The Art of Buying ‘ Good’ Light

A study of valuing in practice

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Abstract

Dette speciale skal med en forskningsmæssig indsats undersøge de praksisser, der ligger til grund for forbrugernes værdisætning af lys. Det skal, gennem et empirisk indblik i deres hverdagspraksisser klargøre, hvilke udfordringer der opstår og hvordan de udfolder sig i købssituationen. Dette er med henblik på at løse et konkret problem, hvori forbrugerne fravælger LED lyskilder til fordel for de ældre halogen, gløde og sparepærer. Problematikken er fremstillet af Dansk Center for Lys, der på baggrund af antagelser om dette teknologiskiftes udfordringer, ønsker kvalitativ data på feltet. Der ønskes mere præcist viden om, hvorfor de private forbrugere ikke optager LED i det ønskede omfang og hvordan dette kan afhjælpes.

Specialet indeholder en dybdegående undersøgelse af forbrugernes oplevelser af at købe lyskilder. Empirien er genereret gennem observationer, interviews og en workshop inspireret af Future Workshops. Efter grundig undersøgelse og analyse, er den genererede empiri overført til potentielle design forslag. Ved hjælp af prototyping og test på potentielle slutbrugere, vil dette speciale resultere i en endelig prototype, som har til formål at re-designe og ændre den købspraksis, der finder sted når forbrugerne køber lys. Formålet er, at købssituationen skal opleves nemmere og mere intuitiv. Dette skal opnås gennem en direkte intervention. Denne forandring skal bidrage i overgangen til LED lyskilder og altså øge optaget af LED i de private hjem.

Specialets forslag til direkte intervention, er en redesignet lyskilde emballage. Denne emballage er udviklet på baggrund af forslag fra forbrugerne. Specialet sætter derfor fokus på, hvordan at brugerinddragelse kan bidrage i produktudviklingsprojekter. Et produkt som dette, der har til formål at re-designe en købssituation, skal nemlig ikke kun have en funktionel værdi eller være æstetisk. For at den ønskede ændring kan blive en realitet, skal den kunne fungere hos alle feltets aktører, hvilket kan være en udfordring.

Specialet er skrevet i samarbejde med Dansk Center for Lys, som samtidig er aftager. Det er vores hensigt at specialet skal bidrage til fremtidig forskning på feltet.

Table of Contents

1 Introduction

1.1 The technology shift

Light is ubiquitous as it surrounds us all and is included in most of our daily tasks. Light is the prerequisite for our perceptive abilities and simply put, enables us to navigate without tripping over our own feet. This is why light sources are a necessary commodity in our private homes. We need light in our lives, whether it be functional bathroom lighting, cosy ambience in the living room or outdoor spots on the patio. How do consumers then choose the right light bulb for the right practice? What is behind the decision to buy either incandescent-, halogen-, energy-saving- or LED bulbs?

With the introduction of LED as the new and better light source, consumers now have even more light technologies to choose from. The traditional incandescent light bulb was phased out in 2012 as a household bulb and consumers are now forced to embrace the technology shift towards LED (Energistyrelsen 2013). Still, they tend to hold onto their old traditional light bulbs and disregard the LED technology as something appealing (Guldagger 2015).

> *"We are in the middle of a huge shift in technology, and LED-light will entail a revolution of the markets of light. But people want to choose something they recognise and then they choose a halogen bulb which resembles the traditional incandescent light bulbs the most…"* (Guldagger 2015)

The Danes are very happy with the traditional incandescent light bulb, and for many years they have been used to measure the effect of the bulb from wattage. With LED, the specification lumen has replaced watt as the reference to the strength of the light, and consumers are forced to understand this new numerical value. This has led to an unsuccessful transition towards the new technology and as a result, consumers preferably buy halogens or energy saving light bulbs as they look more familiar (Guldagger 2015). Why make the move to LED then? What are the selling points in the new technology? There are quite many. Longer life expectancies, low power consumption, no start-up time and cheaper electricity bills are some of them (Energistyrelsen 2013). Why are the consumers then, not sold on this idea? Is it due to a lack of technical knowledge, confusing specifications or unappealing designs? There are no simple answers, but the issues within this technology shift are something the lighting industry is well aware of. One of the organisations within the industry, is Dansk Center for Lys (The Danish Centre for Light) who also work with this problematic.

1.2 Dansk Center for Lys (DCL)

DCL is a national organisation, which figures as an information centre for the Danish lighting industry and consumers, which they have done since 1948. One of the overall aims of the organisation is to enlighten the Danes about what good and appropriate light is. However, DCL operates across various fields and puts a great effort into connecting actors with different viewpoints to share their knowledge within the field of light. This is done through courses, conferences, publications and debates (DCL 2016). According to DCL, light might be the most important factor in an indoor environment. Many consumers are just not aware.

Another aim of DCL is to strengthen the awareness of light's value and importance in the everyday life of consumers. DCL focuses on the connection between technology, wellbeing, energy, environment and design. They are both concerned with the private households and the use of light in more professional and industrial matters. Through these interests, it is their aim to continually maintain a relevant and critical debate regarding Danish light culture (DCL 2016).

The EU has a lot to say on the legislative field of light. One of DCL's tasks is to communicate the latest knowledge regarding technology, both EU directives and standards. DCL also figures as the Danish lighting industry's representative in international contexts. With a multidisciplinary background, DCL is a critical and constructive organisation, which is independent of all commercial interests. This gives DCL the opportunity to serve as a link between manufacturers, the electricity supply sector, public authorities and consumers (DCL 2016).

1.3 Uptake of LED

Dansk Center for Lys experience that the uptake of LED technology does not occur to the desired extent. CEO at DCL, Anne Bay (pers comm., 17 may 2016) has multiple suggestions to why this shift in technology seems so difficult to the consumer: Lack of knowledge, bad experiences with early energy saving light bulbs, fear of technology and tradition might be some of the reasons why consumers deselect LED, when buying light sources. Through dialogue with the organisation, we have been informed that they are interested in qualitative data regarding the issues on the technology shift. More particularly:

'Why do the Danish consumers not buy LED light sources in the desired extent and how can we make them buy more LED for their homes?'

This is the assignment that we are tasked to investigate for DCL. Where to start then? We choose to focus on the practice of buying light. In the following, we will explain our argumentation for this decision.

1.4 Why the practice of buying light?

In our attempt to accommodate the request from DCL, we will investigate the practice of buying light. However, we did not just simply arrive at that idea. As described in the previous sections above, there are speculations as to why consumers do not buy LED and why they instead buy other types of light sources. All of the suggestions and examples point in various directions, but they all have one thing in common: They regard the "buying of something." This empowers the significance of the practice of buying, and to accomplish our task from DCL, we believe in a redesign of this practice to show its worth. However, we would like to present some of the inspirational people that have helped us shape our direction and project. Through interviews with laymen who work with light in their professional lives, we will see how it grounds substance for our research design.

1.4.1 The professionals

Throughout this project, we have been in dialog with Anne Bay. She has been the starting point for this thesis. Bay works with light in her professional life and possesses highly qualified knowledge about the industry. We have held meetings with Bay and this thesis is based on the expressed issues and wishes from DCL. She has also had the role of a gatekeeper in this project, since we got in touch with other professionals through her. Anne Bay did not tell us how to investigate the practice of buying light, but rather stated her issues and request for qualitative data.

Our first interview was with Charlotte Louise Jensen, postdoc at Aalborg University CPH. Her knowledge regarding the LED-technology is comprehensive and she has done research within the field for years. She is one of the few Danish researchers who have researched light usage of private consumers. She did not investigate the practice of buying light, but rather the social practices taking place in the homes of the consumers. It is remarkable how there is not

much research done on the private consumers whereas the use of LED-light in professional relations is well documented. This is exactly the reason why DCL has interest in this thesis. Charlotte (pers comm., 19 May 2016) did agree on the problematic stated by DCL and was convinced that there is a lot of activity in the stores when the consumers are buying light sources.

Another researcher in the field who is one of our informants is Mikkel Bille, employee at Roskilde University at the department of Human and Technology. His main research field regards the human practices with and thoughts of material objects (RUC 2015). In connection with his postdoc, Mikkel Bille has interviewed more than 60 families, where he has compared Danish light culture with foreign ones. His first article about light was published in 2007 and he has been in the field since (pers comm., 3 August 2016). The aim of interviewing Bille was to gain an understanding of his projects. It was interesting to us, to understand how he perceives the field and how he experiences the consumers dealing with this more or less forced technology shift (pers comm., 3 August). After a discussion of our empirical data and a comparison of his work with ours, it gave us confirmation of the relevance of our work and opened for new angles on the data. Bille (pers comm., 3 August) underlined the importance of knowledge about the field. He told us how he experiences a frustration when buying light himself even though he actually does have knowledge about light.

Our final interview with professionals was held in Philip's headquarters in Copenhagen with a representative of the company. The aim was to get an idea of how the company considers the involvement of consumers in their design of light sources. Our main questions were '*how do they involve the consumers and what are their visions and hopes for this new technology*'.

The interview with Philips gave us a good idea of how they work and think about the practice of buying light. Listening to how Philips is approaching the market and the buying situation was very interesting to us. We could relate to many of their findings and vice versa. We found this agreement on design thoughts to validate our methodical work. At Philips, they told us how the packaging is their direct line of communication to the end-users. We experience how they strive to design well-functioning packaging to be placed in the stores and affect the practice of buying light (pers comm., 12 July).

Knowledge acquired through interviews and in cooperation with the task given from DCL convinced us that the practice of buying light is a good place to investigate and intervene to achieve change. All our professional informants supported our project design. Investigating the practice of buying light in this context has not been done before and the innovative take on the problematic was well received.

