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Analysis of existing solutions

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Relaxed Care Consortium

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Executive Summary

This deliverable shows a detailed analysis of existing user interfaces and ways of user interaction. Consideration is given to solutions for usage on mobiles (e.g. smart phones) and in domestic environments (e.g. furniture-like device).

The presented already existing solutions are described within defined categories as those solutions follow a certain design approach and aim to address for instance emotions, behavior, social interaction or ambient awareness.

Each solution is described and evaluated corresponding to its functionality and positive or negative design features.

1 About this Document

1.1 Role of the deliverable

This deliverable presents already existing user interface solutions and ways of user interaction to give an overview of technological developments and state-of-the-art solutions in interaction cases between two parties.

1.2 Relationship to other Relaxed Care deliverables

The deliverable is related to the following Relaxed Care deliverables:

Deliv:	*Relation*
D5.2	This document supports the basis for the development of RelaxedCare concepts and designs by presenting technological developments and state-of-the-art solutions. title: this document presents…. add a short description and make sure you explain how this document relates to it.

2 Evaluation of available ambient and social awareness tools relating to product design criteria

2.1 Introduction to this chapter

This chapter offers an overview of available ambient and social awareness tools. The presented objects are valuated relating to product design criteria with relevance for the RelaxedCare project.

2.2 Emotional product design

This subchapter shows an overview of existing products which highlights especially emotional product design features. Each product will be described shortly corresponding to its functionality and will be evaluated regarding to positive or negative emotional design features.

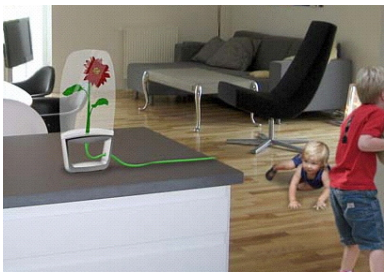
Table 1: Emotional product design

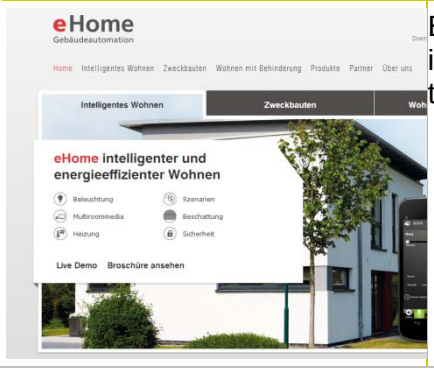
Picture	Description/Function	Conclusion product design criteria +/-
	Gertie: A desk-lamp that expresses four different emotions (happiness, sadness, surprise and fear) by the movement of its "body" – built by a TUM student.	+ anthropomorphized object + creates emotional bondage through humanness - one-directional communication
	NABAZTAG: multifunctional rabbit connected to the www. On the one hand Nabaztag is able to receive and record voice and text messages. On the other hand it offers also the possibility to track specific information on the internet and read them aloud. The system also contains tags which can be mounted to different objects of everyday life e.g. the key chain of a child. When the child comes home a message is sent to the mother informing her that her child is at home now.	+ emotional product design approach: giving technology an appealing and innocent shape, + is able to show 'thinking of you' gestures by moving his ears or leaving personal messages + time independency, + possibility to create the content which is traced on the internet individually - one has to be present to see ear movements, - the material of the object generates no emotional bonding.

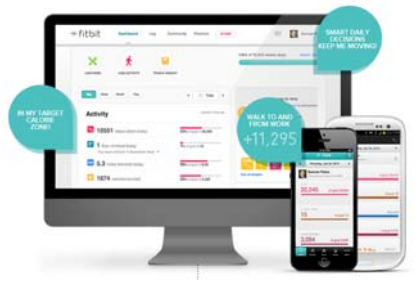
2.3 Design for behaviour change

This subchapter shows an overview of existing products which highlights especially design features which support an individual change in behaviour. Each product will be described shortly corresponding to its functionality and will be evaluated regarding to positive or negative approaches concerning design for behaviour change.

Table 2: Design for behavior change

Picture	Description/Function	Conclusion product design criteria +/-
	Flower robot: is a simple electronical device which contains components such as stems and leaves with small sensors and effectors embedded in the structure. This object is used as a sensing device for temperature, pressure, voice and light intensity. Furthermore it is capable of small movements of the leaves, recording of voices, illumination and to emit scent and humidifier.	- Stand-alone product, no interaction qualities
	FlowerPod: the object makes the energy usage (heating, cooling, water, electricity) in a household visible. The collected data is analyzed and according to one's usage patterns suggestions are given how to improve the individual energy usage.	+ distinct product purpose, + clear display of the functionality, + unobtrusive information display = excellent example for design for behavior change
	The Power Flower: is a Living Energy Meter that transforms with Household Power Usage, like the FlowerPod. When too much energy is used the lamp drops down and emits a low light intensity. In case of optimal energy usage the flower stands upright and produces a bright and "healthy" light.	+ distinct product purpose, + unobtrusive information display - Aesthetics: due to too technical and frosty product appearance (material and form)

