The multimedia jukebox

How to experience multimedia in a social context

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Table of Content

Introduction and research question

The jukebox as a phenomena is more than 100 years old. Ever since the phonograph was invented there has been a strive to earn money on playing recorded music in public places like bars, pubs, dance halls, restaurants or anywhere else where people meet to be social engaging. Especially in the fifties and the sixties the jukebox was an important part of the youth culture and it was a strong driver for publication of new music. The jukebox business was lucrative for producers, operators and music distributers but the competition was also hard pushing both design and technology. A jukebox should have "play appeal" and multiple choices of music selection. The result was an orgy of big beautiful machines with light, big buttons and smooth running mechanisms. Over the seventies and eighties people had their own music players and you could hear the new music on the radio or buy the record yourself before it was available in the jukebox. Ever since the business and the interest in the jukebox has been declining. Today they are smaller, the mechanics is replaced by a computer, the control is made through a touch screen and the distribution of music is made through network services. You can find them in some bars and bodegas, and you can rent it for private parties but they are not seen very often anymore. Though there is still a need for music in social settings, and the jukebox is a well proven user driven way to select end play back music.

If we look at the way we experience multimedia in our homes today there are several products competing to cover our needs, but how well do they deliver the right audio, video and control experience in a social context. The PC and the mobile platforms are very good to discover, edit and render multi media, but they are also highly personal tools, the screens are small and so is the audio experience. The television is a more social product and it is not seen as something personal. It belongs to the room. On new televisions you can explore, select and render multimedia. The viewing experience is good but exploring and selecting media is not implemented very well. When it comes to audio we get more and more used to poor sound, but are we loosing something, and if so how can we get it back?

What I want to do is to study the jukebox concept and hold it up against todays solutions for delivering a multimedia experience in the social context we have in our homes. I want to see if the jukebox can learn me anything new about interaction. For that purpose I have built a multimedia jukebox which is used as a platform for experimenting and testing. This leads to the following research questions:

1. What can we learn from the jukebox about experiencing multimedia in our homes?
2. Can the jukebox teach us anything new about design and interaction?

Method description

To provide conceptual understanding on the jukebox I have not only read about the history but also talked to people about their experience with the jukebox, and combined this with my own experience. I have made two specific interviews. One with Gert J. Almind, who is passionate about the jukebox history. He is a collector and he has contributed to several exhibitions on jukeboxes in Denmark. He is maintaining a website about the jukebox history on juke-box.dk. The other one was an interview with Ronald Lund (www.sirjuke.dk) who produce, sell and rent out jukeboxes for private events. Both interviews were made in an informal way, where my intention was to create a dialogue that could contribute with new insight and new understanding for all parts. I prepared some open ended questions but I also considered in advance what value I could bring. Both interviews took more than three hours. They are voice recorded, and from this I have extracted conclusions, comments and good stories. Beside this I made a visit on a local bodega to experience the culture and to try out a jukebox myself.

The insight in use of AV products in our home is gained over the 5 years I worked as a concept developer at Jamo (2001-2006). In the beginning my work was mainly focused on sound (Jamo produced only speakers then) but with the convergence between AV and IT products the scope was broadened to multi media. I used a lot of time testing different solutions - mainly in my own home with my family as "real users". Unlike me, my wife is absolutely not interested in technology and observing her use of AV and IT equipment has been rewarding. Also the four children have different needs and usage. I observed different situations and reflected upon them trying to figure out what solutions would work. Schön (1983) writes: *"When a practitioner reflects in and on his practice, the possible objects of his reflection are as varied as the kinds of phenomena before him and the systems of knowing-in-practice that he brings to them. He may reflect on the tacit norms and appreciations that underlie a judgment, or on the strategies and theories implicit in a pattern of behaviour. He may reflect on the feeling for a situation that has led him to adopt a particular course of action, on the way in which he has framed the problem he is trying to solve, or on the role he has constructed for himself within a larger institutional context."* Those reflections are not documented scientifically but since it is an important part of my conceptual understanding I have included it and combined it with new observations and reflections.

To learn more about the jukebox and the use of multimedia in a social context I made a prototype of a multi media jukebox, and this jukebox has been subject for test and experiments. It was placed on a strategic good place in my home so everybody could use it and I used any occasion to talk about it and reflect. I also used design as a reflective practice. Schön (1983) calls this "reflection-in-action" *"doing and thinking are complementary. Doing extends thinking in the tests, moves, and probes of experimental action, and reflection feeds on doing and its results. Each feeds the other, and each sets boundaries for the other"*. Based on issues discovered on the prototype I made two experiments: The social screen and the attracting button. Both experiments were design processes, where i had the opportunity to

work with glass as a material and to combine this with my knowledge on interaction. The goal was not to end up with a new design, but to grow new knowledge and to learn about the possibilities. During this process I used video as a design tool. Ylirisku and Buur (2007) writes: *"There is a special kind of originality in video compared to symbolic materials such as text and diagrams. Video preserves action in a sensitive and detailed fashion in relation to what originally happened. This allows subjecting the events to close scrutiny and enables designers to construct a deeper understanding of the timely interdependence and interaction between things."* I used video to learn about glass and light and later I used video to capture interaction situations as basis for reflection. Based on these recordings I have made an eight minutes video called "Glass Display"documenting the process.

Emotional design

Figure 1

My wife is operating a gesture controlled volume control. Why is she smiling?

In my article "Beyond Logical Thinking in User Interfaces" Lars Skjærbæk (2008) I worked with the human experience of technology. I wondered "*Why are products with electronics and computing for a large group of people often seen as a "non-intellectual", low value products that we don't want to expose in our living room."* To find an answer I moved into emotional design. I made two experiments clearly showing that you can affect emotions through interaction if you hide away the technology and based on that knowledge I made a first prototype on the jukebox with a volume regulator based on gesture control. On the picture you see my wife smiling when operating it, but she would newer figure out what to do if I had not shown it to her first. Though the experience has motivated me to dive deeper into emotional design to see if I can find knowledge and tools that can help me designing good solutions.

Dealing with emotions from a technological scientific perspective is very complex but we all know that emotions have a determining role on the way we act and interact in the world, so embracing emotions can lead to new ways of defining interactive solutions. Donald A. Norman (2004) writes *"We scientists now understand how important emotion is to everyday life, how valuable. Sure utility and usability are important , but without fun and*

pleasure, joy and excitement, and yes, anxiety and anger, fear and rage, our lives would be incomplete". In his book about emotional design he not only talk about embracing emotions in interaction design. He also provides some general and explicable definitions that can help us designing with emotions. He defines three levels of emotional response:

- The visceral-level is where appearance matters and first impressions are formed. It is about look, touch and feel. If it looks good we are more attracted to it and as Norman (2004) state in his book *"Attractive things do wok better – their attractiveness produces positive emotions, causing mental processes to be more creative, more tolerant of minor difficulties"*.

- The behavioural-level concerns use and experience of the product. How well does the product do what we expect from it? Does it have the right functionality and performance but measured by our feelings when interacting with it. Is it pleasurable, enjoyable or even funny to use.

- The Reflective-level is about message, culture and meaning of a product or its use. It is also about the personal remembrance something evokes and about self-image. Objects that really means something for us are those with special memories or associations but our attachment is really not to the thing, it is to the relationship, to the meanings and feelings the thing represents.

During this project I use Donald A. Normans definitions and reflections to help me reflecting on all three levels.

The Jukebox Concept

Origin of the Jukebox

The jukebox originated back from 1889 where the first coin operated phonograph was demonstrated in a restaurant in San Francisco. This was the starting point for a lot of product and business development. The idea was to deliver music on demand without having a live band. From the early start there was a clear business concept. You pay a coin to listen to a piece of music. Gert J. Almind (1998) writes: *"From the start there was an acceptance of the phenomenon and an understanding among operators and saloon owners. The mutual understanding was easy to notice, because the operators often recorded a request like 'go to the bar and buy yourself a drink' at the end of each cylinder. The financial advantage was certainly greater than the costs of running a phonograph, and especially the operators were happy to get another source of income and prosperity."* The business was profitable but the competition was also hard. A lot of patents on automatic phonographs were taken and many new products saw the day light. In the beginning of 1900 you could select more tracks and in the late twenties the first jukebox with electrical amplification, a pick up arm and a record changing mechanism that could play both sides was introduced by AMI. This was the starting point for the golden age of the jukebox.

The origin of the term 'juke-box' is described in "The Story of the Blues" by Paul Oliver (1998): "*...A hand-wound phonograph could now provide music for dancing more cheaply, and often with greater variety than could a single singer, a duo or even a string band. In the late thirties the inroads made in group entertainment by the record industry were bolstered by the introduction of the mechanical players, which could handle as many as fifty records at a time. They were set up in the country districts at every crossing cafe, and in every joint and juke. The latter gave them their name - juke-boxes began to replace live musicians everywhere; florid, chromium plated and enamelled in genuine pop art fashion, they were installed at roadside booths, even on breakfast counters…*".

In the golden age of the jukebox the design came to play a big role. Here brands like Wurlitzer, Seeburg and Rock-Ola used industrial designers and new materials to differentiate the products. Gert J. Almind (1998) writes: *"In the year 1940 the hey-days of design really started with the full-size models Wurlitzer 700 and 800, and the counter-top model Wurlitzer 41 made by the company in North Tonawanda. The Victory line model 41 was the first jukebox with plastic pilastres in all four corners. Especially the big model 800 with three coloured pilastres, catalin-plastics, extensive use of nickel-plated parts, and for the first time the use of bubble tubes, was simply all one could expect from a classic jukebox in those days. The bubble tubes, which were delivered by Biolite Incorporated in New York, contained methylene chloride (CH2Cl2), which was animated in a glass tube by heating to a low boiling-point."*

"A new detail in the design of the Wurlitzer 850 was that it had illuminated push buttons that turned dark when selection had been made. The feature in question was not quite easy to combine with another operational detail, namely the electric selection mechanism. In the earlier years of

mechanical selection the customers could see which records had been selected, and therefore they avoided selecting the same record again. With the new electric selection mechanism the same record could be selected several times, but normally only played once. In short, the new electric selector gave the operator(s) an opportunity to earn more due to the motto that the customer would be satisfied if only he heard the tune he had paid for. The Wurlitzer 750 was the first jukebox from the company with an electric selection mechanism. The last model in the series, the Wurlitzer 950 of 1942, was originally produced with glass pilastres and not as the previous models with catalin-plastics, and the use of many wooden parts in the cabinet combined with a very limited production number makes it very popular among collectors today."