1.4.2 How do we understand the practice of buying light?

When approaching the practice of buying light we will investigate the practices where light is enacted. Being introduced to the field of Valuation Studies, we do know that when people are purchasing goods, they do not arrive at the stores without any expectations (Miller 1998). Their actions in a buying situation can be shaped by practices, which takes place outside the stores and often in their own homes.

Studies conducted by the anthropologist with focus on material culture and consumption, Daniel Miller (1998) suggests how consumers decide which groceries and clothes to buy, based on their ongoing relations with family members at home. "Shopping is primarily an act of love that in its daily conscientiousness becomes one of the primary means by which relationships of love and care are constituted by practice." (Miller 1998).

This indicates that shopping is a practice in which love and care is manifested. In his article "Making love in supermarkets, 1998" Miller observed how housewives strived to change their families' unhealthy habits, by buying healthy food and respectable clothes. These purchases were not requested by the family members, but still influenced the practice of buying the goods. In relation to our project, this can be seen when consumers buy certain light sources based on social practices in their homes. The idea of valuing products influenced by social activities is also conveyed by the Spanish sociologist Fabian Muniesa (2012), who, in his article "A Flank movement in the understanding of valuation," express how valuation is something pragmatic.

> *"Value can be understood as something that something has by virtue of how people consider it (how they personally like it, in particular), but also as some- thing that something has as a result of its own condition and of its relation to other things (for instance, in relation to work or to money, or to any sort of standard metric)."* (Muniesa 2012)

Objects do not just have value, it is allocated through actions and processes. Value is something that relates and happens to something in a practice (Muniesa 2012). In the activities, actions and processes of valuing products, consumers are never alone. Qualification devices have agency both in stores and in other practices (Callon et al. 2002). In the context of our thesis, these devices might be commercials, tech-magazines, signs in the store and packaging. It is in the relation between the devices and the consumers that valuation occurs.

> *"The qualities of a product depend on the joint work of a host of actors and there is no reason to believe that consumers do not participate, like the other actors concerned in the objectification of those qualities." (Callon et al. 2002)*

Seeing how valuation is constructed from multiple practices and qualification devices, we also argue the practice of buying light, as something constructed from practices. Here, light is enacted differently. Following this mindset, we aspire to investigate this practice and the surrounding factors that might be influential. To accomplish this, we will use Annemarie Mol, a Dutch ethnographer and philosopher. Some of her work investigates valuing in practice and thereby contributes to the field of Valuation Studies, which we will return to later in the thesis. Her theoretical and methodical framework enables us to unravel the many realities regarding the usage of light.

1.5 Problem statement

In accordance with the multiple ways in which consumers acquire light, and the task handed to us from DCL, we will in this thesis work from the following problem statement:

"How do consumers buy and valuate light? And how might insight in- and redesigning of- these practices, change the uptake of LED light?

To answer this, we will now present how we theoretically and methodologically intend to approach the field.

1.6 How are we approaching the field?

Besides the interviews, we will draw upon other anthropological methods to generate our empirical data supporting the investigation of the field. To open up the field we have done observations in stores who sell light, this is done on the background of an open observation

strategy (Hastrup et. al 2011). We have performed a workshop at Aalborg University CPH with consumers as participants. We have used this anthropological activity to get an insight in the consumer's everyday practices. This Workshop is performed with great inspiration from Kensing and Madsen's (1991) 'Future Workshop'. In preparation of this workshop, we have drawn use from Eva Brandt and her writings regarding Design Games (Brandt et al. 2008).

Kensing and Madsen (1991) has not only served as framework for our performed workshop at AAU-CPH, but is the main methodological move in this thesis. The workshop model will also be the framework for the processing and presentation of our empirical data in chapter 5,6 and 7. Kensing and Madsen presents three phases in their work with future workshops. The critique phase, the fantasy phase and the implementation phase. We will use this framework since our aim is to change the practice of buying light through a direct intervention in the consumer's every practices. We believe that the use of a future workshop model as an analytical structure, allow us to perform this direct intervention due to the implementation phase.

The first part, the so-called *critique* phase will be very inspired by Annemarie Mol, since we will use her theoretical framework to investigate the multiplicity of the practices where light is enacted. We will use the article "What Is a Good Tomato?: A Case of Valuing in Practice" (2013), since Annemarie Mol and Frank Heuts, here present how to open up the messiness of a complex field, which we will draw use from in this first part.

The second part will be called the *dream* phase. Here we will we use Bruno Latour's terminology to conceptualise the complex realities and make them more tangible. We will move toward a more *strategic*-oriented approach, moving from a world of messiness toward more ordered networks.

Our third part will be called the *realisation* phase. This phase will process the outcome of the previous parts and turn them into designs. Designs which we think will contribute with stability in the network of buying light. These designs are created during the project with inspiration from Tim Brown (2009) and the product development tool, Prototyping (4.4.1)

From a theoretical framework, we will argue for an effort on communications devices, which will enable the private consumers to buy light sources in an unproblematic way. From an

investigation of the current practices of buying light, we will argue how the packaging of light bulbs often seems to cause problems. Following this, we will, through prototyping, create a product that we believe can change the practice of buying light into something more intuitive. This shall increase the use and uptake of LED technology, as requested by Dansk Center for Lys.

1.7 Outline of thesis

The following section is an outline of the entire content in this thesis. The purpose of this is to guide the reader and provide an overview of how this thesis is constructed.

Chapter 1: Introduction to the thesis.

Chapter 2: The first chapter will be an introduction to the technology of different light sources and layman terminology. This will provide the reader with the necessary knowledge to comprehend the technical specification used in this thesis.

Chapter 3: The second chapter will serve as a presentation of theory and theorists who have contributed to our project. This chapter will contain a brief presentation of Bruno Latour and a part of this terminology. We will only present the terms we have drawn upon. Further, we will present our Post ANT approach through Annemarie Mol and explain the notion of Multiplicity.

Chapter 4: This chapter outlines our methodological approach. Here, we give a thorough explanation of how we approach and have conducted our fieldwork. We will present a variety of methods including: Future Workshops, Design Games, Prototyping, observations and interviews.

Chapter 5: This chapter is our *critique* phase; in which we use the empirical data collected through our workshop. Here we will look into the many points of criticism stated by our informants, through registers of valuing. This is a *multiplicity*-oriented approach, which is adopted from Annemarie Mol. These statements are later used in both chapter five and six.

Chapter 6: This is the *dream* phase, where we conceptualise the many wishes and requests aired during our workshop at AAU-CPH. We will use terms from Bruno Latour to explain how we translated critique, wishes and demands into tangible ideas.

Chapter 7: This chapter is our *realisation* phase, where we turn the ideas from chapter five into physical design proposals. This will happen through Prototyping where different design ideas are realised and evaluated.

Chapter 8: In this chapter, we will test our created prototype on potential end-users to gain feedback. This feedback is then transformed into new changes and a final prototype is presented.

Chapter 9: Finally, this chapter will conclude the thesis.

2 Light & technology

As mentioned in the introduction (1), consumers have issues with the many specifications and technical knowledge regarding light. In this chapter we will provide our readers with sufficient knowledge regarding light, in order to understand the most common specifications that appear on packaging for light sources (namely, lm, K, Ra, W and socket size). This chapter is mainly written with inspiration from lysviden.dk (2016) as it is a reliable source developed and published by Dansk Center for Lys. We have also been inspired by the leaflet "NY PÆRE - hvad skal jeg vide før jeg køber?" published by Energistyrelsen (2013) which is an informative guide for consumers who are in the market for new light sources.

Now, what is light? How can we conceptualise light, which surround us all? Well, light determines our perception of materials, objects, dimensions, colours and it shapes our surroundings visually. It consists of electromagnetic radiation, which appears in different wavelengths. Humans can perceive light within the wavelengths of 380 to 780 nanometres. This is the visible spectrum for humans (lysviden 2016). The human eye cannot see light, but instead we see the particles or surfaces upon which light falls and are hence, made visible to us. It is in this sense that different light sources with different features are required in order to accommodate desired lightscapes. Illumination and light itself is amongst other features characterised by luminosity, colour representation, luminous flux and colour temperature (lysviden 2016). These are the features that we will present in this chapter.

2.1 Watt (W) - Energy consumption

Watt is the expression of the amount of energy a light source consumes. It has been the go-to specification for consumers for many years when using traditional incandescent light bulbs. With the introduction of newer technologies such as the LED bulb, the watt has become obsolete as a measurement for the bulb's effect. The reasoning behind its inclusion in this chapter is due to its continued appearance on packaging. By incorporating this measurement on packaging, consumers are able to consolidate the newer measurements with the "traditional" ones (Energistyrelsen 2013).

2.2 LUMEN (lm) - Luminous flux

Lumen is the measurement for the overall amount of visible light that is emitted in every direction from the source (lysviden 2016). Lumen has replaced watt as the measurement for

the effect of the light source. Private consumers will typically have access to light bulbs within the 140-1500 lumen range and they are advised to look for lm instead of watt when buying new light bulbs (Energistyrelsen 2013). Please note that we use the term "luminosity/lysstyrke" to describe lumen in the thesis.

2.3 KELVIN (K) - Colour temperature

Colour temperature (K) is the expression of the colour of white light emitted from the source. The white light we see when turning on our bulbs at home, is a result of a mixture of different colours like green, blue, yellow, red etc. And hence we operate with white light that can be characterised as cold, neutral or warm, depending on the amount of each colour (lysviden 2016). This might seem very confusing, but imagine this for a moment. "*If we heat a piece of iron, it will initially glow vaguely red. If we then increase the temperature of the iron, it will become bright red, then orange, yellow, white, white with a blue tinge and finally at 20.000 Celsius, it will have the same colour as the northern sky when it is bluest."* (lysviden 2016)

This is why warmer light has a low Kelvin and cold light has a higher Kelvin. Colour temperatures below 3.300 Kelvin are categorised as warm white, while 3.300-5000 Kelvin is neutral white and 5.000 Kelvin and above is known as cold white (lysviden 2016).