	„Wilting Flower“: hangs her leaves if energy consumption rises. Like the FlowerPod and the Power Flower this object shows via light and movements of the leaves the energy consumption.	- Very technical and industrial product appearance. - Through this no emotional response to the product.
	Audient Robot plant: this object reacts to human speech through bending, and twisting according to the way the user speaks to it.	- No distinct function at all – just a fun object
	Energy Orb: is a frosted glass ball that provides real-time data about energy consumption, enabling customers to modify their energy usage when it matters most. The simple display communicates changes in pricing and demand by glowing a varying degree of colors; when the device glows green, demand and pricing is low, while glowing red indicates that demand and pricing is high. The Energy Orb receives signals over the Ambient Information Network, a service delivery infrastructure and wireless network.	+ in comparison to the FlowerPod the Energy Orb offers detailed information about the energy costs and the best time to consume energy = display of distinct function + unobtrusive information display - No emotional design factor in this object
	E-Home Gebäudeinformation: intelligent energy management tool for houses.	+ possibility of efficient energy management of your home - No emotional design factor, - No interaction possibilities (one directional)

	Fitbit Fitbit is one of the well designed, wireless activity trackers you can find currently on the market. Fitbit consists of an object you can wear and a user interface (mobile app, website), which shows tracked information and allows social interaction with others who use fitbit, too. Other examples: Jawbone, Dacadoo, Nike+, Amulye et.	+ Unobtrusive information display + Supports social interaction + Aesthetics: Well designed + Product in different forms and colours available (wristband, two types of zip) + Supports change of behavior
	Fitbit is dedicated to helping people lead healthier, more active lives. It enables following functions: ▪ **Activity:** Track everyday activity like steps, distance, calories, stairs climbed, and active minutes. ▪ **Food:** Log your food with Fitbit's online tools and mobile apps to get a more complete view of your health and fitness. ▪ **Weight:** Use the Aria WI-FI scale to stay connected to your weight, BMI, and % body fat over time. ▪ **Sleep:** Measure how long and how well you sleep. Wake up in the morning with a silent wake alarm.	- - No emotional design factor in this object

2.4 Design for ambient awareness

This subchapter shows an overview of existing products which highlights especially product design solutions which feature awareness in an unobtrusive and ambient way. Each product will be described shortly corresponding to its functionality and will be evaluated regarding to positive or negative approaches concerning positive or negative design features.

Table 3: Ambient awareness

Picture	Description/Function	Conclusion product design criteria +/-

	AmbiLamp (purpose: email notification): AmbiLamp with three differently colored light zones. Each color represents a certain level of importance, and the brightness of each segment refers to the number of emails in this category.	+ unobtrusive + distinguishing between email by level of importance (3 light zones) + interaction: by coming close to a specific zone with a PDA, the emails from the corresponding importance-level are shown
	Lantern Supports the learning process in recitation sections, (i.e., when students work in small teams on the exercise sets with the help of tutors). Each team is provided with an interactive lamp that displays their work status: the exercise they are working on, if they have called for help, since when, and on which exercise. Lantern is meant to facilitate the interaction between tutors and teams, and to encourage collaboration among students.	+ the design of the object is aesthetically appealing + can improve the efficiency of tutor-teams interaction - "pretended" unobtrusive information (color and brightness generates "stress")
  	Twitter Mood Light - The World's Mood in a Box An object, which shows how the world feeling is right now. The Arduino connects directly to any wireless network via the WiFly module, continually searches Twitter for tweets with emotional content, collates the tweets for each emotion, does some math, and then fades the color of the LED to reflect the current World Mood: **Red for Anger, Yellow for Happy, Pink for Love, White for Fear, Green for Envy, Orange for Surprise,** and **Blue for Sadness.** If an unexpectedly high number	+ Design of the object is aesthetically appealing + Tries to connect information from social interaction tools (such as Twitter) with an object that shows the emotional aspects from those information in form of colours + Aesthetics: Well designed + Unobtrusive - No interaction possible - No emotional design factor in this object - Not commercially available

	of tweets of a particular emotion are found, then the LED will flash to alert us to the possibility of a world event that has caused this unusually strong emotional reaction.	
Intelligent Mirrors	AwareMirror: presents information relevant to a person in front of it by super-imposing his/her image. A toothbrush has been chosen as an identification tool while proximity sensors have been utilized to detect a person's position (in front of the mirror). Also, three types of information that can affect a user's decision have been selected. The mirror has been constructed using an acrylic magic mirror board and an ordinal computer monitor. The acrylic board has been attached in front of the monitor, and only bright color from the display can penetrate the board. As a result of preliminary evaluation, we found that the mirror is useful to offer information in an unobtrusive manner while preserving its metaphor.	+ unobtrusive object + aesthetically neutral + object of daily life + bathroom mirror frequented several times a day + mirror identifies user in front and provides relevant context information for the person - interaction with mirror confined to a spot in the apartment (not pervasive) - displaying of colors impeded due to technical limitations (brightness)
	Persuasive display to motivate walking exercise. The display is an ambient display that is an originally daily object like a mirror, and provides information about one's exercise level on the periphery of a line of sight. The presentation is designed to have an unpredictable nature as well as competition/collaboration aspects with others so that he/she could continue the exercise to have fun with it. We describe an initial case study on information presentation to demonstrate our approach's feasibility and effectiveness, where a mirror is augmented.	+ gamification part of design + presentation of exercise level is unpredictable, i.e. habituation to content displayed avoided + unobtrusive object + aesthetically neutral + object of daily life - interaction with mirror confined to a spot in the apartment (not pervasive) - Intention to persuade user contradicts with idea of pervasive interface
	Smart Mirror represents an unobtrusive interface for the ambient home environment. The	+ instead of e.g. password authentication, face

