

Blekinge Institute of Technology  
School of Engineering  
Master Thesis  
2005-05-30



# Being at one with the tool

- applying flow to usability

## Authors:

Roger Antonsson, roaa01@student.bth.se

Lena Petterson, lepe01@student.bth.se

## Supervisors:

Christina Hansson, School of Engineering

Hans Tap, School of Engineering

## **Acknowledgements**

We would like to thank a number of persons that have influenced our work and thoughts during this semester:

Our supervisors Christina Hansson and Hans Tap for as well their support as their constructive and guidance feedback throughout this thesis.

Magnus Johansson for his linguistic comments.

Densitet AB for letting us be a part of their organization and participate as usability designers in an interesting project.

The participators in the user-tests and interviews for their time and valuable comments.

Finally a special thank to our respective families for putting up with us during this time.

## Foreword

*"The trouble with software is... it sucks. That's not a nice thing to say... but it is a fundamental truth. Software customers—you, me, CIOs of multibillion-dollar companies...have learned to live with mediocre software. We do not count on software to be intuitively easy to understand or to work consistently. Instead, we make do."*  
(Stewart Alsop, Fortune Magazine, June 10, 1996)

Even today there is a lot of truth in that quotation, however we are of the impression that it is about to reverse in a small scale. We are two students attending the fourth year at the Human Work Science programme at Blekinge Institute of Technology. (In this thesis we will use the Swedish name Människor Datateknik Arbetsliv (MDA)). MDA is an interdisciplinary programme which combines work science with computer science. This semester our work at the telecom company Densitet has been to refine a web application used to administrate a package of mobile services. MDA is a program that put emphasis on design and usability, and as students on that program it is important for us to satisfy the end-user. As graduated we see ourselves within the usability design discipline and central for our education has been to take both the technology and the people using it into consideration. We consider ourselves as the link between the developers and the users of technology.

## Abstract

Communication between people has become more and more important in society today and so has the way to communicate. Our work, which this master thesis is based upon, has been to evaluate and redesign an existing web application that works like a communication tool. To carry out this work we have compiled two questions; *how to facilitate the interaction for an application that is used as a tool, focusing on interface design, usability and flow; how can the usability be improved in a system, with help of flow theory.* To deal with these two questions we have used a number of methods that have had different kinds of influence of our work. The one that has had the greatest impact of the work with the evaluation has been cognitive walkthrough. For the design we have used literature studies along with the result of the evaluation.

A problem during our work has been that the user has not been specified the design should work at a generic group of users. The problem has not been to define the target group rather to suit the interface to everybody. This has been the challenge of this semester and we found designing an interface infusing usability with help from flow as interesting.

**Keywords:** interaction design, interface design, usability, flow, web application, mobile communication

## Sammanfattning

Kommunikation mellan människor liksom sättet att kommunicera har blivit allt viktigare i samhället idag. Vårt arbete, som magisterarbetet bygger på, har varit att utvärdera och omdesigna en existerande webbapplikation som fungerar som ett kommunikationsverktyg. För att genomföra arbetet har vi utarbetat två frågor; *hur förenklas interaktion för en applikation som används som ett verktyg, med fokus på gränssnittsdesign, användbarhet och flow; hur kan användbarheten öka i ett system, med hjälp av flow teorin*. För att kunna ta itu med dessa frågor har vi använt ett antal metoder som har påverkat vårt arbete på olika sätt. Den för arbetet med utvärderingen mest betydelsefulla har varit kognitiv genomgång. För designen har vi använt oss av litteraturstudier tillsammans med resultatet från utvärderingen.

Ett problem under vårt arbete har varit att användarna inte har varit specificerade utan designen bör fungera på en allmän grupp användare. Problemet har inte varit att definiera målgruppen utan snarare att anpassa gränssnittet till alla. Detta har varit en av utmaningarna under denna termin och vi tycker en annan intressant utmaning har varit att designa ett gränssnitt genom att ingjuta användbarhet med hjälp från flow.

# Table of contents

<b>INTRODUCTION .....</b>	<b>1</b>
THE COMPANY .....	2
OUTLINE OF THE THESIS .....	3
<b>DESCRIPTION OF THE SYSTEM.....</b>	<b>4</b>
<b>METHODS.....</b>	<b>6</b>
SCENARIOS .....	6
INTERVIEWS.....	6
USABILITY EVALUATION METHODS .....	7
<i>Expert evaluations.....</i>	<i>7</i>
Heuristic .....	7
Cognitive walkthrough .....	8
<i>User tests.....</i>	<i>8</i>
REFLECTIONS .....	9
<b>INTERACTION DESIGN .....</b>	<b>11</b>
INTERFACE DESIGN .....	13
<i>Interface metaphors .....</i>	<i>13</i>
<i>Shneiderman's golden rules .....</i>	<i>14</i>
USABILITY .....	23
FLOW.....	30
<i>Control.....</i>	<i>32</i>
<i>Ease of use .....</i>	<i>35</i>
<b>CONCLUSION.....</b>	<b>37</b>
<b>REFERENCES .....</b>	<b>39</b>
<b>APPENDIX</b>	

## Introduction

The use of information technology has in industrialized countries increased rapidly since its entry. In the beginning computers were used mainly by persons with great computer knowledge. Programs and systems were designed and built by as well used by a small amount of computer enthusiasts. Today there are not many people that never use computers either in their work or/and at home. The society more or less demands that, and we are surrounded by information of all kinds and tasks digitally. For example, in Sweden, the broadcasting media often offers more detailed information about part of a programme at their websites. Also the assets of technical devices have increased and work more and more connected to each other.

This progress in system development has put other demands on the industry of computer and information technology. The needs of the user and the way of presenting the data have become two important issues. The technical development needs to turn more towards the actual users and their benefits in order to facilitate the use. Magnus Lif states in his dissertation that *“The user interface should be designed so that the user can handle the interface automatically (i.e., on a lower cognitive level), leaving the higher cognitive level solving work-related problems.”* (Lif, 1998, p 5)

The technology has also improved and from our experiences wireless technology and mobile solutions are in demand. As we see it, one of the next steps that are about to happen is to apply mobile solutions that are tailor-made in larger scale onto the general users.

Our master thesis work has taken place at Densitet in Karlskrona, a company within telecom that specializes in wireless technology and mobile solutions. We have redesigned a web application with an evaluation as a starting point. The system is a web application used to administrate a package of mobile services. A basic idea with the system is that it should work as a tool to the user, while performing a task. The design solutions have been developed throughout the process in an iterative way, where the solutions have been refined with assistance from new ideas through the design phase. Both Densitet and the system are better described later in this section.

In order to design a desirable user interface, we think, it is important to bear in mind that end-users are central to software design and their perspective should always be the starting point. During our work, which

this master thesis is based upon, we have chosen to work with a minor user involvement. However, the needs of the end users were still important to us to have in mind when developing and evaluating this application.

During our four years of studies we have often come across an attitude among developers that users have to learn how to use a product, instead of focusing on users and their interaction with the system. A consequence of this is that users often are forced to spend a lot of unnecessary time learning and trying to figure out how a product or a system works, if it is even possible. In order to develop products and systems that succeed on the market, the design of usability should be equally important in the process. It is our belief that users in their purchase have larger needs of usability aspects than the market assumes and is therefore often underestimated.

Since we consider this application as a tool all along the question of how to ease the use and improve the interaction, has been a matter of importance. Also essential for the application is that it is purposeful and effective for its context. We have used three angles of approaches to attain our intention; interface design, usability and theory of flow. This ended up in these two thesis questions of issue;

*How to facilitate the interaction for an application that is used as a tool, focusing on interface design, usability and flow?*

*How can the usability be improved in a system, with help of flow theory?*

Of course, none of the three concepts are isolated phenomenon and nor are they the only elements in interaction design. There are similarities between them and they are closely related to each other. As we see it; in interface design, the aspect of usability is essential and the theory of flow is used to increase usability. However, in this thesis we have chosen to separate the three concepts to discuss and elucidate them respectively. We are aware that some of the examples we have placed in one concept as well could have been suitable in another concept.

## ***The company***

Densitet, placed and founded in Karlskrona year 2000, is a company that are characterized of the surrounding telecom environment and specialized in mobile solutions and wireless technologies. Their motto is "Communication solutions for a better world.". The company has two departments; one for consult business and one department for development. We have been at the development department, attending a project. At the development department there are several products based on the platform Mobile Service System MOSES and the project we

attended was also based on that. Densitet's business concept for MOSES is that anybody without a deep technical knowledge or programming skills should get mobile services in operation in just minutes. Other products they have are SecurePhone and MobileBackup.

### ***Outline of the thesis***

The thesis opens with a section about the methods we have used in our practical work. Under this section we describe both the methods we have used more frequently and thoroughly, and the ones used briefly. This section ends with a reflection of the methods. The following part, interaction design, theory is described along with our examples and our own comments. It starts with an introduction to interaction design. After that we discuss three aspects of interaction design in relation to our thesis questions of issue. Each aspect ends up with key findings. The thesis ends up with conclusion where the outline of our work is presented.

The figures presented in this thesis originate from both the existing system that we first evaluated and then have redesigned and from our own design proposal. Throughout the thesis figures from the existing system will be called *Densitet design* and our proposals will be called *Our design*. At the end, in the appendix, there are screenshots showing overall pictures from both the designs.

Already here, we want to alert the reader of the fact that our design work is still in an iterative process and therefore not finished when writing this thesis. Although, we are sometimes giving written examples on design proposals that has been further developed.

## Description of the system

Mobile Service System, MOSES, is a platform for mobile services. Today MOSES contains five different services, where some of them are more dependent of each other than others. The main concept in MOSES is fast communication. This communication is achieved by sending and receiving messages in all devices (computers, PDA and cell phones) MOSES are intended to be totally available online, from the start when a customer buys a service or a package of the system, to using it in their own business. There are another solution if the customer wants to use the system in a more specified environment it is possible to get it custom-made. To access the services paid for, there is a login page where the user connects to its account and performs the different tasks. MOSES is a web application that can only be accessed via Internet. The different services cost a fixed amount of money each month and every message sent costs an additional amount of money (the operator's traffic fee). The services in MOSES are supposed to work in small and medium sized companies, to support and develop their business, without having to invest a lot of money. The services are intended to work as easy as the Windows Office-package do, and be as well-known as the Office-package is in the computer world.