2.4 Ra – Colour Representation

Ra indicates how well a light source represents colours. The Ra (Rendering Average) index spans from 0 to 100, where 100 is perfect representation (lysviden 2016). Beneath, we exemplify two versions of how strawberries are presented in light with different colour representation. The strawberries in the upper part are illuminated with a light source with Ra of around 80-82 while the Ra is 90+ in the lower part of the picture (lumicrest 2016)

Figure 1

2.5 Socket size

The two most commonly used socket sizes are large and small, labelled E27 and E14 respectively. These socket sizes are used for all of light bulbs referenced throughout in this thesis.

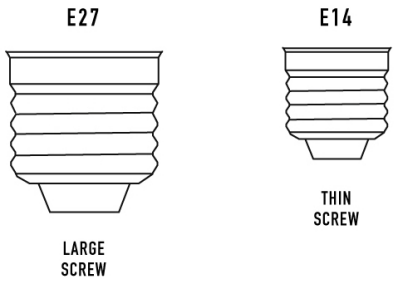

Figure 2

2.6 Different light bulbs

In order to understand how the various specifications of light are encompassed in different technologies, we will now present four different types of light bulb. These are the most commonly used light sources and are (except the incandescent bulb) found in the majority of supermarkets, interior stores, DIY retailers etc. in Denmark (observations 10 march 2016).

2.6.1 Incandescent light bulb

Figure 3

The incandescent light bulb is the traditional light bulb and has historically been the common choice for consumers. In December 2008, it was decided by the EU to phase out this technology due to its high-energy consumption. In September 2012, it was prohibited to sell these bulbs in the EU (Energistyrelsen 2013).

The incandescent light bulb is constructed from glass with no air inside. Instead, it is filled with gas and contains a filament, which together create light when connected to electricity. For this bulb type, the watt is the reference number to measure the strength of the light. Higher watts equals more light. Consequently, this measurement is what consumers have been used to and hence why this specification can still be found on packaging today. The incandescent light bulb has a Ra value of 99, which means that it represents colours with a high accuracy. It can be turned on instantly and is dimmable. These bulbs typically have colour temperatures around 2400-2900 K and a life expectancy of one year (Energistyrelsen 2013).

2.6.2 Halogen light bulb

Figure 4

Halogen light bulbs, or halogens, come in a variety of shapes with different purposes and have a two-year life expectancy. Halogen spotlights are commonly used in the bathroom, while halogen filament bulbs have been used to replace incandescent bulbs. This bulb uses the same technology as the incandescent bulb, but contains a different gas material. It also has a Ra value of 99, can be dimmed, instantly turns on and can produce colour temperatures between 2500-3000 K (Energistyrelsen 2013). As with the incandescent bulb, halogen light bulbs also use the watt to measure the strength of the light emitted.

2.6.3 Energy saving light bulb

Figure 5

Energy saving light bulbs are constructed from thin fluorescent tubes with enclosed electronics near the socket. The fluorescent tubes are covered internally with phosphorus powder and contain argon gas and mercury. When connected to electricity, the gas heats and generates ultraviolet radiation. When the radiation comes into contact with the powder inside, it begins to light up. This is why fluorescent light sources typically have a slow start up time (Energistyrelsen 2013). The energy saving light bulbs often have Ra values around 85, which means that they represent colours poorly. They lack representation in some red colours and are overexposed in some yellow/green areas. The bulbs have temperatures around 2700 K, are by default not dimmable and have a life expectancy of 6-10 years (Energistyrelsen 2013).

2.6.4 LED light bulb

Figure 6

LED light bulbs are the newest of these technologies. They are constructed from a varying amount of light emitting diodes (LED) and are encased in either plastic or glass. The diodes are electronic components, which in themselves emit light when exposed to direct electric current (lysviden 2016).

Depending on the type of diode used, the life expectancy ranges between 10-30 years (Energistyrelsen 2013). LED bulbs can produce colour temperatures up to 8000 K. The Kelvin of LED bulbs vary from the choice of diodes and to regulate the temperatures, these diodes are covered with phosphorus (Lysviden 2016). LED bulbs can both represent colours poorly and very accurately as the Ra value varies, depending on the quality of diodes. High quality LED bulbs can have Ra values up to 95. To measure the strength of this type of light source, lumen is used, as it references the luminous flux of the bulb, that is, the total amount of light emitted from the source (Energistyrelsen 2013). LED bulbs have great advantages over the other technologies. They are energy efficient and about four to five times more effective than halogens. They have a long life expectancy, are turned on instantly and are very robust. They do not contain gas or mercury and do not emit the same amount of heat as the other light sources. They are capable of producing different colour

temperatures and are comparatively the cheapest solution over their life span (Energistyrelsen 2013). For a comparison of watt and lumen we have included an indicative table that illustrate this.

Incandescent & Halogens	LED	Energy saving
15 watt	140 lm	130 lm
25 watt	250 lm	230 lm
40 watt	470 lm	430 lm
60 watt	800 lm	740 lm
75 watt	1.050 lm	970 lm
100 watt	1.520 lm	1.400 lm

Figure 7

This concludes our presentation of light in general and the different light bulb technologies that are relevant for this thesis. For further information, it is recommended to visit the Danish Centre for Light's website: www.lysviden.dk and energinord.dk where Energistyrelsen has uploaded a leaflet on light bulb awareness.

3 Theoretical approach

As a background for the analysis of our collected empirical data, we have taken inspiration from the ideas behind 'Valuation Studies'. We have been introduced to this growing field through Michel Callon, an associate of Bruno Latour, who will be presented later in this chapter. In 2002, Michel Callon published the article 'The Economy of Qualities' with Cécile Méadel og Vololona Rabehariosa as co-authors. It argues for a new kind of economy, called 'The Economy of Qualities', which demands an optimised cooperation between 'supply and demand' actors. This demand has arisen due to a disagreement on the markets functional and organisational characteristics and a desire for more of an impact from consumers (Callon et al. 2002). In this sense, consumers must take a greater part in the valuation of objects as

> *"The qualities of a product depend on the joint work of a host of actors and there is no reason to believe that consumers do not participate, like the other actors concerned in the objectification of those qualities."* (Callon et al. 2002)

As the consumer engages in various valuing practices, they are also aided by different qualification devices. These devices affect the consumer both consciously and subconsciously. In the context of our field of study, this can be understood as commercials, employees in stores, product placement, packaging and more. Alone or collectively, these devices have the purpose of generating an attachment by the consumer to the specific product and hence strengthen the relation between consumer and product (Callon et al. 2002).

Further, Callon argues that consumers are also never alone when valuing goods outside stores and other situations. Valuing can be done in different social networks and practices where cognitive influence occurs in an interaction with others. Here all kinds of products are being discussed and evaluated, typically collectively between family members and friends. Taste and preferences are often formed here (Callon et al. 2002). However, there may still be material actors involved in these networks and practices, as technological tools enable assessment of products before purchase. Reviews in magazines, guides and reviews by experts influence the consumer's assessment of the product (Callon et al. 2002).

Another member within the circle of valuation studies is the Spanish sociologist Fabian Muniesa who has written the article ''A flank movement in the understanding of valuation'

(2012). The main point of the article is to see value as something pragmatic. Value is not something objects "just" have. It is something allocated through actions and processes:

> *"Valuation, in turn, refers to something that happens to something, and this happening can be a matter of consideration or of relation, or both at the same time. In this sense, the idea of valuation may be tackled in the same way in which the notion of signification is elaborated in pragmatism – that is, as an action." (Muniesa 2012)*

Here we see the argument for valuation as something that happens as an activity. This performative view on valuation is also our inspiration for investigating the practices of buying light. Value can been marked by the virtues users attach to objects (personal preference) and how objects are related to other things (jobs, foreign exchange and other measuring devices) (Muniesa 2012). However, considering the quote above, it is argued how value is created through practice, that is, as an activity.

This thesis will argue that Danish consumers have challenges when buying light sources for their homes, and the valuation of light is not only enacted in the buying situation, but also outside of stores. The works of Callon, Muniesa and others, all suggest that value is something more than simply putting a price tag on a good. Hence, it is also our aim to investigate how light is enacted in practices outside the stores and how valuation is something performative. Being able to contribute to the sought after knowledge by Dansk Center for Lys, requires a thorough study of the consumers and their everyday practices. In this sense, valuation studies might be a beneficial direction to follow in our aspirations to investigate the practices of buying light. Following this basic overview of valuation studies, and how we choose to work with it, we now turn to an introduction of Actor-Network Theory, as it is fundamental to the theory used in this thesis.

3.1 Bruno Latour and Actor-Network Theory

The basic elements of Actor-Network Theory are grounded in the works of Bruno Latour, Michel Callon and John Law starting from the beginning of the 1980's. The development of ANT builds upon a number of other theories and methods from within the field of, Science and Technology studies (STS). This chapter will provide a brief introduction to ANT but will not go into the movements within STS or the theoretical foundations that underlie ANT.

Instead, we will focus on a few ground elements from Latour's scientific thoughts that benefit this thesis.

The book 'Laboratory Life: The Construction of Scientific Facts', written by Bruno Latour and Steve Woolgar (1979), was one of the first ethnographic studies of a laboratory. This is still regarded as one of the most thorough and in-depth studies of scientific practices that take place in a laboratory (Blok & Jensen 2009). An important argument in their work is that without the measuring equipment that scientists use, they would not be able to establish scientific facts. Through the studies of natural scientific practices, it is, according to Latour, not possible to talk about natural sciences without also talking about instruments, laboratories, scientists, printers, knowledge and fields of study. He rejects that there is a world out there, which can be observed, described, measured and weighed in an objective matter. Latour challenges a traditional perception of nature and urges theorists and scientists to rethink the conditions (Blok & Jensen 2009).