	mirror provides a natural means of interaction through which the residents can control the household smart appliances and access personalized services. Face recognition-based authentication is used to automatically identify the user facing the mirror and provide widget-based interface to access data feeds and other services.	recognition is used. + unobtrusive object + aesthetically neutral + object of daily life - interaction with mirror confined to a spot in the apartment (not pervasive)
	Intelligent Bathroom is prototyped and demonstrated in the HomeLab of Philips Research. It shows a multi-sensory space with interconnected devices, where interactive content and services accessible on the Interactive Mirror support users in their daily activities. The experience is enhanced by functional and ambient lighting adapted to these activities. To avoid fingerprints on the interactive mirror, two interaction concepts were introduced: 1) Making the frame of the mirror sensitive to touch 2) Touch less 2D detection of the hand in front of mirror and alternatively a 3D detection of the fingers allowing to sense gestures	+ unobtrusive object + aesthetically neutral + object of daily life + functional lighting atmospheres (e.g. lighting mode “rising sun” in the morning) and the Style Coach (lighting mode, which avoids shadows in user’s face) that were highly rated with regard to their ease of use and perceived usefulness. + interaction with user possible - interaction with mirror confined to a spot in the apartment (not pervasive)
	i-mirror imitates a mirror using special optical systems. The applications are based on virtualizing and enhancing features of a mirror. In this paper, three i-mirror applications are implemented: a mirror with gain, a look-younger/older mirror and a mirror with memory.	+ suitable for being an information / interaction system in the daily life space of people. - mirror does not act as bidirectional user interface. Camera(s) record what happens in front of mirror area and present this on the screen (“mirror”)

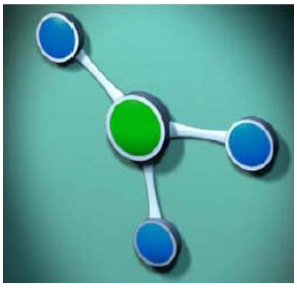
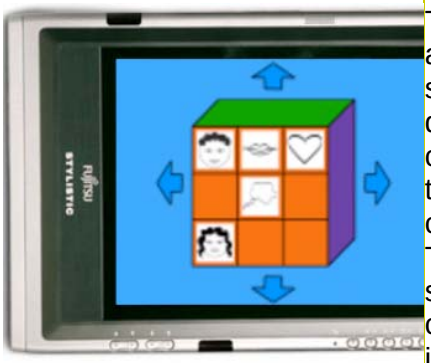
	Ambient Org: is a frosted-glass ball that glows different colors to display real time stock market trends, traffic congestion, pollen forecasts, or any other ambient information channel: weather, wind speed, pollen, and more.	- no distinct functionality
	Dangling String: is an 8 foot piece of plastic spaghetti that hangs from a small electric motor mounted in the ceiling. The motor is electrically connected to a nearby Ethernet cable, so that each bit of information that goes past causes a tiny twitch of the motor. A very busy network causes a madly whirling string with a characteristic noise; a quiet network causes only a small twitch every few seconds. Placed in an unused corner of a hallway, the long string is visible and audible from many offices without being obtrusive.	+ unobtrusive + fun + useful + calm technology - no interaction
	Ambient Display using Musical Effects Ambient displays are an active area of research aimed at leveraging one's attentional scope by presenting information in a low-stress fashion in the periphery. Music may provide a natural and flexible medium for ambient display because it is considered a desirable component of many human environments, public and private. Music has low interference with, and may even enhance participation in unrelated activities; most can listen to music while working, relaxing, cleaning the house, chatting, driving, or exercising. Moreover, music is sufficiently complex that it has the potential to provide a display substrate with considerable bandwidth. The relation of music to emotions suggests that it may be well-suited for communicating information	+ pervasive in otherwise quiet environments + in case of emergency, it is possible to use obtrusive sounds to wake up a sleeping person, which is not as simply possible as with light + Algorithms change currently playing music. I.e. user can play the desired music and changing music (no habituation) - no interaction implemented

	about human affect.	
	Information transfer efficiency of peripheral audio cues: The implemented ambient notification system consists of a background soundscape and the optional non-speech audio cues for notification purposes. We are able to mix these notification instruments seamlessly into the ambient soundscape in that way that other present people will not be disturbed. That type of unobtrusive notification gives us the chance to follow a low level privacy approach especially in multi-user environments. A notification signal can be triggered by an arriving email, upcoming dates or important messages.	+ pervasive + insertion of audio cues is performed in a way that aesthetic quality of sound is preserved - user has to remember what change in instrumentation means - no arbitrary playlists for users, since harmonic insertion of additional instruments needs preparation
	Seamless user notification in ambient soundscapes: We describe a method for notifying users through auditory cues embedded in an ambient soundscape in the environment. It uses pieces of music which are composed in such a way, that particular instruments or motifs can be added or omitted without losing the aesthetic quality of the overall composition. This allows for very subtle modifications in the soundscape which are only noticed by those users who have chosen this particular instrument or motif as ”their” notification instrument before. As a side effect, the soundscape itself can be used to subtly influence the mood of users.	+ notification of one user possible, while it is impossible for further users in the room to perceive the “message” + pervasive + insertion of audio cues is performed in a way that aesthetic quality of sound is preserved - user has to remember what change in instrumentation means - no arbitrary playlists for users, since harmonic insertion of additional instruments requires special compositions