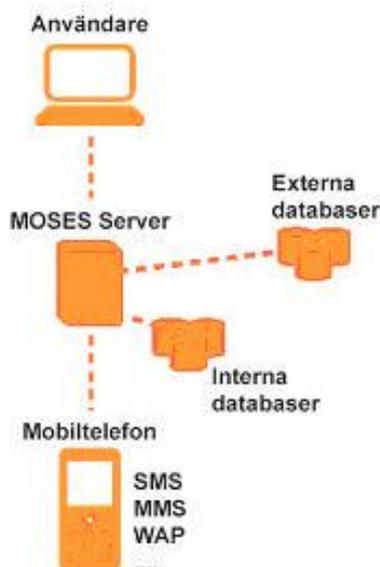


Figure 1 System description of MOSES

The services available at MOSES are Instant messaging, Mobile Community, Mobile Marketing, Mobile Opinion, Number Collector, RemindMe and Inbox. In Instant messaging the user sends SMS, MMS and e-mail to optional number of recipients. Mobile Community works like a community where the members receive SMS at their cell phones.

Mobile Marketing offers possibility to create campaigns that are distributed through SMS, MMS or e-mail to customers. Mobile Opinion is a tool for opinion poll for cell phones. The Number Collector collects number from people which send an SMS to a specified number. In RemindMe it is possible create reminders and notifications. The Inbox collect and display the incoming messages.

## **Methods**

The methods for evaluating and designing the user interfaces have mainly been expert evaluations, creating scenarios and literature studies. Additional methods have been working with user tests and think-aloud technique. The design work will in this part only be commented and will be further handled in the next section.

In this section there is first given a description of scenarios, followed by a description of interviews. After that comes a part about usability evaluation methods. This part is divided in two fractions. The first one is expert evaluations, including heuristics and cognitive walkthrough. The other is user test including the think-aloud technique. At the end of this section there are reflections on the methods.

## **Scenarios**

Throughout the process, both during the evaluation and the redesign we have used scenarios. A scenario is a narrative description of what users do in the course of completing a task. Scenarios are created to elucidate specific functions in the product that will be designed. The scenario contains actors, background information on the actors and assumptions about their environment, actors' goals or objectives and sequences of actions and events. (Go and Carroll, 2004) Actors in a scenario are specific people who carry out real or realistic tasks. To envision the use of a system that has not yet been constructed, the scenario writers have to describe potential users and what they may do with the system in extensive detail, including, for example, a description of workplace contexts. Some of the products that we worked with is not on the market and has no actual users.

Rather than describing the state of the system, scenarios present the perspective of a user moving through the task space. To be effective, scenarios need to be detailed enough so that designers can infer, and reason about, the implications that the activity flow and interactions have on the interface design. (Carroll, 1997) The use of scenarios helped us envision situations throughout the work, mainly the cognitive walkthrough and the redesign.

## **Interviews**

To find out about both the developers and a current user thoughts and opinions about the different products, we have been conducting interviews.

Interviews are a data-gathering technique that implies to ask a set of question to a person or a group. Interviews can be classified in three ways - structured, semi-structured or unstructured. In structured interviews the questions are created before the interview and they are questioned as planned without any resulting questions. Unstructured or open ended interviews are the opposite to structured, where there are no pre-written questions, more of a topic or topics to discuss. These interviews are more of a conversation or discussion and the answers offer deeper information. Semi-structured interviews are a mix of structured and unstructured interviews, where there are predefined questions, but even possibilities for further discussion about interesting topics (Preece et al, 2002). We have mainly been using semi-structured interviews.

## ***Usability evaluation methods***

We have used evaluation methods to find and identify usability problems in MOSES. In usability evaluations there are two main categories, one where experts evaluate the system and the other with the focus on the user testing the system. Below we will give a short description to each category.

### **Expert evaluations**

Expert evaluations mean that one or more usability experts review a product or system. Important for an expert evaluation is that the expert that carry out the evaluation is not the one responsible for the design of the product or prototype. (Ottersten and Berndtsson, 2002) This method has been the major method for us in reviewing the products.

### **Heuristic**

Heuristic evaluation is a form of usability inspection where usability experts judge whether a user interface follows the rules of a set of specified heuristics. The method is developed by Rolf Molich and Jacob Nielsen in 1990 and they worked out a set of heuristics. Nielsen has later refined the heuristics based on an analysis of usability problems, which ended up in the ten below listed heuristics. (Nielsen, 1994) The heuristics help the evaluators to focus on aspects that often engender problems for the user. Since this evaluation was done to a system that has no specific users and on the contrary is suppose to fit users in general we have used some of the established heuristics that Molich and Nielsen developed without specifying any heuristics of our own.

Below are the ten heuristics that Nielsen (1994) listed:

- visibility of system status

- match between system and the real world
- user control and freedom
- consistency and standards
- error prevention
- recognition rather than recall
- flexibility and efficiency of use
- aesthetic and minimalist design
- help users recognize, diagnose, and recover from errors
- help and documentation

In the evaluation we have to a certain extent taken all the heuristics into consideration, however six of them have been more significant for us. They will here shortly be described:

- *Match between system and the real world* – The language used in the system should be adjusted to the user’s language and the information displayed should appear in a natural and logical order.
- *User control and freedom* – The user should have the possibility to undo and redo an action or restart.
- *Error prevention* – the user should not run the risk to make errors.
- *Recognition rather than recall* – minimize the user’s memory load.
- *Aesthetic and minimalist design* – only relevant and essential information should be displayed.
- *Help users recognize, diagnose, and recover from errors* – Supply the user with helpful and constructive error messages.

## Cognitive walkthrough

*“Cognitive walkthroughs involve simulating a user’s problem-solving process at each step in the human-computer dialog, checking to see if the user’s goal and memory for action can be assumed to lead to the next correct action.”* (Nielsen and Mack, 1994, p 6)

This method is task oriented and focuses in detail on users problems in interacting with a system and that is the strength with this method. This method is good to use when there are no real users to access or in addition to user tests. Also good is that it is not necessary with a fully working prototype or system to carry out this method. (Preece et al, 2002)

## User tests

User tests are performed to get an understanding of how users interact with a system. Nielsen (1993) points out that user tests are superior to expert tests and we think that in combination with the think-aloud

technique it is even better. When using the think-aloud technique the user is performing a task and constantly commenting the execution. The advantage using this technique is that information, not available in other methods, would be visible, like problems understanding certain steps or commands. (Preece et al, 2002)

For us it was important to try the proposed design with potential users, to find out how the design worked. In order to get feedback on both the existing system and the new proposed design we have conducted user tests with other persons. We would like to point out that they are not potential buyers of the system, but can easily be considered as potential users since that the system is supposed to be suitable for anyone with normal computer skills. We have conducted five user tests. The tests contained as well frequent as minor used tasks, to expose a wider range of problems.

It is important that everyone is clear about that the focus is on testing the system and not the user. Like Nielsen (1994) points out, the users must not have the feeling of being tested themselves.

## ***Reflections***

The methods of choice have, as we see it, been relevant and suitable to our work. A valuable method for evaluating has been cognitive walkthrough. We attach great importance to users' viewpoint and this method proved to suit our purposes.

Our work this semester has been to improve an existing web application. The work started out with a usability evaluation, and as customary we had no previous knowledge of the system. However instead of writing down a usability evaluation protocol to give to the developers, we ourselves took the role as developers of the interface design. Usually that is not the case. For us, changing roles, did not cause any problems, on the other hand we found it quite fruitful. Of course, the preconditions are different from designing without an existing system and there are as well pros and as cons. We used the existing system and made adjustments according to our ideas of design, but also influenced by what Densitet wanted.

In order to attain some more information about the system and a current user's perspective we used interviews. During the interviews there were times when we sensed that they had been so involved in the development of the *Densitet design*, that they became blind to defects in their work.

The target group of end users, for this application, are defined as people with normally IT-experience. This group is generic and therefore not so hard to define, but the system that has these kinds of requirements of the users is hard to design for. In order to get a feeling of how well our design

would work, it was important to get some reflections on the both designs and in particular for our own design. The testers commented the designs diligent and this was helpful for us in our design work.

We have used the same testers for both the *Densitet design* and *Our design*. There are probably both pros and cons with that. One problem, as we see it, is that one can become ruled by the other design.

## Interaction design

In this section we will discuss for us important parts of interaction design and try to apply it from our point of view. It opens with an introduction of interaction design and a short description of human-computer interaction (HCI). After that comes three parts; **interface design** which contains interface metaphors and Shneiderman's golden principals, **usability** and **flow** that contains control and ease of use. Each part will be discussed separately along with examples from both the design of Densitet, further on called *Densitet design* and our design proposal called *Our design*.

We would like to point out that the design iterative has changed during the work with this thesis and that some of our solutions here may be changed or removed in the current version. Also the appearances of the views have changed to some extent.

Interaction design is fundamental to all disciplines, fields and approaches that are concerned with researching and designing computer-based systems for people. Figure 2. For us human-computer interaction (HCI) is the most natural interdisciplinary field and from our point of view an important research field that affects interaction design.

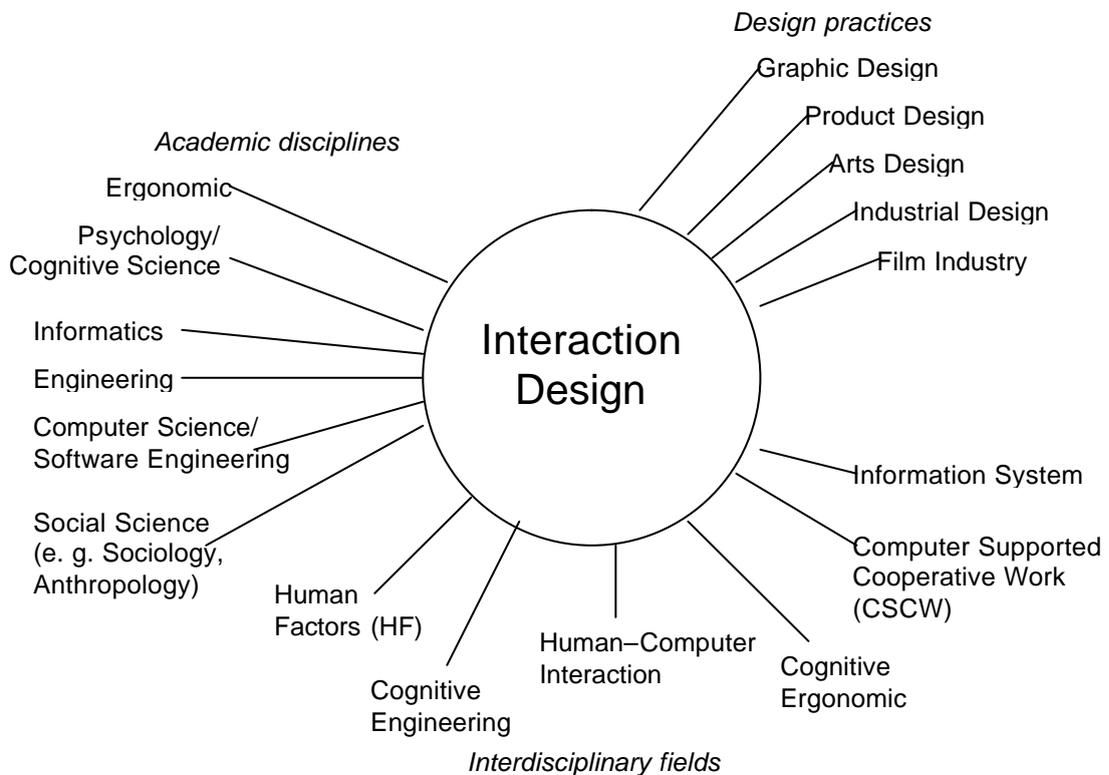


Figure 2 Picture from Preece et al (2002, p 8) showing Interaction Design in a larger perspective

HCI has no general or homogeneous definition. Gulliksen and Göransson (2002) claim that the perhaps most accepted definition is presented by ACM SIGCHI Curriculum Development Group.