According to Latour, it is not possible to talk about a scientist who discovers nature. Instead we should talk of the scientist as one among others who generates the field of study. Scientific facts are not something that are discovered, but are something that are being constructed, formed or established through a larger network of actors. To describe the construction of scientific facts and bring to light the mechanisms in the network of actors is one of the main objectives of ANT. The world is comprised of an endless number of heterogeneous actors, which is connected in different networks. We will present to you some of the main terms in Latour's terminology, though only those we adopt and will further utilise in our analysis in chapter 6.

3.1.1 Actor-network theory

When talking about actors, the focus is not only on the human, but also the non-human. Objects and discourses are also encountered as actors equally with the human actors. This is why one of the arguments from Laboratory Life is that, without the devices that scientists use, they would not be able to establish scientific facts, as mentioned in previous section. All phenomena comprise networks of actors contributing to the construction of those phenomena. To this effect, the phenomenon, 'good light', only comes to matter through the importance that the network has assigned to it.

It is the network that defines the actor, it is the network that gives the actor status and it is at the same time the network that constantly takes part in the stabilisation and destabilisation of the actor (Blok & Jensen 2009).

3.2 Terminology

In order to increase focus on the fact that it is not only human actors that are important in Actor-Network analysis, ANT has introduced yet another concept. The concept *actant* covers all stakeholders, human as well as non-human. The aim of this concept is to avoid 'actors' being conceived as something human and independent. The aim of introducing the more broad concept of *actant* is to embrace all kinds of actors, people, animals, machines, measuring equipment, institutions, theories, reports, microorganisms, websites and so on (Olesen & Kroustrup 2007). In this way, the concept also serves as an explicit way to break with the notion of an actor, as it is traditionally understood within the social sciences. In this thesis, we do not find it necessary to use the actant concept to focus on the non-human actors. Instead, we have chosen to highlight the notion of an *actor*'s versatility by consistently using the term about everything that can be assigned agency (Olesen & Kroustrup 2007).

> *... ANT defines a specific ontology through the use of his (Latour) concepts of actor, network and translation. This is a fully relational ontology. ANT argues that any actant is completely defined by its relationships. There is nothing but network: no essences, no underlying factors, no context. ANT describes the world as a multitude of points and connections (but nothing else)." (Blok & Jensen 2009: 81).*

3.2.1 Translation

To describe the ongoing negotiations regarding status and stability, Latour uses the term *translation.* A translation occurs when one actor is granted credibility by other actors, through negotiation. The term *translation* covers the processes that take place in an attempt to create order within the network. When a translation occurs, one actor is granted power and status. We can then talk of the actor as a *spokesperson,* since it does not only speak for itself but also on behalf of other actors within the network (Olesen & Kroustrup 2007). Through the process of translation actors are transformed into being more or less important and become representatives for bigger or smaller networks. This is how order is established. The actors in the network do not have to negotiate and discuss what good light is, buying what in their opinion is good light, becomes intuitive. That being said, it is not how we experience the

current field however we would like to change the network into a more strategic-oriented network to cope with complexity. We will return to this point later in this thesis.

3.2.2 Spokespersons and obligatory passage points

After a comfortable number of translations, the *spokesperson* gets so powerful that it becomes necessary for the other actors to go through the *spokesperson* to gain influence. This is where an *obligatory passage point* occurs (Olesen & Kroustrup 2007). This is another important term presented by Latour and it is a term we will investigate further in connection with the last part of the analysis (7).

3.2.3 Black boxes

As a network around one actor becomes more and more stable and the number of negotiations increases it might get more complex to identify the network behind this actor, the network becomes less transparent. When this situation arises, we can call it a *black box*. A black box is when the underlying network of a given actor is transformed to be more or less invisible and we find consensus regarding the terms, thoughts and objects in the invisible network, which is not questioned from the outside. To get an understanding of the current situation it is our aim to open up these constituted black boxes or consider how black boxes are already being deconstructed due to the shift in technology.

3.2.4 Inscriptions and inscription devices

Latour also operates with two important terms which we find very useful: i*nscription devices* and *inscriptions.* When using the term inscription devices, Latour refers to different kinds of instruments which can be used to produce data. Latour often refers to data produced in a laboratory due to his field of study. However, we also find the notion of inscription devices useful in the valuation of good light. Light is also measured, otherwise we could not be able to talk of light as something tangible. Here we are talking about processes where the examined object or phenomenon is transformed into some kind of visual output. Through the inscription devices a new reality is created. It can be numbers, graphs or pictures. The visual outcome is *inscriptions*. Something that does not lose shape when moved geographically (Blok & Jensen 2009). The inscriptions become a new construction of reality, which can be ordered, analysed and put into systems. A simple example of an inscription device used in the production of light is a lux meter. A lux meter is used when measuring the luminosity of a

specific light source. The outcome of the lux meter can be translated into lumen and a concrete number is added to the packaging. This is an attempt to make luminosity tangible for the consumer. The number added to the packaging is the inscription. Lumen can be taken into account when valuing good light. Inscriptions are constructions that make it possible to relate or describe objects in new ways. Inscriptions can also be seen as *"...disciplined and loyal allies"* (Blok & Jensen 2009: 72), that the scientist can use as argumentation.

To understand the practice of buying light we will also draw upon Post-ANT through Annemarie Mol, which we will outline in the following.

3.3 Post-ANT

We have not only focused on the classical ANT promoted by Latour, but we have also been very drawn to the empirical philosopher Annemarie Mol who connects to the so-called post-ANT tradition, which has a different but related research agenda, also presented as 'after-ANT' approach. Signe Vikkelsø differentiates between the two notions of ANT by referring to them as *strategic*-oriented ANT and *multiplicity*-oriented ANT. Vikkelsø uses these terms to describe the way empirical data is handled and how the outcome of an analysis can be used (Vikkelsø 2007). A *multiplicity*-oriented approach deals with messiness and complex realities whereas the *strategic*-oriented approach is more about laying out a strategy and creating order and stability in a network.

3.3.1 Multiplicity

We will, in the thesis, use the term *Multiplicity*, as presented by Mol (2002). This will be the foundation of the first part of our analysis. The *multiplicity*-oriented analysis distances from a classic ANT analysis since we do not follow only follow essential actors but also open up for the difficulties of the weak too. This can also be seen as a critique of the classic ANT analysis (Vikkelsø 2007). It is suggested that ANT tends to focus on strong and ambitious networks and overlooks the minor networks. The critique is then that ANT is not suitable for all research fields.

One of the things that Mol brings into focus is that reality is not singular. Mol stresses how it is important that we do not only seek consensus and coherence in a single reality, but that we try to work with these different versions of reality. We have more than one reality but less

than many (Mol 1999). Objects and subjects are different in different socio-material practices. They can be multiple. To talk about reality as being multiple, we need another set of metaphors, the metaphors of intervention and performance. The suggestion is that a reality is done and enacted rather than being observed (Mol 1999). Looking at an object with different eyes does not mean that the object stays untouched. She has an example:

> *Here it is being cut into with a scalpel; there it is being bombarded with ultrasound; and somewhere else, a little further along the way, it is being put on a scale in order to be weighted. But as a part of such different activities, the object in question varies from one stage to the next. Here it is a flashy object, there one that is thick and opaque and in the next place it is heavy. In performance stories flashiness, opacity and weight is not attributes of a single object with an essence which hides. Nor is it the role of tools to lay them bare as if they were so many aspects of a single reality. Instead of attributes or aspects, they are different versions of the object, versions that the tools help to enact. They are different and yet related objects. They are multiple forms of reality. Itself.* (Mol 1999: 77)

There are different versions, different performances, different realities, that co-exist in the present (Mol 1999).

In a chapter of Actor Network Theory and After edited by John Law and John Hassard, Mol tells the story of Anaemia (Mol 1999). What anaemia is has not really been answered even though it is not a controversy any longer. Mol argues that the ways of handling anaemia do not overlap and rather than revealing different aspects of anaemia different versions are performed. Anaemia is multiple. What multiplicity highlights or entails is that realities might clash at some point, however various performances of an object may collaborate and even depend on one another (Mol 1999).

Mol argues that interventions should be open ended as she concludes the Body Multiple with "*open endings do not imply immobilization."* (Mol 2002). This quote is reinforced with her argumentation regarding how therapeutic interventions work in the hospital in which she conducted her fieldwork. In her findings, diagnostic outcomes diverge and loses credibility as golden standards. As of such she suggest the move from the question of "*is this intervention effective?"* to "*What effect does it have?*, *How to do the clinical good better?*" (Mol 2002).

This demonstrates the move to open ended questions and other questions that might have more powerful effects when researching multiple matters.

3.4 Our intervention

The problem presented to us by DCL, is that Danish consumers do not adopt LED technology to the desired extent and the question to be solved is "Why is this and how can we change this?" Asking the consumers *why* they do not adopt the technology, will according to Mol not be beneficial. We need to know how light is enacted in practices. So instead we asked the consumers *how* they use light in their everyday. This way an intervention is kept open ended.

During this project we would like to challenge the perception of good light. From reading The Body Multiple by Annemarie Mol (2002), we have become aware that we need to investigate the multiplicity of good light as all stakeholders within the field, each have their own reality. Light is enacted differently depending on who we ask and what good light is, is not definitive but rather an open ended matter.

In the first part of our analysis, which is mainly inspired by Mol we have chosen to follow her article 'What is a good tomato? A Case of Valuing in Practice" (2013). The article is written in collaboration with Frank Heuts. In the article, Mol and Heuts utilise the concept of *registers,* which we will also use to handle our empirical data. An explanation of registers will follow in section 5.1.

3.5 Constructivism

We have chosen a constructivist ontology to approach the expressed issue from DCL. This ontology implies that there are multiple interpretations of any given situation, hence there is no universal truth.