Figure 2

Designs form the golden age of jukeboxes

Left:
Wurlitzer 950
Right:
Rock-Ola 1428

The jukeboxes were an important part of the youth culture after the war. Young people earned money and they wanted to spend it having fun. It was also an important part of the promotion of music until people could buy their own players and records, and the radio stations started playing rock'n roll. The no. one hit most frequent played on juke boxes is Hound Dog by Elvis Presley from 1956. The no. one danish track is "Billet mærket" with Bjarne Liller from 1980.

Over time there has also been several attempts to make audio visual jukeboxes, where you could see movie clips. Already in the forties you could see music promotion videos (forerunner from the music video) on the panorama machines, based on 16 mm video. Later in the seventies came machines like the french 50-selection Cinématic 50 based on super-8 mm video, but it was never really a success. The machines were too expensive to build and in Denmark you needed a cinema license to set it up.

The juke box experience

When I was introduced to the jukebox in the late seventies on our local bodega the design was more moderate (see front page) but the sound quality was excellent and you could select among more than 200 popular tracks. I remember it was placed near the toilet, it was big and with the big display and the big buttons it was inviting for interaction. When we passed it we often stopped, put money in and selected music. It was also socially accepted that you left the table and went up to the jukebox to put on music. Anybody could decide what to play if they were to pay. Though there were certain rules of playing. If you played the same track again and again people would start complaining. Even though there were more than 100 tracks they were all listed at the front plate and operating the jukebox was very simple. The tracks were always played in the order they were selected.

The content was on my opinion not always up to date, and some of it was really not my taste of music, but I got used to it and today it evokes certain nostalgic feelings inside me when I hear it. For me it was not a source to discover new music but a way to discover the old classics, but new music was added from time to time. Beside selecting the new music I remember I had my own favourites, and some of them were B-sides. Gert J. Almind, who is 5 years older than me, explains that he heard the new music first from the jukebox in the local grill bar. *"The content was based on optimised earning. The operator could see how many times a record was played. If it was played very often and almost warn out he would change it. Records not played would be replaced with new ones."* Since music was only changed when the jukebox was serviced it was difficult to keep up with the faster dissemination of new music, and the jukebox lost the role of introducing new music, but are we still willing to "pay to play"?

The jukebox has been placed in highly social areas like bars, saloons, coffee shops, grill bars, restaurants and dance halls. Places where people go to be social and engage with others. When you pay to play it is not only because you want to explore or enjoy the music yourself. It is because music has a strong influence on the mood and the atmosphere in the social context, and when selecting music you have the chance to affect this. Norman (2004) writes about music and emotions: *"The proliferation of music speaks to the essential role it plays in our emotional lives. Rhyme, rhythms, and melody are fundamental to our emotions. Music also has its sensuous, sexual overtones, and for all these reasons, many political and religious groups have attempted to ban or regulate music and dance."* With music in the right social settings we can communicate or affect emotions, we can create a special atmosphere or we can even create special moments of magic when we select a track and ask a woman for a dance. That is worth paying for.

Where is the jukebox today

Today most of the old jukebox companies have closed their factories but there is still a need for a music solution in bars, pubs, restaurants and other public places. Technology has changed. Music is not something you have in a box, but something that is available in the cloud, and selecting music is done through software services delivered by music network providers. The jukebox is just a computer with a touch screen, a coin slot and a sound solution. New players like TouchTunes have entered the market. On their homepage they write: *"TouchTunes is positioned at the intersection of technological innovation and social interaction, with the goal of creating irresistible entertainment experiences. Originally launching the first fully digital pay-per-play jukebox in 1998, TouchTunes is present in over 60,000 bars and restaurants in North America, and is second only to iTunes in volume of paid music downloads. Fans play an average of 2 million songs a day on TouchTunes devices, accessing a growing library of 3 million hit songs as well as music by local, independent artists. The company grasped the power of the Internet, digital media, and touch screens at the emergence of those technologies and has kept the name TouchTunes ever since in respect of that visionary moment."* The designs of these products are still inspired from gaming machines with led light and digital commercial pictures. The functionality is improved with smart features and interaction through apps but the basic needs are still the same. I went to a Bodega in Holstebro to try one of those machines (MSN Icon) . It was placed beside the toilet door. It cost me 5 kr. and after a while I found and selected two tracks on the touch screen. After me came a woman who paid 20 kr. for 11 tracks and she was quite fast selecting them. Even though you can get music for free on the internet there is still an acceptance that you "pay to play" in this context. Just like you are willing to pay 25 kr. for the beer even though you can get it for 5 kr. in the supermarket.

Figure 3. I am trying a digital jukebox in a local bodega

Figure 4. Ronald Lund is making a demo of Sir Juke, a jukebox for private parties

You can also rent a jukebox for a private party. You get well assorted content and the user engagement in selecting music in one package with simple "rules of playing". I visited a Danish company who develop and produce the jukebox concept called Sir Juke. The two owners are musicians and their aim is to deliver the experience from live music in a jukebox. Beside popular music you can play backing music for "fest songs" and "cheers melodies". You can also play complete mixes from popular DJ's. Ronald Lund, one of the owners, explains: *"People using the jukebox are often in a good mood (meaning drunk), so it is very important that selecting music is extremely simple but it is also important to keep a continuous flow in the music. For that reason only the host can change the volume, start and stop the music or skip tracks on the playlist. The host can also make his own playlist in advance through our website."* He also tells me that they would like to enter the market for "pay to play" in public places, but the major problem is license agreements *"It is a jungle, and we want to be straight"* he says. On the Visceral design of the product they did not spent that much effort though they have rebuild a number of Wurlitzer retro jukeboxes. They look good but as Ronald Lund mentions *"the sound performance is not very good but for some people the look is more important"*.

Reinventing the jukebox

In 2011 TouchTunes launched the new "Virtuo" model. It was developed together with Frog Design, a conceptual design company like Ideo. I visited Frog design in May 2011, and I know when they have been involved there has been put a lot of effort in "shared understanding" of the concept, and "entire experience" design. The following description of Virtuo is from "design mind" (2011) which is Frog Designs media platform on design:

"TouchTunes tapped frog design to reinvent a cultural icon that connects people with the music and entertainment they love, reinvigorating the social experience of listening to music in a bar or club. This new music hero needed a thoroughly modern design in both its form and function that successfully captures the engagement and spirit of vintage jukeboxes, yet matches the shifted expectations that users have of digital music experiences.

Instead of frustrating the user with endless lists and alphanumeric scrolling, the Virtuo has a fun, game-like interface that offers several new ways to browse and search music catalogues. Also, the Virtuo interface can be customised to the venue by letting staff input a selection of their favorite songs; so the punk rock bars can stay angsty and the country bars can stay gold.

Figure 5. TouchTunes Virtuo designed together with Frog Design (Design patent no.: US D686,591 S)

The industrial design leads the user to the screen interaction and the signature Play button, then to the touch points around the credit card and bill collector slots. An LED array above the interface screen and ambient lights help draw users to the jukebox from a distance while blending in with the environment's ambience. The slightly angled, landscape-format touchscreen promotes a "shoulder to shoulder" experience with friends and has an integrated camera that turns the juke into a photo booth.

For the consumer who isn't sure what to play, the jukebox's smart interface is designed to inspire them. Using contextual data for all songs, users can search by lyrics, and explore songs in a 3D contextual web that links genre, chronology, influences, and geography to re-connect and remind them of music that they love. Additionally, Virtuo lets users build and edit their own customised playlists onboard or from their MyTouchTunes account."

Experience multi media in a social context at home

In a family (home) with different people there are different needs for multimedia and different ways of serving those needs. In my house I love to listen to music (often loud), but if I need to focus on something else I need silence. My wife is very interested in communicating with family and friends (Phone, Skype and Facebook) and she likes to deal with our photos. The kids play a lot of computer games. They are also interested in communication, photos and music, but they prefer their own content. We talk a lot about it, show things to each other and take turn on deciding what to play. When watching TV we normally do it together in the living room where we have a large screen (the only place we have a TV receiver). We do not always agree on what to watch but we are together even though everybody have their own PC or tablet at hand. When a good movie, a music show or an interesting sports event is on we turn on the large sound system and enjoy it together.

This is just an example. Every house have their own context, users and usage and they are all different. Since I am mainly interested in the social usage I vill focus on the multi user context, where more people with different perception are involved probably with different experiences of the same content. Beside this I distinguish between a lean forward situation, where we interact with the medium and a lean back situation where we focus on experiencing the content. There is also the situation where we use multimedia as background "noise" in a multitasking situation. That means that we experience (and care about) the content but it is not our focus. In the following I shall analyse different product concepts and how they serve our needs.

The PC in a multi user social context

The laptop is no doubt the ideal tool to search and manage multimedia content but as a presenting tool in a multi user context it has some limitations. The picture quality is very good but the screen is small and the sound quality limited leaving a poor AV experience. Beside this the PC is seen as a personal tool (The reason why it is called a "Personal" Computer) often related to personal productive or engaging activities and that is not well seen in a social context. In a dialogue with Jelle van Dijk about screens he writes to me *"I get that same kind of negative feeling when I am talking with friends over a glass of wine and then for some reason we need to open up a laptop in order to search something on the web. I tend to do it very quickly and I am always happy it is over when I close the laptop, hoping that the 'moment' is not ruined yet."* When interacting with a computer you are looking through a window to another world, and then you are not seen as present in the room. What makes things worse is that this window is pointing at the user, sometimes putting a wall up between people until the others are invited in (the laptop is turned around so everybody can see the display).