*“Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.”*

(ACM Special Interest Group on Computer-Human Interaction (SIGCHI) Curriculum Development Group, 1992, section 2.1)

This definition is also the one that best reflect our understanding. In our opinion the interpretation of HCI easily can be too narrow, and only include understanding the usability and interface design. This research field is multidisciplinary and knowledge is gained from several disciplines, such as human work science, computer science, psychology, ergonomics, design and social science. MDA is boundary exceeded and represented in two various disciplines and increases the ability to work within the field.

Preece et al. (2002, p 6) define interaction design as being concerned with “designing interactive products to support people in their everyday and working lives”. It is a definition that well consent with ours. Interaction design is the process where the interplay between the user and the product takes place.

Since the system is an already existing one and we are refining the design, we have often illustrated our thoughts by a comparison with the design of *Densitet*. Since the design work not is finished, these design proposals are not yet implemented in the system and therefore not tested in the real environment. To be able to obtain some response to *Our design* from feasible users, we have had some user tests. They were asked to perform some tasks, the same tasks were done on the *Densitet design*.

There are, according to Preece et al. (2002) four fundamental activities involved in the process of interaction design:

- Identifying needs and establishing requirements.
- Developing alternative designs that meet those requirements.
- Building interactive versions of the designs so that they can be communicated and assessed.
- Evaluating what is being built throughout the process.

The four activities are meant to update one another and to be iterative.

Unfortunately, interaction design is often mixed up with graphical design. Admittedly there are visual elements to consider, but the foremost matter

is to design the interaction with the product. (Ottersten and Berndtsson, 2002) In interaction design, one investigates the artefact's use and target domain by taking a user-centered approach to development.

## ***Interface design***

Norman (1986) argues that the design of the interface should be dominated by the needs of the user and that the rest of the system should be dominated by the needs of the interface. A system that has an excellent technical solution but lacks a good user interface may never be used. On the other hand, a user interface that is well designed cannot hide a bad system. We will first discuss how interface metaphors can be of help in interface design. After that the eight golden rules of Shneiderman (2004) has been applied in our design. Interface design ends up with some key findings.

## **Interface metaphors**

Preece et al (2002) argue that interface metaphors have proven to be highly successful in interface design. When we come across something that is unknown we usually try to place it into a well-known context. Interface metaphors are descriptions of similarities to a known phenomenon and they give more evident information when using them in the design of user interfaces. Interface metaphors can make it easier for the interface designers to create a good and understandable interface design. When using metaphors the users have the possibility to recognise themselves from other similar situations in their life. Since the interface metaphors are providing users with for them well-known representations of activities, it can help them understand and learn how to use a system. A good way to start designing user interfaces is therefore finding metaphors related to the future product or system.

Bruce Tognazzini (2003) has written "*First Principles of Interaction Design*" encourages the use of metaphors but he states that it is important to carefully choose them. Well-chosen metaphors will, according to Tognazzini (2003), enable users to instantaneously perceive the finest details of the conceptual model<sup>1</sup>. They are like stories and can generate visible pictures in the mind.

Metaphors have been, to a large extend, ingrained in the language and we use it a lot to express ourselves. Metaphors, according to Kendall and Kendall (1994), have an amazing power to structure people thoughts

---

<sup>1</sup> "a description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, behave and look like, that will be understandable by the users in the manner intended."

when they are caught by a metaphor. We agree with them as they argue that “Metaphors are ubiquitous, but that should not diminish their importance. In contrast, metaphors are so deeply embedded in our daily language that we become blind to the important ways in which they shape our thought and influence our behaviour.” (ibid, p 37)

In the design of interfaces, according to Kendall and Kendall (1994), it is not possible to understand, or to communicate an understanding of the physical world and the semantic world without using metaphors. The metaphors are there to make the interaction easier i.e. more comprehensible for the user. The recognition of things, words, processes, phenomenon etcetera is helpful in supporting the user. The metaphors evoke something familiar. It is important though to choose metaphors that is understood as logic and supportive by the users.

Rosenfeld and Morville (2002) argue that metaphors are commonly used to help users understand the new by relating it to the familiar. Wisely used they can be powerful in the connection.

Aaron Marcus (1998) means that successful user interfaces depends on the design of metaphors. We are not willing to go that far; it is not universally prevailing but can be of good help many times. One major benefit with the use of metaphors, is that it can be easily explained how to use a software application since there are in the terms of something that is already understandable. In the *Densitet design* the address book is named database and has the attribute address book. In *Our design* we have named this part of the database Address book.

The use of metaphor is also criticized; Donald Norman (1998) is among them who is negative to the use of metaphor for interface design. Norman (2001) argues that users need good conceptual models to relate to. Metaphors on the other hand, he sees as misguided attempts to simplify a system. His verdict is rather harsh “..., *design through metaphor has become embedded within the collective wisdom of designers, or perhaps I should say, the collective lack of wisdom.*” We think Norman has a point in his argument; the use of metaphors must not be overused.

### **Shneiderman’s golden rules**

For developing user interface design bearing usability in mind there are mainly two authors that are referenced, Shneiderman (2004) and Nielsen (1993). Shneiderman has worked out what he calls eight golden rules that are applicable in the majority of interactive systems. Also Nielsen has worked out principles, similar to Shneiderman’s. These kinds of principles are to be considered as guidelines; subsequently these fundamental principles of interface design should be adjusted and refined to suit each individual design. In our design proposals, the design principles by

Shneiderman have served as guidelines, adjusted to suit our needs. Below is each rule presented along with examples of how we have applied them in *Our design*.

*Strive for consistency* – Shneiderman (2004) points out that this principle is the most difficult one to follow, though there are many ways of being consistent. The essence, however, is to endeavour towards limiting exceptions in consistency. As far as possible a consistent sequence of action should be employed.

In regards to this rule we have as far as possible, displayed information in the same way throughout the application. We had problem in one of the services with the consistency, when we designed for the message service where the user sends out messages to a range of people. The standard procedure of sending a Short Message Service (SMS) or a Multimedia Message Service (MMS) interferes with the standard procedure of sending e-mails. In the *Densitet design* they have chosen to follow the rule of consistency by always choosing the recipient before the message. In *Our design* we have chosen to follow the standard procedures for respective alternative, i.e. SMS and MMS message first and recipient afterwards and vice versa for e-mail.

*Cater to universal usability* – enable for as well novice users as expert users to use and navigate conveniently.

In the *Densitet design* there is a solution in the application where the user has the possibility to recognize where they are in the system with an index row at the top Figure 3. We have used this and improved the solution Figure 4.



**Figure 3** Index row in the *Densitet design*

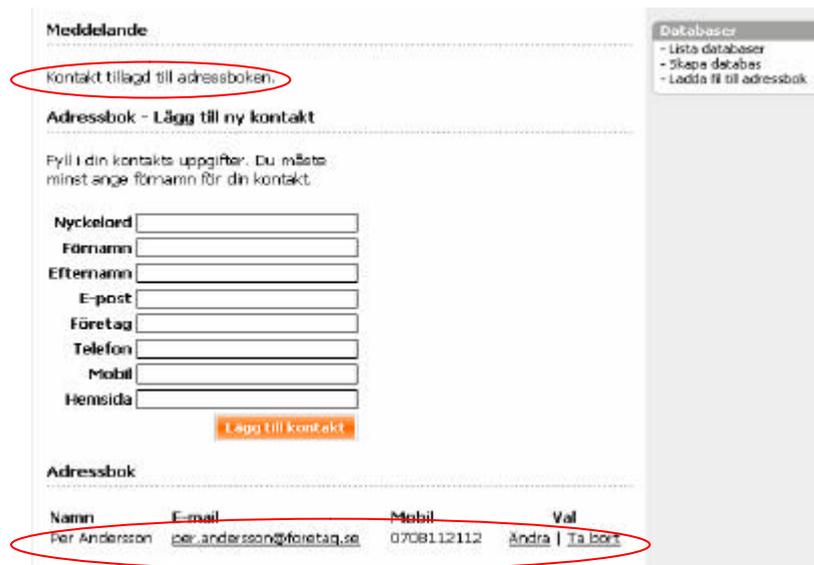


**Figure 4** Index row in *Our design*

In a later version of *Our design* we have developed the services in a much more step based interaction. This has required more views for the user to attend to, and we think that is good and convenient for the novice user. In order to also enable a convenient navigation for experts there has to be a possibility for them to change the settings on the application to avoid many steps.

*Offer informative feedback* – Shneiderman (2004) means that there should be a response from the system for every user action. Depending on the action the feedback can differ. For common and minor actions the feedback can be insignificant, but for major actions the feedback should

be more substantial. We find this rule important to get a usable application. In the former application the feedback was not as visible and evident as wanted. For example the information when a new person was added in the address book was displayed at top of the screen, at the same place and in the same way as the information before the action add a contact took place. The participants in our user tests all had problems to comprehend the feedback. It was perceived as vague and did not appear where the testers expected it to be. Figure 5.



**Figure 5 Feedback in the *Densitet design***

In *Our design* we have used an ordinary pop-up, with information that a person has been added and that person's first and last name Figure 6. Although, one should be cautious with the use of pop-ups, too many only cause irritation and the users will not pay attention to them.