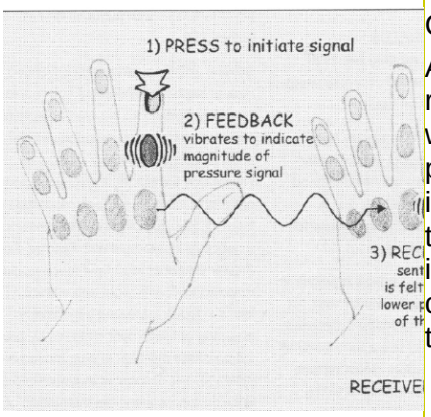
2.5 Social interaction tools

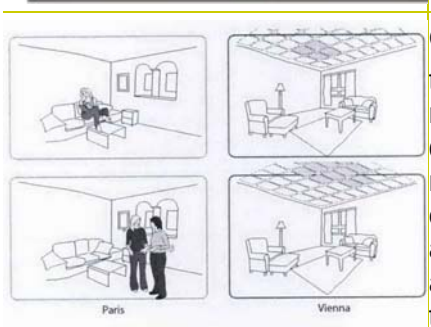
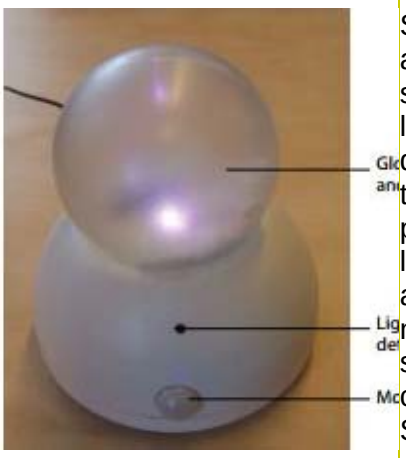
This subchapter shows an overview of existing products which highlights especially product design solutions which feature social interaction possibilities. Each product will be described shortly corresponding to its functionality and will be evaluated regarding to positive or negative interaction techniques.

Table 4: Social interaction tools

Picture	Description/Function	Conclusion product design criteria +/-
	Tree-Lamp: the tree-lamp is a wall mounted modular tree of lights, which enables you to map the relations between people you care about. When you touch a certain part of the tree, the corresponding person will be notified that you have been thinking about her.	+ Visual notification of a social interaction (“thinking of you”) - Aesthetical appearance - Material and haptic
	The 6th Sense: 6th sense is a light sculpture. It uses telecommunication to respond to the remote flow of electricity, water or movement. You can place its sensors in an apartment belonging to someone close to you. By varying the intensity of the warm light from the multiple small light bulbs it becomes a living sculpture. The original idea was to build on the family tree metaphor where each leaf is a representation of a remote family member or a friend.	+ Overall idea of display of family network is good + unobtrusive display of family members activities - Aesthetical appearance - Material and haptic
	The Cube: is as a lightweight asynchronous messaging system enabling physically distant intimates to communicate via the internet through personalized and combinatorial graphical codes. The codes are laid out on the surface of a shared virtual 2.D cube. Composing a message involves rotating the cube to reveal one of six sides and then placing one or more symbols on the thereby-three canvas. When	- Very complicated, not intuitively usable

	a new message has been composed, a notification can be posted via email or SMS to the remote partner, who can then access the Cube to review and reply to the message.	
	HOMEinTOUCH picture frame: The largest picture in the picture frame displays the picture sent by the relative. Above this to the right, there are three small pictures, a portrait of the person who sent the picture, a clock showing the current local time where the picture is taken, as well as the current weather. Below this is the position indicated on a globe. The black round spots on the sides of the frame are squeezable zones where the recipient of the photo can squeeze to indicate that she or he has seen the picture. As these are squeezed, the sender gets a small round icon on the mobile phone with the picture seen at the time of the squeeze.	- Confusing usability of the product (seeing the picture and pushing the right button) - Size of the picture displayed is too small with regard to the size of the object itself
	LumiTouch: Passive Communication - When a user is in front of her/his LumiTouch, the LumiTouch emits an ambient glow to indicate her/his remote presence. This information helps people figure out if there is a recipient on the other end, or also if it is a convenient time to increase interaction levels (e.g. start active communication mode or use an alternative, like a phone). Active Communication - When a user picks up the picture frame and squeezes, the feedback display area illuminates to show that the picture frame has been squeezed. The display colors are transmitted over the Internet to the corresponding remote LumiTouch. The display varies depending on the squeeze attributes (where, how hard, and how long the user squeezed).	passive communication: + possibility of immediate communication + unobtrusive way to start a communication - Difference to a phone call? Active communication / Interpersonal Language: + possibility to send an overall status to another person + social interaction (squeezing = “thinking of you” = emotional bondage) - Aesthetical appearance: form and material does not motivate a user to actively interact with this product

	While the recipient party can simply enjoy this display, s/he has the option to pick up the frame and squeeze back a response to the first user, and begin an interactive exchange. Interpersonal Language - The system was intended to allow users to develop an abstract form of emotional language. People could communicate in real-time by sending each other color mixtures and light patterns. The combination of colors and force allowed a grammar, while the duration of squeeze provided syntax for creative interpersonal dialect between two people.	
	ComTouch: A device which augments remote voice communication with touch, by converting hand pressure into vibrational intensity between users in real-time. The goal is to enrich interpersonal communication by complementing voice with a tactile channel.	- Everyday feasibility is very difficult due to the necessary use of a tactile glove
	Wristband as unobtrusive interface: Wearable textile-based electro-tactile display embedded in a wristband that can be integrated with current mobile phones and wearable computers. The display provides the user with an unobtrusive alert that is easy to distinguish.	+ less energy consumption than vibro-tactile displays + smaller than vibro-tactile displays - acceptance not verified - - 250 V AC for “stimulation”

