Semantic

Resources

A practice oriented approach: Sustainable services for television. Student: Nick Sturkenboom

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Introduction

In my previous attempt to make energy monitoring more meaningful and pleasant during my internship at Philips R&D ended in a considerable success. Therefore I wanted to continue exploring for opportunities that promotes a sustainable lifestyle. Granted this experience, I wanted to look further into energy monitoring and introduce a socio-culturally aware context and meaning of consuming resources so systems could show users how they compare with people that fit their own ethnographic profile.

With the rise of the Internet of Things (IoT) a world of consumer electronics is ready to connect and exchange information through complex networks. This opens both potential and problems, such as new smart services and appliances that possibly are derived out of this system.

The SOFIA project is a European research project that targets to makes this information available in the physical environment. During the Semantic Resources project we aim to raise awareness of our daily use of resources and energy by meaningful and playful means, enabling users to understand and manage their consumption for a more sustainable way of consuming.

Reason for participation

My reason for participation regarding this project was to improve my understanding of energy consumption and look for opportunities to reduce our increasing consumption of electricity in meaningful ways to consumers. My assumption was that the current information display of an energy monitor could be improved by adding an awareness of socio-cultural context of its users. In that way people can reflect themselves better with others they feel related to and might be motivated or persuaded to change their behavior.

In summary, I started off with the research question 'are energy monitors capable of providing meaningful information to users in order to support their lifestyle and therefore increase the acceptability in changing behavior among users?'

Also, I wanted to broaden my design vision within the subject of semantics and believed that this project could provide some room to explore this area. During this project I have simultaneously read 'The Semantic Turn' of Krippendorff but unfortunately did not find any relevance for it during my research project.

A personal note

Before I started this with project I already had gained a lot of experience within persuasive and sustainable design during my internship at Philips and therefore wanted to look whether I could make the current energy monitors aware of socio-cultural context in order to provide more meaningful information to its user.

During my project I had been receiving very valuable insights from the area of social sciences. Curtailing energy consumption through behavioral changes prompted by current persuasion models do not seem to be efficient enough in reducing our energy consumption. Instead, we still witness an increase in demand of resources, also known as a 'Jevons Paradox' or a 'Khazzoom-Brookes postulate'. (Hertwich, 2005) (Herring, 2008) This theory states that efficiency rather leads to an increase of demand in resources rather than diminishing it. We can witness this aspect throughout history and currently in our own society where efficiency seems to increase along with consumption of resources.

Furthermore, energy monitors themselves seem to be only effective until the user has acquired the skill to manage and prevent electrical waste. (Pierce J. O., 2008)

Generally users are depended on the cooperation of others and the infrastructures of their homes. In addition, it has been pointed out that people rather conserve out of financial motivation and maintaining comfort rather than from an environmental perspective. (Hargreaves, 2010) (Lavrysen, 2010) (Pierce J., 2010) (Chetty, 2008) This partially causes that same energy efficiency paradox from the previous paragraph. (Herring, 2008)

Although I believe that people are willing to become greener, they are not willing to give up their comfort and convenience within practices, especially when they are supported by a strong sense of social norms (like the perceived necessity of owning a car or flat screen television). This is due to our practices, which can be seen as a system of 'doings' that reoccurs in everyday life.



"It can only be attributable to human error."

Furthermore, after talking with an installation-consultant it became clear that most of our homes are not supporting the right infrastructure to start green initiatives. For example, most houses could do fine without a drying machine if they had the possibility to install a 'droogkast'. Unfortunately, these compartments need to be supported by the construction of homes, which has to be taken in account of by the architect who designs them.

Another example explains the rise in air conditioning as we have isolated our houses so well that heat can't escape, which is an excellent solution for energy saving during the winter but can be bothersome during summers. (Chetty, 2008)

A ventilation system within the roof could have easily overcome this problem but costs a lot of time and money when installed in existing homes. An air-conditioner is far more in reach of consumers to make the summer cool and pleasant within the home. Last but not least, people with lower incomes will have more trouble to adopt these green initiatives as they often cost a lot of money. In order words, we may have created a 'luxury lock-in' that is difficult to get out of without the proper support. (Chetty, 2008) (Jackson, 2008)

In that sense, it is harsh to blame consumers for their unsustainable behavior when there is little to no support in infrastructure, materials and social norms to make those significant changes. This overrules the information-deficit model of energy monitors, which states that by providing meaningful information people will become aware of their behavior and change it. (Wilhite, 1995) If there is not enough support within products and infrastructures, it is hard to change. (Hargreaves, 2010)

That is why, during this project, I decided to try and tackle our form of consumption issue from a different perspective. Not only because of the earlier described efficiency paradox, but rather to shine a different light onto sustainable design by looking for ways to alter our rituals and practices rather than making our ever increasing demand of resources more efficient or forcing people into a pro-environmental form of thinking.

In summary, this project will not state to shun the principle of energy monitors. On the contrary, energy monitors are a great tool to empower people with the skill to manage energy. Although a lot of research is done within this area but recent research has showed that energy monitors have a limited effect (avg-7-8%) and relies on a model that is considered extremely individualistic, withdrawing itself from everyday life. (Shove E. , 2010) (Ahmad, 2010) (Chetty, 2008) (Ellegård, 2011) (Hargreaves, 2010) (Pierce J. , 2010) (Aune, 2007)

Instead, I imply to also look at the origin of our unsustainable consumption, especially since industrial designers are configuring the practices of people through our designs. On the positive side, it has been suggested that designers also have the potential to transform unsustainable practices. (Shove E. M., 2008)

Practices, in this context, are seen as a system of doings that describes the everyday life of people or in other words: 'the accomplishment of routinized patterns of collective behaviors that is deeply embedded within our socio cultural identity and are therefore seen as 'normal''. Consumption in this sense is not a form of output but rather something that happens over time along with the execution of our practices.

Practice theory in essence recognizes that the exchange of use and values varies from one setting to another. This lends weight to the view that there is nothing about physical characteristics of an object and intention or skills of the designer that guarantees its place in a world of goods. In comparison, user centered design for example focuses on the individual experience through an isolated context while practice theory requires extensive understanding of how materials and practices evolve and circulate in everyday life by acknowledging that users are designers too. (Shove E. M., 2008)

As said before, practices are part of one's culture and define our systems of everyday life. (Reckwitz, 2002) I believe that studying this subject will greatly improve my understanding of the dynamics within society and I feel that it could be used as a bridge towards understanding successful system/service design. Furthermore, I needed to recognize that consumption full fills a certain role in satisfaction, comfort, convenience and cleanliness and is socially dynamic and active. It defines our identity and expresses it throughout all factors within society. (Warde, 2005) (Shove E. , 2003)



Due to gaining this new understanding of consumption, my literature study ended later then I intended in order to gain sufficient knowledge about this new area of research for designers. The approach of practice theory seems to fit perfectly within my vision that prefers this socio-cultural dimension within design.

I consider practice oriented design (POD) as an interesting method for systematic design. POD is currently carried out by just a handful of scientists and designers in the world. However, subconsciously practice oriented design has been opted by not only social scientists of consumer theories but even within our own faculty; Overbeeke, who have been opting for a framework in designing for (intelligent) systems or the faculty of Next nature, that strives to 'guide the growth of technology' while I also see possibilities for it within cultural design and service design. (Overbeeke, 2010)

Personally, I am also interested in how I can create meaningful services and systems for business from a practice oriented approach in order to transform society so I have put myself in contact with Eva Hopma for a possible FMP.