Also tablets and smart phones are perceived this way, though less intrusive than the laptop, but still so much disturbing that many families prohibit usage of those devices during the Dinner. You cannot be present at the table and at the same time look through a window to another world may be even interacting with other people. Norman (2004) writes about telephone calls: *"The limits of conscious attention are severe. When you are on a telephone call, you are doing a very special sort of activity, for you are a part of two different spaces, one where you are located physically, the other a mental space, the private location within your mind where you interact with the person in the other end of the conversation. This mental positioning of space is a very special facility and it makes the telephone conversation, unlike other joined activities, demand a special kind of mental concentration. The result is that you are primary away from the real, physical space, even as you inhabit it."* The same goes for other kinds of interaction like SMS, chat, games or use of social media. When entering into the other world you leave people around you in the physical world to them selves waiting to get your attention back again, and for them the waiting time feels very long. If they were invited into the other world it would be completely different.

I can easily see situations where you would like to explore and experience multimedia content in a multi user context as a social activity. I was at a family gathering. The kids were sitting at their own table exploring clips on Youtube together on a laptop and they found a very funny clip with a famous guy (Bubber) eating an extremely hot chilli. They wanted all of us to see it, so they held up high the laptop, turned up the volume and showed the clip. It was a bit difficult to see and hear exactly what happened but it was very funny and it raised the mood and the energy level in the room. (It was a good energiser). Other social activities could be watching pictures, exploring and selecting music or searching for information, but I can also see a lot of possible scenarios that could completely destroy "Moments of magic".

To improve the audio experience you can add good active speakers. You can also add a larger screen but where should you place it, and where do you place the PC so everybody can take part of the interaction? When the guests arrive it is often hidden or removed from the room. (Norman 2004) asked people about things that they liked and things that they disliked, and about the PC one wrote: *"Almost nothing about the PC is pleasurable"*. Though a lot has happened on PC design since then, and apple products are certainly pleasurable.

Also Microsoft has tried to solve this design issue. First by hiding the PC away in an AV box (media server) and adding a remote control for lean back operation, a product that has had some penetration in the market but it is also very complex compared to traditional AV solutions. Another attempt to make a game changer is the Microsoft Surface where a PC and a projector are hidden in a table, and the control is made through multi touch technology (see figure 6). With this solution people can interact together around the table just using their fingers. It is funny to use and it is new that you can share the interaction, but it is clearly only for lean forward use. You don't watch a movie on the table. The solution is expensive and you don't see it in normal homes, but it could be an interesting step towards new solutions.

Figure 6 Microsoft surface.

Figure 7 Beosound 8

Audio solutions

Lately we have seen music players that can be used as an audio monitor and a docking station for tablets or smart phones (See figure 7). This serves two purposes. Partly to play music and partly to make sure that the mobile device is charged with power. With this solution you have a good music player, simple control, a good music navigator and somewhere to place your mobile device. Further more many devices now support wireless transmission of music from the device to the monitor (Apple's Airplay), so you can separate the music selection from the playing device. This is smart but also increasing the complexity in use. To make this work you first need to turn on the monitor, find the mobile device, link the sound from the device to the dock and then select the music you want. (with the old transistor radio we had all this in one button - just turn it on). You also have to deal with the charging situation as well. In a multi user context there are even more things to consider. What if the phone rings or you need to use the mobile device for something that interferes with the music you are playing? Though this type of products is very popular and there is a big variety in price and sound quality. I got a Tangent for christmas present once but I got rid of it because the sound quality was too poor but I know the BeoSound8 (see figure 7 - also nick named Dolly Parton) is quite good.

Micro and mini stereos today are also equipped with docking functionality or a wireless music connection, but they still have the traditional "electronics" look, feel and control. Also high-end audio is equipped with Airplay. This New Year we were at a party in our friends' house. We took turn selecting music on our iPhones and playing it on the big stereo through Airplay. It actually worked quite well and it made a lot of fun. The only problem was that everyone could take control any time making it a bit disrupting and difficult to find out who was in charge.

The TV as a multi media device.

The TV-set with the big screen is ideal for watching multi media together with others but when it comes to interactive work like searching multi media most products fail. New TV-sets have online access through apps but for some reason the implementation is often poor and it is not only because text editing with a normal remote is problematic. They are often slow in performance and filled with errors (not effective). Building an ecosystem for multi media applications takes a lot of effort and it can newer be better than the hardware and the remote allows, but you should expect those things to improve over time. Media players like TIVO boxes, BOXEE, Play Station, XBOX and Apple TV has done a far better job implementing multi media selection, but no matter how good it is made, the media exploring process can often be disturbing in a multi user context. One of the classical problems is the controlling user zapping through programs to find what is on while others are watching something specific.

My wife and I were invited to dinner with some friends in their new house. We were sitting in the dining room around their table discussing their vacation house in Bulgaria. Then the guy turned on his new B&O television, selected the apple TV box and showed a website and some pictures from the place. Everything was controlled from the B&O remote (I was quite impressed about the control integration of the apple TV box), but the selection of media and finding the right pictures took him quite a while. The TV was placed behind me so I had to turn around to watch it. When he had finished showing the pictures I turned back to the table again. Instead of turning the TV off he selected a program showing music videos, and some times I noticed him looking at the screen, tempting me to turn around again. It was a bit distracting.

Apple has tried to solve the problem that you need different solutions for interaction and rendering through use of Airplay. The thought is that you can explore media on a mobile device and then send it to play through apple TV. It actually works and performs quite well, but you still need to set it up and to make a lot of button pressures to make it work.

TV screens are getting bigger and better improving the visual experience, but when it comes to sound they are not improving. TV screens are getting more and more flat leaving no space for good sound quality. A work around is to add a separate audio system like a sound bar, a DVD receiver or an AV system made of separate components, something that takes space, need wires and requires separate remote controls. Controlling this can often be both difficult and inefficient (a lot of button pressures to do very basic tasks). You need to turn the products on and off separately, you need to deal with different volume controls sometimes affecting each other and sometimes not, and finally you often have to make separate source selection on both your sound device and your TV. What often happens in practice is that the “big sound” is only turned on for special occasions.

Multi media as background noise

Radio or TV is often used as background noise while doing other things. Some people need it all the time but others get easily disturbed. For my own sake it depends on the job I am doing and the mood I am in. When driving in the car I am always listening to radio or music also even though I am driving together with someone. At home I sometimes turn on the television without watching it just to follow if there should be something of interest, but if I need to be focused doing a task the TV is disturbing. The same goes with music. I like to have music in the background but if I am facing a very difficult task, it can be annoying. Especially if I don't like the music playing. One day when I was working on my master project my mother and farther in law was staying in our house. My father in law was baking pancakes and during his work he put on some old big band music from Youtube. At that time I was frustrated about some things not working in the project and even though the music was not loud it was so irritating that I had to leave the house to be able to think again. Background noise affects everybody in a multi user context, but it affects people differently and it can be a balance to find the right volume level and the right content. To some people silence is a gift. To others it feels empty and boring, but no matter what it should be easy for everybody in the context to change the sound level as well as the content. (Note: Gert J. Almind told me that some people were not pleased with the noise from the jukebox. For that reason they made a "silent record" so you could buy 5 minutes of silence. This record was actually quite popular. They made almost 100.000 pcs.)

Displays for digital content

Today almost all photos are digital. They can still be printed, stored and viewed in photo albums but less and less people do this today. We store them digital and we share them on Facebook and other social media. Most TV's today provide functionality to render digital photos, but it is often complicated to establish and control. You can also buy a "digital photo frame" where you plug in your memory card and it shows the pictures or movies stored. Looking back those digital photo frame products have been a varying experience. They confirm all prejudices on lousy electronics products (plastic, wires, bad picture quality and complicated control), but still they have been quite popular, though where I have seen them they are often turned off. I believe there is a need to show the digital photos in our home, but I am sot sure we have found the right solution to serve this need.

Today when we want to show digital photos to each other we often do it on our smart phones. It is easy because the pictures are already there (probably taken on the same device) so they are very easy to access. On a smart phone you can see what is on the picture and it makes sense if you can explain it or the one you show it to can relate to it. The visual experience is limited.

A platform for experimenting

When B&O made their BeoSound9000 they were highly inspired by the Jukebox. The primary concept developer on this project, Flemming Møller Pedersen, wrote me the following in an E-mail: *"The jukebox was the primary source of inspiration for BS9000. We wanted to be able to select a music program for an entire party evening. In our first research we looked at a solution with room for 100 CD's. We found several good technical hardware solutions, but the big problem was the customers navigation in the music (todays graphical display technology was not available at that time). We worked with a combined Binder for the small booklets you find in the CD cover and the remote control but it was not good enough. Finally we decided to go for visible CD's, and ended with 10 CD's on a row. For practical reasons it was reduced it to the 6 CD's. During the conceptual work we actually visited Wurlitzer in Germany."* The result of this work was a mechanical master piece with a cd arm that could move with the speed of 30 km/hour and at the same time work with the accuracy of 1/1000 mm accuracy. It was a pleasure to watch it in work. Also todays digital music players are strongly inspired by the jukebox. We have play lists, cover pictures, track records (most played), queues and smart ways of browsing, discovering and buying content, but is there anything else we can learn?

Figure 8

BeoSound9000 was highly inspired from the jukebox

A multi media jukebox for home usage

To explore this I have build a multi media jukebox for home usage. I have build speakers, subwoofer, amplifier and a projector into a wooden box with a glass plate as the projecting screen. To explore, select and render content I have added an apple TV. You can explore, select and render multi media directly on the apple TV, but you can also use your iPhone, iPad or Mac to explore and select the media, and just use the apple TV for rendering but how does that correspond to our needs and behaviour in a social context? That is one of the things I am interested in. The jukebox was placed in our living room and I used a lot of time experimenting with multi media selection on the iPhone/iPad. With thousands of apps I discovered that the possibilities are endless. Just to mention some I have used: iTunes, Spotify, DJ mixer, DR radio, Youtube, Photos. Beside this You can use some of the capabilities on smart phones to make smart interaction like voice and gesture control. It is cool to demonstrate but not good enough for daily use? With the apple TV I have chosen a platform made for lean back operation with a remote control, but standing in front of the product you expect to be able to interact with it. We have a lot of people coming in our house so I use any chance to discuss, demonstrate and test the setup. When standing in front of the product everybody tries to touch the screen to see if they can operate this way. It seems obvious and I could decide to change the platform but since the prototype is made for experimenting I decided to look for other possibilities. Based in this I made two experiments. The social screen and the attracting button.

