Tangible Instant Messaging

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Project Tangible Instant Messaging

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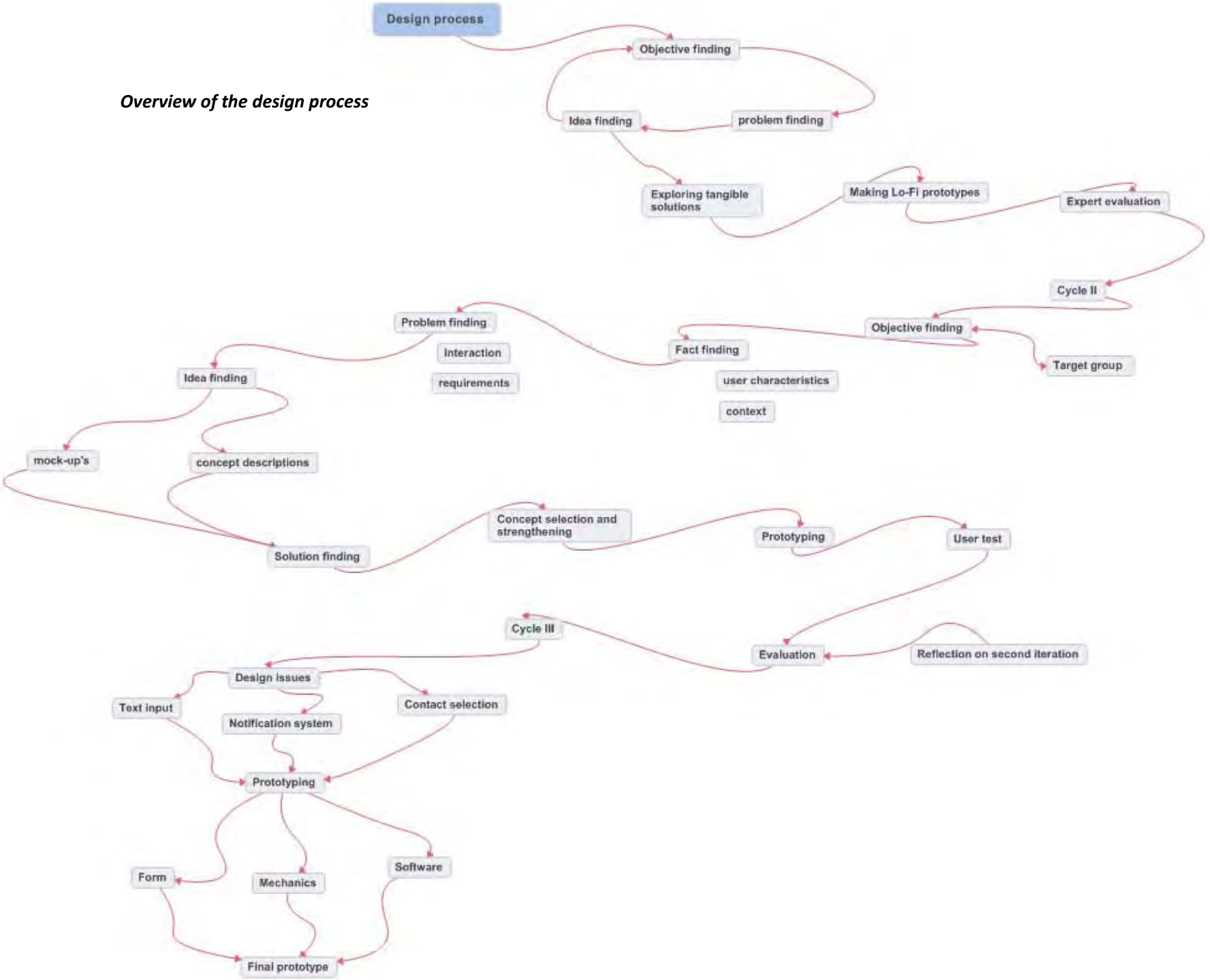
TU/e

Preface

We would like to thank our coach, Dr. J. Hu for all the support. We also want to thank our clients, Bram van der Vlist and Gerrit Niezen, from the Sofia project and everyone else that helped us with our project.

Overview of the design process



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Introduction

Brief Description of the project.
Instant Messaging is a popular means of communication on the internet. Programs like MSN Messenger and ICQ are widely used to exchange text messages within a community of 'buddies'.
The interaction with these programs is through a Graphical User Interface (GUI) augmented with simple sounds to indicate incoming messages. The two main areas of interaction are the dialog window, in which the exchange of messages takes place, and the status window. The status window informs the user about several things. It indicates the status of others, e.g., which of his buddies is online, who is sending a message, if buddies are available or busy, etc. The user can also set his own status through this window, e.g., away, occupied, busy, 'be right back'. Through pull-down menus in this window you can also contact buddies and send them messages or emails.
As a reaction to the dominance of GUI's in human computer interaction (HCI) alternative interaction styles are explored. One of these alternatives is tangible interaction which stresses the importance of the physicality of the interaction. In this approach the physical controls for (digital) input are integrated with the physical representation of (digital) output.

This project description is very open, but we were challenged with one huge problem: how do you get the interactive onscreen user interface out of instant messaging experience. Even though we sometimes were distracted from this target, at every weekly coach meeting we were remembered to stick to this concept. Apart from regular coach meeting we scheduled client meetings on a monthly base so we could also get feedback from them.

The coach suggested doing 3 iterations in the 1:10:100 model. For us this meant we did a very short pressure cooker cycle for two weeks, a longer cycle for 6 weeks, and the last cycle lasted 8 weeks. We decided to continue on the prototype of the second cycle after the user test we did in the beginning of the third cycle. This was also suggested by our coach and clients.

Our weeks looked a lot the same: we met every day in the morning at orange and we started working until 5. We remained doing this until the end of the semester. Apart from our regular meetings we also did some team building activities such as having a beer together after a day's work. We started our project with four people: Pim Vellenga, Hessel Sieswerda, Timo van Langen and Niels Tiemessen. We all had different functions within the team (such as team leader). We quickly noticed that Timo wasn't really working and it was no surprise that he quitted before the end of the semester. After a lot of arguments, hours of prototyping, and tons of research we all agree that we had a good project and that we made a nice prototype.

This report will show how we got there.

Design-Cycle I

Objective, problem, idea finding

The main goal we aimed for the first iteration was making the instant messaging experience tangible. We used the pressure cooker model in order to come to some results in a short time span.

Focus on tangibility, no target group

Expert evaluation on the outcomes

Push-to-talk (Laptop like device with extra messaging functionality)

- Looks too much like a computer. Try to get far away from that.
- There is no tangibility.
- It is a keyboard extension
- Visualizing the messenger functions, but still by buttons.

Push to talk

Status Cube (Different sides of a cube represent different statuses for messenger program)

- It's a mental model, but there's no link between status and effect.
- You've to look to what you want to do and select it. It doesn't have a new value.
- You've could've used different shapes.
- The product isn't appealing besides the picking.
- There is very little feedback and communication.
- Doesn't make use of the capabilities of the target group.
- Doesn't make use of tangible possibilities, e.g. using multiple hands.

Whack a Contact (Representation of contacts of a messenger program by figures)

- Interesting when interacting with it. Manipulating the product.
- Contrast with interaction because online contacts are more appealing. It conflicts when you want to wake a busy person.
- It a visualization of the status screen off-screen
- It invites to interact with. Especially when you manipulate parts while moving.
- It has potential to be a dynamic product that makes senses.

- For future: play with shapes, make shapes and play with it. Think what shapes represent, like cubes, figures etc.
- Activity level is a valuable addition.
- The interaction is clock like, you can just have a glance to get up to date and it doesn't need a lot of attention.

Reflection first iteration

- Tangible is a mean not a end so next time we have to focus more on the whole design cycle instead of a prototype
- Next time we focus first on the design problem and the users concerned to that problem (for example: how can we make instant messaging more fun for teenagers? Or how to get rid of some annoyances for all users?)
- User research should also consist of context information and scenarios, storyboards etc.
- We have to use a more schematic approach
- Explain techniques used for example for brainstorming for concepts and argument why we used it and reflect on outcome of using that particular technique.

Design-Cycle II

Introduction

After the first design cycle we wanted to do things completely different. Instead of just making some part of the instant messaging experience tangible we decided to first pick a target group to design for so we would have some real problems that could be solved.

Objective finding, target group

After a quick brainstorm session we decided that we are going to design for elderly people that feel lonely. There are various reasons for elderly people to feel alone, but most of them come down to lacking communication with other people. This is an opportunity for us to come up with a concept that helps elderly people getting out of their social isolation. And because we think elderly people don't have that much experience with communicating with digital devices there may be a lot of possibilities for us.

We did some literature research on elderly people. This can be read in Appendix A.

Fact finding

User research

Target group research questionnaire approach

After a lot of research we wanted to know how elderly communicate, because this part wasn't available in all the documents we found. That is why we decided to make a questionnaire.
We decided that we didn't want to scare a lot of people by asking intimate questions so we kept the questions very neutral. We also wanted that the questionnaire didn't take more than 3 minutes so people wouldn't get bothered because the interview took too long.

We picked a nearby location that had 2 supermarkets and a couple of convenient stores. This was a good pick because we were able to interview 40 elderly people in only a couple of hours. We decided to split up so we wouldn't intimidate the people. The group we interviewed mainly consisted out of native Dutch elderly people which certainly weren't poor. This may have influenced the overall results for the questionnaire (some old guy pointed us to this fact) because we think that if people are more rich and/or better educated, they might have a bigger interest in computers.

The elderly people were quite helpful and we estimate only 1/3rd of the people didn't wanted to help us with our research. The majority was enthusiastic and was more than willing to just only answer our questions.

Results of the questionnaire:

First of all we took a good sample of elderly people. The average age was a little over 71 years (this isn't very accurate because Timo guessed all ages of the people he interviewed because he thought the question was inappropriate) and the men/women ratio was almost 50/50. The first surprising fact was that most elderly people stopped writing letters as a communication good. Instead a lot (57%) of elderly people started using email instead of writing old fashioned letters. They use email for all the things they used letters before (so from business related stuff to emailing oversea family).

A big opportunity for us lies in instant messaging because nobody of the interviewed people uses it often. The people told us mostly that instant messaging was too chaotic for them and they couldn't really follow what was going on. This is the same thing for Skype/videochat. Also community websites were a bit unfamiliar to most people. They also thought those websites were too hard to learn.

Overall conclusion is that most elderly people are aware of computers, but they only take advantage of them by emailing. Still the most of them is a bit scared of doing more than emailing because of the complexity involved with a lot of computer related processes. So tangible interaction placed in an intuitive context might be the solution to this problem.

For the brainstorming next week we weren't able to find some conclusive information on what elderly people miss in communication. Some of them like the user friendliness of emailing, others like it to talk to each other. Most of the interviewed people seemed pretty satisfied with their lives so for next time we might look at another location with more lonely elderly people.

For the complete results of the questionnaire look in Appendix B.

User group profile

We had to be careful when designing for elderly people because they have very specific characteristics. For example the interface shouldn't be complex, the fonts used should be readable (due to bad eyes) and accurate user input is forbidden because the motoric of elderly people is bad. The product should also be very intuitive because a lot elderly people have difficulties with new devices.

Problem finding

Interaction, requirements

Requirements gathering

9) Functional and data requirements

- The product shall be able to send and store communications
- The product shall be able to send messages of different length
- The product shall be able to communicate with other of his sort

10) Look and feel requirements

- The product shall have an appearance that refers to the context of elderly and therefore is recognized by them.
- The product shall provide elderly a confident feeling when they see the product for the first time
- The product shall have a conservative, authentic look
- The product shall be a solid artifact
- The physical aspects of the product shall be comfortable to use for elderly

11) Usability and humanity requirements

11a) Ease of use

- The product can be used by elderly without help from others
- The product shall be seen by elderly as the first thing to use to communicate with others
- The product shall have a low complexity
- The use of the product shall be in a natural, intuitive manner

11b) Understanding and politeness

- The product shall appear to be a familiar artifact
- The product shall not approach the user as incompetent
- The product shall appear to elderly as the answer to all different communication methods

11c) Accessibility

- The product shall be usable for elderly with reduced seeing and hearing capabilities

12) Performance requirements

12c) Preciseness

- The activities shall have a high success rate
- The product shall send the messages to the people that they are intend for

12d) Reliability

- The product shall have a status indicator (e.g. network connection status)
- The product shall be really reliable to ensure the elderly his safety

12e) Robustness

- The product shall have the ability to function in abnormal circumstances

13) Operational requirements

13c) Partner applications

- The product shall be connected without effort to internet, tv on pc, pc on tv and phone (mobile)

14) Maintainability and support requirements

- The product shall not contain any disposable electrical sources
- The product shall need as less maintenance as possible

Shape studies

We decided that it is good to not only brainstorm on paper to come to good ideas, but it is also important to explore various shapes (it is a project about tangibility after all). So we went to the clay room to explore various shapes.

This is one of models we made, this initiated the idea of a card box to store all the contacts in.