When choosing the scientific standpoint, we accept: nothing takes precedence. Reality is simply constructed from the relations between actors in heterogeneous networks. We will, in this thesis, engage with both Actor-Network Theory as presented by Latour and post-ANT represented by Annemarie Mol, as presented above. They both ascribe to the constructivist ontology. Nature is a consequence of knowledge. Through negotiations, inscriptions are produced, which are crucial to how nature is perceived. The idea that the world exists

independently of us, is dissolved by an analysis of the cumbersome construction work (Jensen 2016).

This approach shapes our way of dealing with the inquiry from DCL. One way to investigate their problematic, is to go out and ask the consumers why they do not buy LED light and consider how we can make them buy LED light, however the constructivist standpoint urges us to approach the field differently. Instead, we find it more important to understand the practices through which light is enacted, and subsequently find space to intervene and change the practice of buying light.

4 Methodological approach

We have been situated as researchers in the field of light usage for quite some time and have used a wide range of methods to uncover this gradually widening field. We have not only utilised different methods, but also combined them differently. Throughout our field study we have moved between different actors within the field, talked to researchers, laymen, investigated different groups of consumers, participated in conferences, performed a workshop and conducted prototyping. All this is done with the aim to understand the current practices of buying light. We want to understand what it means to buy light sources, get to know the thoughts behind the choices of the consumers and understand the decisions made by the manufacturers.

In our fieldwork we have been inspired by participatory design. This includes a variety of methods that facilitates the involvement of designers and end-users in co-design and innovation processes. We decided to use Future Workshops, Design Games and Prototyping to carry out the product development component of this thesis. Furthermore, we also used qualitative research methods such as observations and interviews. All of these mentioned methods will be presented throughout this chapter.

4.1 Future Workshops

The most important tool for gathering our empirical data has been Future Workshops. This is a technique that has been developed for citizens who want a say in a public planning processes, but otherwise have limited opportunity to do so. It is presented as a method to help users and designers in collaboration, to generate alternative ways of working and consider collectively how they would like their work situation to be in the future. The method invites users and designers to create visions and discuss how these visions can be realised (Kensing & Madsen 1991). As mentioned, we have facilitated our own future workshop with great inspiration from the Kensing and Madsen's text 'Future Workshop' (1991).

The aim of our workshop was to understand how the consumers experience the practice of buying light sources, get an idea of what they would like the buying situation to look like, and find out how consumers evaluate good light. By examining the technological challenges in practice, the idea is to find a solution to the actual problem, which is not necessarily the same problem for all (Kensing & Madsen 1991). The aim, first of all, is to agree on the problem,

overcome existing barriers by using a rhetorical open vocabulary and then transform the generated proposals for future solutions.

Kensing and Madsen (1991) use three phases in their example of library workers and IT systems presented in the text: '*Future Workshops*': The critique phase, fantasy phase and the implementation phase. They use these phases to generate a narrative of work practices that focus on issues at hand, imaginative ways of solving those issues and then organising how changes might be implemented.

> *"Essentially the critique phase is designed to draw out specific issues about the current work practice; the fantasy phase allows participants the freedom to imagine "what if" the workplace could be different; and the implementation phase focuses on what resources would be needed to make realistic changes."* (Kensing & Madsen 1991: 157)

In this chapter, we will use the three phases presented by Kensing and Madsen (1991) to account for our methodological approach and later as an analytical framework. In the three phases we have used different anthropological methods to gather our empirical data. They will be introduced accordingly in the respective phases; in which they are used. In this thesis, we interpret and call the three phases: *Critique* phase, *Dream* phase and *Realisation* phase as it suits our project in a beneficial way. This is due to our aspirations to redesign the practice of buying light specifically. We will go into more depth with these phases in the following sections.

4.2 Critique phase

4.2.1 Observations

The first thing we did in the *critique* phase was to spend several days observing how consumers bought light source in various stores, including IKEA, Føtex and Fakta. Since this was our very first field activity, we chose an open observation strategy (Hastrup et. al 2011). We were not completely sure what we were looking for, besides how consumers acted in the practice of buying light, so we strived to perceive and register as much as we could. This strategy might seem simple, but can be surprisingly useful in the early stages of field work. We observed the consumers and witnessed the discussion they had before deciding which light bulb to bring home. This helped us gain a feeling of which thought processes occurred in these specific situations. We took pictures of the lighting section in each store to document

the current assortment and product arrangement. These pictures were later used in creating the surroundings for our workshop.

After observations in different stores, the next step was to investigate how the consumers valuated light and in what practices they valuated light the most. Not necessarily an easy task since people tend to take light for granted. They do not notice light, they usually only notice the light when they find something wrong, if it does not live up to their expectations (Bille 2013).

4.2.2 First part of our workshop

Kensing and Madsen's case is about the future use of computers in the library. First, they asked the participants, including librarians and clerical workers, to *criticise* the current work situation, almost like a structured brainstorming (Kensing and Madsen 1991). To imitate this phase, we facilitated a workshop divided in two parts. The purpose of the first part of the workshop was to understand the activities in which the consumers value light and how this valuation affects their practice of buying light. To achieve this understanding, we chose, due to our research question, to ask questions in a *multiplicity*-oriented way. By asking *how* the participants used light in their everyday practices and *how* they bought it, invited the participants to let out criticism about the experiences when buying light. We will now present how we conducted these interviews.

4.2.3 Interviews

The session in the first part of the workshop was conducted as interviews with the aspiration to learn about valuing light in practice. Our *critique* phase is not only based on interviews from the workshop, but also from interviews with lay people. The so-called laymen are an important part of our empirical data, since they hold qualified knowledge on the field. We asked the informants questions, which made them reflect on the practices in which they include the usage of light. This was achieved by continuously asking them about specific activities "*that informants tend to take for granted. This incites them to not get stuck in relating their opinions, but to take a fresh look at their own practices."* (Mol & Heuts 2013)

Like Annemarie Mol and Frank Heuts, we wanted to investigate the field in an exploratory way. Still, we chose to perform a semi-structured interview. These types of interviews are

held in an informal manner, but with a specific purpose and in compliance with specific approaches and techniques. It is not an open, everyday conversation, neither is it a closed survey. It is conducted in accordance with an interview guide, which focuses on predetermined subjects. It also allows space to follow interesting directions that arise as the interview progresses (Kvale & Brinkmann 2009). We found that our informants were very generous and provided us with rich descriptions of how light is enacted in their daily practices. As a whole, the workshop and interviews with consumers were recorded and later all audio files were transcribed for coding and further analysis. In following the structure of Future Workshops, we now move into the next phase - the *dream* phase

4.3 *Dream* phase

Continuing the narrative of Kensing and Madsen (1991), they turned to the fantasy phase where they asked the participants to reflect on alternative and possibly unrealistic utopian work situations. This was done by asking *how* they would like the ideal work situation to look. Nothing was too extreme. However, this phase also included turning the statements collected from the critique phase into positive statements.

4.3.1 The second part of our Workshop

Our *critique* phase was followed by the second part of our workshop, where we facilitated a *dream* phase. This phase had the purpose of gaining useful ideas from the informants wishes and request for a better practice of buying light. In this phase, we have also been inspired by another participatory method, namely, design games.

4.3.2 Design games

When utilising ideas from design games, it is Eva Brandt (2008), who has influenced this project. She presents the exploratory design game as a technique that brings together designers, potential users/end-users and stakeholders in design dialogue. The point of the exploratory design game is: "*... that they can engage intended users, various stakeholders and the design team in joint inquiry into existing practices and participatory design of possible futures*" (Brandt et al. 2008: 61).

For a design game to be successful, it is important that all actors/participants have something at stake, or have an interest in it (Vaajakallio & Mattelmäki 2014). When facilitating design

games, it is important to remember that you deal with real people and you play with the participants' daily lives. Therefore, design games are never harmless, since everyone must have 'something at stake' and the game can potentially have an impact on the participants. Hence, it is important to consider how such a game is designed, since it is you, as the facilitator who has the responsibility for the participants (Brandt et al. 2008).

Figure 8

We have not adopted all of the design game aspects into our work. However, our workshop does include elements from this method. As Brandt describes, gaming materials are vital to ensure a successful game (Brandt et al. 2008). We will now describe how our gaming materials had agency in suggesting future ideas. Fifteen light bulbs in their packaging were presented on the table in front of the informants. The light bulbs were our version of gaming materials as were pictures from IKEA, Føtex and Fakta. They were placed on the walls behind us to create a store-like atmosphere. The light bulbs were a good way of getting the informants to talk. Some could recognise the packaging from their homes, while others had seen the packaging in the stores. They were objects they could relate to, which made it easier to get them engaged in dialogue. The informants told us about their ideal practice of buying light, and also turned critique points into wishes and positive ideas.

We have not structured our workshop thoroughly after the three phases presented by Kensing and Madsen (1991). We did not give our informants the same tasks as they did in the library case. However, the participants were asked to choose only one light bulb among the fifteen presented in the end of the session. In the process of choosing a light bulb they were asked to elaborate on their choice, reflecting on what they liked or what qualities they would like a packaging to have. This way, we gained design proposals for future prototypes.

4.4 Realisation phase

Finishing the Kensing and Madsen library case, the last part of the workshop was to present the ideas and find out whether the newly generated ideas for an improved work practice could be realised under the current conditions. By using the idea of Future Workshops, the intention is to develop new systems or solutions, based on critique of the existing practices. The point is to prevent negative reactions and make the transition from one system to another as smooth as possible (Kensing & Madsen 1991). For this to become a reality, the implementation phase is crucial and therefore forms a part of our project. We chose to separate this phase from our workshop.