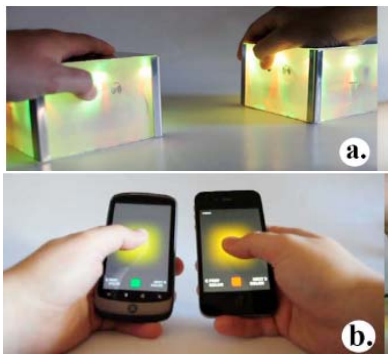
	Social Guitar: displays ambient sounds visually by plucking a string when audio events occure in a remote space. The result is an audible indication of activity levels in a remote space. The greater the activity, the higher the pitch and more frequent the plucks.	- No distinct functionality for everyday use
	Ceiling as a projection space: to create a continuous feeling of remote awareness. In a qualitative study people were most interested in knowing the emotional state of their partners and moreover, the fun factor of a new tool was very important to them. On the contrary, they rejected approaches that supported location, movement, or sound awareness.	+ emotional communication + creative idea to use ceiling (which is mostly unused area) + fun factor + perceived as entertaining
	SnowGlobe: was designed as an SA (social awareness) - system that blends into the living room interior as a lamp. It displays the amount of activity in the living room of another person by the amount of purple light and snow that is fluttering around in the globe. One can nudge the other person by shaking one's globe, which will cause the other person's SnowGlobe to light up brightly in orange for ten seconds, and the snowflakes to move around noticeably.	+ tangible + physical object + visual qualities + increased amount of interpersonal awareness triggers to call or visit each other more often + stimulates social connectedness + enables interpersonal awareness of motion
	Galaxy gear Data watch from Samsung, which offers a touch-sensitive display (touchscreen) and common functions of a smartphone such as: ▪ Integration of different apps ▪ Reminder function for dates	+ Supports social interaction in form of communication + Aesthetics: Well designed + Wearable - No emotional design

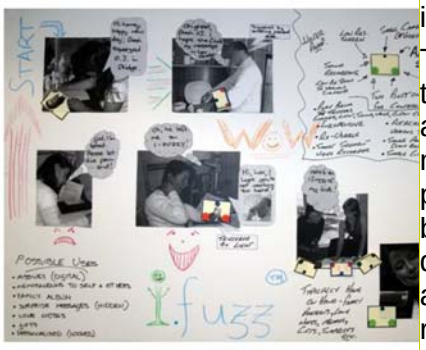
	▪ Functions for communication such as e-mails, messages, phone calls ▪ Integrated camera Can be used in combination with Samsung smartphone. Similar product for example: Sony smartwatch 2	factor in this object - Seems to be a user interface such as a smartphone

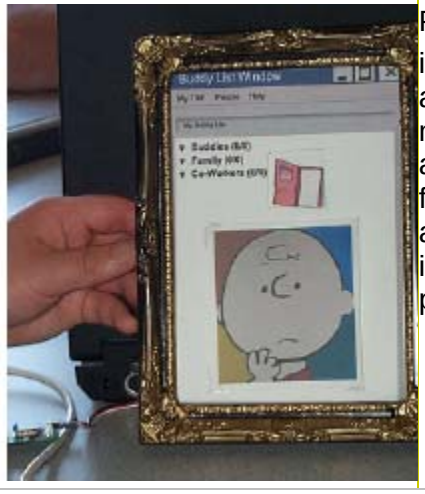
2.6 Tools with a combination of two characters: Emotional Design and Social Interaction

This subchapter presents already existing solutions which indicate more than one classification criteria.

Table 5: Emotional Design and Social Interaction Tools

Picture	Description/Function	Conclusion product design criteria +/-
	Lumicard: is a stand for electronic postcards. Draw or write something on a postcard with an electronic tag and send it to people you care about. Keep a sensor at your home that sends awareness information to the tagged postcard. Your messages on the postcard become alive and keep you connected with the Lumicard.	+ unobtrusive communication possibility + stimulates active handling + enables the creation of personalized messages (handwriting) - Aesthetically not very appealing due to the technological and cold shape
 	Cubble: It is sent by a single tap on the hardware's front or mobile device's screen and received as a single colour flash (matching the colour previously determined by the sender) and a simple vibration. (b) They are presented as repeated light bursts and vibrations in the rhythm as entered. (c) "Holding hands" creates a live connection (see fig. a), resulting in a yellow pulsation and a warming-up of	+ addresses different senses via light, warmth and vibration + simple solution for the message 'I think of you' - creating a live connection by touching the cubble at the same time - "Tap patterns" need memory performance

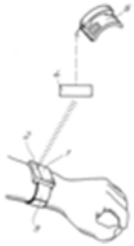
	the clients	
	Stroking device: Each partner has a device, sized to fit nicely in one hand. Holding the device, they are now able to stroke and with the same device receive the actions the partner performs to his/her own device.	- both users have to wear the glove at the same - the product has no aesthetical form by now
 Figure 7. Design poster for the mobile device 'i.F produced in the participatory design sign worksh	i.Fuzz: The idea of the i.Fuzz concept is to provide a simple digital analogy of common analogue media, such as postcards and post-it notes. The i.Fuzz would be a cheap, light-weight, semi-disposable multimedia appliance that enabled pre-recorded messages to be left at different physical locations. The i.Fuzz devices should thus include memory, processing power as well as facilities for recording and playing back audio and video.	- Each functionality is already used by smartphones
 Figure 8. Hug Over a Distance prototype: sh valve, battery, relay controller and wireless use, these components are hidden inside	Hug Over a Distance: This is a step towards wearable computing and smart clothes; equipping partners with jackets providing couples with an open, physical and ambient channel of interaction, and enabling them to exchange a 'hug' while physically separated.	- Technological possibility without any concise design concept
	Tangible MissU: Tangible MissU is a browser-based application for explicit sharing of a music play list and exchanging ambient sounds.	- Missing overall concept - Other technological devices use already the functionality of music sharing (not each technological possibility needs a separate product)

