alternative to the film sequences, they are easy for the presenter to carry and are an alternative way to look at the gestures. The pictures has various functions, we see them as general images of the gestures, but also as symbols on the GUI where the presenter has to make the registration of the selected gestures. The device is ready to use when the Presenter has decided gestures and registered each gesture to a specific area.



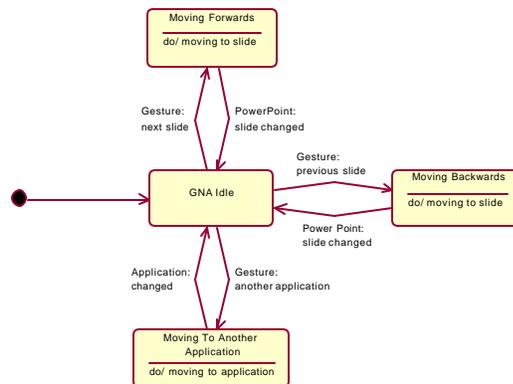
The Interface for Choosing Gestures

<sup>10</sup> For more detailed description of each use case, see Appendix B

### 8.2.2 Navigate through Applications

GNA can only be used if the presenter has turned Power Point in slide show mode and open the other applications he wants to use, and done the choice of gestures (described above). When this is done the presenter can choose between navigating within Power Point and leaving it for another application. When Power Point is activated the presenter can either navigate forward or backward depending on which slide is present on the screen. If the Presenter chooses to move to another application he transfers outside Power Point, and the gestures for changing slides inactivates. The way back into Power Point is to do the gesture for “moving to another application”. These are the different interactions that can occur within the GNA-system. It is illustrated with the State diagram below.

The states can alternate between a moving action and an idle position. The turn starts when the GNA system is activated and any application is opened. The presenter can chose between *Moving Forwards* (as long as not on the last slide), *Moving Backwards* (as long as not on the first slide) or *Moving To Another Application*.



**Figure 21.** State Diagram of the Gestural Navigator Application

### 8.3 Reflections of the Software Design Work

We saw a challenge in embedding the computer in the real world. By using a gestural device we wanted to achieve a flow in presentations. During the work with the design of the system, we have chosen to call Gestural Navigating Application, we got a concrete understanding about the difficulty to find a solution in the computer world to a problem from the real world that will fit in both. We have discovered the difficulty within the meeting between these two worlds. The real world is complex and things are impossible to predict how they will take place. Everything is depending on the environment and things within it. The things can be artefacts, people, their senses or anything existing in the real world. The computer world on the other hand, is from the beginning created by people built upon mathematical calculations. (Janlert, 1999)

There is also a difference in the way we people are solving problems and situations compare to how a problem get solved in computers. When people get stuck in a situation they cannot find a solution for themselves they search for help. There are almost always solutions to problems, and they can be found with help from other people or somewhere else. Compared to the computer, who cannot find solutions itself if there is nothing programmed for it. When the if-propositions are completed, the computer is running for a dead end and does not find a way out on itself.

### 8.3.1 The Complexity with Finding Solutions to Problems

Blum (1996) writes in his book *Beyond Programming* that the informality exists within the real world and the formality must be present within the computer world. Even though we just have explained that we find the real world complex we agree with Blum that there is a kind of simplicity in it. We want to develop our understanding of Blum's view with an example. A person with the average functionality can easily move a paper from one place to another, but the same process within the computer world is much more complex and need lot of coding and work behind. It is the same complexity with the gestural identification. People can easily gesticulate and understand other's gestures, when they once have been "learned"<sup>11</sup>. A computer device has to be able to detect and interpret gestures, for this an artificial neural network is needed, as in the Ring and Bracelet device (Chapter 3). Maybe the computer world can be understood as easy but the most essential from the real world can be a complex process when these two worlds get together. The way that the computer world is structured makes it hard to transfer even a simple act from the real world into the computer world. The work required for implementing software that detects gestures is very complex. During our work with the design of the GNA-system we saw one question arise; how can we solve problems found in the real world so that they fit in the structured computer world? When we structure data from a usage domain in computers, it must not lose its informal appearance. In this we see a challenge and complexity because, regarding to Blum, the formal must be present within computers. We feel that there is no easy answer to this question, but we would like to show how we have confronted it in our work.