Idea finding

We came up with the following concepts:

- A map that would show twitter location
- A trading card system
- A photo frame system, where you could select contacts with a laser by just pointing at the picture of the person you wanted to talk to
- A table, with either pre-made objects or stickers with for instance RFID, combining picture frames of your contacts with certain objects would communicate standard messages.
- A placemat with similar functionality as the table, only the photographs would already be printed on the placemats
- A little fence that would translate slang
- A lamp with little typing machine and screen on the bottom
- A puzzle made out of cubes, combining the cubes in a puzzling matter to create a message

Concept descriptions, prototypes

Guidelines for brainstorming:

- When ideating don't limit technology
    - Give what you want to do
    - Not how to implement
    - So not RFID, but object recognizing each other
- Everyone has their own way of brainstorming
    - Define wants and needs for team
    - Influence/Inspire each other by sharing in the process
    - 4 individual trails have dead ends
    - Wait with commenting and feedback till converging stage, also in your own brainstorming! Judging kills creativity
- "Okay, whatever" is not okay
- Give constructive feedback, not yeah its fun but I don't like it, or don't see what it does.

After getting the feedback and doing the reflection we decided to evaluate our concepts we had so far, everyone wrote down the feedback on someone else's concepts. These are the results;

Timo's Concepts, evaluation by Hessel

Kroonluchter (chandelier)

1. Description:
    - Like a babymobile
    - Contacts represented by hanging pictures; activity on IM visualized by height
    - Link to cycle 1 (physical status window)
2. Advantages:
    - Lots of forms and shapes possible (water pillar with floating balls)
    - Know the activity of contacts by just a glance
    - Can fit in elderly homes
3. Disadvantages:
    - No communication possibilities
    - For the contacts: exposed feeling
        - Contact is aware where he is exposed
    - Complex for elderly to set up
        - Can be given to elderly as a gift to insure help setting it up as well
    - Doesn't offer tangible instant messaging

Placemat

1. Description:
    - Similar Table by Pim
    - On the placemat are pictures of contacts are placed
    - Objects that represent predefined messages that can be placed on contacts
2. Advantages:
    - Can display status of contacts
    - Can display incoming messages
3. Disadvantages:
    - Monotonous because of predefined messages
    - Not able to make it personal

Photo frames:

1. Description:
    - Use of photographs of close contacts
    - Incoming messages appear on TV set
    - Outgoing message interface as well on TV set
2. Advantages:
    - Photographs of close contacts are always prominent visible
3. Disadvantages:
    - No tangible instant messaging
    - Complex to interface on TV set

Niels' Concepts, evaluation by Pim

Cardbox

1. Description
    a. Organizer box with cards
    b. Placing cards on reader will start conversation
    c. Lights on the cards indicate which contacts are active
    d. Handwritten messages, with handwrite recognition
2. Advantages
    a. Physical contact database
    b. Cards you can hold and move
    c. Can be linked to any computer
3. Disadvantages
    a. Lights are to active and chaotic
    b. Handwriting recognition is not as accurate when writing cursive
    c. The fact that elderly people prefer handwriting is an assumption, no research to back it up, because 65% of our user group from the questionnaire actually uses e-mail and likes the quick corrections you can make when typing.

Map

1. Description

    a. Maps shows contacts location and status
    b. Uses twitter, hyves, facebook and such too generate location
2. Advantages
    a. Location and status are easily observed
3. Disadvantages
    a. Privacy issues
    b. Delay, people don't always update their status and location, might seem like they are on the toilet for two days in a row for instance.

Pim´s Concepts, evaluation by Niels:

Tafel (Table)
Description: Objects placed together on a table to communicate
For example a teapot placed near a picture of grandson – a invitation to come drink tea is sent to grandson
Benefits:

- Very intuitive, visual
- Lots of objects to make use of
- Keeping history of messages, show last message, time indication

Disadvantages:

- Object stands for one single message
    - What message to the object
- Too easy to contact everybody
    - Make extra handling to confirm contact (maybe post stamp)

Chair;
Description: Use of interactive pillows.

- Motion and screen in pillow

Cubes
Description: Inspired on puzzling
- Message composed from several cubes

- Looks like claymodel of Niels

Benefits:

- Constraints to force right composed message
- Keeping it interesting to make new combination
- Screen on cubes container for incoming messages

Disadvantages:

- Need lots of cubes
- What part a message per cube
- Only for outgoing messages

Slang fence:

Description: Translator of slang

- Function to add content
- Only an addition to other means

Hessel´s Concepts, evaluation by Timo:

Lamp:

A lamp with a keyboard and screen at the base.

Discription: Lamp turns on when a Message is received

Benefits:

- Clear when a message is sent
- Fits in context, living room of elderly
- Maybe keep lamp (lighting) as extra functionality
- Disadvantages:
- It's very Intrusive, in-your-face.
- It's just a computer with a lamp attached, not intuitive.
- Maybe with handwriting input and without computer element it looks better
  Coach input: why not use webcam to photograph handwritten note
- Childish appeal (kidstoy)

Solution finding

After the evaluation we though the card box database component was the best result of the ideation week, we still had no concept though.

Concept selection

Monday we started by thinking about ways we could send a message, Niels and Hessel were thinking of a mailbox like system. A letter would be written either on paper or a screen, then scanned, if someone replied either the screen would fall out again, or the message would be shown on a screen . Timo and Pim argued that the process was too slow for instant messaging. Niels and Hessel wanted to drop instant messaging, were Timo replied: “Look at the project name, Tangible Instant Messaging”. So we went to our clients for some advice. They told us to get away from how to write the message and focus on the experience of getting to the message, and to stick to just instant messaging. We decided to let everyone create a concept which showed their view on this and evaluate these on Thursday.

So Thursday we started by evaluating our concepts made individually. Niels presented a contact book with screen in it, and a typing machine with more computer like functionality, still with mechanic feel, buts felt too much like a computer. Pim presented a variation on the card box, the card box was replaced by a cookie jar and the writing area by a touch screen, with software for a touch keyboard as well as handwriting, a pen to write and an eraser to erase like a backspace. Hessel was still stuck with e-mailing ideas and came with another mailbox. Pim and Timo argued that the typing machine is too formal, it has too much association with work and writing serious long letters. While instant messaging is informal chit chatting, it is more like at a tea or coffee party, just short informal conversations. That is how Pim argued his cookie jar instead of card box as well, more informal, fits into the living environment and is associated with tea or coffee time. However the touch screen was not needed, and a second part, not one whole.

This evaluation resulted in various ideas building on the informal and the chit chat experience, so we decided to all draw our ideas on this renewed card box, with a screen and keyboard integrated in it. Pim drew a round cookie box, Timo made a more rectangular cookie box. Hessel also made a more rectangular shape, Niels made a rectangular shape, but a tea box instead of cookie. Then the discussion for materials arose and we decided not to leave a material out, and keep both tin and wood, and decided on a rectangular shape. So the screen would (in) the lid, the middle would be the card box, and in the bottom would be a slide out keyboard

Prototyping

On Friday we build shape models of our concept, to decide on our dimensions. We wanted to know how much the height and width influenced the feel of the box. That's why we first made two foam models of what the tea box would look like.

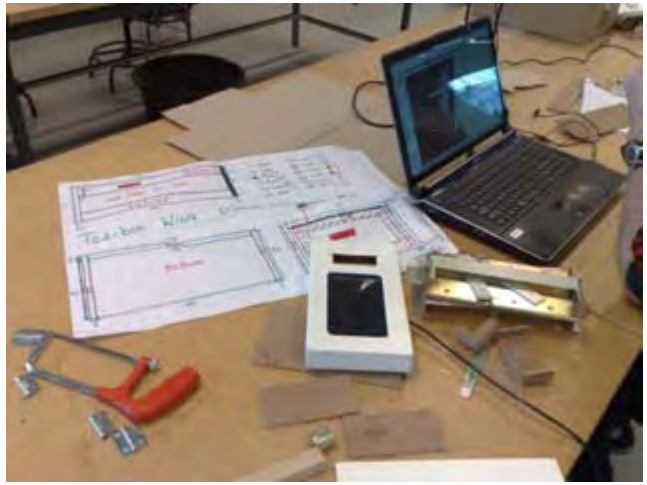
The model on is based on the width of the card as its height, the right one takes the length of the cards as height. Models made by Pim and Niels

The difference in height has some major influence on the feel of the tea box. The right one looks more like a chest while the left one has a more tea box "feel" to it. That's why we decided to go for the left one.

We still had to think of a way to let the device know that a card is being used. We tried some different methods but we quickly came up with a slot where the card needs to be slided into. Instead of making it into the tea box right away, Pim and Niels

made a proof of concept to test it. This model was to deep and the card easily got stuck, that's why we decided to make it less deep and more rounded.

Left is the concept version, right the prototype



We decided to make the prototype white so we could show to people that we could have made it with every possible color.

For the text input we used a keyboard we bought from Marktplaats. The keyboard was placed underneath the tea box on piano rails so it could easily be moved out of the box to start typing.

Prototyping mostly done by Pim, Niels helped

Finished prototype

The last step in the prototyping process was making the notification system. Hessel connected a little DC motor to a Arduino in order to make the cards move. The motor was mounted inside underneath the cards and a little square piece of wood made the cards move.

3D version of how the box would look like in wood made by Niels

Exhibition

Feedback Exhibition

- What is the business model? How will it be put on the market
    - Designing a business model (CA5) is our last missing competency
    - How much will the product cost; price?
    - USB device right next to the computer, without screen or keyboard is cheaper
- Other thing than a tea-box
    - Other things than tea
        - Cigar box, cookie jar, etc.
    - Completely different objects
        - Mailbox, chair, etc.
    - Decentralized objects
- Other thing than card-box
    - Alternative for cards
- Emotions?
    - No emotion translated with device, just messages
    - Implement elements that can translate emotion
- Bigger?
    - Precise movements
        - Small keys
        - Thin cards
    - Aren’t bigger objects easier
        - Cognitive abilities of the elderly decrease
- Different interaction rather than card-reader
    - Other direct interaction with the cards
        - Stroking cards
        - Pushing cards
        - Pulling cards

    - More natural/intuitive motions and interactions
    - Shape of the cards
- Keyboard might look weird
    - Getting rid of keyboard – pro's/con's
    - Computer with tea-box in it, rather than a tea-box with instant messaging device in it
    - Pen movement registration instead of keyboard
        - sensor on pen
- One way messaging
    - Relevance of two way messaging
- Just one general lid that can be place on multiple tea-boxes
    - Just the screen and card reader
- Open/Closed
    - Open – messaging device
    - Closed – Photo Frame
    - Two screen/One screen rotating inside lid
- Better good quality than cheap parts?
- Interaction between cards and displays
    - Cards slide in --- message screen slides onto screen
    - The way the cards is put in than effects the way the screens pop up
- Old Projects as inspiration
    - Book for the Elderly
        - Handwritten messages sent to family
    - Other projects?
- User Test!
    - Continue current concepts
        - Finish loose end
        - Make working prototype
        - Improve design
    - Start over?
- Clear task definition

- Task
- Subtasks
- Timeframe
- Documentation

Reflection second iteration

We got a lot of positive feedback from the exhibition and. In order to decide whether to continue on this concept we wanted to have a user test. We are pretty satisfied with the concept like it is at this point ourselves and we would like to continue working on it, but we also got feedback from the exhibition that it already is a done product.

Design-Cycle III

User test

User test Tea-Box notes, 22/04/10

The small space for the cards in the card area didn't seem too small for the test person. Within 3 seconds he was able to put the card in it. But it is annoying if you have to work with the small space.

The tea was distracting in a way it doesn't have any functions.

After discovering the keyboard, the test person starts typing enthusiastically.

In order to type and to read text on the screen, the person had to bend forward to be able to do this when the tea-box is positioned on a lower table. . It isn't a comfortable feel if you are in that position a long time. Therefore it is a solution to make the tea-box more fitting to the lap of a person. Then the person can use the tea-box in his own chair in a comfortable way

The typing of the 87e year old test person goes unexpectedly well and fast.

The notification by vibrating the card is very noticeable.

The space inside the box, were the tea is in, can be used or other things as well when you don't like tea. But the thought behind the concept is clear to the test person: being able to make contact with others in a short, easy and quick way while doing a daily activity

The cable freeness is nice. It looks neat and it is easy transportable.

The cards representing the contacts are easy to grab. When there are bigger amounts they can be sorted in family and friends or in frequently talking to and not often talking to.

The size is too big according to the test person. He said: “if you put the cards on the height of the keyboard, you can make it smaller maybe.

It takes a very little time to get used to the tea-box. Two test persons completely understood the product within 15 minutes. And after the test persons understood the concept they said it could be a part of their daily life.

The test person used the hand palm rest of the keyboard to put a cookie on it.

The wife of the test person thinks the nicest aspect is that it can be put on the table where you’re the most of the time.

The general computer is very complex for them. The tea-box takes away the menus and other unnecessary functions. This gives the test persons a confident feeling that they understand the complete functionality of it.

The test person is annoyed by new telephones. “A telephone is to make a call with. Not to be obligated to work your way through menus.” In other words: don’t make a product more complex to use if they function perfectly without the extra, complicated functionality.

The keyboard was directly noticed to input text. It is a known method to input text. It is easy but it lacks the personal touch writing has. It has more feeling in its form.

It would be nice to make an easy method to rate a message or multiple messages as relevant for later. Or as special to keep, like you do with written letters.

