Connected Interactions

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Abstract

By looking at and discussing the two main types of interaction-design; screen-based and object-based, this dissertation will reveal a gap between these two discourses. The project questions whether or not it is possible to combine the two and create products that take advantage of both the flexibility of screens and the tactility of tangible interfaces. It then develops three strategies on how to design for this field. These are followed through with design-responses that shows that it is indeed possible to create products with improved usability and lowered cognitive friction by combining the two fields of interaction.

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“At another seashore between the land of atoms and the sea of bits, we are now facing the challenge of reconciling our dual citizenships in the physical and digital worlds. Our visual and auditory sense organs are steeped in the sea of digital information, but our bodies remain imprisoned in the physical world. Windows to the digital world are confined to flat, square screens and pixels or ‘painted bits’”

Hiroshi Ishii - Head of Tangible Media Group at MIT, 2008

Introduction - why now?

Apple's introduction of the Iphone in 2007 didn't start the shift towards touch screen phones although it was a big driver in making them mainstream. But where we to eager to start swiping and pressing these seemingly enormous glowing screens that we didn't think twice about dropping all the tactility of the physical keys?
Now the tactile advantage on phones with physical keys might not be a big enough issue to write a dissertation about, but the issue doesn't stop with phones. With the smartphone industry being a spearhead of the consumer electronics market, developments here are bound to affect and influence almost all sectors of this market.

This has led to the whole interaction-design paradigm of the moment is being centered around swiping our fingertips on glass, may it be phones, tablets, computers, in-car systems, or even refrigerators.
If we are to believe companies like Google, Microsoft and Samsung the coming paradigm of interaction-design is even less tangible with the interaction centered around voice commands and waiving your hands in the air.

But what happened to all the ideas about tangibility and tactility as outlined in Hiroshi Ishii's "Tangible bits" and demonstrated by Durrell Bishops "Marble answering machine"?

Why is it that these ideas of tangibility that are praised and considered brilliant by the press and popular opinion so very seldom become anything more than just concepts?

The Internet of Things (IOT) is a concept that has been around for some time under various names. In short it's the idea that connectivity and (usually) sensors resides in many of our everyday objects, communicating with each other and making them "smarter".
The IOT brings some promises of a "shake-up" in terms of interfaces. Looking at the type of IOT products that are surfacing in media and even in retail it seems that many prefer more physical and novel types of interactions. This might be an affect of that many of the products are coming from small start-up companies (often crowd funded) where adding a touch screen complete with a Graphical User Interface (GUI) adds to much cost and work, whereas in bigger companies this seems like the easier option.

The opportunity

The current interface paradigm in consumer electronics is revolving around touchscreens. And though they are great in their versatility and easy implementation in products, they are introduced everywhere with little or no consideration around whether a touch-based interface is the appropriate solution in a particular scenario.

On the other hand the way Tangible User Interfaces (TUI) are designed they often end up with way to few functions, as design-concepts or ending up in museums only. Why do we see so very few products that utilize the ideas of TUI that make it to the
market? And is there a middle ground?

Research question

Is it possible to create products with interfaces that take advantage of both the flexibility inherent in touch screens and at the same time are graspable and tangible so that interacting with them utilizes our senses in a better way and by doing this making the interactions more in tune with the day to day interactions of the home environment.

Structure

This dissertation will start by looking at leading ideas and theories in screen-based interaction design and before moving on to object-based design it will present a short study to compare the two sides. After comparing the two types of design in writing and projects a new area of interaction-design is revealed (where the objects and screens ought to overlap). It will then continue to discuss how IOT has helped to enable this new area. Following this, three strategies are outlined and followed through with design-responses.The dissertation ends with answering the research question by showing how the responses combines the flexibility of screens with the tactility of TUI.

Using Daniel Fallmans's triangle of design practice to locate the dissertation, it possitions itself as "Design Studies" with outcomes closer to "Design Practice".

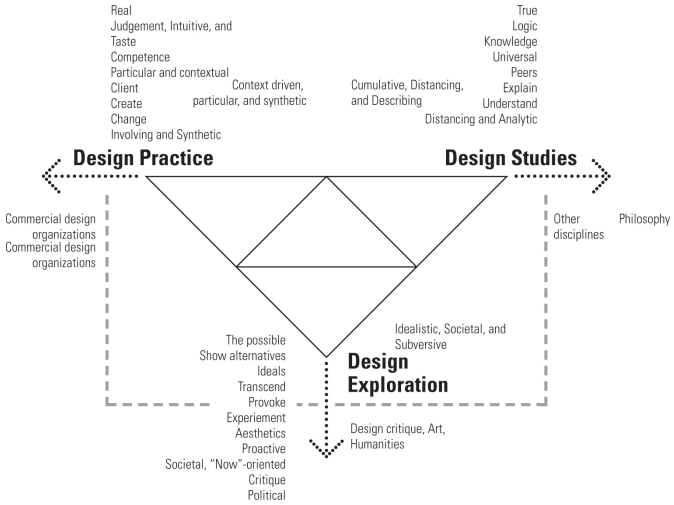

fig. 1 Daniel Fallmans triangle of design practice
© 2008 Massachusetts Institute of Technology.

Screen-based interfaces

In his 1999 book “The invisible computer” Don Norman outlines a scenario in which computing power is dispersed over multiple devices only responsible for performing their specific tasks (in contrast to the all-in-one devices such as PDA’s, and in present day the smartphone)

“In the appliance model of computing, every different application has its own device especially tailored for the task that is to be done. Each device is specialized for the task it performs, so learning how to use it is indistinguishable from learning the task-which is how it should be.” (Norman, 1999, p. 57)

It seems that one of the big drivers for this scenario is closely related to the last sentence of the quote - “..., so learning how to use it is indistinguishable from learning the task...” And that this is a reaction to the hard-to-use screen-interfaces of the time.

Don Norman also talks about the use of conceptual models (a concept rooted in mental model or cognitive maps, a concept introduced by Edward Tolman in 1948) as an important factor when designing interfaces.

“What I do need is a good conceptual grasp of what is going on, an understanding of the different controls and alternative actions I can take and what their impact is on the device.” (Norman, 1999, p. 177)

So a conceptual model is essentially a way to guide users through the use of a product or service by supplying a model of how the product/service works and by making analogies to something that the user can understand. A good example for this is the desktop metaphor in computers (first named the office schematic, invented by Tim Mott, Larry Tesler, Bill Atkinson).