Considering sustainable design, by putting our 'behavior' in this context we might find delightful opportunities to both support people in their lifestyles and efficiently reduce demands in resources. After all, SOFIA is a platform that opens up a new infrastructure for the exchange of information and connection of devices, thus severely enhancing the skills of users in managing their devices. Such a change in technological regime provides an opportunity to transform practices. (Wilson, 2007)

Because practice oriented design is only led by a handful of people (the term originates out of 2005 and was not applied until 2008) I contacted Elizabeth Shove, one of the authors of Practice Oriented Design and the Design of Everyday Life, who followed through and forwarded me to a PhD student, Lenneke Kuijer, from TU Delft to aid me in understanding practices. She took 2 to 3 years to understand this subject and is at this very moment trying to master the subject in her PhD. She was quite surprised that I found this method on my own and recommended me to try and participate within a new EU project that will engage with the future of homes for my master Thesis.

From there on I chose to look at the combination of leisure and energy consumption and found that television is the number 1 appliance apart from the electric dryer that consumes the most energy in the household, varying around 8-10%. (Department for Energy and Climate Change, 2010 (July)) (KijkOnderzoek, 2010) If all the additional devices are counted that support watching television we can even raise that to a higher number.

To learn more about the socio-cultural background of television, I contacted Johanna Kint in order to determine the cultural impact from the domestication of television and whether we may find opportunities to intervene within this continuous process.

To find out more about the different contexts of use within television I initiated an exploratory research among households to keep a television diary on which 2 households were able to keep one on a regular schedule. However, normally one would perform long term user research and testing (e.g. context mapping) to find these opportunities.

After looking at the statistics of domestic energy consumption I saw a steady increase regarding the use of multimedia appliances. Television is starting to become a personal media center and attracts several other appliances to be installed around it such as gaming consoles, digital receivers and home cinema sets. We can see different unsustainable phenomena within this context; such as using the television for background noise or using your laptop at the same time.

Even though studies show a correlation between size of an object and its perceived energy consumption, people do not give up this type of behavior. (Schuitema, 2005)

Therefore, I designed a service that could help drop energy use while maintaining the comfort people get out of watching television, while in the recommendations I propose new ways of doings and comfort. One of the main features, trimming energy use of the screen when people are not actively looking at the screen, was tested within the home environment to see whether people would notice this service and whether they would find such as service obstructing.

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Abstract

In the EU, policy makers have been debating over carbon reduction for many years. One of the methods that pursue to reduce our carbon footprints is to raise energy awareness and stimulate energy efficiency through behavioral and attitude change. However, these same policy makers currently overlook the reasons why people consume resources, how these 'needs' and 'wants' establish themselves and evolve over time in our everyday lives, also known as 'practices. (E.g.) (Shove E. , 2003) (Hargreaves, 2011) (Chetty, 2008) (Stern, 2000) (Hertwich, 2005)

According to Shove, 'practices are defined as a coordinated entity of inter-related and mutually reinforcing 'components' (Shove E. M., 2008) In simpler words, a practice is a system of doing, existing out of 3 elements: conventions, materials and competences which are deeply embedded within society, rendering them to appear 'normal' and are therefore easily to be overlooked.

Practices are particularly interesting to designers as we configure the material infrastructures through our designs while proposing new ways of doings, often resulting in new needs and desires. It is important for sustainability to research this area as technological efficiency improvements may result in unintended outcomes that are often for the worse. (Scott, 2009)

SOFIA is a software platform that enables devices to become inter-connectable and exchange information from the 'Web' (Internet of Things), opening an up a whole new range of (multimedia) applications and control within the household. Revolutions in technological infrastructures like SOFIA are seen as an opportunity to transform our practices into more sustainable ones. (Wilson, 2007)

Therefore a study was initiated into a practice that is rising to be one of the biggest electric consumers within the household, the television. (Department for Energy and Climate Change, 2010 (July)) (Ministerie van Economische zaken, 2008)

During this project a service was designed that aims to diminish energy consumption while supporting the practices that are embedded within the use of television.

One of its features, dimming the backlight of a television when none is actively looking at the screen, was tested against users in a household setting to see whether subjects would notice the dimming effect and if so, how much of a negative impact it has on their viewing experience.

Project Process



Week 1 Week 2 Week 3 Week 4 Week 5 Week 6 Week 7 Week 8 Week 9 Final



SOFIA-project

The Sofia project is an EU initiative that will create a software platform for devices to exchange and manage information through the envisioned future of an Internet of Things. Sofia is bound to inflict radical change in our daily lives. Devices will produce and exchange information, become interconnectable and open up a whole new range of multimedia applications and control within the household. By making smart connections, a world of opportunities opens up.

The set context of the project was to raise awareness of resources through the provision of meaningful information towards the user, also known as energy monitoring.

Therefore I want to provide an insight in how the practice of leisure and television has evolved over the years and whether it is possible to provide socially acceptable interventions to reduce energy use through a frame of practice oriented design. Practices in this sense are reoccurring, bodily activities from everyday life that are influenced by social norms, mental image and skills of consumers; like showering, cooking or the way how we go to our work.

Looking from a practice perspective, SOFIA has a heavy impact on skills of people, enabling the skill to connect any device and integrate it within any system. Therefore I recommend putting further study in this method to see how we can support sustainable initiatives through SOFIA.

Literature Study

After the kick off of the project and exploring the context of SOFIA for a few days I decided to set my context into raising energy awareness. As I already had experience within energy monitoring and persuasive theories of Fogg, Cialdini and Dan Lockton. (Darnton, 2008)

My first hypothesis was that adding a socio-cultural context to an energy monitor would provide more meaningful information, thus enhancing its effect.

Finding a Context

- Study the field of semantics
- Find out what SOFIA is, what it means and will do
- Determine my own context.

Energy monitoring

- Current findings on energy monitoring
- Defining problems and opportunities
- Practice Theory

Practice Oriented Design Approach

- What are practices?
- Redefining the context, what practice has a need for intervention?
- Deliver a hypothesis and explore an appropiate research method.

Watching Television

- The emergence of television
- Cultural fabric of television
- Current trend in Television

Defining the problem

Within this chapter energy monitoring is introduced and knowledge is updated to the latest results to find out whether there are any problems and opportunities to be found and explored for this semester.

During this literature review I found that energy monitors have their limited effect within energy reduction.

Introduction

In the beginning of this project I chose to study the field of energy management and reduction (these terms are deduced to 'energy monitoring' on the following pages).

However, the recent literature led me to believe that energy monitoring alone will not lead to sustainable behavior and any further continuation would not add any significant improvement to the concept but will rather point to societal problems.

Again, I started to look at what energy monitors lack and whether there are interesting fields that could help to aid sustainability without forcing people into a certain type of behavior and pro environmental thinking. After all, how can we expect people to happily adept when we tell them their lifestyles are wrong and not support them with solutions that do not draw on their sense of comfort?