Our *realisation* phase processes criticism, wishes and the many generated proposals into prototypes. These prototypes will figure as potential tools in the process of redesigning and optimise future practices of buying light. Instead of using the term implementation phase we will call this phase the *realisation* phase, since the aim is to transform the many ideas and proposals into more concrete and realistic prototypes. This phase will rely on the results and interpretations of our *strategy*-oriented approach, since it would otherwise be chaotic to accommodate all the messy realities identified from a multiplicity-oriented approach (3.3.1).

4.4.1 Prototyping

The idea of prototyping is to try something by building it. It can be anything and it can be built from all kinds of materials. An early prototype should be fast and cheap. Not necessarily having a lot of detail, and only using as much time as it takes to build something that can generate useful feedback for the next prototypes. Sometimes a very complete prototype can be challenging, since it might limit the creators urge to receive feedback (Brown 2009). The idea is that the faster we make our ideas tangible, the faster we are able to evaluate them. To build an early prototype is often the means to find out if an idea has functional value. Of course it takes time to build something and it might take longer than to think a thought, however prototyping still generates results faster due to the thought of making ideas tangible (Brown 2009).

The aim of using prototyping is not to create a working model, but to give ideas shape and learn about the strengths and weaknesses of the idea. It is a way of identifying new directions for the next generation of prototypes. They might be more detailed and refined (Brown 2009).

At some point a prototype has to see the world to gain feedback from intended end-users of the final product.

In our work with light and packaging we have used prototyping as a tool. Since a very early stage in our project, we have been visiting the university's FabLab to build and create. The FabLab is a creative workshop that contains all the materials and tools a designer could dream of. We have experimented with many ideas, which all have been based on empirical data generated from our workshops and interviews. After producing early prototypes and evaluating them, we designed a final prototype, which was tested on potential end-users. We will return to the results in chapter 8.

4.5 Methodological reflections

The technique Future Workshops has served as a great inspiration in the establishment of our own workshop. Our workshop was formed as a physical shop, recreating the buying situation with immersive pictures from IKEA, Fakta and Føtex. We decided to facilitate the workshop at Aalborg University CPH. The main hall near the reception has a very central location and is a highly trafficked point at the university. Many potential informants passed during the day, both students, employees and visitors. We found it quite easy to attract a variety of informants. The workshop was colourful and stood out from the surroundings. The pictures were of good quality and the signs and logos were recognisable. Most informants approached us, so getting enough informants was easier than expected. We experienced how creating a professional and appealing atmosphere around the workshop encouraged the informants to participate. We printed the pictures in A1 and A0, almost on a 1:1 scale. We then attached them to the walls to create the atmosphere that the informants could recognise from earlier experiences when shopping.

The informants were placed at a table in the middle of the shop. Deciding who to invite as informants and where to facilitate the workshop were also something to reflect on. We chose not to divide consumers into sections or segments since the aim was to get a variety of diverse opinions. Due to the expressed request from DCL, we chose to see the private Danish consumers as a whole, however we did make an effort to have statements from both men, women, older and younger. We are aware that facilitating a workshop at a university might affect our generated data in a certain direction. We imagine how students and employees may

share common interests in something like the environment or possess a certain degree of technical education.

We had informants participating in both groups and individually. Having one informant to state something and another to follow up on it created a dynamic process, where we got some thorough answers, which can be challenging to achieve with individuals. We experienced how one informant stressed the things he usually looked for on the packaging and another informant then said: "*You mentioned a lot of stuff.. but some things.. where I thought 'Oh my god, I'm looking at that too' but I did not remember when we talked about it before*" (informant 5 14 June 2016). He then continued to explain and elaborated his earlier answer. New dimensions arose due to the group constellation and dynamic within. The informants encourage each other to think outside the box and useful ideas emerged. We saw that the informants' creativity increased when working in groups.

The empirical data generated from all the ethnographic activities described in this chapter will be the main material for our upcoming analysis (5,6 and 7). The workshop was taped and pictures were taken along the way to document the process.

In this chapter we have explained how our workshop is inspired by Kensing & Madsen (1991), but the phases are also the framework for our analysis. We will now demonstrate how this methodological move is done. Note that a complete overview of all fieldwork activities can be found in appendix 1.

5 The practice of buying light

In this chapter, we analyse our empirical data from the workshops and interviews during our fieldwork. This chapter will be divided into three parts, which are structured with inspiration from a Future Workshop model (4.1).

First we will analyse our empirical data with a *Multiplicity*-oriented approach in order to understand how consumers and laymen perceive good light and how good light is valued. This will happen through the insight of various practices in which light is enacted and valued in many different ways by our informants. We shall demonstrate how practices of valuing are intertwined and complex networks of different realities. We focus on how criticism can be found within these activities, and this part will figure as our *critique* phase.

The second part will draw on the requests and ideas from our informants in order to establish an understanding of how their ideal setup of light would look like and how they would like to achieve that. This part moves the project into the *dream* phase, where our informants' statements argue for various imaginations of desired scenarios regarding purchase and usage of light. In this part we will use terms presented by Bruno Latour in order to move the messiness of realities into something more tangible (3.2).

The third phase will be based on the statements from the *critique* phase and the *dream* phase. It will turn the many findings into prototypes, which will be evaluated. Again we will use the terms from Latour and turn to a more *strategic*-oriented approach in the attempt to construct a stronger network and change the practice of buying light. This will be the *realisation* phase.

Finally, all three parts will show and argue our aspiration to redesign the current practice of buying light, so consumers in their search for the right product will experience a smooth transition into LED light sources. In this, we will consolidate the assignment handed to us from DCL (1.3).

5.1 Registers of valuing

In the first part, we analyse the realities of a variety of different experts. We are interested in the many ways light is enacted in everyday practices and how light is valued as being either good or bad in those practices. Our intentions are to show how performative valuing is a

messy matter and how we need to cope with this messiness in order to understand the many ways light can be perceived as good or not. We interviewed professionals such as engineers and researchers within the field. We also interviewed consumers during our workshop as experts, as they are qualified experts in their own way of using light in their everyday practices (Mol & Heuts 2013). During our workshop, we asked our informants questions about their practices in which they use light. We asked them how they buy light, which gave us an insight into their daily use of light and we also asked them where they found light to be most important. People tend to take everyday practices for granted and by asking "how" questions about these practices, it opened up for thoughts and opinions that the informants were not initially aware of (3.3). The informants were openly surprised by their own answers and the more we asked, the more they opened up and it broadened their view on light usage. Our interviews with the consumers were deliberately held out of their private residences, as they would have been affected by the familiar interior and thereby might have struggled to be more reflective (4.5).

When following the idea of 'valuing' as outlines of realities and something that is enacted and performed in practices, we need to clarify this notion. 'Valuing' as something active implies that informants are accompanied with other entities in this process. They are not alone in this activity of valuing, and the guarantee of good light is not a simple matter of course (Miller 1998). Informants also interact with all kinds of qualification devices like packaging, specifications, lamps, shopping baskets and currency, etc. (Callon et al. 2002). It is in this interaction between human and material, that performative valuing becomes a reality (Mol & Heuts 2013). That said, it is also important to understand that, from this multiplicity perspective, we do not seek to view valuing purely from an economic aspect where value (worth) is measured as a commodity with a fixed price tag (Callon et al. 2002) , but rather as a social practice, being ongoing, open ended and fluid (Mol & Heuts 2013).

We have analysed our transcriptions by sorting out our empirical data with inspiration from the article '*What Is a Good Tomato? A Case of Valuing in Practice'* by Annemarie Mol & Frank Heuts (2013). By repeatedly going through our material, we discovered keywords which are all related to practices, where light is valued and performed as an activity. Those keywords such as; *Cosy, Ecology, Cheap, Confused, Luminosity* and many more were highlighted and then categorised into six different registers of valuing. These registers are according to Mol and Heuts (2013), a compilation of keywords that share relevance in valuing

something as good or not, depending on the situation. The idea of these registers of valuing is to foreground value as something active where activities facilitate assessment and judgement that can affect the practice of buying. This division of the six registers apparent in our empirical data allow us to view valuing of light from a somewhat schematic perspective to create some order in the complexity. From this, we will be able to concretise more specifically how consumers value light usage, and the surrounding elements that interplay with the buying situation of new light sources. Like Mol and Heuts (2013), our set of registers also turned out to be unstable, as overlaps, tensions and prioritising happened constantly. This is something that we will look into at the end of this section, as it will underline the idea of how registers of valuing can be beneficial when identifying criticism of current situations of light purchases. For now, let us turn to the registers.

5.1.1 Atmosphere

The first relevant register of valuing is that of *atmospheric* light. Here good light has something to do with ambiance. One informant relates atmospheric light with a specific practice in his home. He said: "*So I have nightstands for me and my girlfriend to sit and relax in bed. Because the other light can be a little hard. So we just have one lamp turned on. Then we turn on netflix*" (Informant 1 14 June 2016). The light from the specific 'one lamp' performs the right atmosphere for the practice of watching Netflix. The informant connects atmospheric light with something that facilitates a specific social practice, which is not necessarily a practical issue that needs solving. A second informant emphasises the matter: "*It has to be damn cosy and comfortable. I don't want it to be too bright or too dark"* (Informant 6 14 June 2016). During our workshop, this informant expressed her desire to achieve the perfect ambience in her living room as "*... This is the where you spend so many hour*" (Informant 1 14 June 2016). In this instance, atmospheric light is associated with a specific mood and room, in which she finds herself most of the time and where most of her daily practices are facilitated. Intentional ambience in the living room, is a concept many of our informants agreed on. However, there was a difference in the way this was accomplished.

One informant described how he actively adjusted the level of cosiness in his living room using different light sources: "*In the living room I have a more mellow light with three main light sources installed. I also have a couple of smaller lamps, which is turned on when I need the room to be even more cosy"* (Informant 7 14 June 2016). This informant turns on specific

lamps to achieve a particular mode of atmosphere. Turning on extra lamps intentionally can be argued as something more than just an action.