We found the problem we wanted to solve, how to change slide within PowerPoint and moving between different applications. At a first glance we did not see this problem so difficult to solve, but when we got deeper into the software design we understood that there were many parts involved. To understand how the Gestural Navigator Application would work we started by looking for existing ways of interacting with Power Point. Apart from the "normal" way of interact such as keyboard and mouse, we found a remote controller that was a freestanding product, not offered for sale from Microsoft. We understood that the problem could be solved outside Microsoft's "walls". With this understanding we started to search

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<sup>11</sup> By learned gestures we include both natural and designed ones, even though the learning occur differently.

for possible solutions. We found support for this way of confronting the problem in what Blum advocates as *Adaptive design*, that is a problem-oriented approach. This means that you develop an understanding of the problem to be solved and expressing solutions in a form that can be reasoned about. (Blum, 1996) By confronting the problem the way we did, gave us a concrete understanding of the difficulty of bringing the real world and the computer world together. Our new concrete understanding contributed a curiosity for realise the design. We wanted to develop a prototype for testing with the user, but the time aspect delimited it.

### 8.3.2 Make the User Feel Smart – by Hiding the Complexity

The complexity we saw in the meeting between the real world and the computer world was something we wanted to hide for the users. One way to do hide the complexity was to develop an interface where the users would be able to forget that they actually are working with a computer. Our thought of the interface for choosing gestures in the GNA-system, was to make it easy to understand and simple to use. The user has to select gestures and register them in the computer. We wanted the choice and registration of gestures to be done easy. In the visualisation of the gestures we can see a difficulty. To support the user in the choice of gestures we would have done an interface easy to understand, by letting simple symbols visualise the gestures from the real world. We have done a picture (section 8.2.1) of one part that could be included in a future interface. The gesture symbols are developed from the different ways we have chosen to illustrate the gestures for the user; video clip, compact disc, flip cards and pictures. These different represented artefacts are a first step of supporting the users to forget that they are using a computer. We find support about the power of representations in Donald Norman's (1993) book *Things that make us smart*. He gives an example of experiential and reflective artefacts. The experiential artefacts provide ways to experience and act upon the world, they work as mediations between the mind and the world. Reflective artefacts provide ways to modify and act upon representations of the world, they make the user ignore the real world and instead concentrate only upon the artefact. We see the techniques that we have used to illustrate the gestures for the user as reflective artefacts, because they take the user out of the real world to the represented world. In our system the reflective artefacts was a good solution to let the user focus on learning how to use the gestures, instead of thinking of how it will work in the real world. The system on the other hand we see as an experiential artefact that makes the user act upon the real world and forget that he is using a computer. The Gestural Navigating Application will work as a mediator between the user and his presentation material. We think the fact that we have designed gestures close to the natural behaviour, makes the mediation smooth.

## 9 The End of the Journey

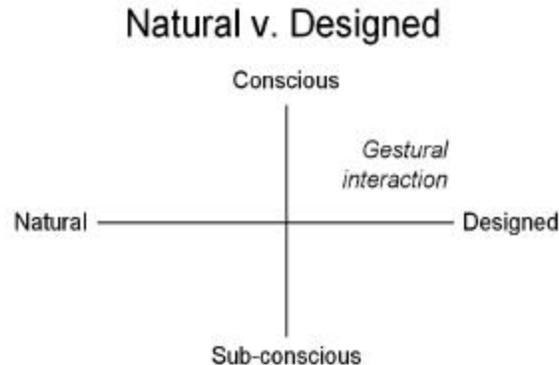
Is it possible to use natural gestures as an interactive tool to control a Power Point presentation on a computer, without interrupting the flow of the presentation? This was our main question when we started our work. We will close the circle in this final chapter by revisiting this main question and discussing it. The discussion will be built upon the elements of our work that contributed to our final results. The elements that we will discuss are; our practice as designers, the different kinds of gestures and their usage, together with the fact that we have done our thesis in Australia. This chapter works also as a creator of an overall picture of our work.

The main question has been reformulated more than one time. The reformulations have occurred when we have reached a new level of understanding, which has happened when we have taken a new step within our dynamic design process. We will not reproduce all the nuances that the question has had, rather we simply state its final formulation. The final question became; -Is it possible to design gestures that presenters find easy enough to use that the gestures become almost subconscious?

### 9.1 The Challenge of Designing Naturalistic Gestures

We have separated the gestures into two main categories; natural and designed. The descriptions we have chosen of the two categories are extremes. We have found out that gestures are performed at different levels of consciousness. The two extremes we have chosen for this illustration are; conscious and sub-conscious.

Natural gestures are the one that occurs in communication between people, both verbal and non-verbal. They occur in a sub-conscious way; people just make the natural gestures without thinking about knowing the exact shape they will take. The category of designed gestures constrains gestures that are used to perform a specific task, the gestures are pre-determined for that specific purpose. Our designed gestures are developed from gestures found in the natural gesture category. To the eye they tend to look similar to natural gestures but they have a different purpose, different origins a different way of development and different meanings. The designed gestures are made in a conscious way.