So why do we need these metaphors and analogies? Alan Cooper describes a reason in his 2004 book “The inmates are running the asylum”. He calls the concept “Cognitive friction” and describes it in the following way:

“It is the resistance encountered by a human intellect when it engages with a complex system of rules that changes as the problem changes” (Cooper, 2004, p. 19)

Larry Tesler describes and “preaches” something that’s tangential with both cognitive friction and conceptual models in his “No modes”.

“mode reduction became a research endeavor and a business mission.” (Tesler, 2011, p. 70)

Mode-less software is when a user action has a consistent effect, rather than changing its meaning dependent on previous actions.

In conclusion; Larry Tesler, Don Norman and Alan Cooper talks about a similar concept albeit from different angles. A concept about how difficult it is for us humans to grasp and understand software and its interactions that take place underneath a piece of glass.

Interaction designer Brent Victor summarises this in a nice way in his influential blog post from 2011 where he argued that most future visions of interaction design completely ignore what we humans are good at.

“Hands do two things. They are two utterly amazing things, and you rely on them every moment of the day, and most Future Interaction Concepts completely ignore both of them. Hands feel things, and hands manipulate things” (Victor, 2011)

Conclusion - screens

The versatility of touchscreens and screen-based interfaces is however unparalleled. And even more so when it comes to mobile devices where product real-estate is extremely valuable and any type of tangible controls takes up space and not to mention restricting engineering layout.

Altough the value of physical interactions for some functions should not be underestimated. If you look at the Iphone, Apple has dedicated three of the four physical keys to sound management (mute switch, volume up and volume down). Considering how they have dedicated 75% of the keys to sound, it would almost seem that when it comes to sound a touchscreen cannot be trusted, or is it about speed and accessibility? Whatever the reason, the use of physical keys for these functions does resonate well with users.

"One of the main reasons why I had an Iphone was the physical mute switch, and the main reason for switching to Android phones was the notification LED." - Anonymous user

The above quote also reveals another type of important interactions, the peripheral interactions (more on page 16)

In mobile devices the touchscreen makes a lot of sense, especially when you consider that a mobile device is something originally designed to carry around with you (the mobile phone being a substitute for the landline phone when you where away from home) This is however not the case anymore. The mobile phone when it turned into the smart phone became a device that far superseded the functionality of its origin; the landline phone. Since the smart phones functionality and versatility is so unmatched, many people carry them or have them in close vicinity at all times, be it in the home, the car, the office or as originally intended; on-the-go.

It is in the home you can start to find situations where the interaction design-paradigm of today's mobile devices seems to be out of tune with its environment. In the home environment it is not necessarily flexibility and mobility that are the most desired features. Is swiping and touching a small glass screen really a good way of interacting with technology within the home?

As MIT media lab-founder Nicholas Negroponte puts it:

"We all have five senses; how sad that our connection to computers is "sensory deprived and physically limited," (Negroponte, 2006, p. 515)[1]

fig. 2 The three physical keys dedicated to sound-control shows the importance of tactile buttons for some functions.

1) From chapter eight Designing Interactions (Moggridge, 2006)

Friction in the home

fig. 3 Using the touchscreen on your smartphone in the morning is a scenario with high friction.

It's easy to find touch-points where the introduction of a screen-based interface is out of tune with the surrounding interactions.
A good example of these out of tune interactions is the alarm clock. Looking at the Philips alarm clock which is intended to represent an average alarm clock (fig. 4). This is by no means a wonder of tactility, most buttons needed to operate the clock resides on the same surface and are not that clearly differentiated from each other. The three most important functions are however very clearly defined. Snooze has been given an extremely oversized button that covers the entire width of the device, making it quite impossible to miss even when you are half asleep. Then there is; Activate and Turn off, these two functions share input but here in the form of a sliding switch, again making its function very distinct and the risk of error is minimal. Another feature of this clock (and most digital alarm clocks) is that when an alarm is active there is a small light glowing on the display, indicating that the alarm indeed is active.

Now let's compare this with the alarm function on a phone. Using the screen to activate, snooze and turn off offers no real physical feedback or differentiation between functions. This has resulted in a multitude of solutions where you can flip, tap and shake the phone to perform actions. These are still lacking some features of the traditional alarm clock. The slide to activate function which lets you activate the alarm in just a second is on a phone under several layers of interface. For example the steps needed to activate the alarm on a Nokia Lumia 810 running Windows Phone 8.0.

> Activate screen > Unlock screen
> Start alarm app > Activate alarm

Instead of one action there is now four. The phone also lacks when it comes to reassuring the user that the alarm actually is active. After turning off the screen there is no indication to whether or not an alarm is active.

One thing that the phone is much faster at is selecting alarm-time. Here the touch-screens ability to scroll through large chunks of information in a short time while maintaining a high level of visibility far supersedes the alarm clock. The clocks multi-button operation requires up to 70 presses to reach the desired time.

fig. 4 Key-layout of the Philips alarm-clock

Object-based interfaces

There has been several projects looking at interfaces that has more in common with the tangibility of the real world (usually referred to as Tangible User Interfaces or TUI).

One of the pioneers in this area is Hiroshi Ishii (Head of Tangible Media Group at MIT). He describes TUI as:

"seamless interfaces between People, bits and atoms" (Ishii, 1997, p. 1)

A design usually referred to as one of the early examples of TUI is Durrell Bishops Marble answering machine from 1992[2] where in which each message is represented by a physical marble. When a new message is received the marble rolls out from the machine and into a bowl. To replay the message you have to lift it up and put it in another "playback-bowl".

Interfaces of this kind is indeed more in-line with other interactions in the home and since you can see and physically interact with its functions the level of cognitive friction is very low. They often borrow metaphors and archetypes from other objects (as most software does). Interestingly enough it's often these metaphors relating to mundane objects that often are responsible for the novelty and user excitement.