Whether consumers are able to adapt to sustainable behavior and how they are able has been a key theme within EU policy debates concerning the environment and CO2-reduction. One of the main goals can be considered to reduce the amount of energy that householders consume, however we should also look into ways on preventing it to flow into other channels. (Shove E., 2010) (Chetty, 2008)

Since Sofia is able to manage electrical appliances within the household I felt that there is a need to look into this matter as Sofia may have a large impact on the future of our homes. I assume that by embedding appliances within the Internet of Things has one obvious consequence, all current ones will have to be replaced or modified and the whole industry needs to be able to comply with this standard.

Energy monitoring

An energy monitor is a smart appliance that is able to provide its users with insight to their energy use and in some cases also give them direct control to it. Often, the monitor exists out of a lcd-screen that provides numerical output in either Watts, monetary units and CO2 in the total or local usage of electrical energy, gas and water. (Pierce J. O., 2008)



Still, with the possibilities to monitor energy consumption, monitors are hardly deriving any useful information. As said before, a great portion of energy monitors convey scientific units on the display such as CO2 and kWh. However, the majority of the people have very little understanding of these units and prone to feel more familiar with monetary units. (Wood, 2007) Not only that, but other sources point out that consumers are more interested in conserving energy for financial and comfort reasons before the environmental ones. (Pankowski, 2010) (Chetty, 2008)

This can be explained through the fact that most of these feedback systems are relying on an information-deficit model: Increased feedback will result in awareness or knowledge and will call for change in behavior and decrease consumption. The key issue with this philosophy is that it withdraws itself from socio-cultural aspects of energy behavior by assuming humans themselves are rational beings. (Wilhite, 1995)

The information-deficit model by Wilhite:



However, results of current energy monitor trials show an average drop of just 7% (3%>,15%<) while other issues such as load management (to equal out the peaks of energy use throughout the day) are left unattended. Prepaid systems seem to save twice more as more than normal energy services have with energy monitors. They conclude the survey with that monitoring does show a drop in energy use but doubt whether this drop is sufficient. Other factors such as domestic infrastructure, social structures and support from energy services seem to be much more important in determing the succes of energy conversation. (Ahmad, 2010)

With respect to that perspective, behavioral scientists pointed out that although conveying information is a crucial factor in changing behavior, information needed to become more socio-culturally aware, in this case meaningful and 'moral' towards the user. (Stern, 2000)

In studies (Pierce J., 2010) (Hargreaves, 2010) more attention was paid to this aspect. One of the highlights was a minimum income household that expressed a potential source of anxiety where one of the users constantly felt guilty of the money she was 'wasting', despite the fact that she was already diminishing her quality of life. The monitor that was being used in this example conveyed monetary units with a color scale according to a set budget (as with normal bank accounts).

As that example shows, energy monitors can have a profound impact on the quality of living, especially for the poorer consumers in society that do not have the finances to make significant savings (e.g. insulating their house) regarding their energy use. In this context, the monitor only makes them conscious about the money that was draining away. Less severe cases than described above express levels of agitation, stating that they are not willing to compromise on any more of their comfort and that they still want to be able to enjoy their lives.

Among the participants of Pierce, there was little interest of saving energy, even with the risen awareness provided by an energy monitor. For them, the savings they would made were not satisfying enough to consider changing their habits.

Chetty, a social scientist from Australia reports a similar case and warns for a green divide between users that are able to afford to conserve resources and those who cannot through system design and wonders whether it is possible to incorporate sustainable values within design, for example by not relying on traditional fuel. (Chetty, 2008)

Another highlight from the Hargreaves study displays a household that reenacts a 'thermostat-dictator' scenario; where one dominant user dictates others on how to behave and inflicts his choice of preference regarding temperature upon others. However, his actions were futile in effort but misbalanced social relationships within the household nonetheless. Hargreaves' study in the social context of energy monitors tells us that most of the times there is one dominant user in the household, most likely male. The Geo monitor was used for this study (found on the right at the above pictures). (Hargreaves, 2010)

A study conducted at Philips Research shows that cooperation is needed in order to succeed in sustaining new behavior and to keep harmony within the social structures of the household. If members of the household are not willing to participate it affects everyone, leading to the suspicion that the

energy monitor is as efficient as the household itself in both literal (e.g. insulation) as well as in social context. (Lavrysen, 2010)

Other studies that paid more attention to the socio cultural context added sensitivity to social norm to the provided feedback of users, by creating tailored messages in order to create new social norms. In the end, it was hoped this would motivate individuals to adopt a pro-environmental mindset. (Foster, 2010) (Barr, 2008) While the study of Foster seems to be influenced by a Hawthorne effect, several critics have argued that such approaches are extremely individualistic and fail to recognize in which social relations, material infrastructures and context are intrinsic to our social practices thus our everyday lives (Shove, 2003) (Hargreaves, 2010) (Southerton, 2004) (Hertwich, 2005) (Pierce J. , 2010) (Spaargaren & Martens, 2005) (Ellegård, 2011) (Elzen, 2004)

James Pierce, a HCI researcher in the domain of sustainable technology points out in his monitoring studies that it is difficult to forcefully introduce new technology and policies into people's homes. He advises that in order to reach populations that do not have the intention to conserve or use energy monitors it might be necessary to gain a more nuanced understanding of the motivations and values of users. Furthermore, users of energy monitors seem to lose interest over time as their skill increases while the system remains the same. In conclusion he proposes to approach energy monitors as a type of training device that is no longer needed after certain behavioral changes have settled, as the classic behavioral model suggests. (Pierce J. O., 2008)

Discussion

In conclusion we can state that, although energy monitors do have the potential to reduce energy waste, it has trouble to adept itself towards the socio-cultural context in which we all live in. Its display of units seems to lack meaningful information while the interaction of the monitor seems to focus mainly to one type of user while cooperation of the whole household is required. In addition, users of pilots point out that they are mainly motivated to save energy in order to save money and in addition to that are certainly not willing to give up their sense of comfort because of that.

Because of this gained awareness I continued further in studying how energy monitors could adept to these socio-cultural aspects and what method would be the most befitted. This time, more general literature was considered instead of empirical to find other opportunities.

Note: During this phase I had studied different persuasive techniques for embedding the socio-cultural context within energy monitoring and was ready to design some paper prototypes until I discovered practice theory, which will be discussed in the following chapters.

Persuasion and the Socio-cultural aspect of energy monitoring:

In theory, energy monitors have heavy potential in reducing the electrical energy waste that modern society is currently confronted with. (McCalley L.T., 2002) As said before, the central assumption of these energy monitor studies is that the provision of feedback will raise awareness and thereby stimulate the rational decision to cut back their consumption to reduce costs or carbon emission. (Wilhite, 1995)

Over the last 40 years the field of environmental psychology has made numerous attempts to construct models of human behavior by looking at an individual beliefs, attitudes and values as the predictor and director for pro-environmental behavior by approaching users through a rational process, just as with the concept of the energy monitor. Famous theorists of persuasion and behavioral change that are sprung from this discipline range from Aizen and Cialdini to Fogg and Lockton. (Darnton, 2008)

The majority of these theorists posit that behavioral intention, which is the initiator of behavior, results from one's belief and attitude towards that behavior, control and the perceived norm towards that subject. In short, if the necessary components can be identified and modified, behavioral changes will flow throughout an individual's lifestyle. Stern however, recognizes that individuals do not exist in a social vacuum and, that in some cases the surrounding context overrides all other factors. (Stern, 2000)



Fogg's Behavioral model (Fogg B., 2010)

Recently, this context has been taken in account to by creating new social norms through the use of social media. (Foster, 2010) By using social media intervention it is hoped that individuals will be motivated to adopt these desired behaviors. Some applaud these new types of social marketing, hoping that the audience is more willing to adopt behavior changes through these channels. (Barr, 2008)

Still, these types of systems keep presuming that environmental damage is a consequence of individual action and that by providing more specific information or more appropriate incentives people could choose to adopt `pro-environmental behaviors'. Supported by this notion, the UK Department for Environment, Food and Rural Affairs (DEFRA) developed a framework (DEFRA, 2008) for this system that depends on a mixture of positive motivators and negative barriers.