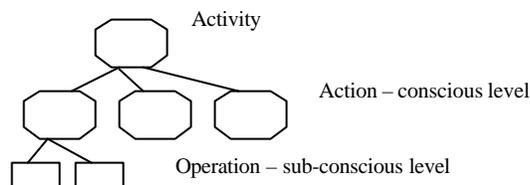
**Figure 22.** Axis of Natural verses Designed gestures and their consciousness

The separation of gestures into two categories was done in order to concretise the difference that we found in the gestures. During our journey towards the artefact we realised that the gestures used for interaction did not fit into the category of natural gestures. This was the reason for the creation of the category named designed gestures.

The fact that the natural and the designed gestures are very much alike, raises the operation of whether it is possible for the computer to distinguish them with the techniques that are described earlier in this thesis (chapter 3). During our work it has emerged that the system has to have some way to ensure that designed gestures can be distinguished from natural ones. Otherwise we see that the computer has to be able to read or feel people's inner thought processes (chapter 4). We found support for this in more than one way during our work. We would like to highlight two of them in this conclusion. During studies of our research material from the introductory ethnographical inspired fieldwork, we saw that one presenter naturally did one of the designed gestures from the workshop. Another example is from the experiment by testing the gestures in real life (chapter 7). The presenter said the following when asked about his feeling of using gestures *"I use a lot of gestures when I speak anyway so I was a little conscious of the fact that I could unintentionally make a gesture which 'the ring' took to mean something."*(Daniel Johnson, 30/04/00) A way to solve this problem could be to secure the system by some kind of on/off function. We have chosen not to go any deeper into this problem, but it could be an interesting area of research to work further with.

We would like to resume our question and discuss the possibility of designing gestures that presenters can use and still find so easy that they become almost subconscious. We know from our research that it is possible to design gestures (chapter 6). We will now explain how we think that the designed gestures have the possibility to become subconscious. In the figure above, we have placed the concept "gestural interaction" in the "designed" and "conscious" quadrant. Our reason for this is that gestures are done consciously in the beginning when the

presenter is learning to use them. As time goes do we think that the gestures will become more and more sub-conscious. This conviction has grown from Susan Bødkers' (1991) way of describing actions and operations. She illustrates this approach with a picture, which you can see in the figure below. She claims that each individual activity arises through actions with specific intentions, done consciously and directed to an object or a subject. Further she writes that each action has operational aspects, which means how they are performed. The “how” has nothing to do with the shaping of the action, instead it has to do with the level of consciousness. We will illustrate it by using Tom the presenter (from chapter 8) in performance. Tom is doing an *activity*, when he is delivering a presentation. When Tom is performing, his conscious *action* is to change slides. The gesture he is using to perform the *actions* can become an *operation*, when it is done sub-consciously. Toms' *actions* are then *operationalized*.



**Figure 23.** The individual persons' activity conducted from actions

Bødker's concept with operationalized actions is what we see our gestures have become when they have reached the level of sub-consciousness. Our motive for the designed gestures reaching this level is that their shapes are close to natural ones. We decided on only three usage areas for gestures during a presentation so that the presenter can get used to them and use them fluently, “practice makes perfect”.

## 9.2 Our Practice - Designer of this Journey

During this work we have discovered the strength of our foundation as MDA-students<sup>12</sup>. This discovery started when we unintentionally studied the presenters at the conference we took part in during the third week of our stay here in Australia. During the presentations we saw a disruptive element within the presenters way of interacting with their presentation material. We think that this observation could be made even without MDA education, but we brought the thought with us unconsciously. When we heard about the project *Design of a Naturalistic Gesture Based Input Appliance for Ubiquitous Computing*, it made us decide the discourse for this journey. In to this journey we brought our theoretical knowledge about how to act as designers. (Chapter 2)

In our research we have found that it is possible to design gestures, which presenters can use and find so easy that the gestures become almost subconscious. This result has grown to its final shape during our work with; literature, ethnographic inspired fieldwork, workshop, testing and design of software. We will

<sup>12</sup> MDA; Människor Datorteknik Arbetsliv, Swedish for People Computers and Work

explain that below the dynamic process resulted from working with these resources and techniques.