Design issues

At the beginning of the project we decided to do three design cycles in the project; Three iterations that result in three moments to present and reflect on the outcomes.

In the first iteration we explored the design case and what design problems there needed to be addressed. We spend two-third of the time on the ideation process and research. The other time we've spend on making models of the best concepts. We found it hard to make a selection of the concepts down to one or two. It led to several concept models in cardboard and foam.

The second iteration we choose a specific target group: Older adults that are interested in using new methods of communication but can't find appropriate products that allow them to do this. We then spend two weeks on research on the target group. After that we had a shorter ideation and concept finding phase, about one week. The goal was to come to one concept to proceed with. The converging to come to one concept went a lot better than the first iteration. The second part on the second iteration we spend on making the first prototype and refining the concept.
At the exhibition, at the end of the second design cycle, we presented a mock-up with working screen and keyboard in the form of a tea-box. We received positive feedback but there were people as well that found the resemblance to a computer very strong. We as well got the advice to zoom in on the specific elements in the use of the product. The whole concept was placed on a solid basis, now it's time to improve the elements further and find design solutions of new design issues that we've come across.

Text input

This section I'll discus the different text-input methods we've come across in the concepts of the first two iterations. In the first iteration we had focused on the tangible aspect of the design case. This resulted in concepts that didn't added value except to interaction methods that were very intuitive and tangible. Most concepts replaced GUI methods of instant messaging programs with a tangible alternative. The aspect of text-input was hardly touched upon. There wasn't a clear target group and we assumed the text-input could be done by use of an ordinary QWERTY-keyboard. In essence we tried to transform the instant-messaging experience by replacing a part of the screen-based interaction to 'real world' interaction. The text-input method wasn't changed in regard to existing instant-messaging programs. At the end of the first iteration we came to the conclusion that we had a good idea of the possibilities and different directions the project had. We saw that we still could make use of other methods than the conventional.

In the second iteration we picked a specific target group, namely elderly who don't have a lot of contact with their grandchildren, what made us reconsider the conventional text-input method. During the research on the target group we found that 70% had experience in using the keyboard. That was more than we expected but not a convincing argument to do no more research and solution finding on the text-input issue. In general we came to three kinds of text-input; Typing on a keyboard, writing on a paper or touch-screen, and composing a text by making a sequence of sentence elements or words. For the first mock-up we made use of a keyboard. The implicit message that the keyboard sends out is 'typing text' or 'writing a message'. This fits the meaning of the concept excellent but we did have the feeling that there was undiscovered terrain that had to be explored.

Target group

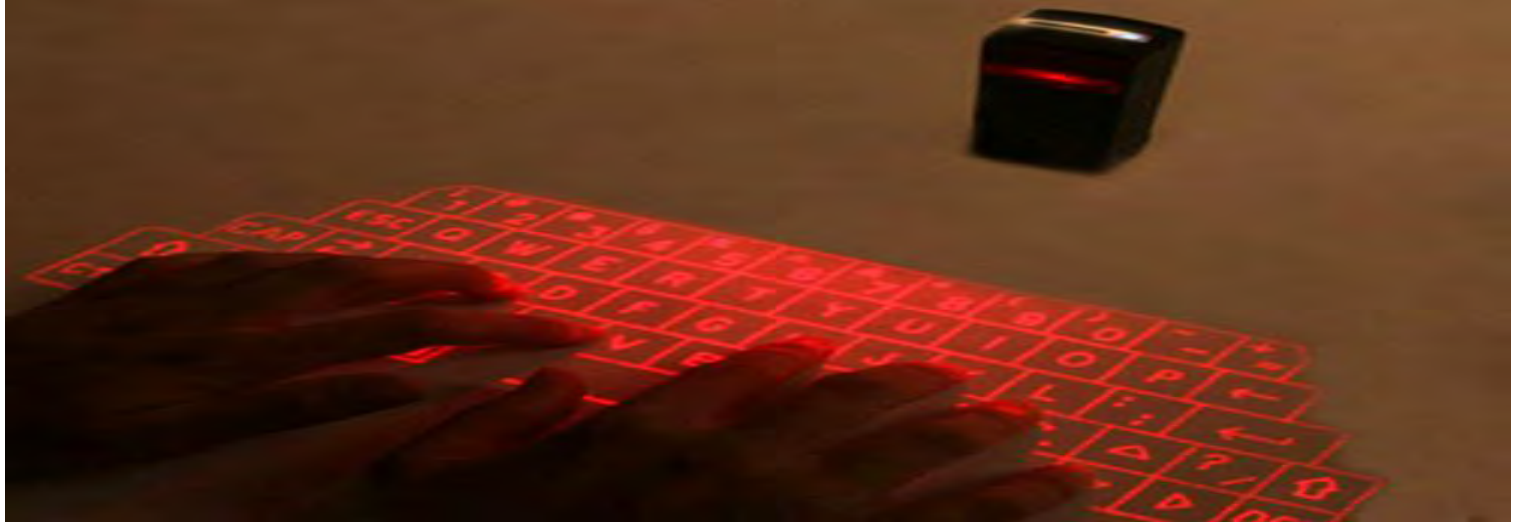
In the user test at the ending of the second iteration we found that elderly know very well how to use a keyboard. The typing speed was above average, though for making messages personnel it wasn't appreciated over handwriting. The keyboard was more associated with working and is seen as an extension of the personal computer. The writing with a pen on a paper is more familiar to them when they're writing a personal message to someone.

Input methods

Traditional keyboard

The use of a keyboard is easy when the right program is started or window is selected and the cursor is blinking on the right place. The lesser used keys aren't obstructing and even can be used to replace some mouse actions. The QWERTY setting of the keys is widely known. All this makes that set of buttons kind of an efficient method to enter text in things. A touch screen QWERTY keyboard profits as well from that. There is however a big difference in interaction and physical feedback. The dimensions of human hands require the screen somewhat to be around the same size. The size of a traditional keyboard can be constraining but it's effectiveness is quite high.

The presence of a keyboard is more or less unwanted in our concept. It has to fit in the context of a cozy table in the living room. Using a keyboard in our concept makes the appearance to much a reflection of a computer. In the previous prototype we handled this by making the keyboard extractable so when it wasn't needed it could be put away



Other existing text-input methods

Virtual keyboard

A virtual keyboard can be an on-screen keyboard or a laser-projected keyboard. I already discussed the on-screen keyboard in the previous section. The laser projected keyboard can project a keyboard on every plain surface. Its advantage is that we could use it only when it needed. If it isn't needed anymore then it can be turned off. Though the typing of plain surface doesn't give a pleasant feedback.

Speech recognition

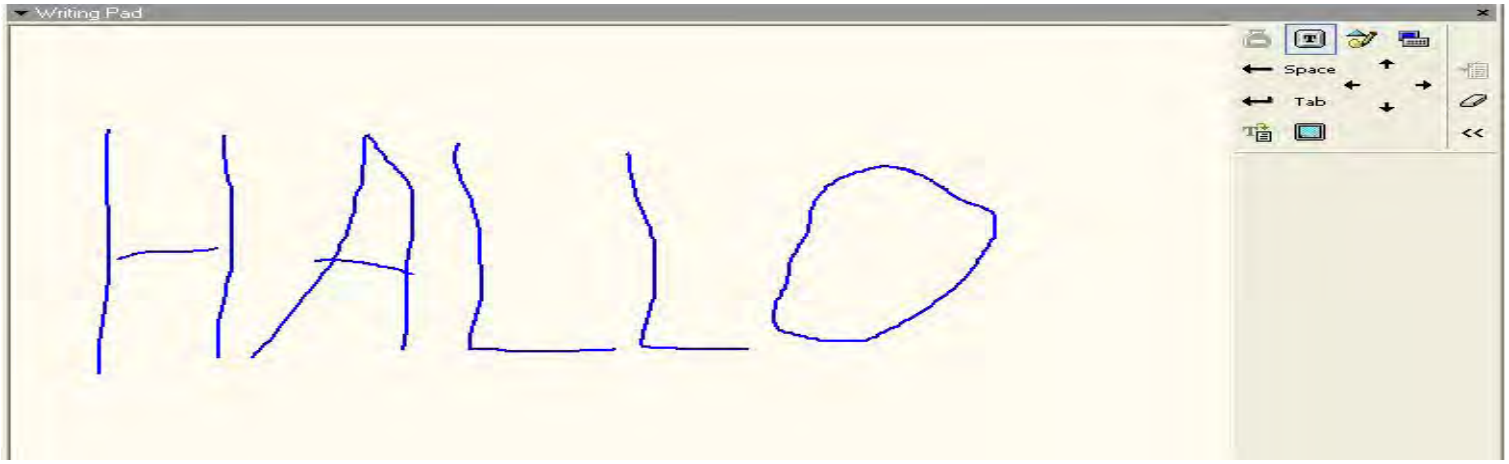
There are several programs that offer this functionality. However it takes a lot of learning before the program has a good interpretation of someone's specific voice. Therefore this isn't an appropriate method for us.

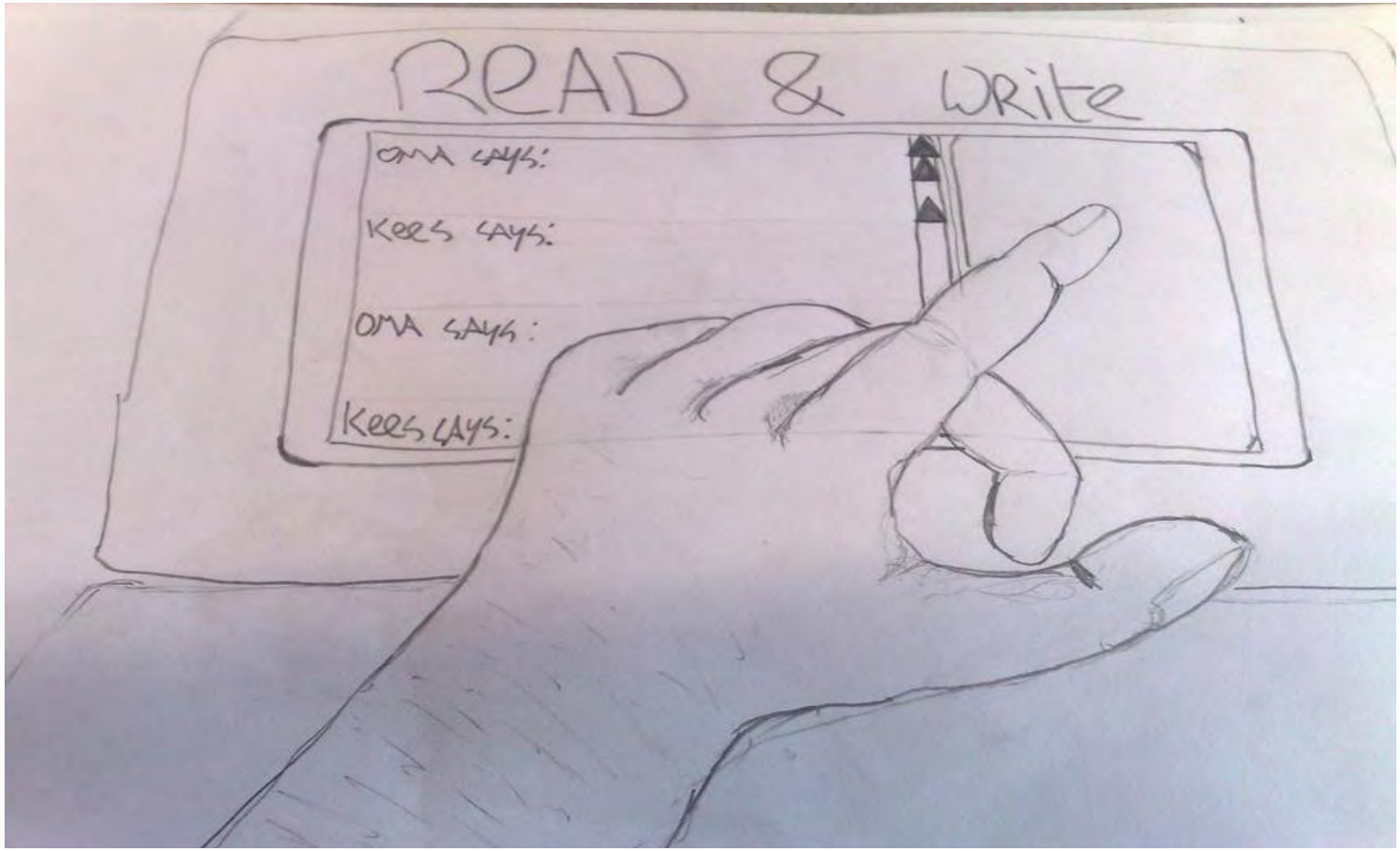
Gesture recognition

This method uses gestures as its input. It's bound by the pre-defined gestures that can represent pre-composed messages. These gestures are captured by webcam for example.

Text-recognition (offline-online)

There are two ways text recognition can work. It can be analyzed while you're writing or it can be analyzed after you finished writing (a part). We think there are several advantages in this method. The slower interaction than a keyboard prevents them to write too long messages. On the other hand is does take them more effort to write then to type.