As Elizabeth Shove notices, the advantage of this framework is that it generates a very clear agenda for effective policy, but is fails to recognize that the framing of a context remains unclear. In the end, anything can pass as either a motivator or barrier and behavior is perceived as something that is shaped by countless of factors. Furthermore it treats context as static and hermetic, a binary phase that does not interact with other forms of context. (Shove E., 2010)

Cognitive models eventually creates an environment where solutions only exist out of opting energy efficiency by adopting green technology and simple behavioral change such as switching off the lights when leaving a room. But we must recognize that these cognitive models only work in different contexts, such as designing for improved safety, which aims to eliminate different situations.

As Bakker suggests "a higher order of inquiry is needed when addressing the topic of sustainability, which exists at a system level where social and material dynamics play a significant role. Within fast changing socio-technical systems, design approaches that prescribe certain behaviors limit the possibilities for different usages and risk too much investment in a one-use scheme." (Bakker, 2009)

In order to comply with goals set by the (future post-)Kyoto protocol, there is a need for a societal and economical transformation that affects peoples growing demand in standards on how they should live and consume. (Heyzer, 2011) The behavioral model however falls short in seeing how daily life evolves. Societal transformation would require new markets, practices, regulations, infrastructures and cultural meanings. (Elzen, 2004).

Another major issue regarding energy efficiency is the proposition stated by Herring. He writes that consumers are likely to spend their financial saving into other forms of consumption. Herring even goes as far as stating that the energy that we save can possibly flow back to less developed parts of the world, allowing them to enjoy higher standards of life and increase their consumption, accelerating the depletion of resources even faster. He concludes his research by stating: "..Before we can change our energy habits we must change our notions of comfort, convenience and cleanliness". (Herring, 2008)

Discussion

Currently, the principles behind energy monitors ironically seem to miss an awareness of socio-cultural awareness while opting to raise energy awareness among households. Without the awareness of their environment, energy monitors are bound to be perceived as useless and forcefully annoying, especially when they are aiming to conserve energy through emotional persuasion. (Pierce J., 2010)

This is mainly caused by the notion that cognitive models treat the social context of our consumption as a static, hermetic vacuum, assuming behaviors and needs do not change or interact with other elements in our social lives. (Shove E. M., 2008) In continuation, the ground principles of energy monitoring seem to over-estimate the environmental motivation of users. (Hertwich, 2005)

In particular, the current awareness for sustainability approaches are "excessively individualistic and fail to appreciate the ways in which, variously, social relations, material infrastructures and context are intrinsic to the performance of social practices and not merely variables among many others within individuals' decision-making processes." (Hargreaves, 2011)

An interviewee of Hargreaves initiated a spark for me to look for other directions. He stated that he was not willing to give up some things, like his aquarium, doing cooking when he wants to and watching football on television. To gain more insight on this notion I investigated a paper about leisure which mentions that people prefer to do things at the same time as others (e.g. going on vacation to France during august, or working from 9 to 5) (Pintea, 2006).

It had opened up my eyes towards the notion that consumers are bound to social structures that have been inherited from culture, infrastructure and skills. From that moment on I found the material of Elizabeth Shove really interesting, which will be explained in the following chapters.

In conclusion, in order to design for sustainable behavior and to make sense of resources, one of the primary reasons policy makers introduced energy monitors, we first must understand how our patterns of consumption have established and how they relate in social context regarding status, image and use over time.

Behavioral change should therefore not only be reached through raising awareness or persuasion to sustainable behavior, but rather focusing on transforming practices to make them more sustainable (Southerton, 2004). Social sciences seem to provide us with a semantic approach by looking at consumer practices, studying how our unsustainable behavior starts in the first place. In the next chapter we will take a closer look at this approach.

Hypothesis

Looking at my previous conclusions, I can state that adding a socio-cultural context to an energy monitor will not likely add more meaning to the information of the user. Therefore I <u>reject my first hypothesis</u>, reframe my context and start a literature research in consumption and practice theories to investigate what drives people to consume and how practices are established. I believe this will provide much more insight into finding opportunities within sustainability.

As I was unfamiliar with consumer and practice I had contacted Elizabeth Shove, author of 'The design of Everyday Life' herself who put me through towards Kuijer, a PhD student at TU Delft who is currently investigating the application of practice theory within design.

Project process



Consumption

During the development of my vision I have been putting a focus upon meaning, utility and sociocultural context. Because of this, it was brought to my attention that none of the persuasive designs considers why people consume, which is an opportunity as users from qualitative studies associate conserving with negative emotions and images. (Hargreaves, 2011) (Chetty, 2008) (Pierce J., 2010)

Furthermore, this project is called 'Semantic Resources', suggesting that we are about to make meaning out of resources that currently have none. But if I am not able to acquire any understanding on how the consumption of these resources are established then how are we able to make sense of the resources themselves?

Alan Warde, one of the social scientists that continued the research on practices and consumer theories of Giddens, Bourdieu and Reckwitz, provides us with the following reasons why people consume:

1 it fosters meaningful work	7 it supplies intellectual stimulation
2 it promotes the aesthetic attitude	8 it provides refreshing entertainment
3 it facilitates social rebellion	9 it sustains comfort
4 it is enjoyable and pleasurable	10 you can always get what you want
5 it nurtures possessive individualism	
6 it supports socially meaningful practices	(Warde, 2005)

Looking at these points, we can partially explain why persuasive design may fall short when trying to promote sustainable behavior. There simply too many factors to overcome in order to divert the aimed behavior. It also tells us why certain 'bad' behavior such as having 2 cars and regularly use can arise and embed themselves within practices. Especially with (invisible) technological systems, such as electricity, it is easy to become dependent on the resources they supply and hard to overcome this dependency.

Warde describes this overall trend in resource consumption as a complex combination of efficiency improvements, lifestyle changes and changes in the systems of provision. For example, the emergence of out-of-town superstores and reduction of school buses and the distance to work have increased car use. Jackson states that the simple assignations of 'luxury fever' are all very well but getting beyond this to a point where it is possible to understand human aspiration and to develop social structures that respond efficiently to human needs are key to delivering sustainable consumption. (Jackson, 2008)

Eventually, this theory of consumption leads to a practice theory, which precisely focuses on routines and the collective and conventional nature of consumption (Warde, 2005) and how artifacts are involved in establishing new practices. (Shove E. M., 2008) Shove in particular has been one of the running advocates to enhance designers with this knowledge, in 2005 she developed a practice oriented design method and inscribed it within her latest book, 'The Design of Everyday Life'. (Shove E. M., 2008)

Practices

Now that we have reckoned the different facets of consumption we need to figure out what exactly a practice is:

A "practice" (**Praktik**) is a routinised type of behavior which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, "things" and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. (Reckwitz, 2002)

"the principal implication of a theory of practice is that the sources of change behavior lie in the development of practices themselves." (Warde, 2005)

Still, this remains very vague to work with as designers. Elizabeth Shove describes practices as *'the routine accomplishment of what people take to be normal ways of life'* and breaks it down into the following 3 parts:



If this routine cannot be accomplished, the practice eventually will break links and start to fossilize while other will evolve and make new links which are carried over the spatial dimension of time:



In this diagram you see: (A) The present practice and (B) the future practice exchanging the 3 parts described above, determining whether the practice will survive/evolve or fossilize..