In an interview with Mikkel Bille, he said: "*Light is not just a background for an activity, but rather a practice in itself, where you turn on the light to create an atmosphere, in which you seek ambience*" (pers comm., 3 August 2016). According to this, atmospheric light is changeable and deliberately something people actively choose to tweak. To further emphasise on the matter he also explained in an article "*We have a special appreciation of light and a view on how we want to use it to create a cozy atmosphere*" (Information 2014) and "*The light helps to create an emotional state, you want to be in - and bring others in. One might see the Danish use of light as a practice in which we are constantly looking to set the mood*" (Information 2014). This specific way of practicing and valuing light, facilitates a sense of security and embodies comfort. Anne Bay from DCL also regards light as something that facilitates social practices. Light can gather people in a room and create a certain atmosphere, where people feel comfortable. She says: "*A pendant above the dining table gathers people*" (pers comm., 17 May 2016). This statement indicates the relevance of a specific atmospheric lightscape and how it performs as a beacon in a room.

Within this register, atmospheric light is something that tunes ambience in various practices. There is a tendency in the intentional control of ambiences to secure comfort and include other people into private lightscapes. It is performative in the matter of facilitation, as atmospheric light enacts comfortably social practices in private homes.

5.1.2 Aesthetics

Some informants also value good light as something aesthetic. The usage of a light source in this register addresses the appearance of light and relates how appealing lightscapes are prioritised. A female informant puts it this way: "*So just in the hallway, we actually have four light sources with bulbs that just provides mellow and cosy light, they are not very eco-friendly but they are neat*" (Informant 6 14 June 2016). There are two aspects of valuing in this statement and we shall return to the environmental perspective later, but what is important here is the value of this informant's decor design. The first thing she told us when we asked her about her usage of light, was that she knew nothing about light sources in her apartment, because her boyfriend handled all the practical stuff. However, by articulating her

usage of light she realised how much she actually valued light when putting on makeup or having a stylish light setup in the hallway. The practice of relevance here is that of designing lightscapes, that look good. They might not facilitate anything in particular, but are integrated as a part of the interior.

Another informant explained: "*Neither of us appreciate the design of light bulbs, available on the market today. So we make it an effort to buy lamps where you can't see the bulb*" (Informant 4 14 June 2016). He continued: "*We have a lamp in the living room, which is the only one where you can see the bulb… One of those where the lamp is unimportant for the light. It is just there because of the look of it*" (Informant 4 14 June 2016). In both statements by this informant, the value of good light is something that is enacted in through combination of lamp and bulb.

One informant told us that he appreciates a matching setup of light and when buying new bulbs, they must also match the existing light sources. "*Sometimes, when you have bought light bulbs, you get home and they do not fit into everything else that you have. And then sometimes, they are too cold or too warm*" (Informant 10 14 June 2016). Here, good light is a lightscape that is continuously maintained and provides aesthetic stability. The practice at hand, handles light as building blocks, which structures appealing lightscapes to the informant. When talking about good light with our informants, the prioritising of aesthetic light and light sources became a recurrent topic. Hence, the argument for a register of valuing, with light as something aesthetic, being enacted through deliberately constructed lightscapes.

5.1.3 Money

As we went through our empirical data, this register turned out to be a compromising matter since economical concerns often were related to other monetary aspects. We chose to sort out those informants who solely valued good light in practices related to cost reduction, whether it being savings on the electricity bill or the products themselves.

One informant: "*If I need light for the bathroom or the kitchen where it's just practical, then I really don't care, I just want the cheapest solution offered to me"* (Informant 7 14 June 2016). This statement is an example of how the decision to buy a certain light bulb is affected heavily by the selling price of the product. The informant regards savings as the most

important value in the buying situation and disregards any other factors that might have been useful to him.

During our workshop, another informant showed interest in a Philips light bulb on the table and told us that this would be her first choice if she could choose any of them. However, she completely changed her mind when she was made aware of the price of 170 dkk. Her response to the price was: "*I would never buy this! Maybe if the price was 35 dkk.*" (Informant 11 14 June 2016). Like the informant before, the valuing of light occurs through the practice of comparing the costs of light bulbs and then choosing the cheaper one. A third informant emphasised on the matter of product prices, as he shopped second hand light bulbs online: "*I have bought a lot from IKEA due to their improvement of Ra. So the light has become decent. And then I have actually bought some expensive bulbs on DBA.dk. Those Sunflux with a Ra value around 95 or something. As new, they cost a fortune and I did not feel like paying 300 dkk each*" (Informant 9 14 June 2016). From this statement, valuing of light bulbs is done through the practice of weighing costs of new bulbs, versus used ones. Compromises are considered and end up being related to the selling price of the product.

The selling prices of light bulbs are not the only economical concern our informants relates to the value of good light. Some expressed valuing as something long-termed. When calculating costs of electricity, one informant said: "*For the most part I try to buy energy-saving light bulbs. The building I live in is relatively old and everything runs on electricity, even the heat. So I want energy-saving bulbs, so I can help the environment, but even more my electrical bill"* (Informant 1 14 June 2016). In this example of valuing, good light happens in the calculation of the amount of electricity used. The informant may find other benefits in his choice of light bulbs, but the savings on his bill are still the basis for his final decision when choosing new light sources. Valuing light from a monetary perspective is enacted through practices that regard economical concerns in many ways. Whether it be savings on the electricity bill, or a good deal in the supermarket, monetary considerations often have their say when consumers buy light bulbs.

5.1.4 Environmental concerns

This register has something to do with the various impacts a light bulb may have on the environment as indicated in our informant's testimonials. During our workshop, many of

them expressed how they perceived ecology from different angles when buying new light sources. One said: "*I don't like plastic for several reasons, it requires oil to produce"* (Informant 5 14 June 2016). Another emphasised on this matter while looking at different types of bulbs on the table: "*...but those in plastic, no. It's very bad for the environment having plastic as well. Having paper, which is re-useable is much better"* (Informant 13 14 June 2016). So, here valuing is enacted through the assessment of materials which the packaging is made from.

The environmental value of light also showed through thoughts on energy usage. Here, some informants valued good light as something that spared the environment and contributed to a green lifestyle. While examining the light bulbs available at our workshop, an informant said: "*Ooh! This one contains less mercury and it is energy-efficient. That is the type of specifications that would make me prioritise this bulb"* (Informant 6 14 June 2016). Another informant also related those values with good light when he compared products. He said: "*I need to know if they are green and energy-saving"* (Informant 2 14 June 2016). The prospect of having green light bulbs seemed to be attractive to many of our informants. In this register, good light can be seen as something that is enacted through environmental concerns and considerations, when comparing light bulbs side by side.

5.1.5 Brands

The brands of some light bulbs were ascribed more credibility than others by consumers. Some of our informants told us, how they value good light quality, solely by the manufacturers. While looking at the variety of bulbs during our workshop one informant said: "*I would buy this one because of this Warm Glow and because it is Philips. And I would actually only buy Philips or IKEA. That's the two brands I trust when it comes to light*" (Informant 9 14 June 2016). The valuing of light in this case, entrusts the brands with credibility and this informant does not need to compare it to any other products. Another informant shared similar thoughts: "*I would pick one of the Philips. Why? Because of the quality. The quality that Philips makes. The don't make rubbish"* (Informant 13 14 June 2016). This informant also value good light as something that have well-known brands behind it. His decision to whether or not a light bulb can fulfil his needs, is solely based on his knowledge about the manufacturers.

One final example of valuing on the basis of brands, is exemplified from the statements of this next informant: "*...But I actually think I would choose this one, Duracell. Also because it has 40 Watt and it definitely express quality!*" (Informant 7 14 June 2016). As his knowledge about light in general was insufficient to assist him in his choice, he turned to a brand which he felt was a safe choice. The statement exemplifies how valuing light bulbs can be enacted by returning to something recognisable and by the informant considered a safe bet. This register may not be the most dominant, but it certainly has its place amongst the rest, as some consumers value light solely by the brands presented to them.

5.1.6 Easy-to-use

This sixth and final register regards how good light is valued as something being easy to use and understand. This practice occurs when handling packaging, reading specifications or even navigating through stores to find the right product. While sharing thoughts on the various packaging present at our workshop, many of the informants expressed negative remarks on the plastic materials used. One said: "*...But this is also such a mess to open up and I really dislike that. I know it protects the light bulb, but I am afraid to crush the bulb when I have to use force to open it up"* (Informant 5 14 June 2016). Another informant joined in on the matter: "*I mean, how do you get into this if you don't have any scissors? NO!"* (Informant 13 14 June 2016). Here valuing of good light is related to the easiness of package opening. The plastic material used to contain the light bulb, is hindering to some consumers and they might choose some bulbs over others based on the packaging materials alone.

The packaging of light bulbs also features a variety of specifications for the consumer to translate into their interpretation of good light. Those numbers and illustrations are tools which some informants also shared their thought on: "*I would choose this one. This is an LED 470lm. It provides a quick overview about the luminosity, how much energy it uses and there is an easy translation of life expectancy"* (Informant 5 14 June 2016). Here, good light is valued as a product which is easy to buy. The informant appreciates the information presented to him on the packaging, as he is able to smoothly grab the light bulb and be done with it. Another informant said: "*I try to find something that is equivalent to 60 watt. Then when I find it, I'm happy. Down in the shopping basket and then I'm on my way!"* (Informant 11 14 June 2016). This example also credits good light with the value of ease. This informant just needed simple information to buy her light bulbs and she is very pleased when she is able to

find that quickly. When addressing easy selection, a third informant told us: "*Generally I like the packaging where you can actually see the product. I really dislike when you can't, then bring it home and unpack a useless light bulb*" (Informant 10 14 June 2016). Here the packaging is also embedded with user-friendly value. As the informant is able to review the light bulb visually in the store, the chance for him of buying a damaged or unusable product is reduced.