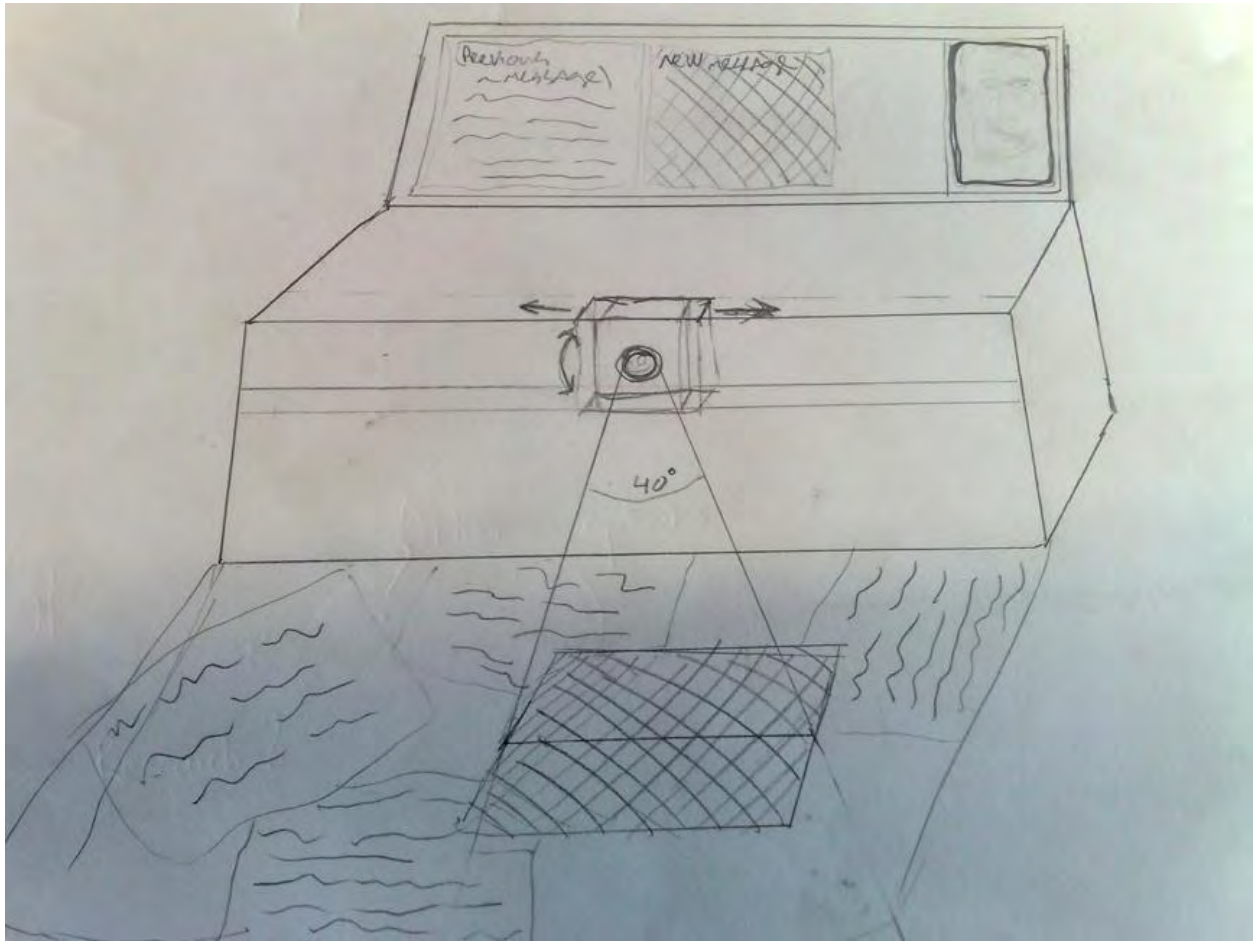




New text-input methods

Photographing written text

A new to input a text is to make a digital image of text written on paper. To make that work only a camera with a view on a physical writing paper is needed. When the message is written it can be easily captured by a digital camera or webcam. Then just send it to the conversation partner to enable him to read the message. The message in this form is very personal because of the characteristic handwriting.



Design decisions based on user test

The results of the user test show that the traditional keyboard offers the highest text input speed and the lowest error rate therefore we choose to make use of a traditional keyboard for our product.

For more information for the usertest look in Appendix C.

Notification system (by Niels)

In our research we discovered that online notifications really distract (and even annoy) elderly users so we had to design a tangible notification system. First I did research on how the user wants to be notified. I found out that lights are very distracting and don't communicate a clear message; for one person a green flashing light can communicate something positive (such as a new message is sent) and for other people they start to panic and think something is wrong. That's why I wanted to focus on the movement of cards. I could have also chosen sound, but sound alone has to be combined with another system in order to notify the user what is going on in which slot. And also since elderly people are our target group the volume of sound might be a problem because of their bad hearing.

I came up with 3 scenarios:

- A IM user is offline
- A IM user is online
- A new message is being sent

Before thinking up a solution I made a small requirement list (they came out of the research did before) which the notification system should satisfy.

Therefore the notifications had to be noninvasive and they had to be very intuitive (we want to have an out of the box experience).

Then I started thinking, which movement makes most sense with each scenario? I really had to think within the constraints of having the cards into a box, so only little movement was available. I came up with only vertical movement of the cards within the slots so that every action would have been translation into a direction. With the card in the bottom of the slot the user would be offline/away/busy (we only wanted online user to appear online since elderly people really want all attention while using IM). If the card was in the UP position the user is online (the card is slightly elevated above the offline cards) so that the user knows that the card "wants to be picked" and therefore they can successively start a conversation. The last action is that

the card gently hovers in the slot so that the user knows there is activity and the card should be taken out and be placed in front of the camera.

After I knew what I wanted I started making the second list with all the technologies (and the pros and cons) I could use:

Electromagnetic levitation
- + Cheap
- + Can be placed underneath every slot
- - Bulky
- - Draws a lot of power

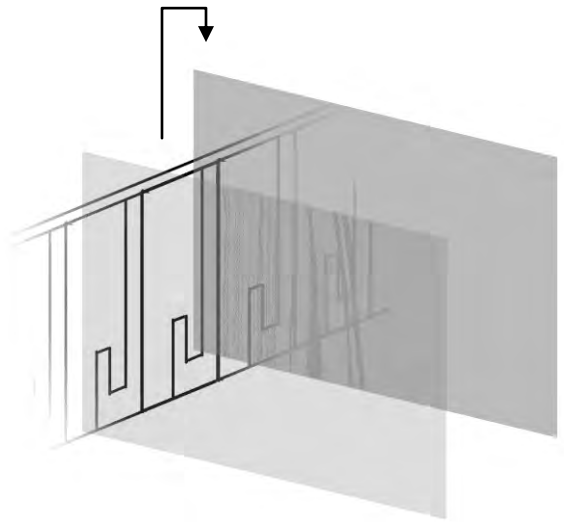
Servo motors
- + Cheap
- + Easy programmable
- - Size issues: smallest servo is 2x2x1 cm without wire

Linear actuators
- Expensive

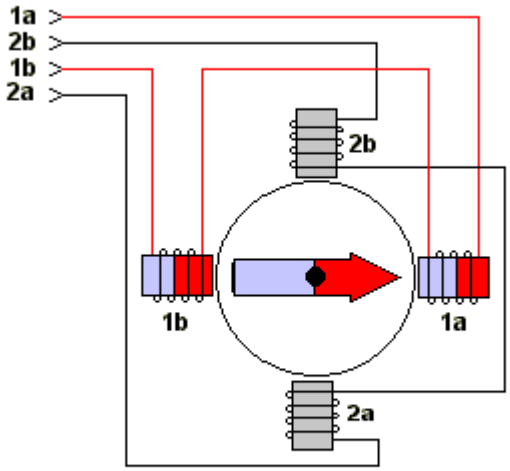
Little air pomps
- - Extremely impractical

Memory metal
- - Impractical
- - Expensive

I really liked the idea of using servos but I realized that having 10 servos in on casing could be made easier. That's why I came up with mounting a servo on a printer motor sledge. I wanted to use the printer motor (stepper motor) to move the servo from slot to slot and then use the servo to push the cards up. But then I realized I still didn't fulfill all the requirements: what if multiple users are online at the same time? I decided to make a structure in the holder of the cards:
The cards can now be placed in higher position by a fork that is attached to the servo, so the card is supported by the wood itself.



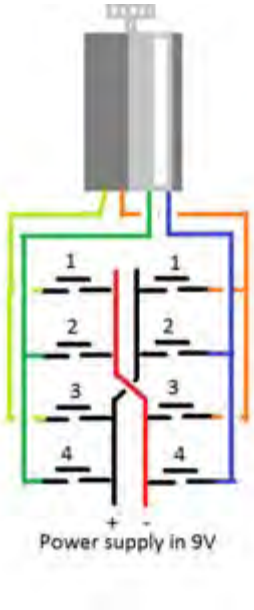
After I had the concept clear for myself I started to search for a printer. I found a HP all in one printer for free and me and Pim started taking it apart (with a lot of fun) but soon we discovered that the needed stepper motor was not used for the printer



Conceptual Model of Bipolar Stepper Motor

part. Luckily we found a servo motor in the scanner compartment and we decided to let it attached to the teeth belt system so I could mount the servo on there.
I got the servo from a RC store in Eindhoven and it was perfect for the job because it was very small (2x2x1cm) and I was able to attach it to the belt system.

Now I had to sort the electronics out. Because we were not able to attach the information from the QR codes on the cards to a database we decided to mock things up (in the beginning we were aiming for a fully functional prototype, but we were not able to do this). I quickly found out that attaching the bi-polar stepper motor wasn't very easy to drive by the Arduino so after a week of trying I decided to just make a manual control.



Power supply in 9V

In order to make the stepper motor move one step (in my case 7.5 degree) the opposite current of the previous step has to be sent to the motor (every step the poles change, see picture on the left).

Is basically had to make an array of 8 push switches combined into 4 pairs in order to make the motor move continuously. The two green wires are one step, the orange and blue one are the other step.
The motor could be controlled relatively easy by sliding with your finger over the buttons.

We were able to control the servo by a pc. It did take a while but I managed to write a small program in processing to control the servo by mouse, keyboard arrows and by shortcuts. A screenshot of the interface is shown on the left.

The only thing left was mounting the device into the tea box. I did this together with Pim and instead of mounting the servo onto a wheel we made a little rail where the servo was hanging into.

Improvements:
When we were using the system during the last exhibition we noticed that the contact cards weren't moving very fluently vertically, but the tended to lean into one direction because the servo was pushing it from one side. That's when I got the idea of making scissor lifts begun; this technology might have solved this issue. Also the manual control of the stepper motor proved to be very hard because of all the wires. Furthermore we got positive feedback about the notification system and everyone knew what the different movements meant.

See appendix D for processing code.

Contact selection

For the contact selection in our "tea-box" we wanted to use smart card size contact cards. However how we were going to let the system identify the contact cards was still unclear. Therefore I did research on different technologies used to identify small amounts of data and fit onto a smart card.

First I made a requirement list:

- Should be able to store a significant amount of contact data
- Should fit in/on smart card standard size
- Should be identified by device within fractions of a second
- Should be fairly cheap/quick/easy to order/make/edit/manufacture

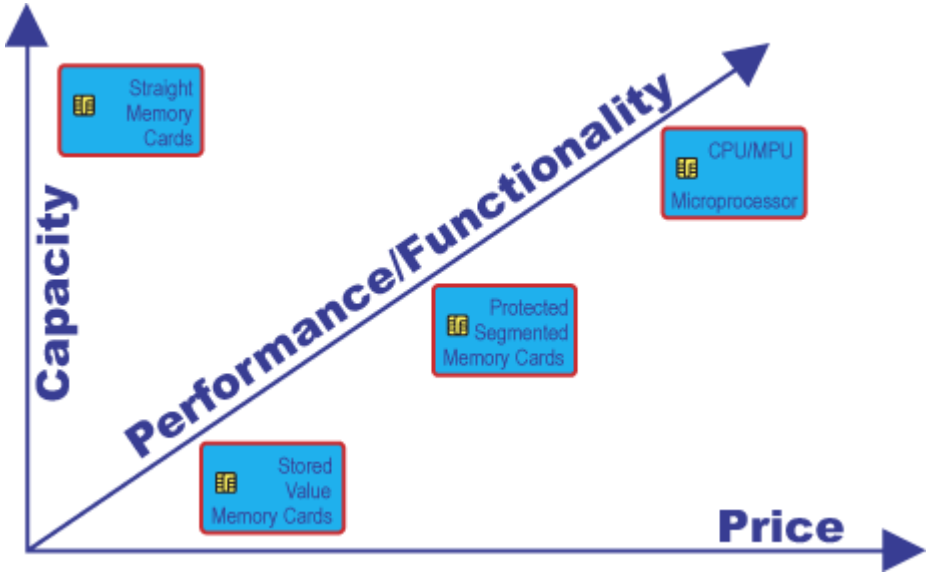
These requirement were set up because we wanted it to be able to identify different contact, so there should be a certain amount of data available on the card. At least enough to distinguish it from the others. Of course it needed to fit in/or on a smartcard, size being 85.60 × 53.98 x 0.76 mm. It should be easily identified by the device, so that it does not take complicated actions or movements for the card/contact to be recognized. Last but certainly not least it should be easy to manufacture, because ideally people should be able to customize or make the cards themselves. If this a difficult or long process it is harder to add contacts and stay in touch with grandchildren or other contacts.