1. These can be new acquired materials required for imagined ways of doing.

2. a balance between having and doing, here the practice will simply transpire

3. New or not yet realized ways of doing, new found uses for the material already owned can lead to new practices (Shove E. M., 2008)

So central to practices are 'doings', such as cooking, rather than products, that are used during the practice. The 3 different elements displayed above can be seen as following:

- The image, norms and symbols of a practice are collective ideas of society regarding what is 'normal'.
- Competences are skills and knowledge that can be embedded in both products and actors.
- Stuff & Materials represent the things being used during the doing of a practice.

Looking at these elements, we can describe designers as techno-social creatures that are able to configure a practice as we have control within configuring the materials, user desires and the ability to propose new ways of doing. This can be seen for example within the evolution of the mobile phone that on this day barely represents the communication device that it used to be, often remarking the joking 'But can it make calls?'. An example within this form of mobile communication regarding a newly emerged practice is the SMS, introducing a new form of communication, language and rules.

So in summary, I envision that designers are advocates that support users in their way of life and have the potential to transform current practices, ideally through participatory design. By emphasizing the relation between having and doing we can see that consumption is merely an factors that transcends over time rather than an activity on itself. In other words: "...designers need to recognize critical moments when socio-technical regimes are openly changing and can be most easily influenced." (Wilson, 2007)

I believe that SOFIA is such an opportunity and therefore practice theory is an excellent approach in looking for sustainable interventions within the principles of SOFIA.

Within the systems of practices we can find methodologies to diminish the use of energy focused on interaction design especially. James Pierce, a HCI researcher specializing on practices provides the following conceptual framework:

1. **cutting**—powering off or putting in an extremely low power state, e.g., powering off the television or putting it in a standby state.

2. **trimming**—using a "lower" setting (i.e., more energy efficient setting) when using a product, e.g., lowering the thermostat setting, or washing clothes on "cold" rather than "hot" temperature wash cycle.

3. **switching**—using a more energy-efficient product in place of product with similar but different functionality, e.g., using a ceiling fan instead of an air conditioner.

4. **upgrading**—acquiring a more energy-efficient product to replace a product of the same type, e.g., replacing an older refrigerator with a more energy-efficient model.

5. **shifting**—shifting use to a different time or place, without necessarily reducing the total energy consumed by that product (but reducing energy demand; see, e.g., e.g., washing clothes at night during off-peak hours of low energy demand.)

In addition Pierce mentions defaulting and relabeling, enabling the efficient options on default or designing interfaces that make the energy consuming options as exceptional. (Pierce J., 2010)

These guidelines touch bases with the 'Design with Intent' philosophy of Dan Lockton, an interesting, promising 'design for sustainability' toolkit. I will discuss his toolkit at the end of this report to explain the main difference between practice oriented design and DwI. In the appendix I will add the DwI cards to be spread within this university.

Because we have limited time to extensively study a practice and to transform it, I had decided to use the framework of Pierce when looking at a practice. The ability to completely divert a practice requires long term, intensive qualitative user studies and extensive additional socio cultural research would have been required. The framework of Pierce however proposes adjustments in the configuration of materials of a practice, making it easier to create a focus while designing.

Conclusion

A practice-oriented approach is intended to guide the project into looking more broadly and having a systematic approach. By looking beyond individual products and users we find integrated routines of practices that unfold everyday life and are build out of elements of conventions, competences and materials. This perspective sees people as practioners rather than consumers, focusing on the organization of the previously described elements and enables us to ask different kind of research questions.

With this insight we find that those 3 elements are key in shaping our current resource intensive behavior and provide us with a methodology to design an intervention that might be capable in transforming a practice into a more sustainable one.

Project Process



Scope & Focus

Now that we have determined our approach, it is time to find a context within the household that is an interesting subject for a designed intervention. First, I investigated several statistic publications from The Netherlands & UK to find out how energy consumption divides itself within the household and how it is developing itself. After finding a system that needs intervention we will investigate its socio cultural history to see how it is integrated within our practices. My main questions were:

- What are unsustainable aspects of leisure in the context of multimedia/communication devices?
- What influences the acquiring and consumption of these devices in these evolving leisure practices?
- How has leisure evolved over time?
- What are the sources of conventions (image), objects and skills

Looking at the current situations in households

When we look at how modern households are currently consuming energy we can see that multimedia devices are growing to be a major concern regarding energy consumption. On one hand we see that energy consuming desktops are starting to disappear and are being replaced by laptops, which is much more efficient energy wise. Unfortunately, we can also witness a huge increase in the number of laptops per household so it is important to monitor this development.

Looking further also witness an increase of flat screens television and additional devices that are connected to television (e.g. digital receiver, game consoles, cinema sets). (KijkOnderzoek, 2010) (Department for Energy and Climate Change, 2010 (July))





⁽Department for Energy and Climate Change, 2010 (July))

As Schuitema (2005) states, the size of an appliance correlates as an indicator for people as subjective measurement to determine how much energy an appliance consumes. Still, multimedia devices such as television systems seem to be regularly used appliance within the household, on its own consuming nearly 10% of all the electric energy used by a household. If we look at television as a system for multimedia (Games, receivers, cinema sets etc.) it consumes nearly 25% of all the energy and continues to grow. (Department for Energy and Climate Change, 2010 (July))

In conclusion, the system of television seems to be interesting for this project. Lights, electric chargers and stand-by modes have already been big subjects within designing for sustainability while television has not. Also, within the principles of SOFIA, television seems to be an interesting system to connect with, being a portal for information/media.

Therefore I pursued a research into the domestication of television to understand the dynamics that are embedded within watching television, hoping to find opportunities. I contacted Johanna Kint to enable myself to immerse quickly into the subject. Furthermore, I initiated an exploratory research into the use of television within the household which will be all discussed in the following chapters.

Television

Looking at television, we can distinct two different purposes within the system: Leisure and reflection with society. The practice of watching television will be dissected in this chapter to understand the dynamics of television and to find design opportunities.

As for materials and infrastructure, the contemporary home use television for more than viewing television programs at set times during the day. People play video games, use internet, cinema, radio and watch films and sporting events on demand via newly emerged services. Television starts to evolve as a personalized media channel within this information age, which also may increase the amount of televisions within a household.