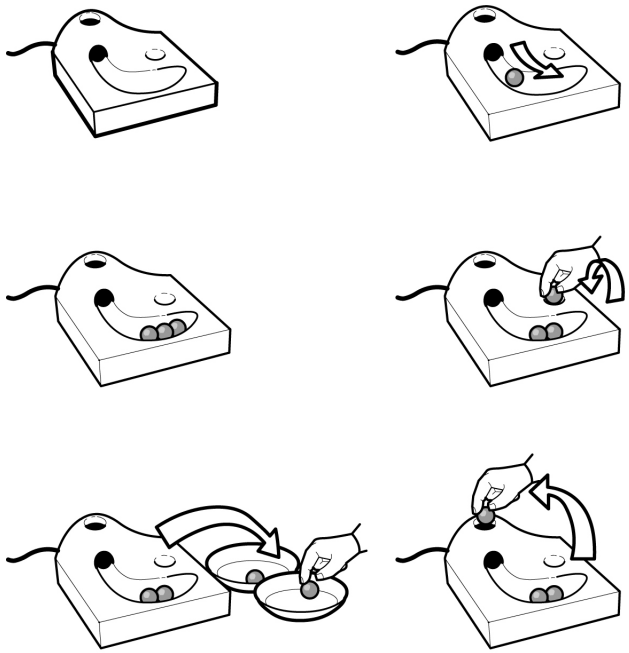

fig. 5 Durrell Bishops marble answering machine © Durrell Bishop

2) Referenced in Hertzian Tales (Dunne, 2005, p.17), Interaction design: beyond human-computer interaction (Rogers, Sharp, Preece, p.3-4), Described in the Interaction Design Foundation's description about Tangible Interaction (Hornecker, 2009)

Object-based interfaces

Projects
The following examples illustrates and explores the area of object-based interfaces.

The Plugg radio
The radio is operated by a cork-plug that when removed from the device reveals the speaker and by doing so also starts the sound. To turn it off you simply put the cork-plug back again.

The Plugg radio created in 2012 by Skrekkogle manages to use a highly tangible and metaphorical interface but still be simple enough that using it isn't any more time consuming than any other interface. The metaphor of opening up a container to let something flow out is a very strong and simple one and is easily translated from a wine-container to a "sound-container". Although there is only really one function that takes advantage of the TUI it is this simplicity that gives the product its charm.

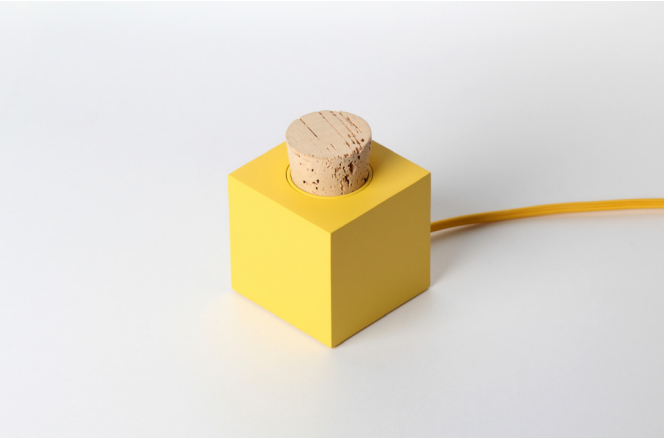

fig. 6 Plugg radio in "off-mode" © Skrekkogle

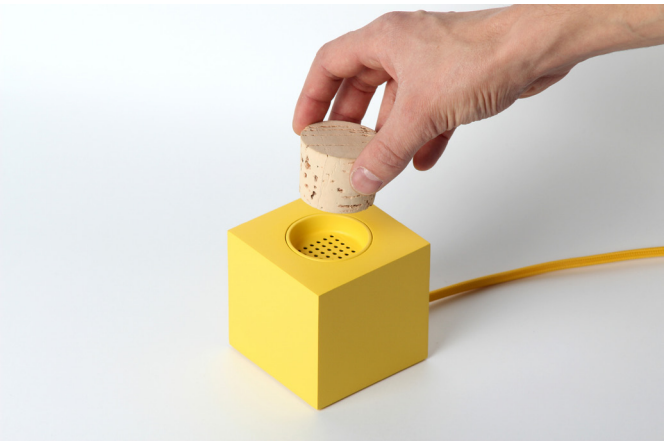

fig. 7 Plugg radio in "on-mode" © Skrekkogle

Skål
In 2009 Timo Arnall (in collaboration with Einar Sneve Martinussen and Jørn Knutsen) prototyped a TUI for children named Skål (English: Bowl) in which NFC (Near Field Communication) tagged objects are placed in a bowl to start actions on a screen. For example placing a cartoon character in the bowl would make the screen play the corresponding cartoon-film, show or game.

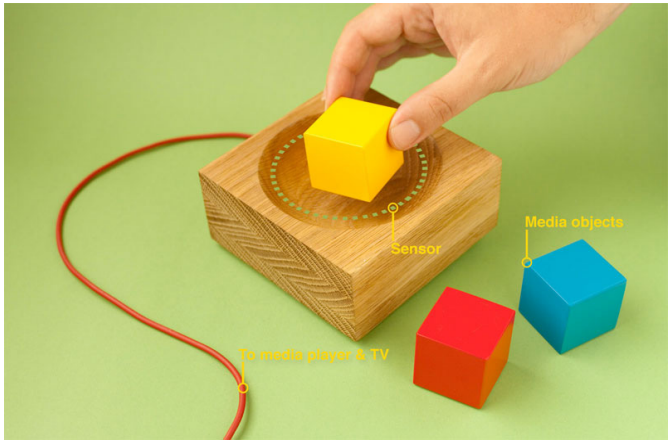

fig. 8 Skål © Timo Arnall

fig. 9 The Skål with NFC tagged toy © Timo Arnall

Object-based interfaces

Little printer
The little printer released by BERG in 2012 reflects the frustration with screens everywhere in a compelling way. The internet connected joyful looking printer prints out your daily to-do list, top headlines, top rated tweets or Instagram pictures and so on. This gives you a daily update in the shape of something between a smartphone screen and a newspaper.