**Figure 6 *Our design* solution of feedback, when adding a new contact**

*Design dialogs to yield closure* – sequences of actions should be structured into groups with a clear start, middle, and end. The user must know that the task is done and this gives the user a sense of relief and satisfaction. When the task is completed the users mind is ready for

another action. This rule has been important and we applied it into to *Our design* to give the user a perceived control. In the picture below there is an example from *Our design* with a start, middle and an end Figure 7.



Figure 7 An example of a clear start and end from *Our design*

*Prevent errors* – the system should be designed to prevent users from making any serious errors. In the case a user makes an error the system should discover the error, and subsequently offer a simple, constructive and specific instruction for recovery.

In the *Densitet design* there is a well-thought detail to prevent errors. SMS messages have a limit of 160 characters for a message. Visible below the text field there is a counter box showing the characters, the characters are counted down while the user writes the message and it is shown how many there are left to use. It is not possible to enter more characters when the counter is showing zero. This way the user is prevented from writing too much text. Figure 8 below shows their solution, that we also adapted to *Our design*.

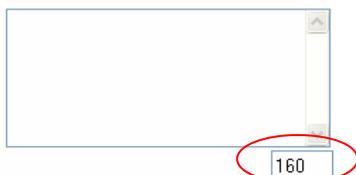


Figure 8 *Densitet design* solution with box below the text input message

Drop-down lists are good ways of preventing errors in when the user has to enter some data. In the *Densitet design* they have in a good way used drop-down lists when possible. Fields in the application that requires inputs by the user, they have made an effort in lower the error frequency with pre-defined alternatives.

In the existing system there is not always information of what the user has to type in. In some of the input fields the required information and how much information needed is not told before the action. There is no text information about what should be typed in the fields, nor are there examples of how the information should look like. Below is an example from the *Densitet design*, showing the procedure changing password. Prior to the wrong message, which comes when the user tries to save the new password, the user is unaware of what input that is demanded. Figure 9, Figure 10.

Användare - Ändra användare

Användarnamn: fcdemo

Nytt lösenord: ● ● ● ●

Bekräfta nytt lösenord: ● ● ● ●

Namn: Densitet

Företag:

E-post:

Mobil:

Telefon:

Tidszon: Europe/Stockholm

Spara

Figure 9 Change password in *Densitet design*

Fel

Lösenordet måste vara mellan 5 och 8 tecken.

Figure 10 Information displayed after the user tried to save the new password in the *Densitet design*

In *Our design* we chose to display the conditions to enter a password next to the input field. Figure 11.

Figure 11 In *Our design* the user get the information before trying to save

Nielsen (1993) argues that error messages should follow four basic principles. Error messages should be written in the users own language and codes should be avoided. The message should specify what is wrong and not just tell that something is wrong. The message should tell the user how to solve the problem, and should also be pleasantly presented and not degrade or insult the user. Below is an example of an error message that breaks the principles. Figure 12.

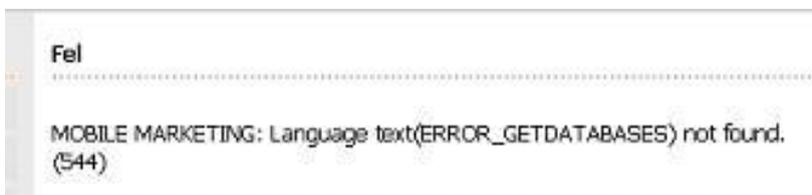


Figure 12 Error message in *Densitet design*

Not all the error messages are bad, but throughout the *Densitet design* the error messages are inferior and leave the user confused. In the user tests the participants were asked to do a task that generated a wrong message. None of the users were able to understand the message received. Constantly recurring in every error message is a number code that code means nothing to the user and is placed there for the developers to easily find what is wrong.

*Permit easy reversal of action* – to the greatest extent possible, actions should be reversible. This makes users comfortable using the system, because of the knowledge that a mistake easily can be repaired by stepping backwards.

We have created an additional possibility for the user to easy make steps backwards in the application if wanted. Since the system is a web application there is always a possibility to go back in the system by using the step back function in the browser. Figure 13.



Figure 13 Step back function in web browser

However, the application is mainly a software tool used in a working-environment to perform a task. To not distract the user and make them feel like they are “surfing the web”, we have designed for a function in the

system to be able to step backward in the system. The interaction is in the system and to make sure that all users feel, as Shneiderman (2004) puts it, comfortable we have buttons with Tillbaka (Back) along with an arrow. Figure 14.



**Figure 14** Step back function in *Our design*

*Support internal locus of control* – Shneiderman (2004) claims that it is of importance for experienced users to feel that they are in charge of a system. The system should respond to the user's action and the user not being ruled by the system. Any surprising system actions or repetitive sequences of data entries or inability to perform the action planned for will create anxiety and discontent.

We think it is equally important for an inexperienced user to feel in charge of this system and that has been our guiding-star in our design work. In order to achieve that, the importance of the text throughout the application cannot be emphasized enough. By active headlines informing the user what do, and with informative text smooth the progress of navigating in the application are ways of putting the user in charge of the system.

With the following example we will illustrate an example of how the user has to do side-steps in order to perform a certain action in the *Densitet design*. This can easily lead to dissatisfaction and confusion. If a user wants to send a message and is not sure whether a certain contact is saved in the intended address book, the user has to leave the service and choose another menu alternative. Figure 15. Next the user has to choose what type of database to see, in this case the address book. Figure 16. Next there is a list with the address books and the user can choose the one intended. Figure 17. In the list that is displayed next, the user can see if the wanted contact is saved in the right address book, Figure 18. The contacts are listed in chronological order. Since it is an address book, the contacts should be listed in alphabetic order. In order to send the message after this is to once again choose the message service.

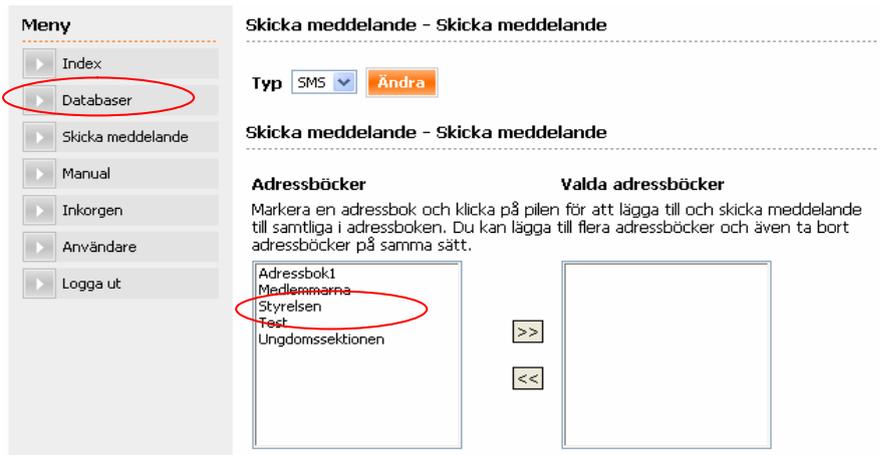


Figure 15 In the service sending message in *Densitet design*



Figure 16 Choosing type of database in *Densitet design*

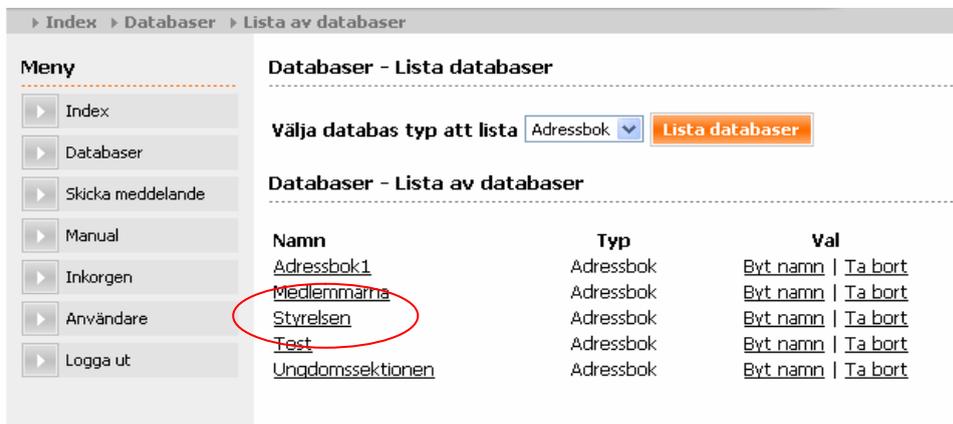


Figure 17 Choose the right address book in the *Densitet design*

**Adressbok**

Namn	E-mail	Mobil	Val
Arne Berg	<a href="mailto:arne@moses.com">arne@moses.com</a>	4.6112112112E10	Ändra   Ta bort
Sven Borg	<a href="mailto:sven@moses.com">sven@moses.com</a>	4.6112112112E10	Ändra   Ta bort
Frida Borg	<a href="mailto:frida@moses.com">frida@moses.com</a>	4.6112112112E10	Ändra   Ta bort
Leif Öhman	<a href="mailto:leif.ohman@moses.com">leif.ohman@moses.com</a>		Ändra   Ta bort
Anders Andersson	<a href="mailto:anders.andersson@moses.com">anders.andersson@moses.com</a>	+467777777777	Ändra   Ta bort

Figure 18 Checking the contact in the *Densitet design*

In *Our design* we have tried to have a more dynamic application. The user should always be able to access information, important for the intended task. In our proposal the user can click at a link and through that receive a list of the contacts in the address book and still remain at the message service, Figure 19.

Skicka meddelande

---

Skapa meddelande

Valj typ  SMS  MMS  E-post

160

Välj mottagare

Hela adressboken

Kontaktgrupper  Styrelsen  Valberedningen  Ungdområdet

Ytterligare nummer

(ex:070-1234567)

Figure 19 Follow the link to the contacts in *Our design*

*Reduce short-term memory load* – in order to facilitate the memory load for the user, displays should be kept simple. The limitation of human short-term memory also benefits from avoiding spreading the information over various numbers of pages.

In the *Densitet design* it is nearly impossible to remember what was written down and saved in a specific message. In the figure below the user is supposed to update a delivery. Figure 20. In order to see the message the user has to leave the specific view and choose another menu alternative that requires additional steps and after that return once again.

### Mobile Marketing - Uppdatera leverans

---

Här uppdaterar du en leverans.