A downside effect of this evolution is being suggested by that heavily energy intensive consumption is being encouraged by design and marketing of televisions and the services that support them. The study points out that householders are currently reconfiguring their homes and lifestyles to fit the encouragements. (Crosbie, 2008) (Kortti, 2010)

For example, flat screens are marketed with the proposition that people can use their new television as a picture frame when not actively watching television or hook up their computer to the television, configuring the television into a computer monitor, including the 'active screen saver' function. People actively respond to this in the study, imaging that televisions should 'disappear into the background' of the household when not in use. (Crosbie, 2008)

this phenomena fits perfectly within the practice theory discussed earlier. New, imagined ways of a practice are proposed, desired and eventually acquired and domesticated. To discover how television got domesticated and evolved I performed a historical study to understand the social dynamics of television and find possible opportunities for intervention within the system of television. In order to quickly accomplish this state I contacted Johanna Kint who offered me the PBS/BBC Documentary People's Century. Along with that I read two other studies on the same subject to see whether they confirm each other.

The domestication of television



During the domestication of the television we see that television was not only letting consumers get used to a product but we see in the process that both consumer and product change. Following People's Century episode 'Picture Power', we see how television gradually takes on different forms. At first, television is there primarily for news and connecting different nations by sharing their historical events. Politicians are suddenly able to convince vast audiences and alter the democratic process, while commerce suddenly finds a new channel in which they can promote their products.

Soon, television started to become the main source of news and commentary, pretty much as internet is developing itself now. It was seen as a source of inspiration and education, one that would make a better world. And after the second world war, television started to also play a central part in our forms of leisure, introducing entertainment through public television, cinema and video formats. Throughout time, television has acted as catalyst for the emergence new values within society, activism and political change.

Looking at infrastructures, the documentary describes that people had special television rooms during the introduction of television and often friends were invited to watch as it was a novelty to have. Suddenly, a television was an object of status while over the time it became a social norm to own one. Nowadays, I found that is much more common to have the television within the living room near the place where people gather the most..

In terms of function, Television now is becoming more a portal for entertainment embedding itself within the fabric of gaming, internet services, cinema and music. USB, Blue-tooth and all other sort of

computer technologies are being embedded within television to act more and more as a media platform, allowing to connect services in ways very similar to the intention of SOFIA.

In terms of values, television introduced a new form of consumerism among a generation that was raised with television and exposed to a new era of advertisements and lifestyle television. Suddenly youngsters were able to connect and subcultures began to thrive within western society.

But television also broke down other practices, church ceremonies needed to be altered in duration and time slots in order to sustain the numbers of presence. It soon became more difficult to meet up with people because of television shows that others did not want to miss. One person mentions that they do also could not call the people that were not attending meetings as it would disrupt their show (new rules that emerge). But television was also used to arrange meetings with others, by implementing it into public places such as bars which suddenly regained popularity. Other socio cultural studies of television in Finland also seem to confirm this. (Kortti, 2010)

Era of scarcity 1956–87	Era of availability 1987–2001	Era of plenty 2001– Collective watching of TV and DVDs		
Collective watching	Collective watching of TV and videos			
Change in visiting culture	TV as background noise	TV as background noise		
The influence of TV on other leisure activities	The influence of TV on the timing of daily activities	Priorities in the timing of daily activities		
The influence of TV on the timing of daily activities	Time management through the use of videos	Time management through downloading and the use of DVRs		
Oral culture (chatting and gossiping about TV programs)	Oral culture (chatting and gossiping about TV programs)	Oral culture (chatting and gossiping about TV programs and on the internet too)		

Table 1. Television in Social Interaction

(Kortti, 2010)

The BBC documentary also points out that these practices do not necessarily evolve the same everywhere. In India, it was exploited much more by religion as they suddenly had the ability to create lively stories by using special effects and actors to reenact the original story. These actors were started to be seen as religious symbols throughout the nation, eventually leading them into a political career. Bollywood actors are still seen as one of the most important role figures for Indian society, much more than we would see here.

Conclusion

In the end we may conclude that domestication is not only about a consumer getting used to a new product and learning to use it. In the process, both consumer, society and product may change, and the result is not always what was anticipated by the producers. The relationship (and industry) with our

television is a strong one, which does not divert itself easily. However, the system is starting to become a personal multimedia system that is starting to be a growing concern energy wise.

Therefore, it is best to design products or services that reconfigure the use of television rather than trying to diminish the use of television itself.

Exploratory Research

To find out how television is used throughout the day, how much of the time people are actually watching and why I initiated a small exploratory research along with the previous research. Although context mapping was preferred for this type of qualitative feedback I did not have the time myself to operate within such a time frame recommended for this technique or intensively interact with subjects to sensitize them through use of cultural probing, storytelling and the creation of workbooks.

My assumption is that people are often not actively looking at the television when it is turned, either leaving it on as background noise or leaving it on for others as an opportunity to see something interesting. In summary, my research questions were:

- What motivates people to watch television?
- Do they turn the television off after watching?
- Are they doing any other activities in the mean time?

In the end, I had approached several households of different backgrounds with a diary that they needed to fill in to monitor their use of television. The only criterion was that the household needed to exist out of partners with children, as they are expected to provide the richest information concerning energy use. (Lavrysen, 2010)

By registering their consumption pattern and by finding out when, why and for how long the television was used I hope to find opportunities to reconfigure the use of television through the framework provided by Pierce. I made a verbal consent with them to register their patterns for the means of scientific research. Because a verbal consent is very difficult to legally prove I excluded their full names and have only used first names.

Household number 1 exists out 4 people, husband and wife and their 2 sons entering their late teens. The second household exists out 5 people, husband and wife and their 3 teenage daughters.

In addition I have used myself as an observant within normal household situations when visiting others to gain inspiration. (this was based on the reporter technique found within cultural probing) This form of information gathering might seem biased. However, I would have preferred to use more intensive research techniques but this was time wise impossible to perform so observing the daily life of others during my free time was the most efficient way of getting input.

In the end, only 2 households were able to register their television use for a week. Still, this information and the information from what I have observed myself provided enough possibilities for designing an

intervention as they were confirmed by other studies. (Crosbie, 2008) (Kortti, 2010) The diaries are added within the Appendices.

Discussion

Looking at the diaries and performing a clustering method upon the data, we can see that television is often used as background noise and 'coziness', also confirmed by the previous mentioned study. Furthermore news is often watched accompanied by a laptop. Group viewing is more present at the household with the teenage daughters, which might be explained due to age and social structure within that household. However, comparing this to the study of Crosbie or Kortti, this should be more seen as an exception, pointing out how different practices can be within everyday life of people.



Clustering diaries



Finding design opportunities

Project Process



Design

From the earlier performed research we were able to conclude that altering behavior found within the construct of everyday life is not as simple as it may seem. A system such as the television is currently deeply intertwined within daily life, providing a lot fulfillments of consumption that were described by Warde.

Furthermore the television provides an infrastructure for other appliances and was able to create new rules and norms within society. Looking from this perspective we can see why watching less television can be an impossible accomplishment for people, especially as the rest of society does not comply with this reconfiguration.