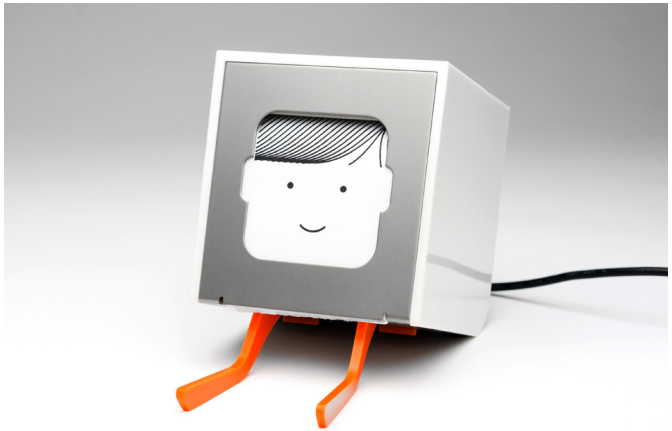

fig. 10 Little Printer © Timo Arnall, BERG (bergcloud.com)

fig. 11 A piece of paper from the little printer.
© Timo Arnall, BERG (bergcloud.com)

Good Night lamp
The good night lamp project (2012) is looking at ways of staying connected with friends and family and sharing a little bit of your daily routine with them. The product is a set of lamps that are connected, so when you turn yours on the very same thing will happen to another lamp located somewhere in the world with someone close to you. This project shows in a clever way that these seemingly simple and mundane ways of interacting can sometimes be more emotionally powerful than the direct and information loaded interactions that are today's norms.

fig. 12 Good Night lamp © Alexandra Deschamps-Sonsino

fig. 13 Good Night lamp © Alexandra Deschamps-Sonsino

Conclusion - objects

As seen in these examples, tangible interactions can often be very natural and often offer way greater tolerances and error margins than it's screen counterparts. They also let us utilize what our bodies are good at in a different way. To quote Don Norman;

"We have constructed a world of machinery in which accuracy and precision matter. Time matters. Names, dates, facts, and figures matter. Accurate memory matters. Details matter. All the things we are bad at matter, all the things we are good at are ignored. Bizarre. (Norman, 1999)

This is one of the big appeals with tangible interfaces, that they stimulate a wider range of human abilities than screen based interfaces. At the same time the versatility of the touchscreen is hard to ignore and many of the more tangible interfaces are very limited in number of functions so it seems a merger of these two schools of interaction-design would be interesting.

This is where the design led project begins, finding a good middle ground in which you take advantage of our capabilities as humans without creating interfaces that slow down the interactions and become too tedious. One of the problems with products currently in this middle ground area is that they tend to lock the device in a specific mode. Although the interface is sometimes greatly improved in this particular mode, usability for most other functions is decreased. As Larry Tesler "preached", switching modes is a tedious task and should not be implemented in software. In hardware, switching modes is often even more tedious!

Hardware modes

Good and bad examples of hardware modes in products.

Big snooze
This docking station clearly amplifies the functionality of the alarm clock application and it is a good example of how versatile the smartphone screen really is. However since you “lock” the phone in the docking-station the mobility of the device becomes seriously reduced. It is also questionable if the action of inserting the phone into the docking station is justified by the added functionality.

I.am+ case
This camera-case (for Iphone 4s) arguably adds functionality and a grip that enhances the camera-experience. But by doing this it adds considerable volume to the device and the ergonomics of the case for anything but using the camera seems to be seriously hampered.

Microsoft Surface Tablet
A good example of combining tactility without creating a tedious transition is the Microsoft Surface tablet and it’s keyboard accessories. Instead of having a separate portable keyboard or a keyboard docking-station the keyboard is a integral part of the tablet as it acts as a screen-cover as well.

fig. 14 Big Snooze © Distil Union (distilunion.com)

fig. 15 foto.sosho V.4 © I.am+ (i.am)

fig. 16 Microsoft Surface RT tablet
© Microsoft corporation (microsoft.com)

IOT - an interface agitator

As mentioned previously the IOT is promising in terms of new interfaces. The following three themes are considered to be interesting in the context of this project.

1) Data visualisation
Data visualisation is deeply imbedded in the concept of IOT and often the data it's referring to can be very analogue things like weather conditions, movements of pets and the flooding of your basement.

The default in many of these scenarios is to simply give you notifications or graphs sent to your smartphone and for many of them, that works just great. However, when it comes to remotley communicating the act of coming back home to your loved ones (as in the Good night lamp project) this type of interaction might not be the appropriate anymore.

Some types of information loses its emotional value when it is displayed in the very same way as all your work e-mail, Facebook updates and text messages.

2) Peripheral interactions
The nature of the relatively small sized phone screen means that it requires focused attention. Sitting on the bus with nothing else to do, then this is fine, but do we want to spend that much time in the home staring at this small screen?

By just walking through your flat or house you can very easily pick up information in your periphery, from the light you can see that it might start raining in a bit, the washing machine is soon done with its cycle, the bathroom is occupied, that plant needs some water, the floor could need a wipe and so on.

A good example of how this peripheral communication is actually adopted in many smartphones is the notification LED. A tiny light that will flash or glow when a certain type of event has taken place (for example a missed call or a unread text-message). So with a quick glance at your device without holding it, touching it or otherwise interacting with it you know if there is anything that requires your attention.

3) Just-in-time interactions
When our devices becomes aware of their surroundings and locations they can presumably start to more accurately predict our desired actions at any given time. As an example, a person stops at a bus-stop and pulls out their smartphone, the first thing that is displayed at the phone is when the next bus leaves. This idea of just-in-time interactions is something that changes the current smartphone paradigm where everything and everyone wants' to have their own app. This overload of apps renders some concepts useless just because there are too many steps to go through.

fig. 17 Blue notification LED on a Sony Xperia P running Android OS.

Near Field Communication (NFC)

An interesting technology that requires it's mention in this context is Near Field Communication (NFC). These tags are so small and thin that they can be embedded in to virtually anything; business cards, train cards, stickers and clothing to name a few. When a device containing a NFC reader comes within a few centimeters of this tag the device can read the content of the tag. Since the tag is actually powered from just the transmitted signal from the device it needs no power-source and therefore lasts forever.

Traditionally NFC readers have been check-point-like devices, the most common example being the London Oyster card system. In this system a NFC tag is embedded in all Oyster cards and the gates contains readers. However since the introduction of NFC readers in phones this system has been flipped around, now the phone can be used to "read" it's environment instead of the environment reading you (or to be correct; your cards)

Since NFC tags are so cheap and ubiquitous they can potentially be embedded in everything and thus creating a digital layer on top of physical objects, a layer that is readable and interactive to everyone carrying around a NFC enabled phone.

(At the point of writing, there are 128 phone-models currently on the market with NFC readers which is a fairly large portion of the market.)

fig. 18 NFC tags in different shapes and sizes.