We considered for instance USB or Flashcards, these real easy to manipulate and read. These are relatively expensive though, and hold way more capacity than we most likely need. They also do not fit the size standards of a smartcard. Therefore I started investigating the most seen/used options on smart cards: the magnetic strip, the chip and RFID.

Now the magnetic strip is described in ISO 7810 through ISO 7813, it can store up to a 107 characters. It is read by a rolling electromagnet that scans the data through coercive field, this is put into effect by swiping the card pas the magnet. A magnetic stripe can be applied to any standard size smart card.

The smart card chip can store up to 1megaBit of information and it has 64kiloBits of segmented/protected memory. They can even contain small CPU processors, these possibilities do also increase the price though.

The picture below (from the website: http://www.smartcardbasics.com/cardtypes.html) gives a nice graph of how capacity, performance and functionality relate to price.



You can use the straight memory cards like regular floppy disks, they do not identify themselves though, so the computer has to know what kind of card is being scanned. The protected/segmented version can be protected against reading and writing. The processors allow small applications to run on the card, this allows multiple functions and a higher level of encrypting data, it also allows simpler program changes. The smart card chips are also scanned through induction of the coercive field.

RFID-chips are wirelessly scanned through a radio frequency, they often operate like the straight memory smart card chips with just read and write functionality, they do however have a lower security level. They do not have to be swiped or placed in a reader in order to be read, and are therefore more easily and quickly identified, the distance however is also limited. The distance can be improved by using a different kind of chip with power source that emits a signal outside of the readers coercive field.

While looking at different kinds of RFID technologies I stumbled on a lot barcode types as well. Barcodes are one of the most common and simple ways to identify items. They are used worldwide in stores, mailing companies and all kinds of storage places and warehouses. Two different kinds of barcodes are most commonly used, the 1D stripe barcode and the 2D matrix barcode.

1D barcodes are very limited in storage capacity, one single row of data, they consist out of vertical black stripes and the width of the stripes and variations of distance in between determines the code. They are however the simplest and most common form of barcode. These codes are linked to databases, and refer to specific spots inside the database. They are typically read with a infra-red scanner, but open source webcam software is also available.

2D barcodes, aka data matrixes come in various structures, sizes and colors. These data matrixes can store far more data than their one dimensional brother, and are also frequently used as regular barcodes (linked to databases), but can also already in their code distinguish different kinds/types of data. You can for instance store a URL in such code and the reader will recognize it as a URL, the same thing can be done with phone numbers, e-mail(addresses), text messages and contact information. These are easily read by webcams through open source software and usually used to refer to URL's. The complexity also defines the amount of data that can be stored inside of the code.

Simple Aztec code can store up to 1914 bytes of data. While for instance Ultra Code is far more complicated because the squares can vary in width height and color, opposed to fixed grid location, the color can also vary which allows a far greater amount of possibilities and greater amount of data that can be stored.

The most commonly used is QR though, it is mainly used in newspapers and such to give links that refer to articles. Even in a small square (the one to the right is actual size) can contain a full e-mail address, phone number and other contact information, such as name and address. It also recognizes the separate information as such.

A big advantage of these codes over all other methods is that they can be scanned from a distance (with a webcam), so they don't have to be placed or slid. It also really cheap and easy to manufacture since everyone can print them at home with their regular printer.

A sticky zone on a smart card could be enough to place a 2D code, and therefore edit the cards at home, without any hassle or complicated software. The software used to create the codes just requires you pick a format, e.g. contact information, type the information in the destined areas and then generates a code.

Any regular webcam can scan them, even when held up in a shaky matter. So not a lot of extra hardware is needed to be able to use this technology, where others, for instance RFID´s, chips and magnetic strips, require special scanners. Also looking at the fact that it can store a significant amount of contact data, in a really small easily printed square.

Recources:

http://www.jetec.com/2d_codes.html

http://www.barcodediscount.com/

http://www.moxom.nl/

http://www.aimglobal.org/technologies/barcode/industries_2D.asp

http://www.racoindustries.com/barcodegenerator/

http://www.acs.com.hk/dloads/psg/eng/PSG_30series.pdf

http://www.iso.org/iso/catalogue_detail.htm?csnumber=42205

http://www.inotec.de/nederlands/producten/etiketten-in-digitale-offset/

http://www.inotec.de/nederlands/producten/rf-id-etiketten/

http://www.cyberd.co.uk/support/technotes/isocards.htm

http://en.wikipedia.org/wiki/ISO/IEC_7810

http://en.wikipedia.org/wiki/ISO/IEC_7816

http://www.teobyxiring.com/ecommerce/?p=53

http://www.racoindustries.com/barcodegenerator/2d/qr-code.aspx

http://www.adams1.com/stack.html

http://www.adams1.com/patents/US5726435.pdf

Reflection Contact Selection

The hardware we used was outdated and not performing as well as it could be, the webcam for instance was made 2001. We should have used a wide angle lens with two infra-red LED's on both sides to make sure the QR's would always be illuminated properly. In the current model the QR's were printed to big as well, we should have printed (multiple) smaller QR's on the back of the contact cards. The reflection on of light on the surface of the card might have also influenced the process, so maybe a more matte finish to the cards would also help.

Even though all of these small errors the system still worked quite well. We still see this as the most valuable option for contact selection, because the users or users acquaintances can create QR's themselves. Therefore they do not need to order or program anything to add contacts all they need is to print a QR and share their cards. All the errors can easily be corrected with some more up to date hardware and small adjustments.

Designing the graphical user interface (Niels)

We discovered after the first user test that the graphical user interface sill was too distracting. We found out that elderly people read **everything** on the screen from top to bottom. So in the case below (which is already a really smooth msn interface which I made in the 2nd iteration) they start with reading the name which is basically irrelevant for elderly people, they are not really into customization. Since this name changes many times a year they might be confused who they are talking to. Even the indicator that tells you when the last message was sent and the hand writing button proved to be very confusing and distracting.

The old interface

That's why I made this new interface. The top name is static so it is always clear who the person is talking to. I also removed all buttons so only the text input box and the actual part where the messages are displayed were remaining.

This screens shows you what a conversation would look like.

Prototyping

We decided to make the new prototype from wood to give it a nicer feeling. We kept the same dimensions because we got positive feedback on the size. Working with hard wood proved to be quite difficult because of its toughness. Because of previous feedback from our coach we decided to make a mechanism that allowed us to have the screen on top if the box is closed, so it could also be used as a photo frame.

Because we didn't manage to make the whole interface working we decided to make a mock up version of the keyboard. We used the same keyboard but we removed all the electronics so only the rubber pad was exposed. Pim mounted it in between two pieces of wood so it got a nice feel to it and it would match the tea box.

For the rest it was just a matter of mounting the card system Niels made. To finish it off the box was lacquered to give it a nice glossy feeling.

Photo from the finished prototype, slideshow playing on screen

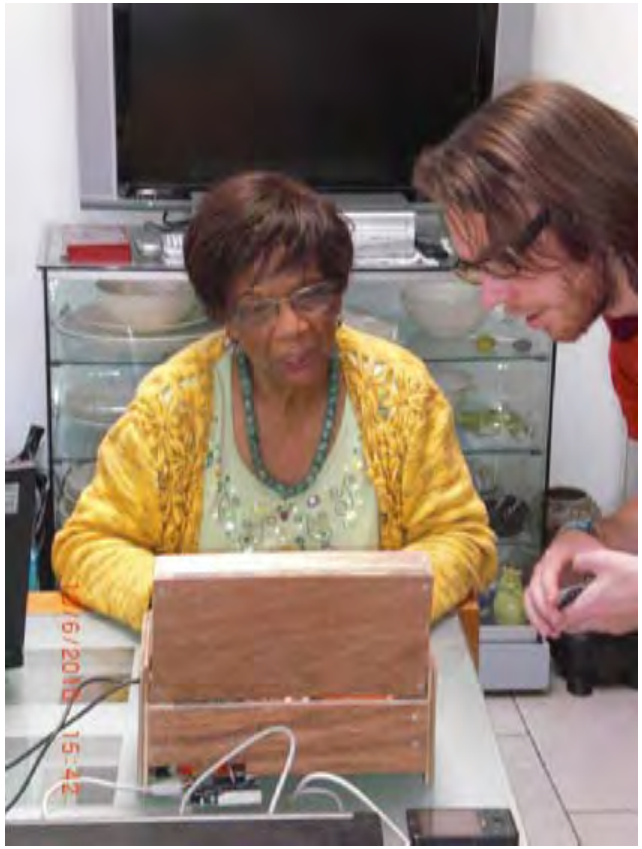
Special hinges are clearly visible on this picture

Exhibition


B1
realities
Tangible Instant Messaging
Context
TU/e
B1
realities
Tangible Instant Messaging
User Experience
TU/e
B1
Tangible Instant Messaging
individual research
input methods
notification systems
TU/e
Text input
10/6/2010 14:25

User test

Reflection User Feedback Session 15-6-10



For this user feedback session was performed with Mr. and Ms. Monsanto, an elderly couple.
The first response was not as positive as in the previous User Test. However after some small explanations and hints in the right direction the system was clear. Our expectations were met, they understood the purpose of the physical/tangible interface, they really like the fact the mouse was gone. They also really appreciated the fact that only one screen can be open at the same time, the fact that interface was really clean, the fact that their grandchildren, children and even them themselves could print new contact cards or feeds. Ms. Monsanto even called it “The ideal device for elderly people!”.

After playing with the cards and the device they understood the entire concept and really saw its purpose as very useful. Therefore we can conclude our choices (after reflected error reductions) are right ones and the concept is clear to the specific user-group. Our technological decisions positively influenced the prototype, but didn’t not change the concept. This was a very successful user feedback session.

Business aspects

After a colloquium about the Business Model Generation we discussed what the elements of our project were significant. The outcome is made into a poster that we showed on the final exhibition. We assigned the business aspects to our fourth project member but he unfortunately quitted the study before he did this.

Evaluations

This project started out in a very wide direction. Firstly we wanted to explore the tangible dimension of the project. We did this by making concepts that focused on the tangibility. We put our first ideas on the table and we made them in the workshop in Vertigo. This gave us a clear idea on the tangible aspect that we could use in our project. After the first iteration we focused on working with a clear design process. We started over in the second iteration and made a clear design process. That helped us to lay foundations for our final design. In the ideation phase we had some trouble brainstorming for new ideas. The ideas of the project members didn't start a train of thoughts in the others. After discussing this in the group it went better and resulted in the tea box concept. In the second iteration we built the first version of the tea box. We had made some foam models in advance to come to a shape that resembled a tea box.

When we tested the first prototype it became clear we had the right metaphor. The test persons really liked that the tea box could be placed on a table in the living room. Both the man and the woman liked working with the cards and the keyboard. They experienced the value of the tea box in communication with family and friends. It exceeded our expectations in the way they accepted the prototype.

This outcome of the user test made us choose to continue with the tea box concept in the third iteration. We discussed the activities we would do with our coach and the client to finish the project. We focused on the design issues we already came across in the second iteration. Especially the prototyping took more time than we expected. The casing itself wasn't that difficult to make but the integrating of the components had to be done accurately. The final prototype was made of hard wood that gave a nice finish of our prototype

Appendixes

Appendix A Research elderly

Social network of elderly

"Binnen het domein van sociale relaties, bijvoorbeeld, concentreren mensen zich met het ouder worden in toenemende mate op directe familie en een beperkte kring van emotioneel nabije vrienden, waaraan ze dan ook relatief veel tijd en aandacht besteden, in plaats van op het in stand houden van een zeer uitgebreid sociaal netwerk."(1)

In the design process there has to be considered that the social network of elderly is in general limited. The effort they spend on this is relatively high so it's important for elderly to have close contact with their friends.

Social choices based upon cost-revenue analysis

"Mensen lijken - bewust of onbewust - een soort kostenbatenanalyses te maken op een subjectieve weegschaal, met aan de ene kant de investering van energie, tijd en moeite, en aan de andere kant de verwachte 'winst' in termen van welbevinden, zoals dat bepaald wordt door sociaal-emotioneel functioneren, fysieke onafhankelijkheid en zelfontplooiing." (1)

Before elderly engage in activities or effort it has to be apparent that they are profitable for the level of their well-being. They will choose to do the activities if the prospect of satisfaction is positive for their well-being.

Short term and long term profit

"In de beleving van 'waarde' vindt onder andere een accentverschuiving plaats naar het hier en nu, met als mogelijk gevolg dat inspanningen die pas op de langere termijn hun vruchten af zullen werpen, in het bijzonder door oudere mensen als minder lonend en minder interessant worden ervaren." (1)

It's important to consider in the design process that elderly do not have a lot of interest in getting results on a long term for efforts they do in the now. They don't have the patience to wait for results; they want it on short term.

Selection of social relations

“Op grond van deze studie kunnen we concluderen dat de selectie van sociale relaties in de eerste plaats wordt bepaald door de *betekenis* die een relatie heeft voor de persoon in kwestie. Afstand (de moeite die het kost om afstand te overbruggen) gaat vooral tellen wanneer een contact als minder belangrijk wordt beschouwd, of wanneer het overbruggen van afstand door concrete of verwachte gezondheidsbeperkingen een absolute barrière dreigt te worden.” (1)

In the selection of maintaining social relations the meaning of the relationship is the most relevant issue for elderly. The distance to that person is not a reason to lower the contact.