Namn: Opera  
Tid (Europe/Stockholm): 2005-05-10 14:14  
Typ: SMS  
Databas: Kampanjer ▼  
Meddelande: Verdi ▼  
Spara

Figure 20 The message is not easy to access in the *Densitet* design

The solution of this problem in *Our Design* is to have the possibility to check the content by a link of the message being in the service, to avoid forcing the user to make extra or unnecessary actions not relevant to their actual task. Figure 21.

Namn	Typ
<a href="#">TestEtt</a>	SMS

Figure 21 In *Our design* it is possible to access the message by follow the link

### Key findings

- Metaphors can be a way of conceptualizing the world
- The user should be in charge of the system and not vice versa
- Informative and constructive error messages

## Usability

Below is the quotation of the international standardization for usability. It is a general definition that is easy to subscribe to.

*"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."*

(ISO 9241-11 (1998) Guidance on Usability)

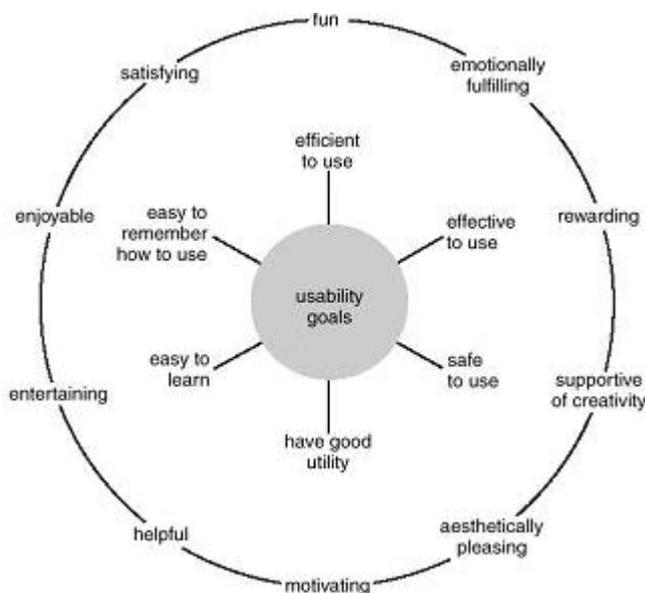
Usability is a term that is extensively described in the literature, among others by Ottersten and Berndtsson (2002) who describe usability as a quality characteristic for interactive products. It is in the interplay between the product and its user the usability of a product becomes visible. Below comes a range of explanations from other authors on the subject along with our comments and design proposals. All the authors emphasize that it is important to identify target groups and the intended user, and the context of use. That is also underlined in the standardization. This system

is turned to a large target group and users in generic which made it more difficult to apply usability.

A term that sometimes is mixed up with usability is user friendly. Both Löwgren (1993) and Nielsen (1993) turn against that term and means that the term is inappropriate. Users do not benefit from machines being friendly to them, but machines that smooth the progress for them in their efforts of getting the work done.

According to Preece et al (2002) usability is generally regarded as making sure that interactive products from the user's perspective are, enjoyable, easy to learn and effective to use. However, they point at that usability must not get mixed up with functionality of a product. The functionality is not a question of how well the user can use a product, only the functions and features of it. A product with greater functionality does not mean improved usability, it is important to think of the functions needed and their relevance.

Preece et al (2002) argue that there are as well usability goals as user experience goals to take into consideration. The usability goals are central to interaction design and are concerned with meeting specific usability criteria. User experience goals, on the other hand, focus on how users from their perspective experience an interactive product and are less clearly defined. The figure below illustrates both the usability- and the user experience goal. Figure 22.



**Figure 22 , picture from Preece et al (2002, p 19) showing usability goals and user experience goals**

One of the prominent within the area of usability is Jacob Nielsen. In Kaasgaard (2000) Nielsen gives his view on how many companies spends a lot of time and money to provide support services instead of include

usability in the product. As we see it, this effort with time and sometimes also money also affects the specific user. Today usability is often negligent used and has become an expression that companies use incautiously.

According to Nielsen (1993) usability is defined by five quality components; learnability, efficiency, memorability, errors and satisfaction. Underneath we will expound each and illustrate with examples from both the designs. He states that the definition must contain all parts to comply with the requirements of usability, but he claims that learnability is maybe the most important one. Below is a picture showing how Nielsen place usability in a wider perspective. Figure 23.

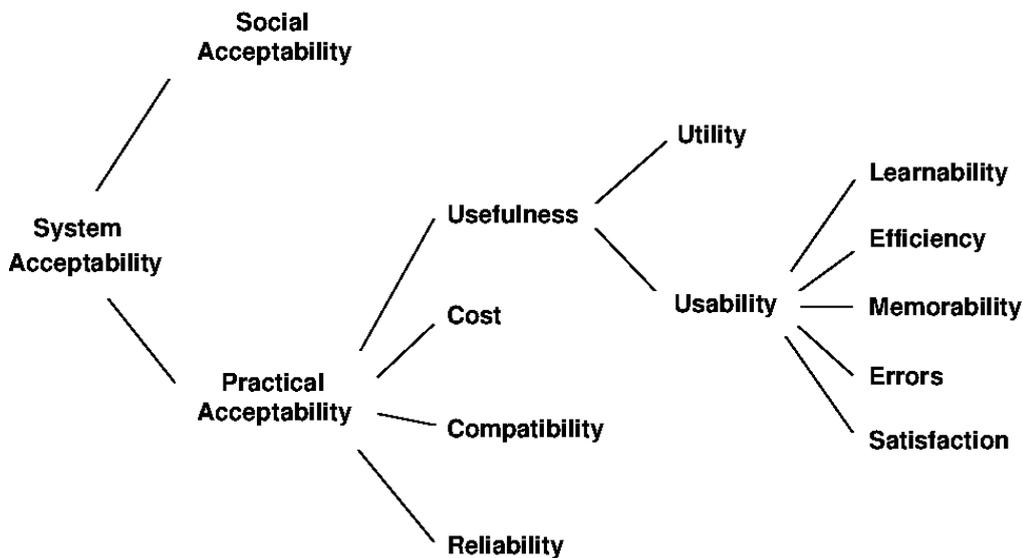


Figure 23 Picture from Nielsen (1993 p. 25) showing usability in a larger context

*Learnability* – how easy a system is to learn and use. We realize the importance of this first usability goal, which Nielsen (1993) points out as the most essential one. The system must be easy to learn so the user easily can start using it; otherwise there is a risk that the system never will be used. If the users not even try to use the system a second time, because the first impression is that the system is not worth the effort to find out how the system works and its benefits.

By using, for the user, well known concepts the learning threshold can be reduced because the user know intuit the use, structure and process of the products. In controlling the user's expectation of both known and familiar structures and processes, the designer can attain forms that enable the use for the user.

The language and terminology for the application is another issue we have improved. In the *Densitet design* there were many technical words, for example template, instance, database, these terms can be difficult for the average users to understand. We have simplified the language and tried to use words that are familiar also to people outside the area of Information Technology. An example of that is to use the name Address book (Adressbok) instead of Database (Databas) for the function that saves contacts.

*Efficiency* – how efficient a system is to use, Nielsen means once a user has learnt the functions of a system, high productivity should be attained. A basic idea with the system is that should work as tool to the user, while performing a task. The use of the application should be easy and the user should never hesitate to use it because it feels too circumstantial.

In the *Densitet design* the first view after choosing a menu alternative is the name of the alternative and a short description of what is possible to do on a couple of lines, this is constantly recurring throughout the system. The system always requires further action of the user to be able to access the service. The example below illustrates the many steps a user must do to change their personal data and their own logotype. Figure 24, Figure 25, Figure 26.

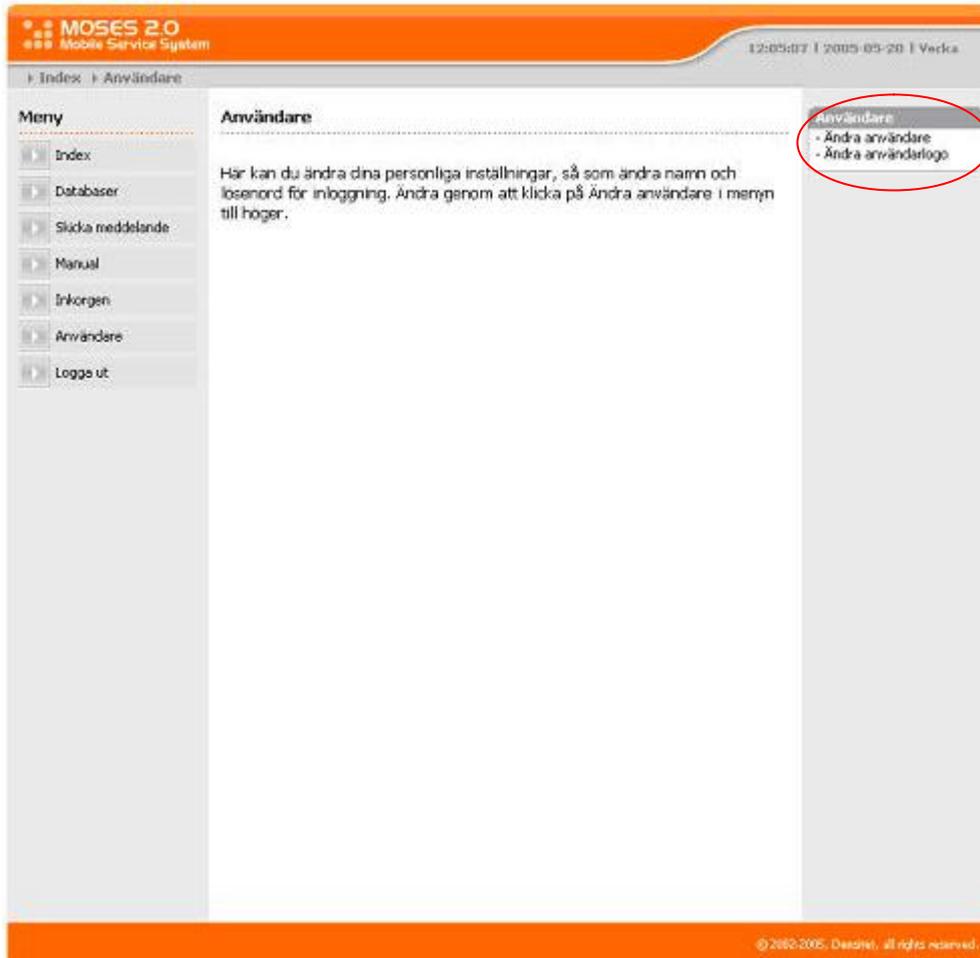


Figure 24 Chosen "Change user" in the *Densitet* design



Figure 25 Change the user settings in the *Densitet* design



Figure 26 Change logo in the *Densitet* design

In *Our design* we have cut down on the steps and the user can access the service directly from the menu alternative. Further on we have put together tasks that are closely related, so in this example the user can change everything in the same view Figure 27.