Design strategies

By looking at points of friction in the home and merging these with the themes within the idea of the Internet of Things, three design strategies where developed; Translocation, Making tangible and Physical feedback. The overarching design aim being “making the interactions more in tune with the day to day interactions of the home.” (As outlined in the research question)

Translocation
This strategy aims to move functions out from underneath the glass and place them in the real world to make them more accessible and present.

Making tangible
This strategy is looking at how an intangible function or mode can be mapped to something physical like a position, action or manipulation of the real world.

Physical feedback
Physical feedback is revolving around the idea of using the real world to act as a feedback element for digital interfaces.

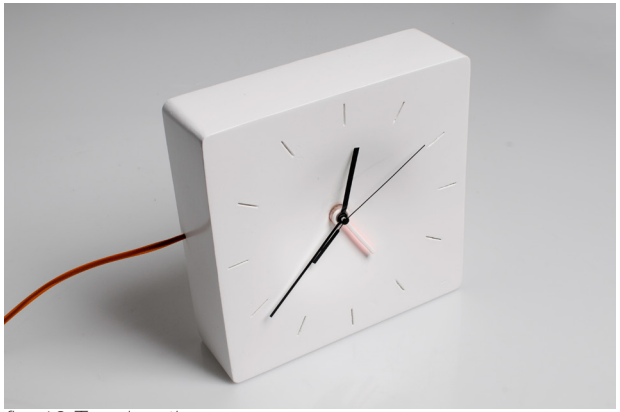

fig. 19 Translocation.

fig. 20 Making tangible.

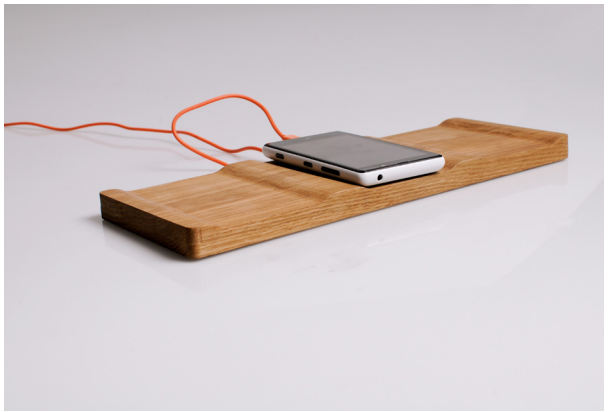

fig. 21 Physical feedback.

Translocation

Introduction
This design strategy has it's roots in ideas about authority and feelings of trust. Trust in the way that the mute switch on the Iphone assures it's user that the sound really is off. The idea about authority comes from an interesting user observation.

Observed user behavior:

Sitting at the kitchen table quickly eating lunch while on her smartphone trying to find when the next bus is leaving, finding the bus on the screen and then looking up towards the clock on the wall to see how much time she has left. [3]

What's really interesting in this behavior is how the person looks up on the analogue clock on the wall even though right before her eyes as she sees the time of the departure is the current time as well. This behavior might come from that the person thinks the analogue way to display time makes it easier to picture how much time is left.
It could also be that the sheer size and placement of the wall clock makes it more authoritarian than the small digitally displayed clock in the top of the screen. Whichever reason it shows how powerful our relation to our tangible world is in comparison to the intangible digital world.

3) Ethnographic observation carried out in October - 2012.

Translocation - development

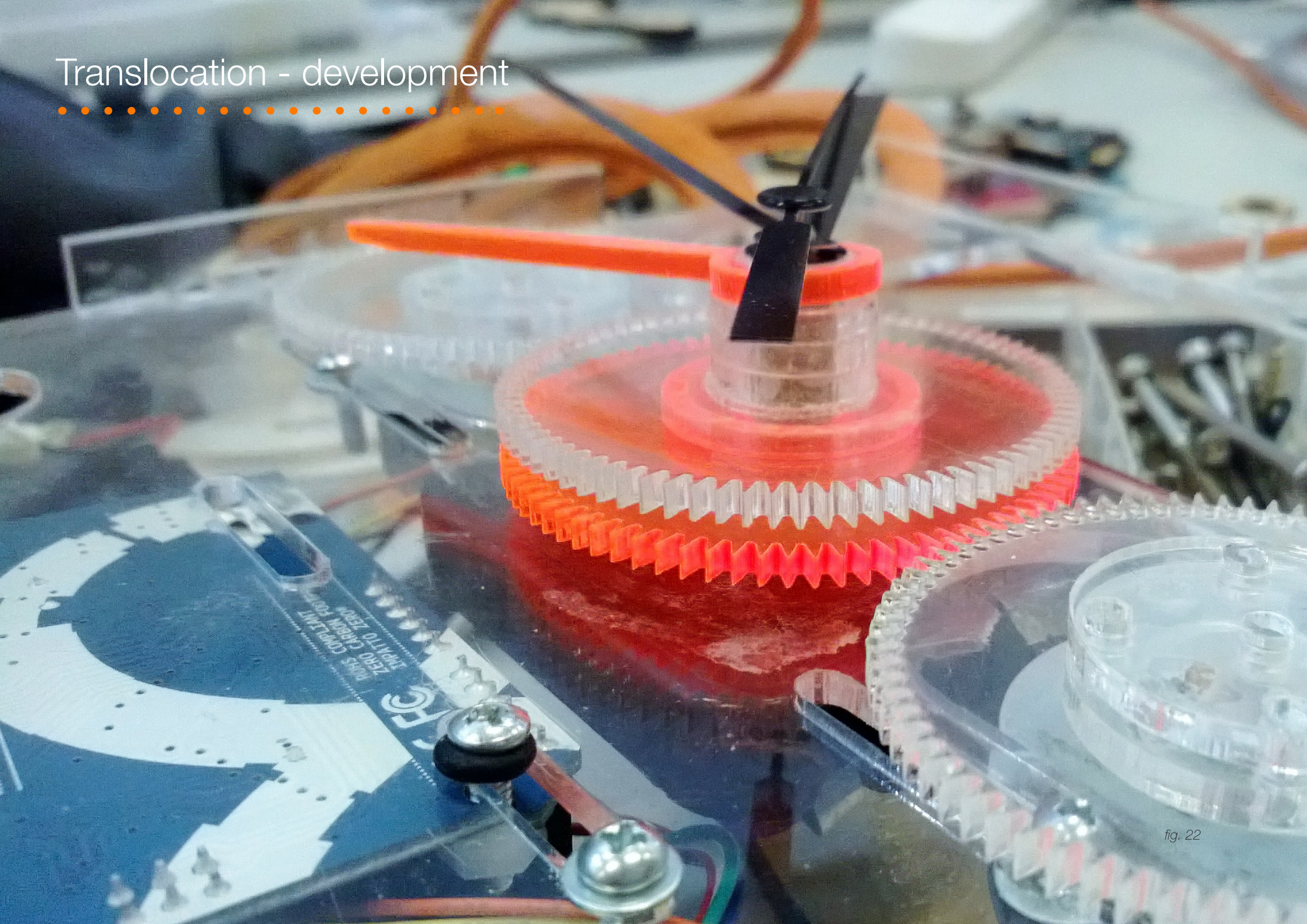

fig. 22

Translocation - development

Since people turn to the wall clock to see what time it is, and how much time they have until their appointment, bus and so on then why not display just that. A clock that displays their next appointment, bus departure, and any other time-related event. This was the original idea which pretty much stayed the same during the concept development.