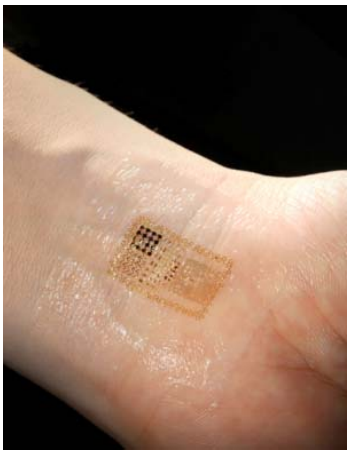
      Feellight Mobile Design I Light attachment  Feellight Mobile Design II Strap with light	FeelLight: Throughout pressing, a very simple and intuitive action, users can feel and make his/her presence felt in a distant place. Communication by a simple action with the developed device. The device can be connected to different network terminals such as laptop computer or phone or wrist watch. Users preferred the real device to the software application on the computer. Users can easily and intuitively understand how it works because the input (sensing the button pressing) and the output (luminous light) carried out at the same interface.  Feellight Mobile Design III Wrist watch with light	+ creates attention to a message + easy understanding of idea + mobility - No further use of the product
	Picture Frame: is a tangible display of user activity taken from an instant messenger (IM) client. The application retrieves user status from an IM client, and displays an image at the top of the frame indicating whether the user is present, typing, or idle.	- Only display functionality (status information) - No interaction possibility due to the bulky frame

2.7 Technological developments

This subchapter shows an overview of technological developments which could enable new product design solutions. Each item will be described shortly corresponding to its functionality and will be evaluated regarding its possible application in the RelaxedCare project.

Table 6: Technological Developments

Picture	Description/Function	Conclusion product design criteria +/-
	Foldable and transparent picture sensors This is a transparent slide which transports pictures on its surface	- lightweight - scalable - transparent - flexible - can be mounted everywhere - inexpensive production - not available commercially - camera resolution 32x32 pixels - camera b&w - only specific wavelengths can be captured
	Wristband with sensors: flexible synthetic chips and an electroluminescence display of health status information.	+ cheap production + alerts in case of danger + relevant for mood and / or stress measurements
	Surveillance of somatic functions: Surveillance and analysis of blood pressure, heart rate, etc.	+ relevant for mood and / or stress measurements

	Smart Skin is a slim patch with electronic components adapting on movements of the skin without being damaged. The chip saves medical data, communication tools and a human-machine-interface. It is worn like a temporary tattoo.	+ relevant for mood and / or stress measurements + glue-and-forget. Better than wristband or similar devices. - not commercially available
 	ACREO: Integrated Printed Disposable Biosensor Biosensors that can be used to monitor the health and warn of disease could soon be worn in every pocket. Printing them directly on plastic or paper enable the manufacture of them for 50 Eurocent, according to researchers at Acreo Swedish ICT and Linköping University. The fully functional prototype developed uses electrically conductive materials as "inks" to print battery, sensor and displays which are integrated with flex electronic circuits. The next version will have all printed components integrated with a miniaturized chip, an integrated printed bio sensor. The enabling technology is developed at the research institute Acreo Swedish ICT in collaboration with The Biosensors and Bioelectronics center at Linköping University.	+ Cheap production + Biosensor + Can monitor the health and can warn of diseases + can be worn in every pocket + Uses electrically conductive materials + Printed components integrated with a miniaturized chip - Not available commercially (right now, but planned)
	NFC: Near field communication NFC enables for example contactless transactions (e-banking), data exchange, social networking (e.g. sharing contacts, photos, videos) or more complex communication	+ Unobtrusive + Contactless transactions + NFC tags could be used in different situations + +/- Works only in combination with a mobile phone - The technical solution

	(e.g. wi-fi). Smartphones equiped with NFC can be paired with NFC tags. These tags can for example switch on bluetooth and by taping twice switch it off again. These tags could be used for different situations and requirements like online shopping, listening to radio, weather forecast and more.	works only in small distance - Data transfer max. 424 kBit/s

2.8 Content design/input

This subchapter shows an overview of already existing product design solutions. Each product will be described shortly corresponding to its functionality and will be evaluated regarding its applicability in product design criteria for the RelaxedCare project.

Table 7: Content design

Picture	Description/Function	Concept aspects relevant for the RelaxedCare Project +/-
	The Story table: is an interactive table that contains a wealth of multimedia clips. An interface, designed in close cooperation with elderly people, makes it possible for them to listen to or play digital clips from a large database. The material contains songs, sounds, images and movies from the 1920s to the 1980s. The clips inspire memories which lead to animated conversations.	+ possibility to create a living family memory (pictures, movies, audio material)
	Key alert: In case of danger the owner has to pull very strong, and an alarm with 120 dB shrills. This device has a mini flashlight as well.	+ alarm function + key chain = accompanies the user wherever he/she goes + alarm function

	Mobile Locator: Localisation via GPS and an emergency button allow surveillance and safety. The locator itself can be reached by phone.	- The person has to take along the locator every time when leaving home

2.9 Summary of the chapter

This chapter presents an overview of existing solutions in terms of user interfaces and ways of user interactions, describing the functions and evaluating positive and/or negative design aspects.