Figure 9

Multimedia jukebox for experimenting. Inside there is a stereo, speakers, a projector and an Apple TV

The social screen

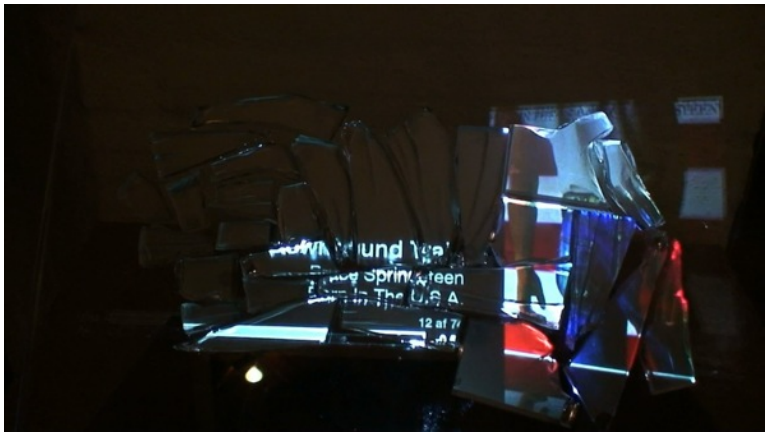
There was a time when we easily distinguished between a display and a screen. The display was a component that could show status information on a product. It was a window to the product. In the beginning it showed mainly numbers and letters, but today you can make anything in a display, also live pictures. When we talk about screens we normally refer to something that shows live pictures. A television has a screen and when the movie industry refer to the big screen they mean the cinemas. Actually the screen is only the visual front part showing the picture but since it is the only thing we are interested in we often refer to a whole product as a screen. In the computer world we also use the term monitor for the product showing the visual output, but when integrated on a lap top or tablet it is a screen - unless we are talking "technology" language. Then it is a display. The reason why this is interesting is that we perceive screens monitors and displays differently. The display is a technological window to a product, the monitor is a window to a computer but the screen is a window to another world, where the content decides where to take you.

When looking on mobile phones we have moved from the displays on the early Nokia models to the screens on todays smart phones, and it has made quite a revolution on our use. Today you record, explore, select and even modify multimedia on mobile platforms, but what happens on the PC and the consumer electronics side? First the laptop has become more popular decreasing the sales of the stationary PC and the monitor. Now it looks like the tablet PC is going to take over as the most popular computer in our home. The screens are getting smaller but the resolution is increasing and touch control is taken for granted. These products are very suitable for exploring, selecting and modifying multi media, and they have other advantages. They are fast to start up, they can be used and placed everywhere and they do not "put up the wall" between the user and other people in the room. They are more "social". On the TV side the screens are getting bigger and better making a better experience watching live pictures. The designs are also improving. They are getting thinner and the frame smaller. On the high-end models the front is pure glass and may be aluminium, but they are still flat and square. You do not decorate your room with a TV because it looks beautiful. Right now we are yet to face a new technology based on OLED (Organic Light Emitting Diodes), where screens are extraordinary good, very flat (we are talking about few millimetres) and they are even bendable. They also use less power. Imagine what design possibilities it gives.

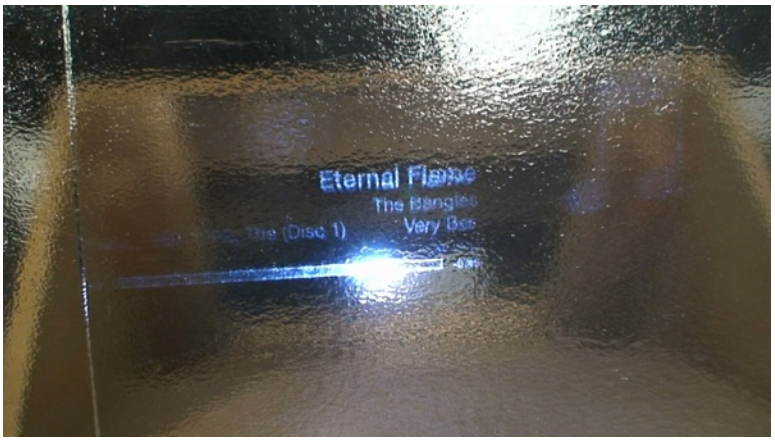
To learn more about the way we perceive the screen I made some experiments. First I wanted to design a screen that was not inviting for touch control and secondly I wanted to see if we can change our perception of what a screen is by changing the visceral design.

The glass workshop

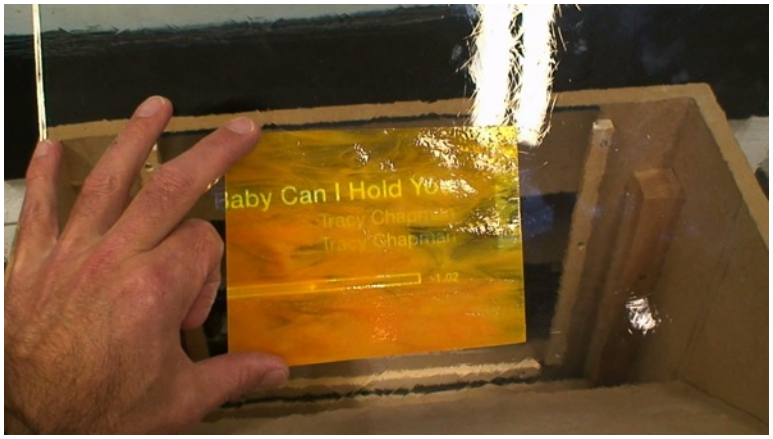
I took the jukebox to a glass workshop in Struer and explained my mission. I wanted to work with the material and to learn about the possibilities in making glass objects. I also wanted to meet the people working with glass craft and art. Every Wednesday evening they met in the workshop and for a couple of months I joined them. The experiments are documented in the video: “Glass Display”.



About Visceral design Norman 2004 mention sharp objects as something we respond negative to, so my first thought was to make a screen of sharp objects by braking a glass and glue it on the screen, and it certainly worked. You were not tempted to touch that screen, but it was too difficult to see the content.



Using clear glass is quite a challenge. It looks beautiful when you can slightly see the picture in clear glass, but it is a problem with ambient light and the “hot spot” from the projector. You need the screen to diffuse the light - or projection from another angle.



You can get glass in many different colours and different opacity. Some of it looked quite good but the combination of the glass colour and the colours in the menus was a challenge.

Colours are often used intensively in glass design, and so is shape. I discovered that a curved screen made an interesting perspective. Who says a screen has to be flat and square and the picture cannot be skewed or distorted. This screen is not a window to another world, but something living inside the object.

To make this object you need to make a form in "Gips" and then melt the glass on it. But after having looked at and lived with this solution for some days I put on the old flat display and it made me feel much better about the product.

(Norman 2004) writes about Visceral design: *"You can find Visceral design in advertising, folk art and crafts and children's items. Thus, children's toys, clothes. and furnitures will often reflect visceral principles: bright, highly saturated primary colours. Is this great art? No, but it is enjoyable."* Taking a look at the objects in the glass work shop strongly indicates that making glass objects is playing with Visceral design. There is a lot of colours but what makes glass interesting is the beautiful combination of colours and light. Already in the mid forties the designer of jukeboxes recognised this. The jukebox should "draw attension" and the way to do it was to enlightening the jukebox with coloured light. They even made animating light effects like the "Bobble Tubes". Gert J. Almind told me that they used a lot of effort and made several user tests to find the right colours and effects. Being able to control and change the light in a glass object is interesting but also complex when both glass and light is coloured. With a projector and a coloured glass sculpture you can make a very beautiful visual effect but when you want the light to form a live picture it gets very complicated and you need to decide if the light effect or the picture is most important. My experience with the broken glass experiment was that the light experience was very nice but the picture was to difficult to see. It did not make sense.

What did make sense was making a screen in clear glass. The screen is not intrusive. When off, you cannot see it and when it is on it doesn't give you the same feeling of making a window to another world. Actually it is more a window to the real world augmented with information. It is like "Augmented Reality" just with he difference that

the augmented information not necessarily relates directly to the physical world behind the screen. The technology in this screen is not visible. It is not seen as a display but as something magic visualising in the glass. A good scenario showing what this could lead to is made in the movie: "A Day Made of Glass" made by Corning (2011). A practical problem making a screen in clear glass is that only a very small part of the light is reflected in the glass, so it is difficult to see anything in normal light settings and if you want a good black level in the display you need it to be black in advance (no reflecting light). That is why most screens today are black. Another problem is the light not reflected in the screen. Especially if you get it directly into your eyes. Even with quite good reflecting glass (etched or sand blasted glass) you can still see the "hot spot" from the projector when standing right in front of it, and when moving to the sides the picture is fading. The display industry has been struggling to solve this for years. It vas difficult for me to avoid light reflections to other parts of the room like walls and ceiling but I soon discovered that those "light effects" were quite interesting making a good contribution to the visceral design.

Figure 10

This glass made a beautiful artistic reflection on the wall behind the jukebox

It was interesting to experiment with different shapes of glass. They skewed and distorted the picture, but it turned the display into something artistic or even organic. When the display follows the material you sense the real analogue world together with the digital content. You almost feel the content is living inside the glass.

I was at an experience exchange meeting at InnovationLab, who is working with future technologies and trends in innovation. Instead of having the meeting in a normal conference room we met in a small cosy restaurant. For the presentations we had a projector throwing the picture on a white wall. The projector was not placed directly in front of the picture so the "screen" was skewed. On the wall there were a couple of objects (bolts). Technically this disturbed the picture but it did not disturb the experience. Actually it felt perfectly right and extremely social.

Figure 11

A skewed and distorted screen matching perfectly in a highly social event

Technologically screens are getting bigger and better with higher resolution, more brightness and better contrast, but do we really need it. To a certain level yes. We need to be able to see and recognise objects on the screen but when this is fulfilled your thoughts will be on the content. (Norman 2004) writes about photographs: *"Photographs, more that almost anything else, have a special emotional appeal: They are personal, they tell stories. The power of personal photography lies in its ability to transport the viewer back in time to some socially relevant event. Personal photographs are mementos, reminders, and social instruments, allowing memories to be shared across time, place and people."* If you know the picture you do not need details but if you don't know it you need details to be able to relate to it. The size and quality of the screen also affects your ability to "enter the other world" and empathise with people. Watching a movie in the cinema is completely difference from watching it on a mobile phone even though the content is the same.