*“*De resultaten van dit deelonderzoek laten zien dat de beoordeling van e-mail behalve ervaringsgerelateerd ook doelgerelateerd is. Belangrijk is dat het medium vooral op zijn *merites* werd beoordeeld, die afhingen van de specifieke communicatiewensen en doelen van de gebruiker. De ingeschatte toegevoegde waarde van e-mail aan het bestaande mediaspectrum -of het ontbreken van toegevoegde waarde- leek voor frequente gebruikers, maar ook voor 'weigeraars', een belangrijker argument voor of tegen e-mailgebruik te zijn dan de ondervonden of verwachte geriefelijkheden dan wel moeilijkheden bij de bediening.” (1)

The choice to make use of e-mail by elderly is decided partly by expectations of difficulties or easiness in the interface. We can use this in giving our concept a simple and easy-to-use appearance. That way the target group, elderly, can get a confident feeling what will lead to making use of our product.

“Voor de aanvaarding en het gebruiken van nieuwe communicatietechnologie op latere leeftijd kunnen we op grond van dit proefschrift concluderen dat de volgende voorwaarden belangrijk zijn:

- *Zinnigheid* van het nieuwe medium

De mogelijke voordelen, of 'baten', van een nieuw communicatiemiddel moeten relevant zijn vanuit het perspectief van de oudere gebruiker, met diens specifieke sociale en communicatieve aspiraties.

• *Zichtbaarheid* van de voordelen
Deze relevante voordelen moeten voor de potentiële gebruiker expliciet en duidelijk zijn, ook om te voorkomen dat ze expliciet als 'afwezig' worden waargenomen.
• *Zekerheid* over het zullen profiteren van die voordelen
Mogelijke 'kosten', zoals het leren bedienen van een apparaat, moeten behalve overkomelijk, ook transparant zijn voor de oudere gebruiker, vooral wanneer deze onervaren is, om de onzekerheid over het verkrijgen van het beoogde voordeel te verkleinen." [(1)]

Concluding: The important factors for accepting new communication means for elderly are: The meaning for use has to be relevant from the perspective of elderly with their specific social and communicative ambitions. The benefits have to be visible, explicit visible to prevent them from being explicit invisible. And as last certainty to benefit from the use. The learning of the using has to be transparent and is got to be surmountable to lower the uncertainty of benefitting from the use.

Most relevant results of the study of old folks and their social relations:

50%	Of the children of elderly are living in the same municipality
21%	Of the children of elderly are living on walking-distance
86%	Of the children of elderly visit them on their birthday
32%	Of the children of elderly participates in leisure-time activities
30%	Of the children of elderly helps around the house of their parent
65%	Of the parent-child relations has a intimate character
51%	Of the children of elderly are not participating in leisure-time activities with their parents

49%	Of the children of elderly does not held around the house
25%	Of the elderly does not have an intimate relation with one of their children
55%	Of the children of elderly with children does not live on walking distance from their parents
26%	Of the children of elderly with children does not visit them once a year
32%	Of the children of elderly participate in leisure-time activities. 65% have an intimate relation with their parents.
35%	Of friends of elderly participate in leisure-time activities. 62% have an intimate relation with them.

Other relevant outcomes:

- **Next to children, friends take a very important second place in the primary social network of elderly.**
- **Next to children, the most help around the house comes from neighbours.**
- **The social well-being of elderly ligatures with frequent contact with neighbours and friends. Not with the extensiveness of their network of friends.[(2)]**

This study is done in 1980 therefore the results are not very up to date. In our first user research we will try to compare the results to the outcomes of this study for the relevant part.

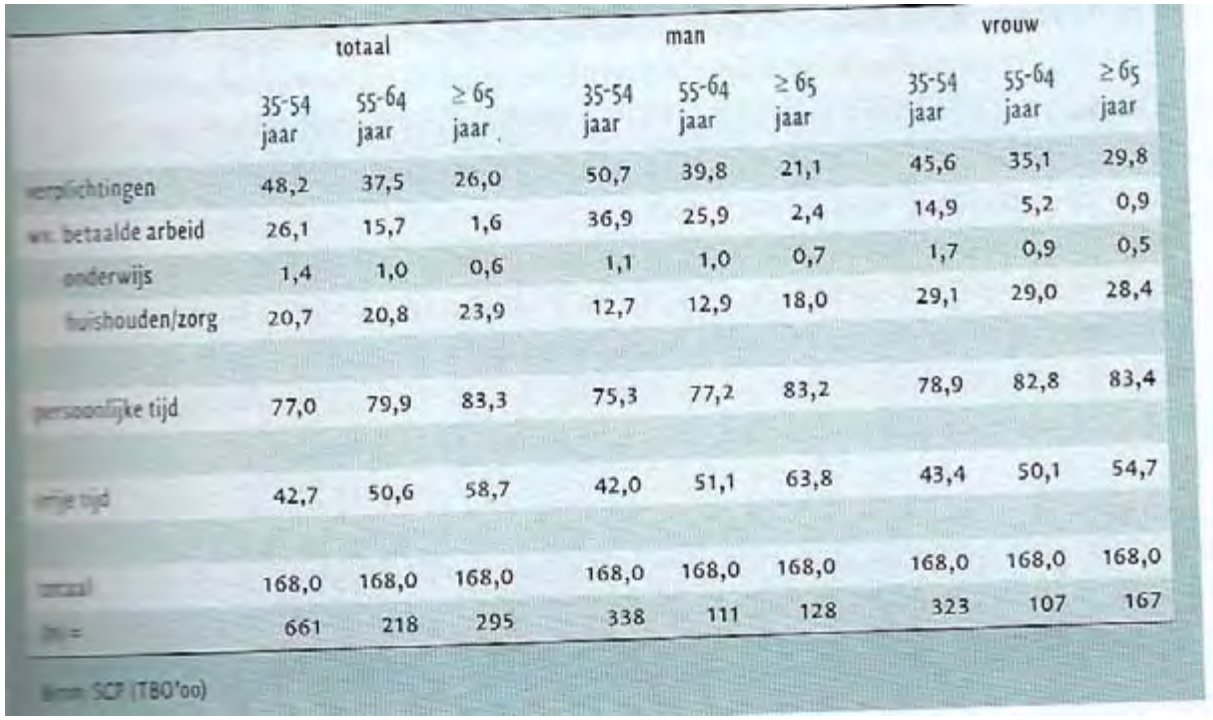
References

1. Adopting communication technology in later life: The decisive role of benefits / by Anne-Sophie Melenhorst. – Eindhoven: Technische Universiteit Eindhoven, 2002.
Retrieved on 3/5/10 from http://alexandria.tue.nl/extra2/200212648.pdf

Oude mensen en hun sociale omgeving. Een studie van het primaire sociaal netwerk by drs. C.P.M Knipscheer. VUGA-Boekerij ’s Gravenhage 1980

Rapportage ouderen 2006, Verandering in de leefsituatie en levensloop
Translated: (Rapport Elderly 2006, Changes in living situation and course of life)

Published by: Sociaal Cultureel Planbureau, Den Haag, 2006



	totaal			man			vrouw		
	35-54 jaar	55-64 jaar	≥ 65 jaar	35-54 jaar	55-64 jaar	≥ 65 jaar	35-54 jaar	55-64 jaar	≥ 65 jaar
verplichtingen	48,2	37,5	26,0	50,7	39,8	21,1	45,6	35,1	29,8
w. betaalde arbeid	26,1	15,7	1,6	36,9	25,9	2,4	14,9	5,2	0,9
onderwijs	1,4	1,0	0,6	1,1	1,0	0,7	1,7	0,9	0,5
huishouden/zorg	20,7	20,8	23,9	12,7	12,9	18,0	29,1	29,0	28,4
persoonlijke tijd	77,0	79,9	83,3	75,3	77,2	83,2	78,9	82,8	83,4
vrije tijd	42,7	50,6	58,7	42,0	51,1	63,8	43,4	50,1	54,7
totaal	168,0	168,0	168,0	168,0	168,0	168,0	168,0	168,0	168,0
(N =	661	218	295	338	111	128	323	107	167

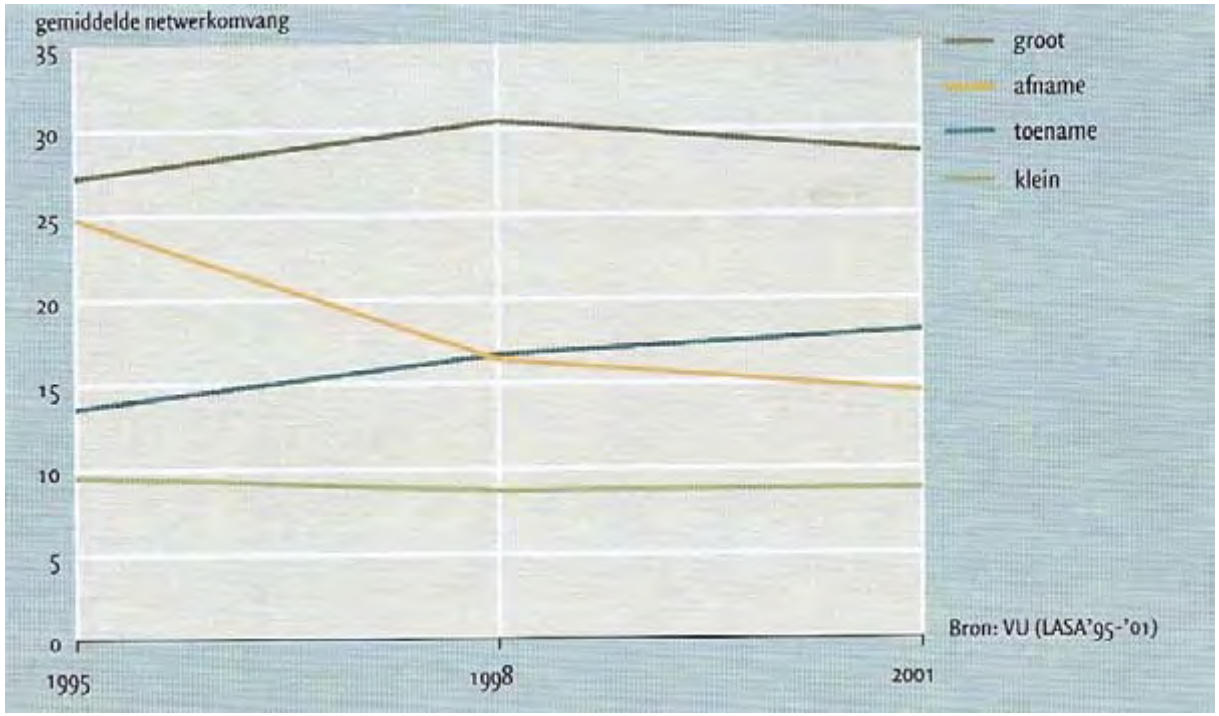
Bron: SCP (TBO'00)

In this rapport on page 69, chapter 4 paragraph 2, we found a graph showing how elderly people spend their time, showing that they mainly spend their maintenance/housekeeping, taking care of themselves and sleeping. It also show that people above the age of 65 have about 54.7 hours of spare time.

	totaal			man			vrouw		
	35-54 jaar	55-64 jaar	≥ 65 jaar	35-54 jaar	55-64 jaar	≥ 65 jaar	35-54 jaar	55-64 jaar	≥ 65 jaar
	42,7	50,6	58,7	42,0	51,1	63,8	43,4	50,1	54,7
	18,0	21,5	26,0	19,2	23,0	29,1	16,6	20,0	23,6
	11,5	13,9	17,0	12,2	14,0	18,8	10,9	13,7	15,7
	0,5	0,8	0,9	0,7	0,9	1,1	0,4	0,6	0,9
	2,1	1,3	0,6	2,9	1,9	1,1	1,3	0,6	0,1
	3,8	5,6	7,4	3,5	6,2	8,1	4,1	5,0	7,0
	14,4	15,8	17,0	13,2	13,6	16,1	15,6	18,0	17,7
	12,0	13,8	14,9	10,9	12,1	14,0	13,0	15,6	15,6
	2,4	2,0	2,1	2,3	1,5	2,1	2,6	2,4	2,1
	2,0	2,7	3,1	1,6	3,5	4,4	2,3	1,9	2,1
	1,6	1,7	1,7	1,8	1,6	2,1	1,4	1,7	1,3
	6,8	8,9	10,9	6,2	9,3	12,1	7,5	8,4	9,9

On page 71, chapter 4, paragraph 3, is a graph showing the ways older people use this spare time. You can see that nearly half is spend in media communication e.g.; watching TV, listening to audio/the radio, reading and internet usage. About a third of the total is spent socializing, mainly to people outside the house.

On page 215, chapter 10, paragraph 1, they talk about the change people face after retiring and also about the fact that a lot more time becomes available for social contact. People usually tend to spend in their closest social networks e.g. family. They also state the fact that older people do really want to stay socially active, but current society focus too much on own responsibility and being able to take care of it yourself. Highly educated elderly are usually more socially active than others.