Figure 27 *Our design* solution when changing settings, gathered the tasks at the same place

*Memorability* – signified by how it should be easy to remember how to use the system. Users should even after a break in using the system, easily be able to start using it again. It is essential that a user should not have to learn the application all over again. We believe that a way to improve the memorability is to use icons as a complement to text. There are several reasons for that; it is our belief that an icon is easier to recognize at a glance than text. Also humans' percepts different i.e. some have easier to remember texts and some have easier to remember graphical presentations. Icons without any text could be difficult to understand. Below are some examples from *Our design* Figure 28, in the *Densitet design* there are no icons.

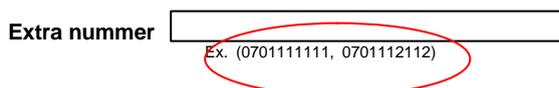


Figure 28 Examples of icons in *Our design*

A way to facilitate and improve the memorability is to keep the tasks in the system as similar to each other as possible. Keeping the same structure

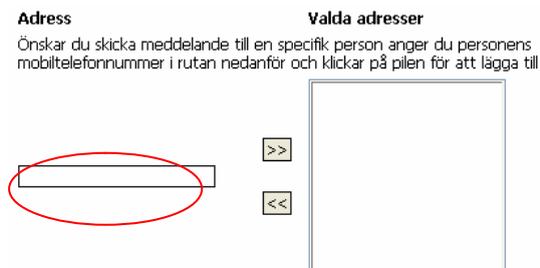
throughout the application, increases the likelihood that the users remember how to use the application's different tasks. An illustrative example is the Office-package where the different applications, used in different contexts and with different purposes are quite similar in their structure.

*Errors* – the system should have a low error frequency so the user makes as few mistakes as possible. This is important to get the system usable. Our contribution to prevent errors has been to make the application apt and clear. To make clear to the user what is going to happens next and what is demanded of the user. Minimizing the input where the user put their own values into the application reduces the errors made by the users. One way of facilitate for the user is to make use of drop-down lists when possible and where unavoidable show examples of how to enter the data. Below is an example of how we in *Our design* have exemplified for the user in what way extra mobile phone numbers should be entered. Figure 29.



**Figure 29 Information as an example below the input box how information**

In the *Densitet design* the information of how to enter data is left out, Figure 30. At the beginning, during the evaluation, the system also required that the mobile phone number started with the country code. From the intended users perspective, we think, that this is not the natural way to enter phone numbers. This was changed after the evaluation.



**Figure 30 Adding an extra number in the *Densitet design***

*Satisfaction* – the system needs to be subjectively appealing to the user. To us appealing is not just about a good looking interface which is important too. To appeal the users, the system has to provide a good functionality and be reliable. Since this application turns to a generic crowd and probably not advanced users, designing for cutting edge technology is not the most important. The intended users, we think, are more concerned with an effortless and easily understandable application.

Löwgren (1993) also defines usability. Even though their terminology is not the same, his definition is quite similar to Nielsen. Löwgren (1993) describes that the usability of a system is a result of its:

- *Relevance* – how well the system supports the need of the user
- *Efficiency* – determine how effective the users can achieve their tasks
- *Attitude* – the users subjective feelings for the system
- *Learnability* – how easy it is to learn a system and how well the users remember that knowledge over time

The difference from Nielsen's usability components, as we see it, is Relevance and its significance. For this design it has been important how well the system has supported the needs of the users, since it is a work tool.

**Key findings:**

- Put the needs of the users in the centre
- Designing for an easy learning and an efficient use
- Provide feedback to guide the user

## **Flow**

This section introduces the concept flow that prior to this thesis was unknown to us. Flow is a theory that originates from psychology and the theory was founded by Mihalyi Csikszentmihalyi in the 1970s. Along the time the theory of flow have been used in other research areas, among them HCI.

Although there are studies of flow taking place within the use of computers, Finneran and Zhang (2005) point out there is still need of further research. There is no generally applicable notion to refer to. The authors we found have had models of flow with different approaches. Common for them has been that their models originate from Csikszentmihalyi and his psychological description of flow. Although there are differences in their models, the structure of flow is generally agreed upon; there are three stages of a flow framework: flow antecedents, flow experience and flow consequences. (Finneran and Zhang, 2003) In our work the main focus has been on flow antecedents, in other words factors contributing to flow experience. Below we have put together a table with the authors we found and their respective ideas of flow antecedents. (Finneran and Zhang, 2003), (King, 2003) Table 1.

Author	Flow Antecedents
Ghani 1995	Fit balance of challenges and skills in the activity Perceived control Cognitive spontaneity
Hoffman & Novak 1996	Skill/challenge congruence Telepresence <ul style="list-style-type: none"> <li>- interactivity, vividness</li> </ul> Focused attention <ul style="list-style-type: none"> <li>- interactivity, vividness, involvement, process character</li> </ul>
Chen 2000	Clear goals Immediate feedback Potential control Merger of action and awareness
King 2003	Immediate feedback Fast response Few distractions Seamless feeling
Skadberg & Kimmel 2004	Skill: visitors knowledge of the topic Challenge: Web page content Telepresence <ul style="list-style-type: none"> <li>- attractiveness <ul style="list-style-type: none"> <li>• experience with websites</li> </ul> </li> <li>- interactivity <ul style="list-style-type: none"> <li>• speed, ease of use</li> </ul> </li> </ul>

**Table 1 A number of authors and their ideas of flow antecedents**

Most studies of flow are conducted in a web-environment with the intention of keeping the user on the site. King (2003) discusses flow in Web design in relation to keep the user on a certain site, like Internet shops and online games. Even though it is not our purpose to have the user remain at the application longer than necessary, we feel there are many aspects that he talks about that we can relate to.

Finneran and Zhang (2003) point at the importance of separating the task from the artefact in relation to flow. This has not been that obvious in the other findings we have studied. By artefact they mean information technology or computers used as vehicles to conclude a task. For us this is an adequate definition that is well suitable. Though, it could as well have been a question of a carpenter using a tool. Finneran and Zhang (2003) mean that to contribute to the flow experience, there are three separate, yet interacting parts; person, artefact and tool.

We have tried to adjust flow theory to suit our design work in an application. We have used flow theory to ameliorate the interaction, when the computer is used as an artefact and the application works like a tool.

Since it is a tool and the task at hand is doing something using the tool, it is especially important that there is an effortless use with few distractions. In order to show our thoughts we discuss flow on the basis of two terms; control and ease of use. We would like to point out that these two terms are not the terms of any authors. They are our own terms, extracted on the basis of our literature studies and our design work and below we give our definition on each term.

## **Control**

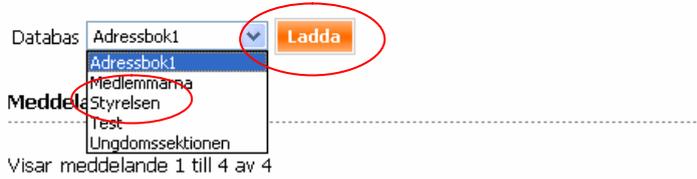
Control is, for us, an important factor contributing to flow experience. In King (2003) Csikszentmihalyi points out that to attain control, there is a distinction between having a feeling of control and actually be in control. To achieve control, we think, it is essential that a user can interact with an application without even have to think about what to do. For us it has been important to allowing the user to interact smoothly and uninterrupted with the application to be in charge of the situation.

Ghani (1995) also points out the importance of perceived control. For a certain action the user should be able to foretell the outcome. Norman (1987) goes so far that he means that in some cases the user has the feeling of being one with the task, the computer becomes transparent. For us it has been important that the user of the system perceives control and preferably really has it. The user should know instinctively what to do next; there should not be any surprises and the response predictable.

In order to help the user to predict actions and responses the names of buttons, headlines, menu alternatives etcetera is important. Also the displayed text has to be descriptive and active; a way of telling the user what to do and what to expect. At first we misunderstood one function in Inkorgen (Inbox). We thought that Ladda (Load) was a way of sorting the messages in different groups from the address book to be able to see only the messages from a certain group Figure 31. What really happened was that the mobile numbers changed to the name of the sender Figure 32.

Välj databas

Välj vilken databas som du vill matcha de inkommande avsändarna med.



Datum / Meddelande	Avsändare	Val
2005-02-10 10:26:35 ndhn jfnefu hgu gu uhgu uåh ghu uiwegå iegie fref efefe efef effe dndhn jfnefu hgu gu uhgu uåh ghu uiwegå iegie fref efefe efef effe fewf wef ef ufhwe 8fh	+46709123456	Ta bort
2005-02-09 16:30:28 test	+46709653758	Ta bort
2005-02-09 16:29:57 hej hej igen	+46709653757	Ta bort

Figure 31 Choosing an address book and then "ladda" in the *Densitet design*

2005-02-09 16:30:28 test	a +46709653758
2005-02-09 16:29:57 hej hej igen	+46709653757
2005-02-09 16:30:28 test	b Gerda Andersson
2005-02-09 16:29:57 hej hej igen	+46709653757

Figure 32 The phone number have changed to a name in the *Densitet design*

From this misunderstanding we developed a new function, sorting messages by groups. If a user has many contacts and groups and uses the inbox (Inkorgen) frequently there are many messages to administrate. With our solution the user has the possibility to see all the messages from a selected group only. Figure 33. In a later version in the design work we thought of another sorting criterion where the messages are sorted by type, shown in Figure 34.