References

2.2 Emotional Product Design – Table 1:

Gerti

http://www.tum.de/en/studies/tumstudinews/issue-022013/show/article/30740/

Nabaztag

http://www.youtube.com/watch?v=Vo_V5X0hZzA

2.3 Design for behavior change – Table 2:

Flower robot

http://en.wikipedia.org/wiki/Flower_robot

FlowerPod

http://www.treehugger.com/sustainable-product-design/flowerpod-makes-energy-efficiency-a-growing-concern.html

Power Flower

http://inhabitat.com/the-power-flower-is-a-living-energy-meter-that-transforms-with-household-power-usage/

Wilting Flower

http://de.engadget.com/2008/11/29/roboter-blume-wilting-flower-laesst-die-blaetter-haengen-wenn-du-z/

Audient Robot

http://www.inewidea.com/2008/10/06/6820.html

Energy Orb

http://www.ambientdevices.com/about/energy-devices

http://inhabitat.com/the-energy-orb-monitor-your-electricity-bill/

I-Home Gebäudeinformation

http://www.ehome.ch/de/Home/

Fitbit

http://www.fitbit.com

2.4 Design for ambient awareness – Table 3:

AmbiLamp

Roecker, C.; Bayon, V.; Memisoglu, M. & Streitz, N.: Context-dependent email notification using ambient displays and mobile devices, Active Media Technology, 2005. (AMT 2005). Proceedings of the 2005 International Conference on, 2005, 137-138

Lantern

Alavi, H. & Dillenbourg, P.: An Ambient Awareness Tool for Supporting Supervised Collaborative Problem Solving, Learning Technologies, IEEE Transactions on, 2012*, 5*, 264-274

Twitter Mood Light

http://www.instructables.com/id/Twitter-Mood-Light-The-Worlds-Mood-in-a-Box/?lang=de

Aware Mirror

Fujinami, K.; Kawsar, F. & Nakajima, T. Gellersen, H.-W.; Want, R. & Schmidt, A. *(Eds.)* AwareMirror: A Personalized Display Using a Mirror. Pervasive Computing, Springer Berlin Heidelberg, 2005*, 3468*, 315-332

Pervasive display

Fujinami, K. & Riekki, J. Oinas-Kukkonen, H.; Hasle, P.; Harjumaa, M.; Segerståhl, K. & Øhrstrøm, P. *(Eds.):* A Case Study on an Ambient Display as a Persuasive Medium for Exercise Awareness. Persuasive Technology, Springer Berlin Heidelberg*,* 2008*, 5033*, 266-269

Smart Mirror

Hossain, M.; Atrey, P. & Saddik, A.: Smart mirror for ambient home environment. Intelligent Environments, 2007. IE 07. 3rd IET International Conference on*,* 2007, 589-596

Intelligent Bathroom

Lashina, T.: Intelligent bathroom
EUSAI 2004, Workshop" Ambient Intelligence Technologies for Well-Being at Home", Eindhoven University of Technology, The Netherlands, 2004

i-Mirror

Ushida, K.; Tanaka, Y.; Naemura, T. & Harashima, H.
i-mirror: An Interaction/Information Environment Based on a Mirror Metaphor Aiming to Install into Our Life Space. Proceedings of the 12th International Conference on Artificial Reality and Telexistence (ICAT2002), 2002, 113-118

Ambient Org

http://www.ambientdevices.com/about/consumer-devices

Dangling String

Weiser, M. & Brown, J. S.: Designing calm technology. PowerGrid Journal, Citeseer*,* 1996*, 1*, 75-85

Ambient Display using Musical Effects

Barrington, L.; Lyons, M. J.; Diegmann, D. & Abe, S.: Ambient Display using Musical Effects. Proceedings of the 11th international conference on Intelligent user interfaces, ACM*,* 2006, 372-374

audio cues

Jung, R.: Information transfer efficiency of peripheral audio cues.
Intelligent Environments, 2008 IET 4th International Conference on, 2008, 1-4

Seamless user notification

Butz, A. & Jung, R.: Seamless user notification in ambient soundscapes.
Proceedings of the 10th international conference on Intelligent user interfaces, ACM, 2005, 320-322

2.5 Social interaction tools – Table 4:

Tree-Lamp

http://uxrelatedness.blogspot.co.at/2013/09/tree-lamp.html

Tollmar, K. & Persson, J., Understanding Remote Presence, Proceedings of the Second Nordic Conference on Human-computer Interaction, ACM, 2002, 41-50

The sixth Sense

Tollmar, K. & Persson, J., Understanding Remote Presence, Proceedings of the Second Nordic Conference on Human-computer Interaction, ACM, 2002, 41-50

The Cube

Howard, S.; Kjeldskov, J.; Skov, M. B.; Garnæs, K. & Grünberger, O.
Negotiating Presence-in-absence: Contact, Content and Context
Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM, 2006, 909-912

HOME in TOUCH picture frame

Petersen, M.; Hansen, A.; Nielsen, K. & Gude, R., Aarts, E.; Crowley, J.; Ruyter, B.; Gerhäuser, H.; Pflaum, A.; Schmidt, J. & Wichert, R. *(Eds.):* HOMEinTOUCH Designing Two-Way Ambient Communication. Ambient Intelligence, Springer Berlin Heidelberg, 2008*, 5355*, 44-57