On page 227, chapter 10, paragraph 5, there is a graph showing the size elderly peoples networks throughout the years, with two constant lines, for constant big network and constant small network, and two varying lines representing the increasing and decreasing lines. Then in the text below and on the next page they talk about the fact that 43% has a relatively small network consisting of about 9 people , 14% has relatively large network of about 28 people, but 43% has a big change in

network size throughout the year. The increasing group taking up 28% of the total gets an increase from 13.6 to 18.1, a significant increase , mainly seen with “younger” and/or highly educated elderly. The other 15% has a decrease from about 25 to 14,5, mainly seen among the oldest ones and the averagely educated.

	klein, stabiel	toename	afname	groot, stabiel	p (Chi²)
totaal	43	28	15	14	
man	43	26	15	16	0,00
vrouw	43	29	15	13	
58-64 jaar	34	34	14	19	0,00
65-74 jaar	43	28	14	15	
75-88 jaar	52	20	19	9	
laag opleidingsniveau	52	24	13	11	0,00
midden opleidingsniveau	38	29	18	15	
hoog opleidingsniveau	38	31	13	18	

Bron: VU (LASA'95-'01)

The graph on page 229, chapter 10, paragraph 5, shows what factors determine the previously mentioned changes. For instance women are 80% more likely to increase their network. The older people get the more likely their network is to decrease. Handicaps and depressions also decrease network size, but losing a partner has less influence on your network than not having a partner.

Appendix B: Results interview

User	Q0: Gender		Age	Q1: Write letters			Q2: Whom send letter to						Q3: Frequency use of home-phone				Q4: Whom call with home-phone					Q5
	Male	Female	(in years)	Not	Birthdaycarts	long letter	Friends	acquintences	Brothers/sisters	Children	Grandchildren	Never	Rarely	Frequently	Often	Friends	acquintences	Brothers/sisters	Children	Grandchildren	don't have	
1		1	58		1									1		1	1	1	1			
2		1	60		1		1	1					1									
3	1		70		1									1								
4	1		69		1									1		1	1	1	1	1		
5		1	69		1									1		1	1	1	1	1		
6	1		68		1									1		1	1	1	1	1		
7		1	65		1									1		1	1	1	1	1		
8	1		84		1									1								
9	1		78		1										1							
10		1	79		1									1								
11		1	72	1										1		1	1					
12	1		74		1				1			1		1			1				1	
13	1		77		1										1	1			1			
14		1	77	1											1	1	1	1	1			
15		1	73		1								1							1		
16		1	86		1			1	1		1			1		1	1					
17		1	70		1				1						1		1		1	1		
18		1	64		1			1	1						1		1		1	1		
19		1	68		1				1						1				1	1	1	
20		1	71			1					1				1	1	1		1	1	1	
21	1		54		1					1	1	1		1				1	1			
22		1	72		1				1						1		1			1		
23		1	68		1			1			1	1			1							
24	1		69											1			1		1	1	1	
25	1		71		1	1									1		1	1				
26	1		70	1											1		1	1				
27		1	68		1										1		1	1				
28	1		74		1										1		1	1				
29	1		80		1	1									1		1	1	1	1	1	
30	1		84		1									1			1	1	1	1	1	
31	1		60		1	1									1		1	1	1	1	1	
32	1		69	1											1		1	1	1	1	1	
33		1	82	1											1							
34		1	59		1			1							1		1	1	1	1	1	
35		1	80			1									1							
Sums	16	19	###	5	27	5		5	7	1	3	4	0	4	15	16	21	22	16	18	15	
%	45,71%	##	###	14,29%	#####	##		14,29%	###	####	##	###	0,00%	11,43%	42,86%	###	60,00%	62,86%	45,71%	###	##	

i: Frequency use of mobile-phone					Q6: Whom call with mobile-phone					Q7: frequency of texting					Q8: Whom to text to					Q9: Frequency of e-			
Never	Rarely	Frequently	Often		Friends	acquintences	Brothers/sisters	Children	Grandchildren	do know	Never	Rarely	Frequently	Often	Friends	acquintences	Brothers/sisters	Children	Grandchildren	do know	Never	Rarely	Frequently
			1		1	1	1	1	1	1			1		1	1	1	1	1				1
			1							1		1											1
		1										1					1	1	1			1	
		1									1												1
		1									1												1
		1			1	1	1	1	1			1			1	1	1	1	1				1
		1								1	1												1
1										1	1											1	
		1								1	1												1
		1								1	1									1	1		
		1										1						1					
	1									1	1												1
			1							1	1									1	1		
		1							1	1	1												
1											1										1		
1										1										1	1		
	1									1	1										1		
1										1	1									1	1		
		1						1						1				1		1	1		
		1								1		1									1		
			1		1	1						1								1	1		
	1										1												
		1											1				1	1	1	1	1		
		1						1	1	1		1					1	1	1				
		1									1											1	
		1									1	1								1	1		
		1									1	1										1	
1											1									1	1		
		1									1	1											1
		1			1	1	1	1	1	1			1		1	1	1	1	1				1
			1			1		1					1										
				1	1	1	1	1	1					1	1	1	1	1	1				
1														1	1					1	1		
		1												1	1		1	1	1				
1																					1		
7	3	19	5	1	6	5	6	7	5	17	18	8	4	3	6	4	8	10	8	10	15	4	10
20,00%	8,57%	54,29%	######	##	17,14%	14,29%	17,14%	###	###	48,57%	###	###	##	####	17,14%	##	##	##	##	####	###	###	###

mailing	Q10: Whom to mail to							Q11: Frequency of instant messaging					Q12: Instant messaging with					Q13: Frequency use of video-messaging				Q14: Whom to video-mess		
Often	Friends	acquintences	Brothers/sisters	Children	Grandchildren	Business	don't have	Never	Rarely	Frequently	Often	Friends	acquintences	Brothers/sisters	Children	Grandchildren	Never	Rarely	Frequently	Often	Friends	acquintences	Brothers/sisters	
	1	1	1	1	1		1										1							
						1	1										1							
						1	1										1							
						1	1										1							
						1	1										1							
				1	1	1	1										1							
				1	1	1	1										1							
							1										1							
							1											1						
							1										1							
1	1	1						1												1				
		1					1										1							
							1										1							
1	1						1										1							
								1									1							
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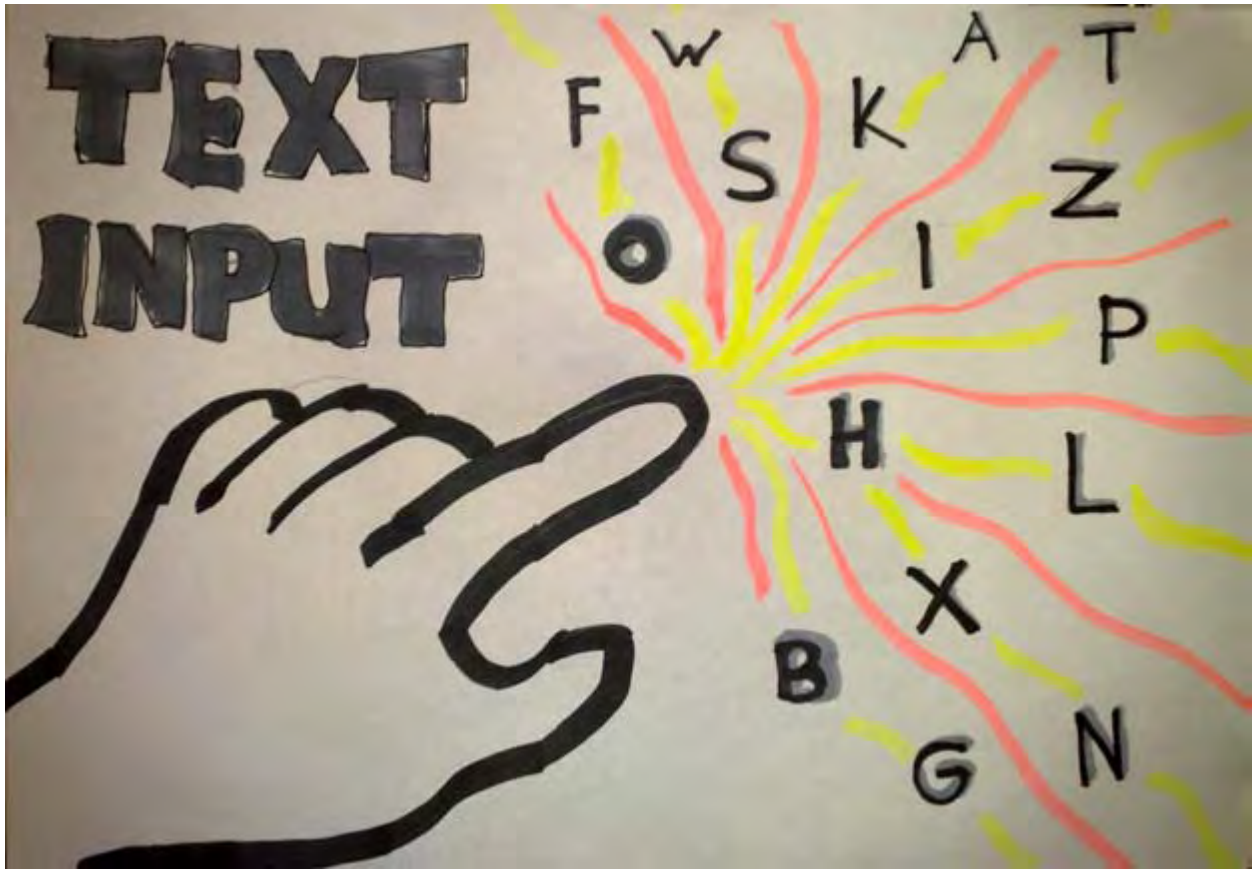
							1										1							
							1										1							
							1										1							
	1		1				1										1							
							1										1							
	1	1	1	1	1	1	1										1							
							1	1									1							
							1										1							
		1	1	1	1	1	1										1							
							1										1							
		1	1	1	1	1	1	1									1							
		1	1	1	1	1	1			1							1							
1									1								1							
1	1	1	1	1	1	1			1								1							
																	1							
1	1		1	1	1		1										1							
																	1							
6	10	8	8	9	9	10	27	5	1	0	0	0	0	0	0	1	33	1	0	1	0	0		
17,14%	###	##	###	##	##	#####	#####	##	###	#####	0,00%	###	###	###	###	2,86%	94,29%	2,86%	0,00%	2,86%	0,00%	0,00%	0,00	

aging with			Q15: Use of community website					Q16: Contact on community website with					Q17: NPD; Open for n		Q18: Preference form of message			
Children	Grandchildren		Do know	Never	once made. Not using	Frequently	Often	Friends	acquintences	Brothers/sisters	Children	Grandchildren	Yes	No	Handwritten	Typed	Voice-message	Video-message
			1	1										1			1	
			1	1										1				1	1
			1	1										1				1	
			1	1										1				1	
			1	1										1				1	
				1										1		1			
			1	1										1			1		
			1	1										1		1			
					1									1				1	
				1										1				1	
	1						1					1		1			1		
			1	1										1				1	1
				1										1		1			
				1										1					1
				1										1				1	
			1	1										1				1	
				1										1		1			1
			1	1										1		1		1	
				1										1					
				1										1			1		
				1										1			1		
					1									1			1		
				1										1			1		
			1		1									1			1		
			1	1										1					
				1										1				1	
				1										1				1	
				1										1					
															1				
				1										1			1		
					1									1			1		
					1										1				
					1										1				
0	1	0	12	25	5	1	0	0	0	0	1	0	30	3	5	10	12	4
%	#####	###	##	###	###	2,86%	0,00%	0,00%	0,00%	0,00%	###	#####	85,71%	8,57%	14,29%	28,57%	34,29%	###

Appendix C: Report text input user test



Foreword

This report is the result of an user test that has been done during the tangible instant messaging project in the faculty of Industrial Design of the University of Technology Eindhoven.

We as project group would give thanks to all participants and others who have made this user test result in a valuable part of our research about messaging experiences.

Introduction

In our project we're giving form to an alternative way of instant messaging. The goal is making the interface of an instant communication system more tactile and intuitive than the general graphic user interface with a structure of menus and submenus. The graphic user interfaces that are wide spread in all sorts of computer programmes demand that the user is already a bit familiar with the functions, especial the place of the functions in the menu structure and how they are exactly named. Otherwise it is very hard to find the functions you want to use.

The target group in our design case are older adults that aren't using instant messaging programs yet, and for who an more intuitive and physical interface will be valuable. The user test focuses on a part of the interaction namely the inputting of the text of the instant messages.

The product we're developing takes the instant messaging experience away from computers and mobile phones, and brings it in more comfortable environment. The product is shaped as a tee or cigar box that fits in the living environment of the target group. The preliminary prototype contained a physical keyboard. It didn't fit the context of the box itself but it did communicate the purpose of the product well, sending text messages.

The goal of this user test is to find the most suitable way for the target group to input a message in a way it can be electronically sent. Instead of using written text a message could also be in audio form. We don't consider this option because we're designing this product to function with an existing text-based instant message program. This program doesn't allow for other message forms than strings of text.