An essential element that we want to throw light upon is the outcome of us working and living together in a foreign country. Close together, we have carried out this project for five months. This has affected the work in a positive way. From not knowing each other well when we arrived in Australia, we have now created a spirit of understanding and trust of each other. This new friendship where we complement each other, has in a good way influenced our work. It has contributed joy and energy. On a professional level we like to call this the strong essence of Community of Practice (CoP) (chapter 2). We think that it is important to take part in a CoP, even though it is just two people. It is a foundation where new ideas can be born and discussed, the other people can bring in their opinions and ways of thinking. The fact that we have someone to debate the matter with brings the area a wider and deeper meaning. Our CoP has had different appearances, it has existed of different people at different times.

The work began with getting to know the field – the world of gestures, this we did by reading different literature within the area. During the whole journey we have discussed the literature, both critically and in order to understand the rest of our collected research material. We see that the information from this literature has worked as a trampoline for us during the work.

The new knowledge created a foundation for our ethnographically inspired fieldwork. It helped us to decide what focus we should have in this fieldwork. We chose to observe presenters (chapter 5) in a new way. Our focus was more on their way of gesticulating and interacting with the computer than understanding the content of their message. We felt that developing practical understanding for the area of gestures, presenters and the whole environment where the future device would operate was important. Therefore we chose to act presenters on our own. We videotaped the presentation to be able to review it and study our way of gesticulating. The videotapes from the ethnographic inspired fieldwork have been one important part of us understanding that the gestures to use are the designed ones. During a review of Ben's presentation, at the end of our work, we saw him expressing himself sub-consciously with one of the gestures that had been designed for gestural interaction. He talked about a subject and needed the gesture to make it clear for both him and the audience. This discovery strengthens our belief that the device needs an on/off function. Even though we saw the difficulty of making the technology work with gestures that are close to natural ones, we are convinced that these are the most useful gestures for people to use as an interactive tool. We had this thought from the beginning but it has grown stronger during our work.

We carried the feeling that we had in the beginning, about the usefulness of gestures as an interactive tool, with us into the workshops. This feeling was created by the knowledge we got from studies of the literature and from observing presenters in action. At this stage we thought of gestures as one concept and did not think of further categorisation of them, which came later. The most important reason for having a workshop was to meet some future users and get their opinions and thoughts about the use of gestures. Their viewpoints were interesting to work further with (chapter 6). We will highlight some of them, but not all. The future

users we worked with turned out to be a group with a wide range of opinion regarding what gestures to use. The opinions were separated between using gestures close to the natural gestures or finding gestures that were so unnatural that people would never unintentionally do them. During the discussions the participants changed their opinions, and in the end almost everybody felt that using gestures close to the natural gestures could be a good way to interact with computer. We feel that through having these workshops we got to understand these future users opinions, the opinions had an opportunity to come to the surface and grow. They also contributed a source of issues for later discussions, which we have done since the opinions arose. Now we were even more convinced that gestures could be used in interaction with computers.

We decided to test all of the experiences we had produced so far in the workshops in the real world, therefore we organised to try the gestures during a lecture. This gave us an understanding of the importance of having a real prototype and trying it in a real situation. Our guinea pigs, Daniel and his students, gave us feedback that we think we would not have got without this test situation. Daniel felt insecure about whether his gestures could be understood or misunderstood by the “the ring” and this made him slightly more conscious about his actions. On the other hand he liked the feeling of freedom to walk around in the room without the need to walk back to the computer to change slides. The students’ opinions were that Daniel’s gesticulation looked more obvious than usual (chapter 7). During our dynamic process; when we have studied the material from the experiment again, we have felt that we would like to try a real prototype to get a more valid result.

During the design of the Gestural Navigator Application (chapter 8) the concept became more concrete and our curiosity too further developing and testing of a prototype increased. The discussions we have had about the challenge of combine the problems from the real world with the solutions in the computer world, is a result from our way of thinking as designers. We strive for making things that people find easy to use and that will fit into their activity, therefore we have to know how to solve the problems we find in the real world with the solutions that fit in the computer world.

Once more we will point out the importance of designing together with a group of future users. This together with the idea of making artefacts that fit in the environment, suit the users and make them feel smart, formed the outcome of this project. These two convictions are the guiding stars for our practice. We needed the future users opinions and thoughts to be able to design a computer-based device that had the potential to work as mediator between the presenter and his message. The presenter would then be able to focus on the audience and the message of the presentation instead of how to interact with the computer.

### 9.3 In Conclusion

As an answer to the question: - Is it possible to design gestures, which presenters can use and find so easy that the gestures become almost subconscious? We have found that it is possible, and we think that it offers a good alternative to the existing interaction devices, such as keyboard, mouse (wireless or stationed) or remote control. To make this new interaction concept possible we think the system has to have a way of preventing it from being activated by a conversational gesture, an on/off function could be a solution.