The clock has two extra hands, these hands can be dedicated to any event you like. You set-up the clock through a website on which you can import your calendar, your local public transportation timetable and so on. While doing this you can set the hands to display busses in the morning and on the weekends they might display when the movie you are planning to see starts. The idea with this concept is to give the user a blank canvas on which they could paint their own everyday activities. Some might have dinner-time displayed; some might want a reminder of medication times. These “reminders” are however not really reminders in the traditional sense, they don’t beep, flash or tell you to do something. They are just there, on display, when you need them.

The extra hands are colour-coded on the backside so that two different events can be displayed and differentiated at the same time.

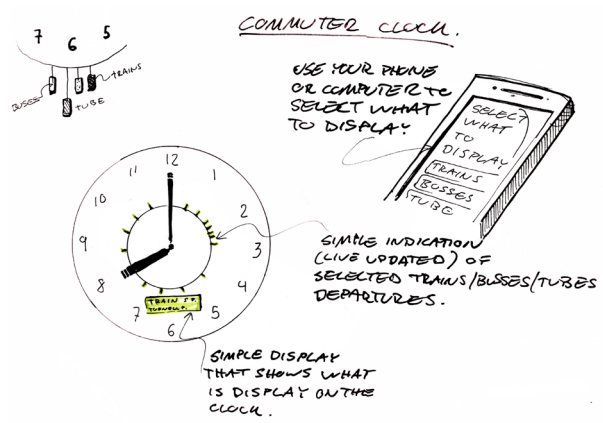

fig. 23 Early ideation sketches of the concept.

Translocation - final proposal

fig. 24

Translocation - final proposal

The warped face of the clock keeps all the hands close to the surface, a design-decision that at first seemed like just a necessity but proved critical to the clocks distinct character.

The clock is designed to be versatile in how you display it, it's thick enough to stand on a shelf but can of course also hang on the wall. The orange cables existing in all concepts is both a way to tie the products together but more importantly it's about being honest, instead of trying to hide the cable (or photo-shopping it away in pictures) the cable instead becomes a major design element.

The lack of numbers on the clock is tied together with the cable and its impact on the design. Since not having numbers means you can position the clock with the cable on any side you like.

The hands are coloured on the back and white on the front. This creates a coloured glow around the white hands making them blend in with the surface but at the same time stick out.

fig. 25 The clock can be placed either standing on a shelf or hanging on the wall.

fig. 26 The reflection of the coloured hands seen in the high-gloss white clock-face.

Translocation - reflection

One issue that was never fully resolved in this concept was the colour on the hands. The prototype was made with colored plastic that reflected on the white surface. There was however ideas about having the hands powered by LED light so that they could change colour.

Since the user was supposed to decide if they needed one or two colours the reasoning was that hands that change colour wasn't really necessary since a higher level of customisation means it dosen't have to be so versatile.

The fact that the events are displayed with traditional information-poor clock hands can be discussed of course. This choice (over various ideas of displays, lights and tags shown in fig 23) has to do with both the research questions later part; "making the interactions more in tune with the day to day interactions of the home" and the user observation in the beginning of the chapter where the wall clock exerted its authority. Moving focus from one display to another doesn't make much sense, but moving information from a screen out in to the real world with objects does.

fig. 27

Making tangible

Introduction
This strategy is linking together the concept of cognitive friction and the ubiquity of IOT technologies. It's attempting to make wireless connectivity and communication more graspable by mapping intangible actions, functions and settings to real-world tangible actions.

The observation that started this strategy comes from audio consumption and more specific the mismatch between where content usually resides today (in smartphones) and what is being used to amplify the playback (stereos and speakers)

In a typical audio-playback scenario a clash of interfaces occur. The smartphone that holds the content is connected either via a audio-cable or via wireless technology (usually Bluetooth) to an amplifier. More often than not you get double volume controls, double playback controls and so on. This together with the smartphones already existing interface duality with some functions residing on the screen and some mapped to physical keys makes for a complex interface system.

Together with this, something that is worth questioning is the form-language of audio amplification and it's relation to its environment. This is very interesting in the context of the research questions later part: *"making the interactions more in tune with the day to day interactions of the home"*. For the last 30-40 years audio equipment has been designed as equipment as opposed to pieces of furniture like it used to be.

"the time was moving to be less furniture and more equipment, more to do with it being an object in the space." - Kenneth Grange about audio equipment in the 1970.

fig. 28 Audio equipment hidden away since it was deemed not to fit with the interior of the home.
Ethnographic research conducted in December 2011.

Making tangible - development

fig. 29

Making tangible - development

One of the main issues here was to remove the duality of the interface. Removing all types of interface on the one device solves this problem, the device (being the amplification) now takes on the role as a pure amplification device and nothing else. Now only one interface exists, but this interface is very attention-demanding and since music is often a background activity in the home the interface should reflect this. These two issues combined with the discussion about whether or not audio-equipment should be seen as equipment or part of the furniture started to form the concept.

fig. 31 The sides of the skeleton-like structure where to be covered with speaker mesh.

fig. 30 The key-bowl and it's role within the home was used as inspiration for this concept.

An inspirational example came from the "key-bowl" – a place where you put your keys when you come home since you have no use for them within the home. Now this isn't really true when it comes to your phone but with more and more devices that compete for your attention together with the fact that phones are getting larger and larger many people do unload their phone somewhere when they get home. And since the always connected phone has access to media content why not unload it onto a "stereo-bowl". This is the train of thought that led to the first concept. (fig 31 and 32)

fig. 32 The first concept was a speaker in the shape of a side table, placing the phone on the top surface would start playback and moving the phone around on top of this surface would control simple actions.