After having tried several different glass solutions I put on the original glass plates with special rear projection material in between. It has a dull grey colour but it makes far the best picture and I am not ready to sacrifice this for visceral design. Though I have learned that there are possibilities in designing screens from a social or emotional point of view. To some extent you can "destroy" or "disturb" the picture but it is a balance.

The attracting button

Some new jukebox designs are only equipped with a touch screen for interaction. In the old days there were buttons on the jukebox and these buttons were a part of the attraction, but have we lost something. To discover this I decided to design an interface without using a touch screen. After having evaluated different methods for interaction I combined this knowledge with my knowledge from the glass workshop to develop a set of glass buttons.

Traditional push buttons

A button seems to be a pretty simple component but when you dive deeper into the physics, the perception, the expectations and the psychology behind pushing a button there are lots of things to consider and areas to explore. First of all you need to identify and recognise the object as a button. There are lots of traditional button designs and styles that we have learned to recognise over time, but with today's technology we can turn almost any object into a button. Just take a look at the solution from MaceyMacey (see fig. 12) where you can make control through drawings, play dough or even organic things like bananas. It does not make sense but it makes a lot of fun and the concept is very popular. Though using different objects for control only works if the user can recognise the objects as controlling objects, and figure out what to do with them, and how to do it. This is very dependent on the users experience, expectations and his knowledge in the field. It has to make sense. Controlling a big crane by pressing a banana does not make sense

Figure 12

With the control concept from MakeyMakey you can turn almost anything into a controlling device.

Affordance is the potential action that is made possible by a given object, especially one that is made easily discoverable. When you see a product you need to be able to identify "the points of interaction" and then you need to be able to calculate how to interact with

it, may be even calculate when to do it and what happens if you do it. Norman (1998) talks about perceived affordance. He makes the concept dependent not only on the physical capabilities of an actor, but also the actor's goals, plans, values, beliefs, and past experiences, and we need to take all this into account when making interaction design. Natural mapping is a relation between buttons and their controls in the world. Some mappings are natural to us and a violation to this is a disaster. Try to switch the up and down arrows on the navigation bar and see what happens. The user will get totally confused. Buttons should be placed so the user can immediately see which control will perform which action. If this is done well labelling is not necessary. Some mappings like keyboard and numerical buttons are well known patterns that should not be violated. Always consider what the user knows in advance.

The "look and feel" of the button has a strong impact on the way we feel about a product. First the visceral design and the use of materials must invite us to touch the button, and when touching it we need to provide a good "sense of touch" experience. This is actually quite complex because pressing a button is a movement where tactual perception, feed back and sensory-motor coupling means a lot. Tactual perception is what you can sense in your finger tip by the cutaneous sense. It can be patterns on the button but also vibrations or changes in force feedback. The feed back is very important for button design. You need to know when it is activated. It can either be visual, auditorial, tactual or a combination of those. Visual feed back is made by light, displays or motions. Auditorial feedback is sound made electronically or natural by the mechanics of the button. Tactual feedback can also be made "electronically" (like a buzzer on a touch screen) but it is typically the mechanical "click" you feel when pressing a button. The sensory motor coupling is a coupling between the action or movement you make and your senses. May be you are not aware about it but pressing a button can leave you with a good or a bad feeling about the quality of the product. Especially if the feeling is different from what you expect you will notice it.

Touch control

Touch control and touch sensors is old technology. Already in 1975 B&O used touch sensors in their Beomaster 1900 *"to hide away technology behind the surface and to access music with a gentle touch"*. *"This product was displayed on several museums almost before it hit the market."* writes Jens Bang, Jørgen Palshøj (2000).

Figure 13

Beomaster 1900 from 1975 with touch control

Since then touch control has been used in various products. The big advantage, and disadvantage, with touch control is that there are no moving mechanical parts. It is purely electrical based on measurement of strain, light, vibrations, electrical noise or capacitive/ inductive changes, so it can be optimised and integrated with electronics, but there is no natural affordance and feedback. This has to be added somehow. The limited tactual perception also results in a "missing" quality experience. It is hard to tell if we perceive a touch based control as high or low quality. It depends on the materials used for the product and the way the affordance and feedback is implemented.

A more sophisticated type of touch control is the touch screen, where you with your fingers can point, select and move things on the screen. This technology is also from the seventies but until this century the use has been limited to high end embedded devices and dedicated applications. Multi-touch is the possibility to use more than one finger on the screen at the same time, giving new ways of interacting with objects on a screen. In the nineties the first tablets and PDA's were implemented with touch screens but the use was limited until Apple launched the iPhone (2007) and iPad (2010) based on the IOS mobile platform, and google launched Android (2008). Those platforms were developed for multi touch. Microsoft has also made several attempts to make smart-phones and tablets based on touch but they have had a hard time to deliver good quality solutions because they only used to deliver the software part, and the quality experience is based on the entire product. With the purchase of Nokia and production of own smart phones and tablets they have changed this strategy. They have even gone one step further against touch. The new windows 8 is basically made for touch control. They believe touch is the future, and based on sales figures for PC's there is no doubt that more and more IT usage is made through mobile touch based devices. Windows 8 could also be a step against touch control on larger screens. Using 10 fingers is more efficient than point and click with a mouse. Demonstrating this on a large screen on the wall (in a multi user context) is easy but ergonomics and practical implementing issues are essential in daily use and here there is potential for new development. See the video by Corning (2011): "A Day Made of Glass".

Figure 14

Gesture control from Minority Report

Gesture control

Gesture control is also point and click with your fingers but you do not have to touch the screen; pointing and moving your fingers and hands is enough to make the control. The ultimate example can be seen in the movie: Minority report (see figure 14) where Tom Cruises manage large amounts of information pointing and gesturing with his gloves. The technology is to some extent available on experimental stage but not commercialised. What is commercialised is controller based gestures used in the Wii and to some extent 3D camera based gestures used for games. Gesture control can also be used for simple operation. A well-known example is he door opener in trains where you open the door by moving your hand in front of the door. I am not sure it was intended that it should be gesture controlled, but it highlights some problems. Mikael Fernstrom (2013) writes the following story in his blog: *"On trains between Copenhagen Airport and the Swedish west-coast, you can observe all kinds of interesting human behaviour when people try to walk through the train. There are automatic sliding doors every now and then. Most people are familiar with the typical automatic door in for example shopping centres that open automatically when you get within a certain range of the door. This is not the case on these trains. On the sliding glass doors, there is a small sticker with an icon, a hand and two arrows. I saw a number of people assuming that the sticker was a touch control, pressing their fingers against the sticker, hoping the doors would open, but this has no effect. Others make strange "Star Trek"-like salute gestures, but the doors remain closed. Some people look around and the sensor is located above the door. If a tall person approaches the door, it will open automatically. For shorter people, e.g. women and kids, the only gesture that will open the doors is by waving a hand above their head."* The door was intended to open automatically, but the implementation turned the solution into gesture control and then it is difficult to explain exactly what to do to make it work. Worse of all is that the solution makes us look and feel stupid. Another problem with gesture control is that graphing a virtual object does not give any "force feed back" (unless built into the glowers). It is not embodied and it doesn't feel natural. Though simple gestures are used more and more together with multi touch panels. It makes sense to base multi touch control on common known gestures.

Swipe and kinetic scroll

Swipe is a movement made by your hand (fingers) over a touch sensor. The speed can be turned into a dynamic value telling how much you want to scroll or regulate, and this is called kinetic control. This functionality is implemented on almost any mobile device today. It makes sense and it feels natural in accordance to our nature laws. Swipe does also have the advantage that you don't have to hit specific areas on the screen, which is handy when e.g. driving car. Kinetic control can also be implemented on push buttons, where the time of pressure determines the dynamic behaviour like the speed of scrolling and deceleration after releasing the button.

The glass button design process

At the glass workshop I found some glass buttons already made and decided to turn them into control buttons using touch sensor technology. As feed back I used a LED indicating touch. The result was quite interesting.

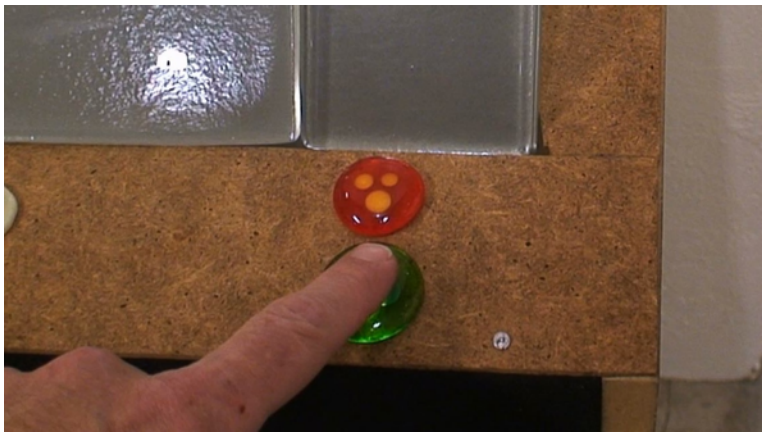


Figure 15

Hand crafted glass buttons. In the glass workshop they were surprised that I could make this work.

The buttons have the classic glass art/craft look with strong colours. They are round and smooth in shape, and there are absolutely no signs of technology around or beneath them. When you see them you don't think on buttons for an AV system, but the smooth shape invites you to touch them. When touching the button the LED beneath it turns on lighting up the button. It is a clear button response (but only visual) giving you a feeling of "empowering" the button with your finger tip.