Description of selected text input methods

A. Touch screen; character recognition
   Making sentences by drawing character by character to make sentences on a touch screen display. This method probably is slower than word recognition but the error-rate can be lower because the characters are put in one by one.

B. Touch screen; word recognition
   Making sentences by writing word by word on a touch screen display. This method offers multiple character recognition. It allows inputting written text almost real-time. This form comes very close to physical writing; you write a word then take your pen of the paper to put it down again when you start writing the next word.

C. Touch screen; on-screen keyboard
   Making sentences by using an on-screen keyboard on a touch screen display. This method is the most used in touch screen devices, for example in navigation. It's as well a character by character selection method comparable with a physical keyboard. Though it doesn't gives tactile feedback.

D. Touch screen; on-screen keyboard with Swype
   This method extends the on-screen keyboard with a word recognizing system that is operated by connecting the characters of a word. Swype is new and not very known. It takes another way of working with a touch screen and on-screen keyboard. It might be hard for the target group to become capable in using it. On the other hand when mastered it can be a valuable addition to the on-screen keyboard.

E. Keyboard; physical keyboard, wired or wireless
   This method is the most conventional. It's widely known and frequently used. Because of that we expect that the error-rate will be low and the speed will be high.

Expectations

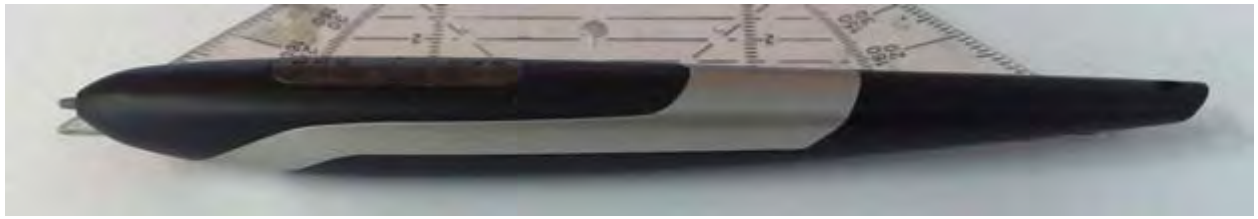
The touch screen display is more and more used in devices in public space. For example the train ticket machines and city information poles make use of it as do navigation systems. Therefore we expect that the test persons have seen and/or used a

touch screen display before already. The error rate in character and word recognition is higher compared with an on-screen keyboard. Because of that we expect that the test persons will prefer the button interface over the character or word drawing interface. On the other hand is maybe so that the buttons of the on-screen keyboard are too small and therefore make it difficult to touch precisely. For the physical keyboard this isn't an issue because you can feel if you press a single or more keys at the same time.

Method

The first part of the test will consist of an introduction of the project and an explanation of the focus of the test. It's necessary to inform them about the context in order to let them understand the purpose of the product. We'll ask them for their own feelings and experiences with the tested methods. The test is to write five sentences that represent an instant messaging conversation with each method. The speed will be measured as well as the error-rate. After each method a short evaluation is done. When all the methods are tested the test person will be asked about his experiences. We don't only want to know if he finds it good or bad but more specific why he finds that and what elements are the reason for that. (See appendix A: The interview guidelines)

There will be as well a side test with the touch screen concerning methods. It is to be expected that the touch screen can give some annoyances when the test person has physical limitations that influences the interaction in a negative way. Therefore we offer during the touch screen parts of the test a stylus pen to the test person. This stylus pen is the size of a big fountain-pen which offers a good grip, and allows precise pointing on the touch screen.



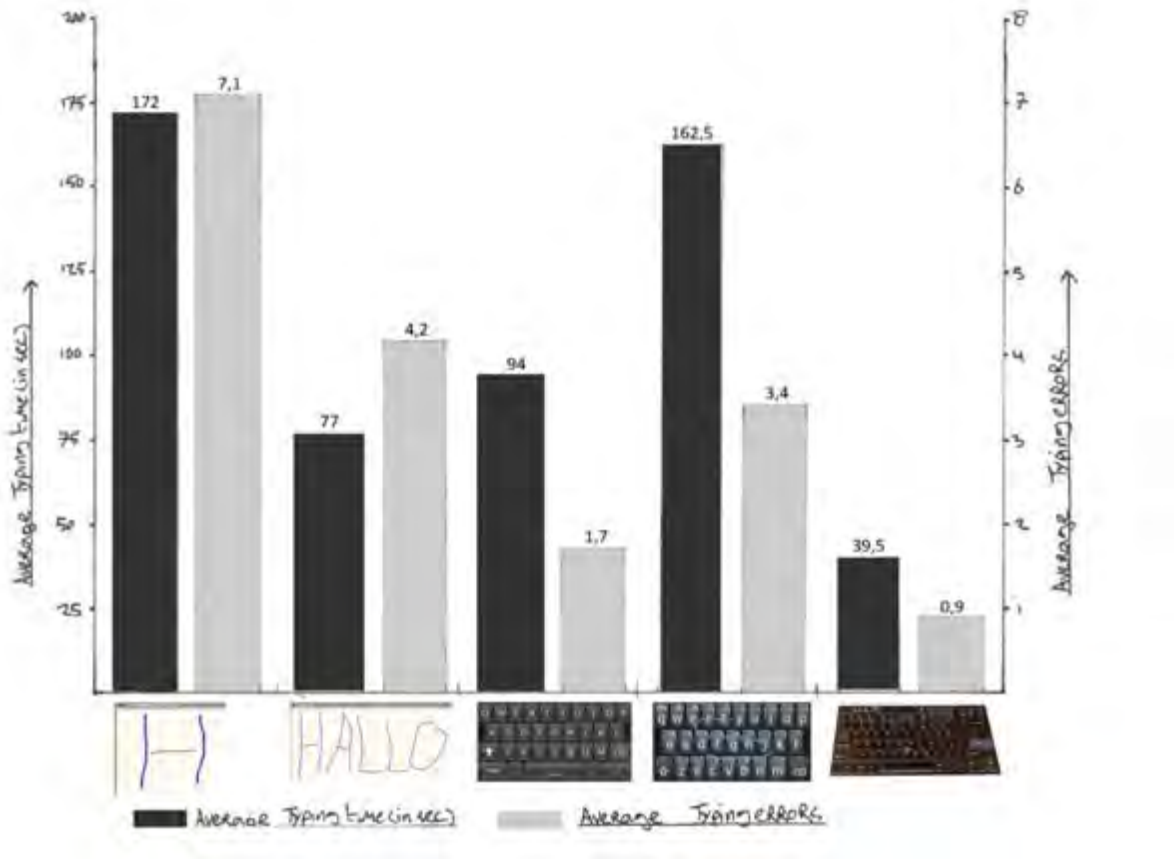
The sentences that have to be typed are a simple conversation.

Hello	---	Hallo
How are you	---	Hoe gaat het?
What are you doing	---	Wat ben je aan het doen
I am feeling well	---	Ik voel me goed
See you tomorrow	---	Ik zie je morgen

Results

All the test persons chose to do the touch screen tests with the stylus pen.

	Method									
	A	Char	B	Word	C	On-Scr.Key.	D	Swype	E	Keyboard
Testperson	Time (in min.)	Error-rate	Time (in min.)	Error-rate	Time (in min.)	Error-rate	Time (in min.)	Error-rate	Time (in min.)	Error-rate
1	240	6	90	5	105	1	300	4	30	1
2	190	5	80	2	70	2	85	3	45	0
3	180	7	60	8	150	1	300	4	45	1
4	115	8	90	3	80	1	95	2	35	0
5	120	10	60	5	75	3	90	4	30	1
6	140	9	70	4	85	4	115	3	50	2
7	105	7	75	1	60	1	75	2	40	0
8	190	7	70	7	135	2	260	5	35	1
9	180	4	70	1	60	1	75	3	50	2
10	260	8	105	6	120	1	230	4	35	1
Average	172	7,1	77	4,2	94	1,7	162,5	3,4	39,5	0,9



Graph 1: Average time per method and average error-rate per method

Summery of interviews

- Age: All the test persons are between 58 and 76 years old. More important they didn't use an instant message program ever.
- Motives:
    - Character recognition:

        - It takes too long before the character is recognized and your able to write the next again.
        - The errors are frustrating. It already takes long and then the character isn't recognised.
    - Word recognition:
        - It's pleasing that your personal handwriting is often recognized correct
        - It feels that you're writing just like on a piece of paper.
    - On-screen keyboard:
        - It's easy to operate but you keep looking at the keyboard because you can't feel the right position.
        - It takes longer than using a physical keyboard.
    - Swype:
        - It's difficult to move to the consecutive characters while you already began with the swype. Then you can't see all the characters anymore.
        - It becomes easier after you use it for a while
    - Physical keyboard:
        - The use is very familiar and allows typing fast recover quickly from errors.
- Stylus pen:
    - All of the test person's prefered the use of the stylus pen over their fingers after a bit of trying.
    - The use of their fingers often resulted in an incorrect input. When they pressed on the touch screen the cursor positioned at their nails.
    - They liked the feel of the pen in their hands.
    - It allowed to point precisely.

Conclusions

During the test the test persons could adapt quickly to the touch screen input methods. Although the best results are for the usage of the physical keyboard the word recognition is a good alternative. The method is comparable with actual writing and appriciated by the test persons.

The speed that can be reached in typing is important for the experience. The character by character method wasn't efficient because it took too long to recognize and to write the next one. The word by word method took the same time to recognize but was less annoying because that break is comparable with the break one makes in actual writing.

The on-screen keyboard methods offered fast inputting. But the relative small keys made it less easy. The swype method especially wasn't appriciated because during the inputting the rest of the keys were covered by the hand of the test person.

The most efficient method was inputting with the physical keyboard. It took the shortest time to input the sentences and with the least errors. The test persons could really go their way with it.

Appendix C-A: interview guidelines

1. Age
    - ……
2. Text input methods

First reaction Experience

A.
-
–

B.
-
–

C.
-
–

D.
-
–

E.
-
–

Appendix D

Prossing code:

```
import processing.serial.*;


int gx = 15;
int gy = 35;
int spos=0;
int pos = 0;
int extrapos = 0;
int lees= 0 ;
float leftColor = 0.0;
float rightColor = 0.0;
Serial port;

void setup()
{
  size(480, 480);
  rectMode(CENTER);
  frameRate(60);
 PFont font;
font = loadFont("serif.vlw");
textFont(font, 30);
smooth();
  println(Serial.list());
  port = new Serial(this, Serial.list()[3], 19200);
}

void draw()
{
PImage b;
b = loadImage("Untitled-1.jpg");
```

```
image(b, 0, 0);
  update(mouseX);
     line(spos*4,0,spos*4,480);
     strokeWeight(4);
   stroke(10);
text(spos, 240, 40);
lees = port.read();
text(lees,400,40);
}

void update(int x) {
   spos= x/4;
  if (spos > 10){
  if (spos < 180){
  port.write("s"+spos);
  }
}
}

void keyPressed() {
  if(key == 'q' || key == 'Q') {
  for(pos = 5; pos < 120; pos += 1)
  {
    port.write("s"+pos);
    delay(15);
   line(spos*4,0,spos*4,480);
   println(extrapos);
  }
  for(pos = 120; pos>=5; pos-=1)
  {
    port.write("s"+pos);
    delay(15);
  }
    for(pos = 5; pos < 120; pos += 1)
```

```
 {
  port.write("s"+pos);
  delay(15);
 }
 for(pos = 120; pos>=5; pos-=1)
 {
  port.write("s"+pos);
  delay(15);
 }
  for(pos = 5; pos < 120; pos += 1)
 {
  port.write("s"+pos);
  delay(15);
 }
 for(pos = 120; pos>=5; pos-=1)
 {
  port.write("s"+pos);
  delay(15);
 }
 }
 if(key == 'w' || key == 'W') {
  port.write("s"+90);
     delay(15);
 }
  if(key == 'e' || key == 'E') {
  port.write("s"+10);
  delay(15);
                                                                    }
    if(key ==CODED){
if (keyCode == UP) {
if (spos < 170){
  spos = spos+2;
  port.write("s"+spos);
println(spos)  ;
```

```
   delay(10);
  }
     }
     }
   if(keyCode == DOWN) {
  if (spos > 10){
     spos = spos-2;
  port.write("s"+spos);
  println(spos);
  delay(10);
 }
 }
}
 void mousePressed() {
 loop();
}
void mouseReleased() {
 noLoop();
}
```

Arduino code:

```
#include <Servo.h>

Servo servo1; Servo servo2;


void setup() {

 pinMode(1,OUTPUT);
 servo1.attach(2); //analog pin
 //servo1.setMaximumPulse(2000);
 //servo1.setMinimumPulse(700);

 servo2.attach(15); //analog pin 1
```

```
  Serial.begin(19200);
  Serial.println("Ready");

}

void loop() {

  static int v = 0;

  if ( Serial.available()) {
    char ch = Serial.read();

    switch(ch) {
      case '0'...'9':
        v = v * 10 + ch - '0';
        break;
      case 's':
        servo1.write(v);
        v = 0;
        break;
      case 'w':
        servo2.write(v);
        v = 0;
        break;
      case 'd':
        servo2.detach();
        break;
      case 'a':
        servo2.attach(15);
        break;
    }
  }

}
```