Making tangible - development

In contrast to this concept a much smaller prototype was created. This prototype acted as the interface only. A device that would mediate between your phone and your already existing stereo.

A working prototype of this concept was made to try out it's functionality. By placing the phone in the center of the plate you would start the music, slide it to the left and it would skip to the next song and sliding it to the right would stop the music.

Having just the plate as an interface doesn't really solve the problem with dual interfaces, since it only really adds another one. And the table version limits the way you can fit the piece into your home. This led the development in to something between the two.

Again going back to the inspiration from the key-bowl and shapes and material found in a home environment the concept started to take the shape of a fruit bowl.

fig. 34 Around the wood-plate is a fabric-covered slot where the sound sips out.

fig. 33 Prototype that acted just as an interface.

fig. 35 The choice to use ceramics as the main material came both from its close relationship with home-objects and its great acoustic properties.

Making tangible - final proposal

fig. 37

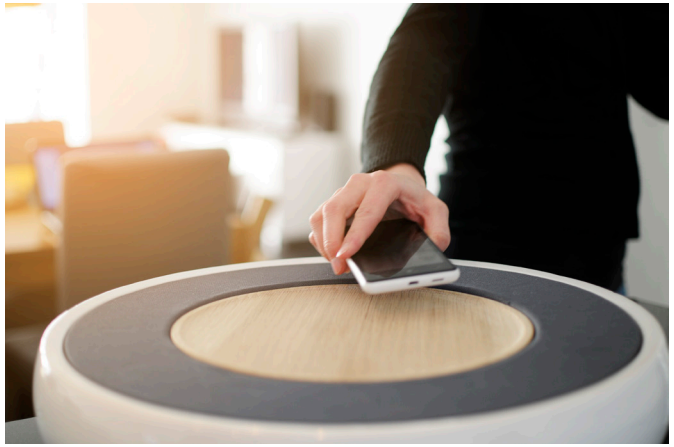

fig. 36

fig. 38

Making tangible - final proposal

The wood plate on the final version has a slight bowl shape to it; this small detail took a lot of work and effort to make but was important for the connection to a key-bowl.

How it works
Placing your phone on one of the three unmarked positions starts one of the three actions (Play, Pause and Radio). These positions are only visible (as seen in figure 40) when powering-up the device and briefly as the action initiates. The reasoning behind not having any marks is that when an interface is this simple and is used by the same people all the time markings outlive their use very quickly and become nothing more than visual clutter.

fig. 40 When placing the phone on the plate the corresponding action lights up for a couple of seconds as a visual confirmation.

By having these three positions on the plate you extract some very frequently used functions and make them tangible. It creates some very compelling and friction-free scenarios.

Example scenarios

Scenario 1) Listening to music on your way home either via headphones or your phone connected to the car-stereo. Coming in and placing the phone on the stereo to seamlessly continue playback but now instead through the speakers in the bowl.

Scenario 2) If a phone is placed on the play/radio position and another person wants to use their phone to play music they have to physically push the other's away. This physical push will translate into the intangible and the new phone will "push out" the first phone's connection with the bowl and replace it with its own.

fig. 41

fig. 42

Making tangible - reflection

For this concept one of the big issues has been; where to draw the line? Are the three tangible actions enough to improve the user experience? Should volume also exist on the amplification or only on the device? and so on. In the end all decisions where based on the two most important parameters of this concept; removing duality and making it physical. The bowl does not have a volume control since this exist in physical form on most devices. And the three actions mark the start or end of most scenarios making them key touch-points.

fig. 43

Physical feedback

Introduction
This strategy is looking at the more “extreme” scenarios, when people are stressed, clumsy, tired, or for whatever reason not focused on the task they want to perform on their phone. The docking station with the large snooze button is a good example of a possible outcome for this strategy, but as discussed that concept does not live up to other aspects of this project.

After going through scenarios where these unfocused state-of-mind’s could be found I came to the same focus-point as above mentioned project. The reason for ending up here was that waking up in the morning and feeling a bit groggy as you try to turn off the alarm is a scenario that occurs frequently.
In this state-of-mind, feedback is extremely important. The feedback-options available in this scenario are: audio, visual, and tactile. Our sight often takes a while to regain full strength after sleeping which pretty much rules this out as a good contender. Visual feedback can be extremely annoying for neighbors, flatmates and not to mention the person you might share a bed with. That leaves the tactile feedback option; unfortunately this is one of the big drawbacks of a smartphone.
The tactile feedback from a phone is very weak and limited, which is just fine for when it acts as a complement to visual and audio. But relying solely on the tactile feedback on a smartphone to perform actions is not really practical in this particular scenario.

Physical feedback - development

fig. 44

Physical feedback - development

Since the device itself is so limited in terms of tactile feedback, some kind of amplification was needed. An alarm clock has three important functions; set alarm, disable alarm and snooze. When setting the alarm you're not necessarily in the same state of mind as when you use "disable" and "snooze". Although setting the alarm can also be a moment with high tension since you have to be able to trust that your action has taken effect, that the alarm will actually ring the next morning. "Disable" and "snooze" are two quite similar functions but mixing them up can have big consequences, in other words; they have to be easily separated.

One important aspect of this concept was also to design something where your phone isn't "locked-in". Since this is a daily activity adding extra steps to connect or disconnect your phone to the alarm amplification (how small they might be) would mean large amounts of time spent on the interface instead of the desired action.

fig. 45 Sketches and the first prototype.

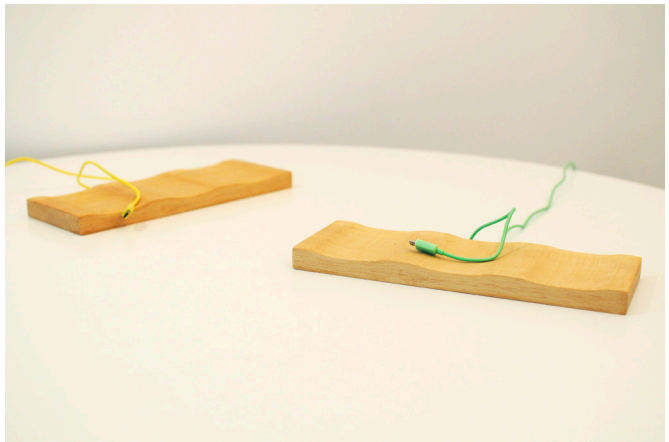

fig. 46 Early prototypes.