I planned to make a test in the glass workshop, with "hobby glass makers" as users. I brought the jukebox where I had implemented volume up and down using the glass buttons. My plan was to video record the test but it failed. Before I put up the camera they were already surrounding the product trying out the buttons. Some of the comments were:

- *"Amazing. How is that possible?"*
- *"OH it works! (Surprised), but it regulates a bit fast"*
- *"The light in the buttons could be made better if you use diffusing glass"*

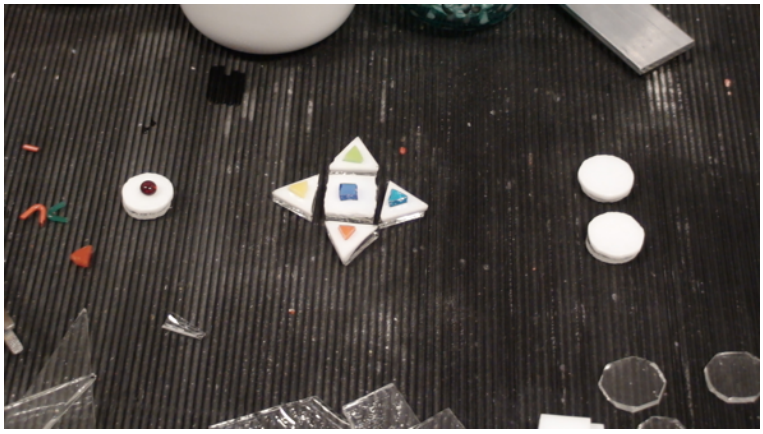
When observing the test I made following remarks:

- *"First time they touched the button they were a bit "hesitating" almost scared of the light, but later they started experimenting to figure out how it worked."*
- *"They were more interested in the magic (the light in the button) than the functionality (turn up/down)"*
- *"The buttons were not fixed to the panel and that was a problem."*

Later when I had the jukebox running at home I found great pleasure in turning up and down the volume until my wife told me not to do it all the time. It was disturbing her.

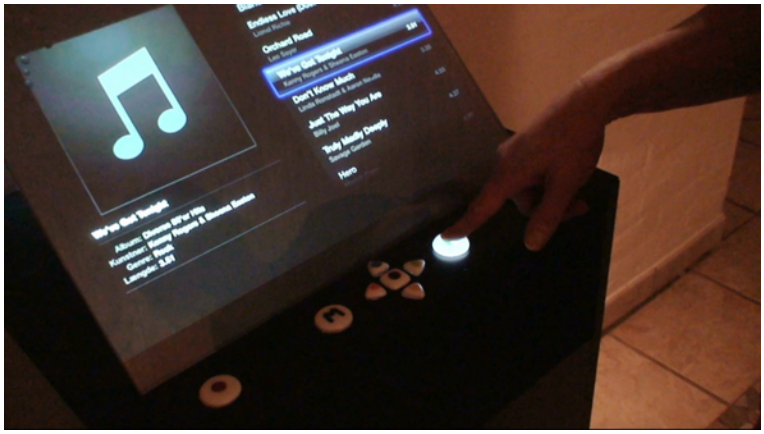
Button panel design

Based on the experience from the glass button test I wanted to make a complete control panel with glass buttons. Beside on/off and volume up/down I wanted to be able to control the apple TV (arrows, accept, menu and pause).



To improve the light effect I made a sandwich of clear and white glass and upon this I put a symbol communicating the function of the button. In the oven these layers melt together in a nice round shape but you can still feel the symbol

The layout is quite simple. The standby button to the left. The apple control in the middle with the menu button to the left and the pause/play button to the right of the normal cursor control. In the right side we have volume up and down.



I used a lot of time to optimise the touch sensitivity and the light in the buttons before inviting others to test it.

I also painted the jukebox in black but it did not make it look any better. I actually regret that.

When I asked the glass designer what she thought about the button design she said: *"I am not quite content. I like the big buttons, especially the standby button is very nice, but I do not like the cursor control in the middle"* The buttons do not have the classic handcraft glass design

look. Actually they look more like they were made in ceramics, but the light effect looks quite good *"It is a shame you only see it when you touch it"* was a comment. When Gert J. Almind saw the design he said that the button layout reminded him of the Wurlitzer Lyric from the sixties. He also told me that light in buttons was quite normal in jukebox design. In some models (like the Wurlitzer 850) the light was turned off when a track was selected. There is no doubt that the buttons are more appealing and affording when enlighten so it should always be on to a certain level and then turned off (or increasing light intensity) when touched. The right level is very dependent on the ambient light but it could be regulated according to this (we have the same problem on the screen).

The layout and the mapping was quite easy to read and understand but not that easy in use. It is a problem to distinguish between OK and play/pause. Partly because they (mosts of the time) do the same and partly because there is some logic in moving down the menu hierarchy to the right when you move up on the left (the menu button is also a return button). We would be better off without the pause/play button.

Making a good touch experience was quite a challenge. I spent days on optimising the sensitivity and programming the right filters and hysteresis to make it feel right. The sensor depends on the distance to your fingers, but also the size of the touching area. I tried to activate it exactly where you could feel the material, so you had some kind of tactile feed back together with the visual (the light). During the test I discovered that the operator had to look at the buttons quite often to use them. Partly because the feed back was visual but more importantly because they could not "feel their way" finding the button before activating it. In some cases buttons were activated by accident because the fingers resting on the control panel came too close. Some times more buttons were activated at the same time. With light in the buttons they would be easier to identify.

When they started touching the buttons all test persons pressed quite hard and it took quite a while before they realised that it wasn't necessary. *"If I am pressing too hard it continues to scroll. I just need to press gentle and softly"* and later *"I actually don't need to touch very much to make it react."* The control of the apple TV is often dependent on the time you press a button. Especially the kinetic scrolling is a challenge to control and it is natural that you relate the movement to a force instead of relating it to timing. What happens in the beginning is that the user is pressing many times instead of keeping the finger on the button. *"When I keep pressing I cannot control it. It does not stop when I remove my finger. It keeps running. You need to get used to that, but that is OK"*. Over time you can learn to handle this.

Beside this I discovered two practical issues. One was the standby button. Since the projector is slow to start up and shut down (45 sec) it is irritating if you hit it by accident. It should be placed elsewhere or standby should be made automatically based on timing, movement sensors or Status of the apple TV box. The other problem is missing auditorial feed back, when there is no sound (e.g. when starting up a new track). It can be solved by making an electronic sound every time you regulate the volume.

Even though you have the buttons at hand it is tempting to interact with the screen. One test person is actually moving the finger to the screen trying so select an object there. Another test person ask me: *"What happens if I touch the screen?"* There is no doubt that the touch screen would be an ideal interactive solution for navigating and selecting content but from the distance visible buttons are more affording and appealing for interaction.

All my test persons were women in the late forties. They did not know the apple TV in advance, but they knew iTunes and Apple's mobile music platform. I was surprised how fast they could navigate and find music, and so were they. They even seemed proud. When they found the right music they wanted to stop the test and listen to the music instead. To them it is the content and the mood you create that matters. One lady in the workshop asked me if we could just leave the product there, and I regret that I didn't bring some beers.

The multimedia jukebox

Multimedia in a social context

Multimedia is a combination of different forms of content like text, audio, still images, animation, video, or interactivity content forms (games). It can be recorded, stored, accessed, modified or played back from different kinds of multimedia devices. There was a time where those devices were analogue but over the last three decades the computer has increased its role as the universal multimedia device. Today we record, store, edit and render digital pictures, audio and video files on computer devices like PC's, tablets or smart phones. In the beginning of this AV/IT convergence period the technical (digital) quality of the content was poor, and the general computer had insufficient power to deal with it, but the new possibilities in distributing, sharing and storing content (access to content) seems to be more attracting than the audio or video quality experience. Today the technical quality is quite good and almost any computer can play back a full HD video without any problems, but have we lost something in that transition?

A big difference between the old multimedia devices and the computer platform is that the computer is a multi purpose personal tool. It contains personal communication, documents and the appearance and interaction is personalised. You often need a username and a password to get access. If you are already interacting with the computer, access to multimedia content can be easy, but if you have to find and start up the PC first and connect it to the speakers it is not. Audio products related to PC's and MP3 players is also called "Personal Audio". Old multimedia solutions are more social. They are not personalised and they are easy to access (but not always easy to operate). They do not belong to a person, but they are a part of a room. The content can be stored and shown on a shelf so everybody can see it.

If we look at our homes we have both the personal and the social needs. Exploring, editing and rendering multimedia can be a personal task but it often makes more fun together with other people. Multimedia sharing services like Youtube and Flickr or social networking sites like Facebook is building on this with great success, but the social context they create is virtual. That is not the same as being together in a room doing things together. When meeting people you can see their face, interpret the small nuances in the way they communicate and feel their presence and emotional state, and with the right use of multimedia you can affect this. With music, videos and pictures you can create beautiful sceneries, evoke memories, affect feelings and this way create a certain mood in the room. It also gives you something to talk about. It can even be a good way to teach your children about music and culture.

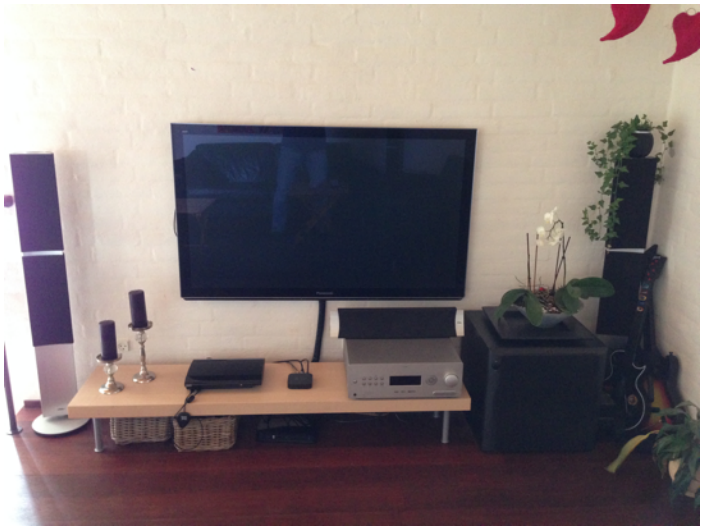
Size and quality of the AV experience matters

The way multimedia affects us is strongly dependent on the size of the audio visual experience. Dancing to music from a small transistor radio does not feel right where not dancing to a large rock concert feels wrong. Watching a movie on a smartphone does not evoke our feelings as much as the same movie would do in the cinema so there is no doubt. Size and quality matters, but how important is it to us and are we aware of it? As mentioned earlier, when you look at your own photos it is not the picture itself, but the memories you invoke that are interesting. The same can be said about music. When you hear a track it creates a sound and evoke memories in your head, but you cannot transfer that to others unless they have had the same experience. If you want others to like the content you need to explain it or you need to provide them with the full experience so they can create their own memories. My guess is that most people are not aware of that. It is difficult for us to understand other peoples lack on interest in our personal photos. On the other hand exploring and sharing memories can be great fun if it is mutual and on a common background, and the more genuine the experience is the stronger is the arousal.