With support from our research result we think that the designed gestures should take the shape of natural ones. In this way they are easier to perform, learn and remember. If they have a natural shape we think they have the potentiality to become operationalized for the presenter. In this way he can put his attention on the audience and the messages he wants to convey instead of the interaction with his computer.

From a technical point of view, the prototype has not quite reached the stage of user trials, so we do not know if there are technical issues that make some gestures hard to detect. However we have focussed on a user-centred approach to seeing what gestures users might prefer. Our workshops found that presenters have different styles of gesturing and they designed different control gestures. Therefore we propose a customisable system. However, based upon our research we have proposed gestures that our users invented, which will be useful as a starting point for testing a functional prototype. They will also serve helpfully as candidate gestures that users can try out first to get a feel for the device. This will aid further development of the device to determine whether it could become a successful product or not. At this stage it is too early to tell.

Finally we refer back to the opening of this thesis, where we described how we travelled to Australia with hopes to experience and learn a lot. With the adventure behind us we feel more than convinced that it has been instructive, in many ways. We feel that we have managed to carry through this work in a good way, and we feel satisfied with the result of the work and the whole experience of living in a foreign country. In spite of obstacles in our way, such as a break in to our apartment and a flea attack, we have managed. But most importantly we have enjoyed ourselves and see this journey as a good memory in our lives. We cannot see a better way of ending the education at the MDA-program from Blekinge Institute of Technology than do it in Australia at the University of Queensland together with all the people that have created our community.

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# Appendix A – Schedule of the Workshop

**The Gesture Workshop - 7th of March 9.30 am – 3.30 pm  
Ipswich, Building 19, Room 102**

The goal is to design gestures for interaction with the computer.

## **What do we expect from you?**

You should be prepared to deliver about ten minutes presentation (you bring your own presentation). The presentation could be about your hobbies or from your research etc. It is not the subject in itself that is most interesting, the goal is to deliver a presentation about a subject that you know and find easy to talk about.

You as the presenters have to use Power Point and move to some other applications, e.g. Word, The Internet or Real Player. Things that you should be able to do during the presentation (and later through gestures):

- Move to the next and previous slide.
- Move to the first and last slide.
- Move to one other tool, such as Word, the Internet or Real Player.

**9.30 – 10.00 Introduction**

### **Part 1:**

**10.00 – 10.30 Step 1:** Two of the participators do their short Power Point presentation and using the different applications. This should be done in as “normal” way as possible, by using the keyboard or the mouse when the slide is changed and when you are moving to another application.

**10.30 – 10.45 Coffee break**

**10.45 – 11.15 Step 2:** All the participators discussing with each other their different kind of problem they have found during the presentations (with the computer interaction).

**11.15 – 12.30 Step 3:** All the participators develop different kinds of gestures to use for switching to next and previous slide, to the first slide, to the last slide and changing to other applications.

**12.30 - 1.30 LUNCH** (we bring tuna salad for all of us, please let us know if you don't eat tuna)

**1.30 – 2.00 Step 3:** Refresh the designed gestures.

### **Part 2:**

**2.00 -2.30 Step 4:** Two of the participators do their presentation and using our own designed gestures, for changing slides and moves to another application. At this point the gestures has to be addressed to a person (one of us, Swedish girls) which takes care of the computer interaction.

**2.30 -2.45 Coffee break**

**2.45 -3.30 Step 5:** All together analyse and discuss what was good and what was bad. About the designed gestures as well as about what we can do to improve the next Workshop.

We are going to videotape the whole workshop.

*Thanks for participating in our Workshop!  
Anette & Caroline*

## Appendix B – Use Case Description

### Gestural Navigator Application

**Use Case:** *Choose Gestures*  
**Actor:** Presenter  
**Type:** Primary  
**Description:** This use case start when a presenter chooses a set of gestures or a single gesture that he connects to the specific task by registration. The use case ends when chosen gestures are have been registered correct to the chosen task.

**Use Case:** *Change Slide*  
**Actor:** Ring and Bracelet Device  
**Type:** Primary  
**Description:** This use case starts when a presenter makes a gesture to change slide during the presentation. The input signal to the Gesture Navigator Application is sent from the Ring and Bracelet Device that have distinguished the gesture. The use case ends when the slide has been changed correct.

**Use Case:** Move to another application  
**Actor:** Ring and Bracelet Devise  
**Type:** Primary  
**Description:** This use case starts when a presenter makes a gesture to move to another application. The Ring and Bracelet Device that has recognised the gesture send the input signal to the Gesture Navigator Application. The use case ends when the other application has been opened correct.