By looking at the results from my exploration I assume that people often use television as means for 'background noise' and are not consciously looking at the television. Still, looking from the perspective of practice, it provides them a sense of comfort and satisfaction. However, the backlight of a television is the most consuming part of the appliance and may not be needed during the earlier describe state. (Katzmaier, 2010)

After brainstorming with help of the framework provided by Pierce I found that within the moments that people are often not actively looking at the television, a lot of energy may be saved by either turning off or dimming the backlighting of the screen, so called 'trimming'. Computer monitors already implement this feature when not in use but these monitors can register activity of the user. (Pierce J., 2010)

Even within the difference between televisions and computer monitors one may witness how practices have transformed the monitors different from each other as the early computer screens needed the implementation of a screen saver to prevent phosphor burn in. Later on, screen savers transformed into forms of entertainment and stand-by mode of the screen. Rationally seen not needed anymore, screen savers are still widely implemented within computer monitors. According to Crosbie, this form of entertainment (e.g. slide shows) is currently also proposed to users of television, creating new unsustainable patterns. (Crosbie, 2008)

Therefore, my proposition is to design a service that registers the presence and activity of users to determine whether the backlighting of the television may be dimmed or turned off. Furthermore it could also configure right amount of the brightness of the television according to the environmental brightness of the living room. We will look further into other possibilities within the last chapters.

For now, we will use a camera that tracks faces to determine whether people are actually looking at the screen. My next research question will be whether people will notice this effect and whether this is found to be acceptable or not.

My assumption is that by dimming the backlight of the television, a large amount of energy can be saved. My hypothesis within this project will be that people will not notice a significant difference in their viewing experience.

Hypothesis H0: There is no difference within the viewer's experience with or without my design

H1: There is a negative impact on the viewer's experience when the system is activated.

Prototyping

As I want to see whether people will notice the effect of dimming the screen and they will perceive this I designed the following system interaction for the prototype of my experiment.



How the software of the program should work:



For my prototype I acquired a Microsoft Lifecam VX-2000 for video input. A Kinect camera would have been an interesting option but software support is still in early development thus was not considered during this project. Within the living room setting, a Panasonic Viera was used (82 cm, LCD).

My first iteration was manually adjusting the brightness of a video, displayed on an external screen to determine how the effect would be interpreted. This was done with some students and effects were barely noticed. Of course, because I was the one who had to anticipate not all trials were successful.

During the second iteration, within the processing of the video input I tried to use Sketchify in the first stage of development together with the open-sourced software OpenCV. OpenCV software is able to track eyes and faces and support a wide range of webcams, including mine.

In addition, Sketchify seemed to be the ideal piece of software to use as it allows to capture your screen desktop and perform different actions upon it. In this best case scenario I would have been able to allow subjects to choose a show to their own preference on <u>www.uitzendinggemist.nl</u>, allowing more immersion during the experiment.



However, the OpenCV libraries of Sketchify seemed to be unable to work with the operating system of my laptop. To solve this problem I informed Obrenovic (the author of this software) within this faculty to find out how I could overcome this problem.

Unfortunately, he had no solution but to recompile the OpenCV libraries within Sketchify and this could take up one to two weeks. Therefore, I continued my prototype within Processing, which unfortunately showed exactly the same error. Processing was unable to work with new versions of OpenCV while the older version were unable to work with Windows 7. A lot of OpenCV users seem to have this problem.

Fortunately, Max/MSP seemed to do the trick. This visual programming software allows rapid prototyping and enabled me to quickly develop a working prototype. The only downside is the lost ability to capture the desktop screen, so instead quick time video clips had to be used during the experiment. This affected both resolution of the videos as the amount of choice. The code of the prototype is found within the Appendix.



Experiment

My assumption is that this service will have no profound impact on the experience of the viewer, therefore the hypothesis will state: "There is no significant difference in the experience of watching television when using a service that trims energy when people are not actively looking at the screen."

As we are dealing with a null hypothesis my alternative hypothesis is: *"There is a negative impact on the viewer's experience when the system is activated."* It is not needed to see whether there is a positive effect from it as this would not influence its acceptance among people negatively.

My aim is to confirm this hypothesis through the collection of quantitative data in the form of a questionnaire that is performed retrospectively. As there was limited time left (1 week), I wanted to collect data from 7 subjects, which will also act as a control group so 14 samples will be taken in total.

To determine the type of study, data collection and sample size, the book 'Research Methodology' was used. (Kumar, 2011)

Collecting data

The population of this experimental study will constitute out of everyday persons from the minimum age of 18 years old, this because of any possible legal rules which I might not be aware of. The aim is to let each subject watch 2 videos, one with the system activated and the other without to act as a control group. In between these videos, there is a short break if needed. So 7 subjects, 2 samples each. Samples are acquired accidental but do require a television within their household as they are our target group. I wanted to contact an expert to calculate the exact sample size, but he was unfortunately unavailable at the time.

The experiment will be acted out within a living room setting and during the viewing of the video subjects will be allowed to read or do something else as long as they remain seated. They do need to remain seated due to variables such as sampling rate of the image processing, the environmental light that might change and the limited viewing angle of the camera.

Consent will be sought through verbal agreement and agreeing with the participation of the questionnaire. For subjects I have used people from the neighborhood that did not know any specifics of the project to prevent any influence. No sensitive data such as full names, occupation and income will be collected as it is unnecessary information for my hypothesis and can only obstruct the willingness for participation. The subject will be asked to bring along some reading material as a tool for distraction.

Questionnaire

As for the questionnaire, I used a framework that was once provided to me by psychologist Jettie Hoonhout at Philips Research. I have used her outlines to construct my questionnaire. First, in the introduction I thank the subject for participating and explaining that this test will take 5 minutes of their time at max and what the purpose is of the questionnaire. Then, I explain that agreeing to participate with questionnaire automatically means that their data from the previous experiment will be used for scientific purposes. The questions provides us insight in whether viewers experienced a change when the system activated and how much of a negative impact this had on their viewing experience.

As for the build-up of questions, I designed them so that I try to avoid false answers by the participants. One of the questions asks the participant whether they saw anything unusual during the experiment. If so, they are asked in what episode they have seen this phenomena and what type of distortion this was before asking how much of a negative impact it had on their viewing experience. In this order I am able to filter out the Hawthorne effect, a situation where a subject tries to improve their result because they are being studied upon.

The full questionnaire can be found within the appendix, together with the results. The questions that are asked:

- Introduction, explain that if they feel that they cannot answer a question, please feel free to explain self at the last question.
- Age, Gender
- Type of television, size. Multiple choice, subject is asked to estimate. Answers are ordered in a radio-button style so only one answer is possible.
- How many hours of television do you watch? (estimation, radio button style)
- Have you been watching the screen the entire two episodes? (Y/N, radio)
- If not, could you provide us with a motivation?
- Have you seen, apart from the low resolution (blocky image), anything unusual about the video clip? (if Y, 3 questions pop up)
- (If Y) During which episode did you see this? (1,2 or both)
- (If Y) What did you see? (Multiple choice with the option to create one your own.)
- (If Y) I think this effect was annoying (Likert scale)
- (If Y) Explanation of the effect they have seen and its purpose
- Is there anything you would like to add or remark?
- Thank you.

Experiment set-up / scenario

In the beginning of the experiment, the subject will be told to sit down and relax. They are offered some beverages and food at the beginning, in between and at the end of the experiment to make sure they are comfortable and are observed for any change in mood or attitude. Also, they are offered the possibility to read something when they don't feel like watching the whole video.

I inform them that this an experiment that looks at the experience of television and that they will be asked to fill in an online questionnaire later on and by participating in this experiment they agree that their data will be spread anonymously within the scientific community. Before the experiment starts I take a picture of the participant for evidence, if gotten permission (which was the case with all participants). These can be consulted upon request.