When Gert J. Almind visited me, I had prepared a playlist with the 20 most played jukebox hits ever, and it was playing on the jukebox in the background. When we talked about the improving juke box sound quality in the 60 ties and 70 ties he said: *"It was much better than the digital sound you can hear now on your jukebox. Stereos today are not made to play rock'n roll. I prefer the analogue record player, and the sound in the old jukebox. To me it sounds more genuine"*. I quite agree that the sound is too "sharp", there is too much treble and the noise from the projector is adding to it. The sound system in the multimedia jukebox prototype is primary made for movies (Surround system) so there is a great potential for improvements here. I could probably learn from the jukebox here as well. Gert and I discussed about sound if the jukebox sound was something that could only be made analog or it could be added digitally. This could be an interesting subject for further analysis.

Figure 16

With a 15", 1000 watt subwoofer I can create a good concert experience in my home. Every saturday evening I put on a concert DVD.



The size of the screen and the sound must be fitting to the room size and the usage. In my sitting room I have a 50" screen, 5*120W surround system and a 1000w subwoofer. Every saturday after dinner I put on a concert DVD and turn up the volume, so it feels like the real thing and it really "touch" me deep inside. In my bedroom I have build in speakers in the ceiling. There is no need for a party here, only background music. In the kitchen/ dining room I have large B&O speakers. I like to listen to music when I am cooking and cleaning and sometimes we are having (or should I say making) a party here - just by turning up the volume. With a multimedia jukebox in your home you should be able to deliver a genuine audio experience to set the mood for any occasion, also for a party. The screen is not made for a "big" visual experience but for interaction and visual effects.

Easy access to content

With the rock'n roll in the 50 ties and 60 ties the jukebox was the place where young people would hear the music and get introduced to new songs. Later on new music was introduced and played on the radio where you could record it on tape or you could go and buy it in the local record store. With this the jukebox lost an important part of its existence and ever since the business has been declining.

Novelty and easy unlimited access to content is important to us. The jukebox producers knew that. Number of records available on a jukebox had always been a competition parameter, and they had to compete with the coin operated telephone line music.
Gert J. Almind (1998) writes: *"In the late 1930s, other kinds of music libraries saw the light of day in America. Barry Ulanov wrote in an article in the "American Mercury" in October, 1940, that a system of jukes were connected to central studios by phone lines, and that they gave customers a choice from thousands of numbers instead of a measly dozen or two."* Later on Sound Leisure introduced the first satellite downloading jukebox and today TouchView claim to have North Americas second largest music network after Apples iTunes.

Today with the internet we have unlimited access to content, but we do not expect the access to be easy. During the test in the glass workshop, one of the users selected a track and said: *"This track is just released today"*. On her smile I could see that she was very content with the situation, she almost looked proud. To find the right content in the right quality can be quite a challenge. Music and movie makers have tried to protect their content by preventing downloading but they have neglected the value of "easy access, anytime, anywhere". Especially the music industry has recognised the situation and we have now music services like iTunes, Spotify, TDC play and Pandora, where the quality is good and it is easy to explore and find music. You have to pay for these services unless you are willing to listen to commercials, but it is OK if the price is right. In February 2013 Apple announced that music fans had purchased and downloaded more than 25 billion songs from the iTunes Store, and even though you can download movies for free on illegal sharing sites, the digital video rental market is growing strongly. It seems that the effort

we use to find the right content has a value, and when we have found a good source we stick to it.

In the beginning iTunes was primary a media player, music library and iPod management tool. From the early beginning you could easily import your own CD's and make your own playlists. There was also support for "Most Played", "Recently Played", "Recently Added" and ratings. Creating playlists can be great fun. Gert J. Almind told me in the interview: *"The week before the big party we met to mix and record the tapes with music. It was almost as funny as going to the party"*. I have also found great pleasure in creating playlists. After having heard a professor speaking about "phases in our lives" I decided to make playlists for different phases in my life, and it took me back on a journey to my own childhood. The more music I fund the more memories were revealed. It was almost as good as watching pictures, and today those playlists are just as valuable as my photos. When I look at my other playlists (dinner music, slow songs, love songs, real heavy stuff) they are made to create a certain mood, and that is probably the most common use of playlists. Beside your own playlists iTunes has support for most played, resent added and highest ranked tracks.

Soon came also support for album covers and smart ways of sliding through covers. In 2004 apple launched iTunes store, and since then the software is clearly optimised on selling as much digital content as possible. When my wife tried the multimedia jukebox for the first time she did not end up in my local music collection, but in the iTunes store, where she selected a track already bought. It just played and she was happy. She did not notice that she was in the iTunes store until I told her to select another track and it asked her if she wanted to buy it. In iTunes store there are a lot of different ways to explore new as well as old music. Beside the charts you can explore, rank and buy other peoples playlists and since iTunes know your music taste it can also make suggestions for you - everything made simple in use.

Rules when playing back music in a social context

What is not simple compared to the jukebox concept is the rules of playing back the music in a social context. That a track always finish before the next track starts, that people need to make an offer to decide what to play and that the tracks are always played in the order they are requested. iTunes have introduced an "Up next" list working like the fifo playlist in the jukebox, but it is a "second choice" (probably not known by many) and there are no restrictions in using it. You can overrule it anytime and there is a big chance that you do it even though you don't intend to.

Also when playing music on turn from our mobile through airplay these rules are hard to follow. With airplay the last accessing device gets access and that is not easy to synchronise with track change when you do it manually. There is also the problem that the setup is complicated and the mobile phone is used for other things disturbing the music

flow. If this should work we should order a track on the mobile phone, but it should be played back by the jukebox.

But there is no doubt that playing music on turn in a group is interesting. Sometimes when driving in the car we take turn finding and selecting music and play it for the others. The rules are easy. We just send the playing device round and the one who has it finds the next track, and it is not allowed to start it before the previous selected track is finished. (The "Up next" functionality is not yet implemented on the mobile platform).

Play appeal

One of the most interesting things to learn from the jukebox is the term "play appeal". Since there was a clear business goal in drawing peoples attention, there has been a lot of efforts spent on design. This led to big beautiful looking machines with build in light effects. They were placed strategic well where people would normally pass (near the toilet door or the dance floor) catching your interest every time you pass it. The coin slot was very visible and on the front there would be buttons inviting you to interact. Today the jukebox is smaller. All you need is a coin slot, a touch screen and a computer connected to a set of active speakers placed (or even hidden) somewhere in the room. Gert J. Almind told me the following story: *"In a period I was often sailing between Aarhus and Kalundborg. On the ferry they had a small MSN jukebox hanging on the wall but despite my big interest in jukeboxes it took me half a year before I recognised it. It was simply too small. On my opinion a jukebox has to be at least 60*60 cm, so you notice it and the design has to be recognisable."* In principle you can turn a smartphone into a jukebox but where is the play appeal then?

My experience with the multimedia jukebox is that it has play appeal. I have placed it in my dining room on a strategic good place. Every time I pass it I feel tempted to touch the buttons, so now I listen to music more often than I did before. When people come into my house they ask me what it is, and when I invite them to try it out they start interacting with it. We have a 6 years old child living with us for the weekend once a month and when he discovered the possibilities he found a chair. (see picture). He often asked me to come and look what he had found (mostly cartoon trailers) and I did - because it was easy and funny.

Figure 17

The multimedia jukebox has play appeal

Another way for the the jukebox to draw attention is to start up automatically when people enters the room and once in a while play a song automatically telling “I am here and I am ready”. Starting up the multimedia jukebox prototype is actually quite a complex process. You need 3 remotes (Apple TV, AV receiver and projector) and several button pressures. Especially the projector is problematic. After you have turned it on you have to wait for 40 seconds before you can select the right input from a menu. It takes 6 button pressures - with the right timing - to start it. All this is now atomised in one standby button, and further more it automatically starts up/shuts down together with the Apple TV (sensed on the LED indicator on the Apple TV). So when I connect my iPhone through airplay everything starts playing automatically. That is the simplicity we need.

Though I still have technical challenges. The visual experience under startup is awful, and sometimes it does not work because of errors in the projector software. Even minor faults make me feel bad and irritated, and they can easily be a reason for not using the product. A better prototype would require a dedicated projector control software with a simple startup and shut down process, and a dedicated controllable amplifier.

Juke box design for the home

Christian Bökenkamp (1998), a German designer, tried to make a new jukebox design. It should be recognisable, he wanted it to have play appeal and at the same time the product should give the impression of being able to deliver a good sound quality. The product should use form, colour and light to draw the attention and the design should communicate the jukebox being: Young, dynamic, modern, emphatic, happy, inviting, elegant and alive. The result of his work can be seen on figure 18.

Figure 18

Jukebox design by Christian Bökenkamp 1998

If we look at the TouchTunes Virtuo model (shown on figure 5) it is clear to see that the jukebox design has come to a new stage addressing young people but still using all the virtues known from the past with the backlight and animating LED light area in the top, the large social screen (26") and a big attracting button. But how would a product like that suit our home?

Very few people would place a real jukebox in their home. It is too big, it does not match the interior and it simply draws too much attention. Even normal stereos and speakers are difficult to place in a house. Partly because of the "technical look" and partly because of the wires, and the "mess" around the stereo. Unless we have an expensive B&O or something similar we want to exhibit, we try to hide it away, and the smaller the easier. Over the last 20 years speakers and stereos have been shrinking in size, and so has the audio experience, but good sound requires "space". One way to solve this is to hide the stereo in a furniture and build in the speakers in the wall or the ceiling, but this is not very flexible for changes (though quite normal in USA). Another solution is to build the stereo (incl speakers) into a furniture. This solution could be "up coming".