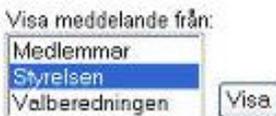
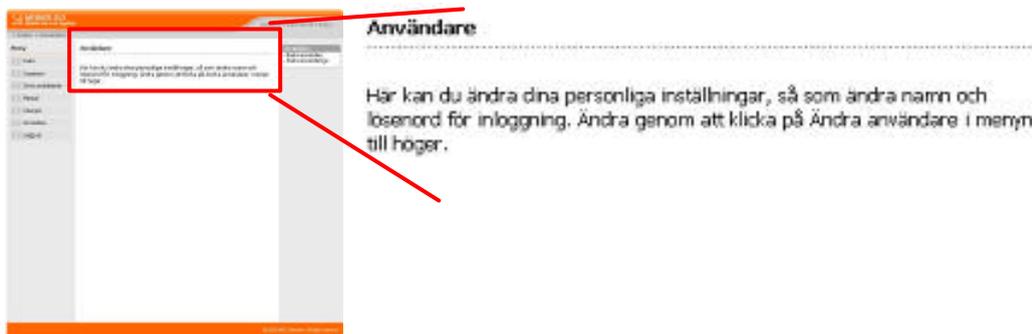


Figure 33 A sorting function in *Our design*



Figure 34 Sorting function by type of message in *Our design*, a later version

Also the amount of text displayed is important. To decrease the amount of text, the information displayed should only contain essential text that is relevant. One example of where the text is unnecessary is shown in the figure below, Figure 35. The text in the display informs the user that he/she can do some adjustments. Below the text there is an empty field. To be able to do anything the user is forced to do an additional action, in order to do the actual task.



**Figure 35** Information of what to do when choosing a service in the *Densitet design*

One way to put the users in control of applications is to provide immediate feedback that is informative. The feedback should be visible, the users should not have to search for it or be left in a state of uncertainty. In the case of written feedback, the language should be understandable and non-technical.

We have earlier, in the section Interface design, discussed the detail of showing how many characters there are left to use when writing an SMS Figure 36. In regard to flow, this detail is a good way of putting the user in control.



**Figure 36** Solution in the *Densitet design* where characters left in a SMS is shown

In both systems the user gets the opportunity to choose what kind of message to send; SMS, MMS or e-mail. The text field changes depending on the selected type.

In the *Densitet design* there is a drop-down menu with a button next to it, in order to change conditions the user has to press the button to conduct the change in the system Figure 37. Our solution has been to let the user choose a type of message by clicking one time at the wished type, Figure 38.



Figure 37 Choosing type of message in the *Densitet design*



Figure 38 Choosing type of message in *Our design*

## Ease of use

In view of considering the experience of flow it is important that the users perceive a smoothness use. We have chosen to name this term ease of use. The stops during the process of a task, from the initiation to the end of it, force the user to move concentration from the actual task (King, 2003). For us it has been important to keep the distractions away and let the users to perform the intended task. Sharpe and Stenton (2002) discuss how focus should be put through the tool onto the task. For this application we think this was especially important since the application is a tool to use during the action of a task.

In reference to a smoothness use, we do not think the number of actions is the most important issue. There may be a number of actions, but as long as they are necessary and to the users motivated the feeling of an ease of use remains. The main concern is being able to work smoothly and not be distracted. King (2003) points out working integrated with an application not even thinking about how and when one use it, could be characterized as an application with a good flow.

In the *Densitet design* there is a sub menu to the right, Figure 39. We think that the menu could be a distraction, especially to inexperienced users.

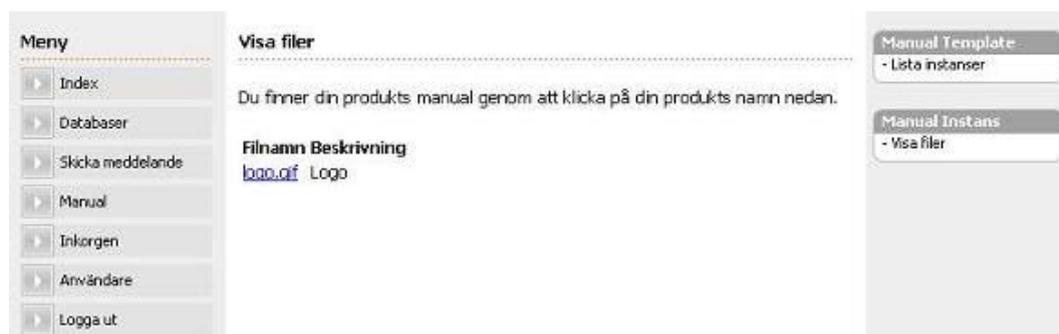


Figure 39 Main menu to the left and submenu to the right in the *Densitet design*

The proposal in *Our design* contains no sub menus to the right. It has been our mission to display the information needed in the white field in the middle, Figure 40. This field is central and should be used as the main working place where the importance of the work of a chosen menu item

takes place. This way the user can focus constantly on the task at hand. In a later version the grey column to the right also is removed.



Figure 40 View of *Our design* when sending a message

The flow is also dependent on the speed of the application. There is the technical speed, where applications perform its process at a high speed and where they have been developed to minimize the capacity of the processing, not to forget the importance of the bandwidth for web applications

Speed has also another dimension, where the user and the application together is the target for the time measurement. The speed of the interaction between the user and the application can not be taken for granted regardless of the technical speed.

#### Key findings:

- Enable user-control
- Provide smoothness interaction
- Offer immediate feedback that is descriptive

## Conclusion

In this conclusion the focus will be on the questions of issue; “*How to facilitate the interaction for an application that is used as a tool, focusing on interface design, usability and flow?*” and “*How can the usability be improved in a system, with help of flow theory?*”. The three concepts interface design, usability and flow are closely related to each other and we see them like this; in interface design, the aspect of usability is essential and the theory of flow is used to increase usability. In relation to that, we will here point at some of the matters that became essential for us throughout the work.

In reference to our questions of issue it is of great importance to have the users in mind. To facilitate the interaction with an application the needs of the user has to work as a starting point. As the application works as a work-tool it has been important to put the attention at the task to be performed and not the application. The application has to be in the background, and work supporting for the task being performed.

There are a number of other issues to take into consideration and here it is of great importance to never leave the user in a state of uncertainty what has happened. To avoid that it is important to provide feedback, but in order to put the user in control of the situation, the feedback has to be supportive, descriptive and immediate.

The application should be, through its interface, easy to learn and simultaneously be an efficient tool for its purpose as a communication tool. The challenge we had to deal with has been to keep it efficient for its purpose and at the same time keep it simple and usable. For a system to be easy to learn we are of the opinion that the text displayed has to be understandable and logical and in order to be effective to use, the number of operations ought to be cut down to a minimum.

When we first came across the term flow in computer related domain, we found it suitable to our work. We have used flow to improve the usability, one idea in flow is that there should be nothing or as little as possible that distracts the users when interacting with the application. Distractions can be avoided by a well-thought interface design where interactions are natural and easy to understand. Also central in designing user interfaces is to make sure that the user easily understands what to do and what input the application demands from the user.

Like we written before Norman (1986) argues that the design of the interface should be dominated by the needs of the user and that the rest of the system should be dominated by the needs of the interface. We think this is important when working with interface design.

Another author that has had a great influence on the interface design has been Shneiderman and his eight golden rules. We think that it is important to follow these principles as much as possible. Some of are harder than other to follow and some interfere with other aspects that we discusses.

To further improve the usability and refine the user interface more design work needs to be done along with thorough user tests. As closing remark we would like to add that we think that the theory of flow has the possibility to become helpful in design processes, but it needs further research.

## References

- Carroll John M.**, (1997), Scenario-based design. In M. Helander, T.K. Landauer & P. Prabhu, Eds. *Handbook of Human-Computer Interaction. Second, Completely Revised Edition*, pp 383-406, Elsevier, Amsterdam
- Csikszentmihalyi Mihály**, (translator Grip Göran), (1999), *Finna flow : den optimala upplevelsens psykologi* (Flow) Natur och kultur, Stockholm
- Finneran, Christina M. & Zhang, P Ping** (2003), *A, person-artefact-task (PAT) model of flow antecedents in computer-mediated environments* International Journal of Human-Computer Studies, Volume 59, Issue 4, pp 475-496, Academic Press, Elsevier
- Ghani Jawaid A.**, (1995), Flow in human-computer interactions: Test of a model. In J. M. Carey, Ed. *Human Factors in Information Systems: Emerging Theoretical Bases*, pp 291-311, Ablex Publishing Corporation, New Jersey
- Go Kentaro & Carroll John M.**, (2004), *The Blind Men and the Elephant: Views of Scenario-Based System Design*, Interactions Volume 11, Issue 6 November and December 2004 pp 44-53, ACM Press, New York
- Gulliksen, Johan & Göransson, Bengt**, (2002), *Användarcentrerad systemdesign: en process med fokus på användare och användbarhet*. Studentlitteratur, Lund
- Göransson Bengt, Lif Magnus, Gulliksen Jan**, (2003), *Usability Design – Extending Rational Unified Process with a New Discipline*, conference paper: DSV-IS 2003 (Design, Specification and Verification of Interactive Systems), Funchal, Madeira Islands, Portugal, June 4-6, 2003
- Kaasgaard Klaus**, (2000), *Software Design & Usability*, Copenhagen Business School Press, Copenhagen
- Kendall, J.E., Kendall, K.E.** (1994), *Metaphors and their meaning for information systems development*, European Journal of Information Systems, Volume 3, Issue 1, pp 37-48, Operational Research Society, Birmingham, Proquest, Palgrave Publisher Ltd
- King Andrew B.**, (2003), *Speed Up Your Site: Web Site Optimization*, New Riders
- Lakoff George & Johnson Mark**, (1980), *Metaphors We Live By*, The University of Chicago Press, Chicago

**Lif Magnus**, (1998), *Adding usability, Methods for modelling, User interface Design and Evaluation*. Eklunds Grafiska, Uppsala.