Because of the criteria that the phone should not be "locked-in", positioning became an obvious choice, something that had been touched upon previously in the "making tangible" strategy but not that deeply explored in terms of feedback.

The concept materialized into a wooden plate upon which you would place your phone while sleeping. The plate contains three positions; set, snooze and turn off. While they are all identical (apart from placement) they are separated with physical bumps. Switching between positions means sliding the phone over to the other side of one of the bumps. This proved easy to do even with eyes closed.

Physical feedback - final proposal

fig. 47

Physical feedback - final proposal

fig. 48 Set.

fig. 49 Snooze.

fig. 50 Turn off.

The final model is machined from a solid piece of white oak that further enhances the feeling of rigidity and assurance of the feedback.

Each slot has a NFC-tag under the surface. When the phone is placed in a slot it automatically reads the corresponding tag that tells the dedicated application to; Set, Snooze or Turn off the alarm.

The functions are positioned in the following way; Left – Turn off, center – Set and right – Snooze. This is following the way many controls are designed moving from left (low or off) to right (high or on) which in its own turn comes from the direction most cultures read in.

There are no markings that tell the user which slot does what, this is because of the same reasoning as with the stereo; when an interface is this simple markings outlive their use very quickly and become nothing more than visual clutter.

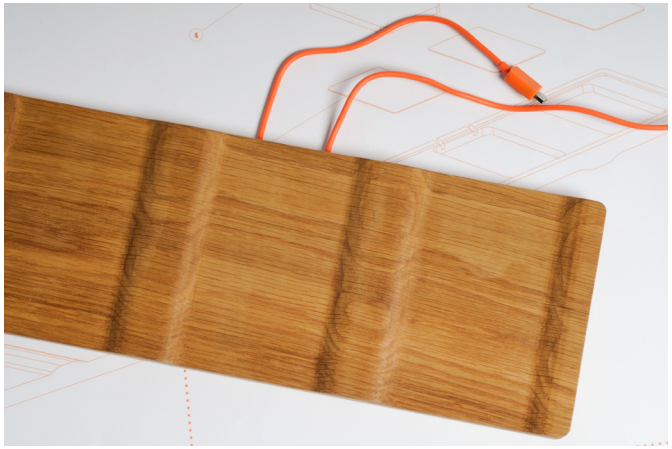
fig. 51 The USB-cable is routed through the plate to keep it in place.


fig. 52 The entire underside is covered with anti-slip foam.

Physical feedback - reflection

A continuous issue with this concept has been justifying the existence of the object. There are many available solutions that doesn't require an extra piece of hardware so what is really the advantages of this object? One of the big cognitive advantages is "mode". What this piece of wood does is that it mentally transforms your phone into an alarm clock.

You are not just setting a alarm on your phone, you are setting you phone in alarm-mode. And this mode is clearly differentiated from normal use since:

1) It exist at a certain place with certain connotations attached to it.

2) The input used for this mode exits outside normal input functions so you are not using the same keys or commands to play a game as you use to manage the alarm.

Looking back at what Larry Tesler says about modes, it seems like adding a distinctive mode would not be something to strive for. But the interesting thing here is how seamlessly you move in and out of modes and how they actually co-exist on top of each other.

Placing your phone in alarm clock mode will have no affect on for example the playback of the song you're currently listening to. This I think is one of the most interesting features about this concept that an extra interface layer is added, without impacting or modifying the already existing interface model.

fig. 53

Conclusion

This dissertations has discussed the two main areas of interaction-design, and by doing this revealed a gap between screens and objects. After exposing this gap three strategies where developed and followed through with outcomes for this new area of design. And through these it answered the research question and showed that it is possible to combine the flexibility of touchscreens and the tactility of objects to make the interactions more in tune with the day to day interactions of the home.

Bibliography - books

Fallman, D., 2008. The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration. Design Issues 24, 4–18.

Norman, D.A., 1999. The invisible computer: why good products can fail, the personal computer is so complex, and information appliances are the solution. MIT, Cambridge, Mass. ; London.

Cooper, A., 2004. The inmates are running the asylum: [why high-tech products drive us crazy and how to restore the sanity]. Sams, Indianapolis, Ind.

Moggridge, B., 2007. Designing interactions. MIT Press, Cambridge, Mass. ; London.

Dunne, A., 2005. Hertzian tales: electronic products, aesthetic experience, and critical design, Rev. ed. ed. MIT Press, Cambridge, Mass. ; London.

Rogers, Y., 2011. Interaction design: beyond human-computer interaction, 3rd ed. ed. Wiley, Chichester.

Cringely, R.X., 1996. Accidental empires: how the boys of Silicon Valley make their millions, battle foreign competition, and still can't get a date, Rev. and updated ed. ed. Penguin, Harmondsworth.

Norman, D.A., 2005. Emotional design: why we love (or hate) everyday things. Basic Books, New York, N.Y.

Norman, D.A., 2011. Living with complexity. MIT ;Press, Cambridge, Mass. ; London.

Bibliography - papers

Tesler, L., n.d. A Personal History of Modeless Text Editing and Cut/Copy-Paste. 2012, Interactions 19, 70–75.

Ishii, H., Ullmer, B., 1997. Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. Presented at the Proceedings of CHI, MIT Media Laboratory Tangible Media Group, p. 8.

Bibliography - websites

Victor, B., 2011. A brief rant on the future of interaction design [WWW Document], worrydream.com. URL/http://worrydream.com/ABriefRantOnTheFutureOfInteractionDesign/ (accessed 12.20.12).

Hornecker, E., 2009. Tangible Interaction [WWW Document]. The Interaction Design Foundation. URL /encyclopedia/tangible_interaction.html (accessed 5.1.13).

List of NFC phones [WWW Document], n.d. NFC World. URL http://www.nfcworld.com/nfc-phones-list/ (accessed 4.28.13).

Bibliography - videos

Kenneth Grange Interview for Bowers & Wilkins Society of Sound, 2011. [WWW Document]. Youtube. URL /youtube.com/watch?v=P96RCyDsVLc&feature=youtube_gdata_player (accessed 10.13.12).

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