Figure 19

Yes this is a stereo - build into a furniture. Source: Lyd og billede December 2013


Jo, det ER et STEREOANLÆG!

Glem IKEA. Det er Geneva XXL, du skal have, hvis du kigger efter en tv-bænk med højttalere, som du kan streame musik til.

Schweiziske Geneva har haft stor succes med deres kubistiske bordhøjttalere. Den lille Model S med DAB-radio er blandt vores favoritter. Det samme kan vi dog ikke sige om XXL, som vi testede for nogle år siden.

Men nu kommer den i en helt ny udgave, hvor alt er kraftigt forbedret. Bl.a. er den mindre, lettere og slankere end forgængeren, og al elektronik og samtlige højttaler-enheder er smidt ud og erstattet med nye i langt højere kvalitet.

XXL er en tv-bænk med opbevaring for spil-konsol eller Blu-ray-afspiller. Under låget er der også plads til ekstra løsøre, og bag de seks højtta-

The multimedia jukebox prototype is a furniture with build in screen and audio. It was a goal to hide away the technology, but the product should still invite you to interact. What works very well is the height, the screen size and the angle of the screen. It is really inviting you to interact, and so is the use of visible buttons, but the current model is too big and clumsy and the black paint makes it look like PA equipment. To make it look like a furniture it certainly needs a redesign made in wood, textile and glass.

The social computer

When I build my home in 1998 I made a special place for digital interaction (see picture). It was a hole in the wall big enough for a 22" screen, a keyboard and a mouse. The PC and wires were hidden in the cabinet behind.

Figure 20

The build-in social computer in my home

The thought was to have an "always on" digital information and communication platform where we could read mails, manage calendar, make quick internet search and store or render multi media. Since you had to stand up it was not a place for work or time consuming tasks. The PC was always running and there was no login, so it was always available for everybody in the house. From the early beginning I have connected the PC to a set of large active B&O speakers (you can see it in the corner behind the couch), making a very good audio solution that works well and is easy to control. Today the PC is replaced with an iMac having a nice visceral design but we still use it the same way - as a social computer.

It has been working extremely well and even though we all have laptops, iPads and smart phones today we still use it a lot. One reason is the strategic good placement. We pass it very often and notice if there is mail, events or Facebook updates. It draws attention and it has certainly "play appeal". We also use it to play music from iTunes, Spotify, internet radio and Youtube. Sometimes just as background music but we often play music because we want to create a mood or we want others to listen. All my 4 children are very interested in music, and it is not only new music they are playing, but also the old stuff. Sometimes they even find old tracks that I had forgotten everything about. I believe that this interest in music is related to the social computer in our home, so it has not only had a social effect but also an educating role. It is not only my family, but also guests in our house that use it. Partly because of the easy access, but also because they experience us using it as a social tool, where they feel invited to participate.

We have also rules of using this PC. It is not allowed to install or play games on it (I am the only on installing software), and it has always been respected. This way we keep it clean and well performing. Once I had a TV tuner attached so we could watch TV on it,

but we never used it. It was not a good experience. The quality was not good enough and it is a problem when the sound and the picture comes from different locations. Our house is quite open so when we use TV as background noise we turn on the tv in our sitting room.

If the PC is not used for a while it starts showing photos from our private photo album. This is a very good way to show the digital photos because it is attracting (high quality) but it is up to you to decide when to look and pay attention. I often see the pictures when I pass. They stimulate my memories and give me great pleasure. Quite often they are subject for a dialogue. Norman (2004) writes: *"Although we like to look at photographs, we do not like to take the time to do the work required to maintain them and keep them accessible"*. A big advantage with this solution is that showing the pictures motivates you to maintain your album.

Since my wife started using Facebook she has spent a lot more time here, but it still feels more social than if she used a "personal device". Probably because you can see the screen, and you know that she is "present in the room". She often show me things and we talk more about the content. So much that I don't bother login into my own profile. The only problem is that she complains every time I remove her browser window. To her Facebook is now the primary tool. I am not sure if a multimedia jukebox should have support for Facebook. It is a social tool and it is a good source for exploring multimedia content, but at the same time it is personal, especially making inputs. The big advantage with the computer compared to the multimedia jukebox is that there are no restrictions in what to use and how to use it, so if I want to use Facebook or Spotify as a multi media source I can do it. This is not supported on the apple TV.

Conclusion

The jukebox is an interesting phenomena with a well described history. It is not only a well designed product optimised for earnings but also a user driven way to experience music and create a certain mood in social places. Norman (2004) writes about music: *"Music plays a a special role in our emotional lives. The response to rhythm, melody and tune are so basic, so constant across all societies and cultures that they must be part of our evolutionary heritage, with many of the responses pre-wired at the visceral level. Rhythm follows the natural beats of the body, with fast rhythms suitable for tapping or marching, slower rhythms for walking, or swaying. Dance, too, is universal. Slow tempo and minor keys are sad. Fast, melodic music that is danceable, with harmonious sounds and relatively constant ranges of pitch and loudness, is happy. Fear is expressed with rapid tempos, dissonance, and abrupt chances in loudness and pitch. The whole brain is involved - perception, action, cognition and emotion: visceral, behavioural, and reflective."* The need for music is unchanged, also in social settings, but distribution of music and our sense of sound quality has changed with the emergence of "personal audio" and the Internet. The market for jukeboxes has been declining but new models are still revealed building on new technology but maintaining the old virtues like good sound quality, easy (smart) access to content, play appeal, simplicity and certain rules of playing.

Also in our home there is a need for music. It can be a subject or mediator for social interaction but used wrong it can also destroy the good mood. You need to feel the situation, respect everybody in the room and then you need a certain flow in the music. It is a problem if one person overrule the others. With the jukebox this problem is solved. You need to make an offer to decide what to play, your track is played when it is your turn and you cannot overrule others choices. This is not supported in home appliances and it could be an inspiration for new ideas.

It is difficult for us to say how much value music brings into our lives and how much effort we are willing to spent on it. With a small radio or iPod speaker you easily get access to music but if you want others to experience music or you want to create a certain mood you need the right sound quality and the price (effort, space and money you need to offer) for this is high, especially for "non technical minded people". Since the Internet arrived the access to content has been developing strongly on the PC platform, but the PC is not associated with good audio quality. Technologies like Airplay tries to build a bridge from the PC (or smartphone) to the AV world, but setting up and using this is not as simple as turning on a radio.

May be the most important thing to learn from the jukebox is the term "play appeal". It is something that draws your attention and reminds or motivates you to put on music. Play appeal is created through design, light, sound and interaction. To have "play appeal" you need an object (product) you can recognise, with a certain size and visibility placed where you often pass it. Beside this the object must invite you to interact with it. This has been a subject for experimenting on the multi media jukebox.

The social screen was an attempt to change our perception of what a screen is by changing the visceral design. I discovered that I had some design possibilities in letting the picture live inside an object, instead of making a window to another world. I also discovered that I could distort and skew the picture, and make the screen look "hand made" but only limited. The picture quality must not be compromised. A beautiful "hand made" screen is more social because you can relate to it and not only to the content, and it can have a visceral effect even though the product is turned off.

The attracting button was inspired by the jukebox design and glass objects from the workshop. Making a good button solution is actually quite complicated. We need to consider visceral design, recognition, tactual perception, feed back and sensory-motor coupling, and with a touch sensor the feed back can be a challenge. Inspired from the jukebox I used light as feedback and it adds magic to the solution, but it also leave some difficulties. You cannot feel your way on the buttons and especially kinetic scroll is difficult to control. The big advantage with buttons is that they are inviting you to interact, and some buttons are attracting more than others. The glass artist's favourite button was the standby button. Not because of the behavioural design, but the visceral or may be the reflective design. With the smooth round look and the red "nipple" in the middle it reminds us about something. May be an old electrical switch? It certainly attracts and affords touching. Today touch screens are always flat and straight, but why not add psychical controlling objects like glass buttons to the screen? I could easily see this button used in "A day made of glass" by Corning (2011).

I have lived with the multi media jukebox for two months now and it is not used that often anymore. I still feel tempted to touch the standby button every time I pass it, but it cannot compete with our built-in social computer we have had since we build our house in 1998. This solution is more flexible, always on, easier to control and the sound quality is superb. I can really recommend making a setup like this but keep the jukebox in mind:

- Choose the best possible placement (where you pass and not where you can find available space).
- Think about ergonomics. Standing up is more social but controlling must feel right.
- Consider visceral design. Remove technology. Hide wires.
- Add good speakers matching the room at any occasion. It is important that you don't have to do anything extra to turn them on and volume control must be easy.
- The solution must always be on, or available within few seconds. No login procedure. Still keep Power usage in mind. The iMac is actually quite good at this.
- Show (promote) personal photos as a screen saver. It is a good way to watch them, and it motivates you to sort and order them.
- Consider what applications to install. On our solution games are not allowed.

Though I still think there is a potential in the multi media jukebox as a product. The next version must be designed like a real furniture (fabric and wood) and the screen should be

made in hand crafted glass with touch control and glass buttons integrated. The sound must be improved, the projector must be silent and everything must be fully controllable from software. Instead of the apple TV I need a general touch controllable IT platform. May be Windows 8 could be an alternative.

I have learned many things from the jukebox but the process in building and evaluating the prototype has provided a much deeper conceptual understanding. I have tried to include emotional design considerations but I have also used my own emotions to "feel" what is right. Donald A. Norman (2004) writes: *"anyone involved with a product is so close to the technical details, to the design difficulties, and to the project issues that they are unable to view the product the way an unattached person can. Focus groups, questionnaires, and surveys are poor tools for learning about behaviour, for they are divorced from actual use. Most behaviour is subconscious and what people actually do can be quite different from what they think they do."* but he also writes: *"An interesting exception from these problems comes when designers or engineers are building something for themselves that they will use frequently in their own everyday lives."* I have included other people in evaluations but when you live with the product, and the first arousal is gone, you soon find out if the perceived value exceeds your total effort, and that is also worth reflecting on. It takes just one negative feeling to make you discard the entire solution, and if you can't do anything about it you loose the interest. On the other hand having the right solution stimulates you to use it and benefit from it. I am so pleased with the social computer in our home an I believe it has catalysed a strong music and digital media interest in our family.

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