**Löwgren Jonas**, (1993), *Human-computer interaction: what every system developer should know*, Studentlitteratur, Lund

**Marcus Aaron**, (1998), *Metaphor design in user interfaces*, ACM SIGDOC Asterisk Journal of Computer Documentation, Volume 22, Issue 2, pp 43-57, ACM Press, New York

**Nardi Bonnie & O'Day Vicki**, (1999) *Information ecologies: using technology with heart*, MIT Press, Cambridge, Massachusetts

**Nielsen Jacob & Mack Robert**, (1994) *Usability Inspections Methods*, John Wiley & Sons Inc., New York

**Nielsen Jacob**, (1993), *Usability Engineering*, Academic Press Inc, New York

**Norman Donald**, (1998), *The design of everyday things*, MIT Press, London

**Norman, Donald A**, (1998), *The Invisible Computer: Why Good Products Can Fail, The Personal Computer Is So Complex, And Information Appliance Are The Solution*, MIT Press, London

**Ottersten Ingrid & Berndtsson Johan**, (2002), *Användbarhet i praktiken*, Studentlitteratur, Lund

**Preece Jenny & Rogers Yvonne & Sharp Helen**, (2002), *Interaction design: beyond human computer interaction*, John Wiley & Sons Inc., New York

**Rosenfeld Louis & Morville Peter**, (2002), *Information Architecture for the World Wide Web*, O'Reilly, Sebastopol, California

**Shneiderman, Ben**, (2004), *Designing the User Interface*. Addison-Wesley, New York

**Skadberg, Yongxia. and Kimmel James** (2004), *Visitors' Flow Experience while Browsing a Web Site: Its Measurement, Contributing Factors and Consequences*, Computers in Human Behavior, Volume 20, Issue 3, pp 403-422, Pergamon, Elsevier

***Electronic sources***

<http://www.usability.serco.com/trump/resources/standards.htm> visited 050603

[http://www.jnd.org/dn.mss/how\\_might\\_humans\\_int.ht](http://www.jnd.org/dn.mss/how_might_humans_int.ht) Norman (2001) visited 050603

## Appendix 1


15:09:23 | 2005-06-13 | Vecka

[Index](#) > [Skicka meddelande](#) > [Demo](#) > [Skicka meddelande](#)

**Meny**

- [Index](#)
- [Databaser](#)
- [Skicka meddelande](#)
- [Manual](#)
- [Inkorgen](#)
- [Användare](#)
- [Logga ut](#)

**Skicka meddelande - Skicka meddelande**

---

**Typ** SMS Ändra

**Skicka meddelande - Skicka meddelande**

---

**Adressböcker**

Markera en adressbok och klicka på pilen för att lägga till och skicka meddelande till samtliga i adressboken. Du kan lägga till flera adressböcker och även ta bort adressböcker på samma sätt.

Adressbok1  
 Medlemmarna  
 Styrelsen  
 Test  
 Ungdomssektionen

>>
<<

**Valda adressböcker**

**Adress**

Önskar du skicka meddelande till en specifik person anger du personens mobiltelefonnummer i rutan nedanför och klickar på pilen för att lägga till.

>>
<<

**Meddelande:**

Skriv ditt meddelande och klicka på skicka för att skicka iväg ditt meddelande.

160 tecken kvar.

Skicka

**Template**

- Lista instanser

**Instans**

- Skicka meddelande
- Meddelandestatistik
- Meddelandelogg

© 2002-2005, Densitet, all rights reserved.

## Appendix 2

**MOSES 2.0**  
Mobile Service System

15:34:05 | 2005-06-13 | Vecka

› Index › Användare

**Meny**

- ▶ Index
- ▶ Databaser
- ▶ Skicka meddelande
- ▶ Manual
- ▶ Inkorgen
- ▶ Användare
- ▶ Logga ut

**Användare**

Här kan du ändra dina personliga inställningar, så som ändra namn och lösenord för inloggning. Ändra genom att klicka på Ändra användare i menyn till höger.

**Användare**

- Ändra användare
- Ändra användarlogo

© 2002-2005, Densitet, all rights reserved.

*Densitet design*

## Appendix 3

The screenshot shows the MOSES 2.0 Mobile Service System interface. The top navigation bar is orange and contains the logo, the text "MOSES 2.0 Mobile Service System", and the date/time "16:28:40 | 2005-06-13 | Vecka". Below the navigation bar is a breadcrumb trail: "Index > Användare > Ändra användare".

The main content area is divided into three sections:

- Meny:** A vertical list of menu items with right-pointing arrows: Index, Databaser, Skicka meddelande, Manual, Inkorgen, Användare, and Logga ut.
- Användare - Ändra användare:** The main form area. It contains the following fields:
  - Användarnamn: fpdemo
  - Nytt lösenord:
  - Bekräfta nytt lösenord:
  - Namn:
  - Företag:
  - E-post:
  - Mobil:
  - Telefon:
  - Tidszon:
- Användare:** A sidebar menu on the right with two items: "Ändra användare" and "Ändra användarlogo".

At the bottom of the form area is an orange "Spara" button. The footer of the page is orange and contains the copyright notice: "© 2002-2005, Densitet, all rights reserved."

*Densitet design*

## Appendix 4

The screenshot displays the MOSES 2.0 Mobile Service System interface. At the top, the header includes the system name 'MOSES 2.0 Mobile Service System' on the left and the date/time '16:29:42 | 2005-06-13 | Vecka' on the right. Below the header is a breadcrumb trail: 'Index > Användare > Ändra användare > Ändra användarlogo'. The main content area is titled 'Användare - Ändra användarlogo'. It features a 'Logo:' section with the 'densitet' logo and the tagline 'Communication solutions for a better world' followed by a 'Ta bort' link. Below this is a 'Ny logo:' section with an input field and a 'Browse...' button. A 'Spara' button is located to the right. On the left side, there is a 'Meny' sidebar with options: Index, Databaser, Skicka meddelande, Manual, Inkorgen, Användare, and Logga ut. On the right side, there is a 'Användare' sidebar with options: Ändra användare and Ändra användarlogo. The footer contains the copyright notice '© 2002-2005, Densitet, all rights reserved.'

*Densitet design*

## Appendix 5


16:25:53 | 2005-06-13 | Vecka

[Index](#) > [Inkorgen](#) > [Demo](#) > [Meddelanden](#)

**Meny**

- [Index](#)
- [Databaser](#)
- [Skicka meddelande](#)
- [Manual](#)
- [Inkorgen](#)
- [Användare](#)
- [Logga ut](#)

**Inkorgen**

---

Här kan du läsa alla meddelanden som kommit till din inkorg.

**Välj databas**

---

Välj vilken databas som du vill matcha de inkommande avsändarna med.

Databas

**Meddelanden**

---

Visar meddelande 1 till 4 av 4

Datum / Meddelande	Avsändare	Val
2005-02-10 10:26:35 ndhn jfnefu hgu gu uhgu uåh ghu uiwegå iegie fref efefe efef effe dndhn jfnefu hgu gu uhgu uåh ghu uiwegå iegie fref efefe efef effe fewf wef ef ufhwe 8fh	+46709123456	<a href="#">Ta bort</a>
2005-02-09 16:30:28 test	Gerda Andersson	<a href="#">Ta bort</a>
2005-02-09 16:29:57 hej hej igen	+46709653757	<a href="#">Ta bort</a>
2005-02-09 16:29:43 hej hej	+46709653757	<a href="#">Ta bort</a>

**Inkorgen Template**

- Lista Instanser

**Inkorgen Instans**

- Meddelanden
- Meddelandestatistik
- Meddelandelogg

© 2002-2005, Densitet, all rights reserved.

Densitet design

## Appendix 6

The screenshot shows the MOSES 2.0 Mobile Service System interface. The top navigation bar is orange and contains the text "MOSES 2.0 Mobile Service System". Below this, the page title is "Start - Skicka meddelande".

**Meny**

- Tjänster**
  - Skicka meddelande
  - Inkorgen
  - Mobilklubben
  - RemindMe
  - Number Collector
  - Mobil Undersökning
  - Mobile Marketing
- Adressbok**
  - Lägg till kontakt
  - Ändra kontaktuppgifter
  - Hämta kontakter från fil
  - Dina kontaktgrupper
  - Visa kontakter
- Databaser**
  - Skapa
  - Redigera
- Mina uppgifter**
  - Ändra lösenord
  - Ändra personuppgifter
  - Ändra logo
- Admin**
  - Systeminställningar
  - Mobilklubben
  - Sales Management

**Skicka meddelande**

**Skapa meddelande**

Välj typ  SMS  MMS  E-post

160

**Välj mottagare**

Hela adressboken

**Kontaktgrupper**  Styrelsen  Valberedningen  Ungdomsrådet

Ytterligare nummer   
(ex 070-1234567)

**Historik**

2002-2005, Densitet, all rights reserved.

*Our design*

## Appendix 7

**MOSES 2.0**  
Mobile Service System

Start

**Meny**

**Tjänster**

- Skicka meddelande
- Inkorgen
- Mobilklubben
- RemindMe
- Number Collector
- Mobil Undersökning
- Mobile Marketing

**Adressbok**

- Lägg till kontakt
- Ändra kontaktuppgifter
- Hämta kontakter från fil
- Dina kontaktgrupper
- Visa kontakter

**Databaser**

- Skapa
- Redigera

**Mina uppgifter**

- Ändra lösenord
- Ändra personuppgifter
- Ändra logotyp

**Admin**

- Systeminställningar
- Mobilklubben
- Sales Management

Logga ut

**Mina uppgifter**

**Ändra lösenord**

Nuvarande lösenord:

Nytt lösenord:  5 - 8 tecken

Bekräfta lösenordet:

Spara

**Ändra personuppgifter**

Namn:

Företag:

E-post:

Mobil:

Telefon:

Tidszon: Europe/Stockholm

Spara

**Ändra logotyp**

Nuvarande logotyp

Ny logotyp

2002-2005, Densitet, all rights reserved.

Our design

## Appendix 8

MOSES 2.0  
Mobile Service System

Start > Inkorgen-SMS

**Meny**

**Tjänster**

- Skicka meddelande
- Inkorgen
- RemindMe
- Number Collector
- Mobil Undersökning
- Mobile Marketing

**Adressbok**

- Lägg till kontakt
- Ändra kontaktuppgifter
- Hämta kontakter från fil
- Dina kontaktgrupper
- Visa kontakter

**Databaser**

- Skapa
- Redigera

**Mina uppgifter**

- Ändra lösenord
- Ändra personuppgifter
- Ändra logo

**Admin**

- Systeminställningar
- Mobilklubben
- Sales Management

**Inkorgen** (visas 6 av 15 meddelanden)

Ta bort  Avsändare

Gerda Andersson

Datum

05-02-09 16:30

Det tycker jag låter bra. Vi ska värna om våra gående. Angående Sallet, är jag tveksam. Det tycker jag låter bra. Vi ska värna om våra gående. Angående Sallet, är jag

+46709653758 05-02-09 16:30

Det tycker jag låter bra. Vi ska värna om våra gående. Angående Sallet, är jag tveksam. Det tycker jag låter bra. Vi ska värna om våra gående. Angående Sallet, är jag

Gerda Andersson 05-02-07 12:10

Hej hej

+46709653758 05-02-06 11:30

Hej hej

05-02-05 16:20 +46709653758

Hej hej

05-02-01 09:10 Gerda Andersson

Hej hej

Markera alla <<123456>>

Visa meddelande från:

Medlemmar

Styrelsen

Visa

**Historik**

2002-2005, Densitet, all rights reserved.

Our design