During the experiment I will be present at the other side of the room to provide both privacy as being able to monitor the procedure of the experiment. During this observation it will be determined how the participant is acting within the experiment. Important is to notice whether the subject is blocking the face, or whether there is a mood present that might influence the results. However, participants will not be disturbed during the test unless they have urgent questions.



The system will be randomly assigned to one of the two videos to see whether they will notice the difference and how significant the effect is upon the viewer's experience. During the experiment, subjects will be presented with 2 episodes of The Office. This sitcom conveys a lot of passive humor and I assume that it will be more likely to make people look at their reading material.

The questionnaire is hosted on limeask.com, the tool that was used is called LimeSurvey, who also provides free hosting up to 30 participants. As this experiment will mainly depend on the engineering of the prototype, a pilot study will be performed to filter out errors and obstructions beforehand. The subjects are able to perform the questionnaire right after the experiment on a borrowed laptop.



Pilot Study

The Pilot study was performed upon a two of my local friends to filter out any errors of the system and the set up of the experiment itself.

During these pilot tests I found out that the camera is heavily susceptible to direct sunlight, rendering it blind and that drinking or eating may make the camera lose its tracking (thus fading the brightness) and that 2 episodes of The Office (each approx. 25 minutes) was too long and uninteresting because of the lack of subtitles.

Therefore I decided to switch to a Dutch series (Gooische Vrouwen) and cut back the video to 2 sessions of 15 minutes. Also, when a subject has a cold it may influence the tracking when a hand is put in front the face so I will keep observe of whether someone has a cold or not or obstruct their face during the experiment.

The questionnaire itself was well understood and did not require any fundamental changes. It can be found within the Appendix. However, the pilot study made me realize how important it is to test the exact scenario before conducting a real experiment.



For all the results please consult the Appendix.

At the end of the experiment, out of the 7 subjects we measure an average age of 33.71 years old (SD 10.92). In the end, only 2 out of 7 subjects noticed the effect; of which one experienced a Hawthorne effect. This is most likely due to the influence of the previous participant, who knew each other. Not only did he experience different types of distortion, he also experienced them during the wrong episode, the control group. In conclusion we can therefore state that only one person did truly experience the service and perceived this as annoying (100% answered 5 'I strongly agree' on a Likert Scale). This was due to a pro-longed obstructing view of the face while watching.

Validity

Because we are dealing with a null hypothesis, officially I would have required to analyze the 'statistical power' before able to rightfully reject the null hypothesis. However, this did not fit within my time frame, which was largely taken by the additional literature study that was needed to acquire knowledge about practices. So I am aware I could have made a Type II Error within this study.

So, although the system did not work consistent on all subjects, its validity was pointed out during the final exhibition where the system worked fine. Some of the visitors tested it out thoroughly, feeling somewhat surprised when I showed them the system was working as they were unable to detect it.

In conclusion, more subjects would be needed to reject the null Hypothesis. However, we can state that when the system is activated while watching that this is perceived as annoying. To make sure that these events are unlikely to happen, we could think of a time-based filter such as seen within the traditional screen saver. How long this filter should be set on and the optimal amount of time for saving energy could be researched in a future study.

H0: Rejected (Possible Type II Error)

H1: Dimming when noticed is perceived as annoying.

Discussion

The overall conclusion of this project would be to rephrase the project initiatives. If wanting to provide sustainable initiatives, we should make meaning out of consumption rather than resources. If the SOFIA project wants to promote a sustainable lifestyle it should look into systems of our practices, offering the right infrastructures and skill set for users to promote sustainable consumption of both resources and appliances. As said before, energy monitoring will enhance the skills of people to conserve but are not capable of making significant changes on itself. It would be best to present sustainable initiatives on all fronts, thus looking at how SOFIA could reconfigure our practices.

Practice Oriented Design shows as a promising new perspective for designers, especially when designing for sustainable application within the everyday life of people. It shows why people consume and how certain appliances change over time, often in ways not anticipated. Practice oriented design is therefore a continuous process. Scott advices to look beyond contextual methods and focus groups and put effort in participatory design with methods such as context mapping. The material of Lenneke Kuijer at TU Delft should therefore be closely followed to witness the result of these approaches. (Scott, 2009)

However, the domain of practice oriented design does not end at sustainability, I see a lot more applications for this methodology, especially within the area of Service Design. Especially the works of Reckwitz and Alan Warde could be helpful.

The proposed design, a service that dims the backlight of a television, was found through exploratory studies and methodological frameworks, possibly reconfiguring the television into a more efficient system by enabling both material and infrastructure to change. It could even reconfigure leisure as people may be less quickly distracted towards the screen when the television is dimmed.

However, the experiment shows us there is still tweaking and testing needed within the system so that the effect of the system does not infringe on the viewing experience of viewers. More samples and preferably longitude studies are required to witness and optimize the impact of the system on both energy consumption as changing practice. Also, it is recommended to look into eye tracking methods to determine whether a user is really watching or not.

Other found possibilities of the proposed service are explained within the Concept Chapter, which proposes a new design for perhaps a future study.

Concept

As for a next iteration of the concept I propose a double lens camera for an optimal viewing angle of the living room. The position of the camera is preferably placed on top of the television so that people that are standing can be detected too. The base of the camera can rotate to a clipping mode so it can be attached to the top of the television.



Service Design

I believe this service would fit best in an information economy such as Google. Google Energy could provide this camera system for free in order to save energy for free or team up with stakeholders such as NUON, who is currently marketing how one can save energy as easy as possible through their own service. As income, the camera could create user profiles based on facial recognition.

Apart from the dimming feature of the backlight of the television I can envision the following extra services that may provide clever interventions:

- The types of programs and forms of media that are used can be monitored in order to create a database that is able to recommend new material to the user. In this way, you could stimulate new opportunities towards group viewing of television by recommending programs that everyone may like, reconfiguring the personal media system. Also, for information economies this could be a primary source of income.
- Through sensors and actuators, the system could adept the environmental lighting settings in order to adjust the brightness to the correct setting. This may enhance both immersion as it can save energy.
- It could register and show who has been watching television, making it a negotiation tool when reconfiguring conventions of television. This would rely on the same information deficit model as energy monitors but more specialized towards a certain context.

However, how much of this type of technology will be accepted regarding intrusion on privacy within the household has to be researched.

Design with Intent & POPD

As mentioned before, at request I will discuss the differences between the Design with Intent toolkit of Dan Lockton and Practice Oriented Design. The DwI toolkit seems to be rising in popularity as Lockton has initiated a tour to present his toolkit, which exists out of different categories that tickle the mind to approach sustainability from different perspectives with card decks.



However, these are clearly build upon on the cognitive models that we have described before, which might lock the designer into a context that remains too individualistic and is unable to offer and allow solutions to reconfigure a practice. These might work well within specific contexts that should not be able to change, e.g. within an interaction menu or public design in order to prevent unwanted scenario's.

In a socio cultural context however this problem will be a lot more complex, as users will not likely buy products that will limit them their use. Practice oriented design is much more suitable within that setting as it investigates the integration of that product within a system of doing, how it has evolved and how it is evolving. From this perspective it is much easier to configure products that are both attractive and effective in use.

In conclusion, both tools are valuable within design but should be carefully selected when designing. Both have to offer a lot to each other but require the designer to know how a practice is build up in order to be more effective. The Dwi toolkit can be found within the Appendix and is encouraged to be spread within the university.

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