LumiTouch

Chang, A.; Resner, B.; Koerner, B.; Wang, X. & Ishii, H.: LumiTouch: An Emotional Communication Device. CHI '01 Extended Abstracts on Human Factors in Computing Systems, ACM, 2001, 313-314

CommTouch

Chang, A.; O'Modhrain, S.; Jacob, R.; Gunther, E. & Ishii, H.
ComTouch: Design of a Vibrotactile Communication Device. Proceedings of the 4th Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques, ACM, 2002, 312-320

Wristband

Lee, S. & Starner, T.: Stop burdening your eyes: A wearable electro-tactile display.
Wearable Computers, 2008. ISWC 2008. 12th IEEE International Symposium on, 2008, 115-116

Social Guitar

Matthews, T.; Dey, A. K.; Mankoff, J.; Carter, S. & Rattenbury, T.
A toolkit for managing user attention in peripheral displays
Proceedings of the 17th annual ACM symposium on User interface software and technology, 2004, 247-256

Ceiling as a projection space

Tomitsch, M.; Grechenig, T. & Mayrhofer, S.: Mobility and emotional distance: exploring the ceiling as an ambient display to provide remote awareness. Intelligent Environments, 2007. IE 07. 3rd IET International Conference on, **2007**, 164-167

SnowGlobe

Visser, Thomas, Vastenburg, Martijn H. and Keyson, David V. (2011) Designing to support social connectedness: The case of SnowGlobe. International Journal of Design, 5 (3), 129-142.

Galaxy gear

http://www.spiegel.de/netzwelt/gadgets/ifa-samsung-stellt-smartwatch-galaxy-gear-vor-a-920047.html

http://www.golem.de/news/smartwatch-2-im-hands-on-sonys-neue-smartwatch-kann-tauchen-1309-101443.html (05.09.2013)

2.6 Tools with a combination of two characters: Emotional Design and Social Interaction – Table 5:

Lumicard

Tollmar, K. & Persson, J., Understanding Remote Presence. Proceedings of the Second Nordic Conference on Human-computer Interaction, ACM, 2002, 41-50

Cubble

http://mediainformatics.wordpress.com/2013/01/02/cubble-multi-device-assistance-for-emotional-closeness-and-communication-in-relationships-over-a-distance/ (31.07.2013)

http://www.medien.ifi.lmu.de/pubdb/publications/pub/kowalski2013tei/kowalski2013tei.pdf

Stroking device

Eichhorn, E.; Wettach, R. & Hornecker, E.: A stroking device for spatially separated couples. Proceedings of the 10th international conference on Human computer interaction with mobile devices and services, 2008, 303-306

i Fuzz

Vetere, F.; Gibbs, M. R.; Kjeldskov, J.; Howard, S.; Mueller, F. 'F.; Pedell, S.; Mecoles, K. & Bunyan, M.: Mediating Intimacy: Designing Technologies to Support Strong-tie Relationships. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM, 2005, 471-480

Hug over a Distance

Vetere, F.; Gibbs, M. R.; Kjeldskov, J.; Howard, S.; Mueller, F. 'F.; Pedell, S.; Mecoles, K. & Bunyan, M.: Mediating Intimacy: Designing Technologies to Support Strong-tie Relationships.

Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM, 2005, 471-480

TangibleMissU

Lottridge, D.; Masson, N. & Mackay, W.: Sharing empty moments: design for remote couples. Proceedings of the SIGCHI conference on Human factors in computing systems, 2009, 2329-2338

FeelLight

Suzuki, K. and Hashimoto, S., "FeelLight: A Communication Device for Distant Nonverbal Exchange", in Proc. of ACM Multimedia - Workshop on Effective Telepresence, USA (October 2004)

Picture Frame

Matthews, T.; Dey, A. K.; Mankoff, J.; Carter, S. & Rattenbury, T.: A toolkit for managing user attention in peripheral displays. Proceedings of the 17th annual ACM symposium on User interface software and technology, 2004, 247-256

2.7 Technological developments – Table 6:

Foldable and transparent picture sensors

Campus News der JKU Linz, Mai 2013

Wristband with sensors

http://www.fraunhofer.de/de/presse/presseinformationen/2010/04/biegsame-kunstoff-chips.html, 14.4.2014

Surveillance of somatic functions

http://www.google.com/patents/EP0985373A1?cl=de

Smart Skin

http://www.mtbeurope.info/news/2014/1404020.htm

Acreo bio sensor

https://www.acreo.se/projects/integrated-disposable-printed-biosensor

NFC

http://en.wikipedia.org/wiki/Near_field_communication

http://developer.android.com/guide/topics/connectivity/nfc/index.html

http://www.pc-magazin.de/ratgeber/nfc-sicherheit-reichweite-technik-1472160.html

https://www.google.ch/search?q=nfc+tag&es_sm=93&source=lnms&tbm=isch&sa=X&ei=1K9TUquRHOnX7Aa0x4CIDg&ved=0CAcQ_AUoAQ&biw=1675&bih=746&dpr=1#facrc=0%3Bnfc%20tag%20logo&imgdii=_&imgrc=_

2.8 Content design/input – Table 7:

Storytable

http://www.storytable.com/html/algemeen.php

Key alert
http://www.amazon.com/StreetWise-KCA022N-Alert-with-Flashlight/dp/B0014JFJ20

MobileLocator
http://www.mymobile-online.ch/News/111028_Mobile%20Locator%20Froeschli