The request for easy visuals not only relates to the physical product, but also the illuminance. One informant said: "*I do not know anything about it, so I would like some help. Like, is it great for the bathroom, bedroom, oven or refrigerator? I mean, more guidance for typical usage instead of those numbers, which I can't relate to.*" (Informant 8 14 June 2016). Valuing light as being good, is to this informant a matter of visual translation. Depictions of lightscapes or written guidance relating to different practices are tools, which would ease the shopping experience for this informant.

The information on light bulb packaging is also something that Anne Bay, from DCL, believes should be redesigned. In our interview with Bay, she outlined a design proposal that dismissed the traditional information about lm, Ra and K. Instead she suggests a more consumer friendly design, which involves a system, providing the consumers with various levels of pre-sets to choose from (A Bay per comm., 17 May 2016). This would dismiss some of the consumer's confusion when comparing light sources.

Presentations and visual displaying of light sources in stores are something that many of our informants found useful when shopping for new bulbs. In the lighting section of IKEA, small showcases are deployed, exhibiting the light bulbs available (observations 10 March 2016) One informant told us: "*They have working examples of all of their light bulbs where you can see how they look, light up and stuff like that. I really like it and it is very influential*" (Informant 6 14 June 2016). In this example, showcases supports the informant as she can easily translate the visual depictions into something she can relate to. There is no need for her to search through piles of products. Valuing light in this case, is a practice of easy browsing, providing the informant with an uncompromising buying experience.

However, some of our informants expressed an opposite view on browsing: "*I am actually really confused when I'm shopping for new light bulbs. And I don't know if what I know is*

right or wrong. It is a jungle! And I don't think you get any clear guidance out there" (Informant 7 14 June 2016). Another informant added, "*I am not shy to admit that I ask for guidance at the store. I do not read the specifications; I always find the packaging to feature an insane amount of information*" (Informant 3 14 June 2016). There are two things at hand here. Firstly, the lack of guidance and comparison to a 'jungle', which directly prevent the informant to find what he is looking for. Then, there is the amount of information printed on the packaging, which prevents the second informant to translate it into something beneficial. In both examples, valuing good light is something that is done through an easy overview of the products available and simple information on the packaging.

In every register above, valuing good light is related to practices, where people weigh, measure and assess a variety of different factors, that can lead to either purchase or not. In the registers of how consumers valuate light, we also find many examples of criticism towards both easiness, packaging, pricing and energy-efficiency. That criticism would arguably be sufficient enough to begin the *dream phase*, but at the same time, our informants have somewhat clear ideas of what they want when it comes to the light itself, whether it being atmospheric light, aesthetic light, practical light, packaging design, accessibility etc. We cannot neglect the importance of those findings. These possible conflicts of activities within and between the registers, are what Annemarie Mol and Frank Heuts (2013) coin as, *tensions*. In these tensions, we shall see how valuing good light, sometimes is a compromising matter between different kinds of *goodness* and how prioritising of registers can be difficult to wrangle.

5.2 Tensions between registers of valuing

Tensions can happen between registers of valuing, as activities which continuously are being either prioritised or overlapped by each other, to decide what makes the specific light bulb better than worse. Consumers also choose light source based on various factors, which results in tensions and clashes between the registers. In this section we present samples of the many tensions that we experienced and which contributed to pivotal points of criticism. The majority of tensions occurred between the registers, but we also experienced internal tensions within single registers.

5.2.1 Environmental concerns & easy-to-use

The first tension at hand is that of *environmental concerns* and *easy-to-use*. Here we exemplify how two registers clash directly as processes of valuing and how from them, the result is an unachievable aim. One informant told us that he only used energy-saving light bulbs, but when asked where he purchased those bulbs, he answered: "*IKEA, I live just next to it"* (Informant 1 14 June 2016). He also told us how he required that type of bulb due to savings on his electrical bill and to spare the environment: "*Well, when the whole building I live in runs on electricity, I find it important to save wherever I can, also the environment"* (Informant 1 14 June 2016). Even so, he was not aware that the bulbs he had bought the day before were LED, since IKEA only sell LED light sources. When made aware of this, he first comment was: "*Damn it! Now I have to search for them elsewhere!*" (Informant 1 14 June 2016). He fully believed that energy-saving light bulbs had the advantage over LED in the consumption of electricity and that LED was the inferior technology. In his mind, the informant has no other choice than to replace IKEA as his favourable store with another that sells energy-saving light bulbs. Since his argument for good light is that of an environmental view, he could actually fulfil his needs at IKEA, but not realising the difference between LED and energy-saving light bulbs, he will not actually be able to do that. This clash evidently highlights a lack of knowledge of the technical specifications and leads to critique of his nearby IKEA for not selling his desired energy-saving light sources.

Looking into the activities within the register of *easy-to-use* another tension is apparent. This appears when consumers value the amount of technical specifications on packaging against the actual information. As quoted earlier, this consumer said: "*I am not shy to admit that I ask for guidance at the store. I do not read the specifications; I always find the packaging to feature an insane amount of information"* (Informant 3 14 June 2016). While examining different packaging in our workshop he picked one labelled (Warm Glow) and said: "*I think this one will produce more exciting light for my living room"..."Because it indicates what kind of light it produces"* (Informant 3 14 June 2016). This consumer prefers having (Warm Glow) written on the packaging rather than 2700 K. Both versions of representing the bulbs' colour temperature indicates the same temperature, but having it written in a colourful font seems more approachable to this consumer. This indicates that illustrations might be a better tool than written descriptions, when communicating information to the consumer. This relation between packaging design and specifications can be seen as fragile, when consumers

praise indicators of the light bulbs features, but are intimidated by the amount of standardised specifications that achieves exactly that. Here we see criticism towards the design of the packaging and the way information is presented to the consumer.

During our interviews and workshops, our attention has repeatedly been drawn towards the various specifications that the informants mentioned and criticised. The purpose of those specifications are to enlighten the consumer in an easy way and they are commonly seen on the packaging and other qualification devices at the place of purchase. However, valuing light purely from specifications is not an easy task to many of the consumers we interviewed. When asked what kind of information the informants looked at, when buying new bulbs, we got an almost unanimous response. Here is a statement from a consumer: "*Well, first of all, I look at the wattage, yeah, that's what I do. I think you can get less, but I would go for 40 watt, you know, that soft and warm light"* (Informant 7 14 June 2016). Another adds: *"You see*, *I believe that effect watt replaces the Kelvin number. Then I know how strong let's say a 55 watt bulb is. Watt, it's a classic number, something I understand"* (Informant 5 14 June 2016). These two statements, amongst many, suggests the focus on watt as the primary specification for consumers to qualify their purchase. No thoughts on lumen (lm) or colour representation (Ra) were mentioned. Valuing light from wattage alone may lead to safety, as this number is something recognisable, but neglecting the other specifications, again tells us something about the struggle of comprehending technicalities dealing with light. As we have experienced, tensions can happen when valuing light from environmental and user friendly perspectives. Sometimes it creates conflicts and this may lead to a struggle in the practice of buying the actual light source.

5.2.2 Easy-to-use & Money

Turning to another tension between the registers of valuing, we look at *easy-to-use* and *money*. Here we experienced some informants who considered both pricing of light bulbs and the accessibility when buying light. One informant said: "*I think it is interesting to look at the different options, but I can't do that in IKEA. Everything is so messy and I can't get an overview. I mean, the good deal could be in any of the baskets and I can't be asked to go through them all, when there are so many*" (Informant 1 14 June 2016). This informant had worries regarding whether or not he would be able to get a better deal by searching through all of the baskets in IKEA. Here tension is a compromise between product arrangement and

selling price of the product. In the end, this informant might just incline towards a quick solution and choose not to care much about pricing, as he can't be bothered with the struggle of searching through piles of bulbs. In this example, the informant criticises the messiness of IKEA's lighting section.

Another informant also shared his thoughts on product versus price. This informant used both the pictures and light bulbs at the workshop to express his opinion regarding light purchases and choice of product: "*Over there (Fakta), that is just really messy and ugly. And IKEA, I do like the balance between price and quality. I don't know, but I don't mind the product placement there. I mean, yes, there is a big difference from the other pictures and I actually think it's nice with a scraped packaging. Finally, when looking at Føtex over there, I think it's a bit overkill, when you just need a bulb"* (Informant 10 14 June 2016). As opposed to the other example, this informant had no problem with IKEA's arrangement in the lighting section. Since the price is lower than Føtex, he accepted the messiness and cheaper packaging. To him a good light is something where price and quality harmonises. On the other hand, he had negative reactions to the light bulbs from Føtex. In contradiction to the more plain cardboard packaging from IKEA, he found some of the plastic ones from Føtex to be too flashy "*when you just need a bulb"* (Informant 10 14 June 2016). Here we see some direct criticism towards the flashiness of some packaging designs. The eye catchiness might act in hindering the consumer, as it can be too overwhelming. In the tensions between *money* and *easy-to-use,* we find that criticism is prone to regard the price of the bulb and arrangement of the products in stores.

5.2.3 Aesthetic & Environmental concerns

In the register of *aesthetic* we experienced one informant who valued good light as being something nice to look at. This is what she said earlier: "*So just in the hallway, we actually have four light sources with bulbs that just provides mellow and cosy light, they are not very eco-friendly but they are neat"* (Informant 6 14 June 2016). She also told us how she considered the environment when buying light bulbs: "*I want some of my light bulbs to look neat and then some which are eco-friendly"* (Informant 1 14 June 2016). She praised having light as an aesthetic addition to the interior, but was very conscious about having energy-saving light sources. During the end of our interview she added: "*I do look at how much energy the bulb uses, I really do!"* (Informant 1 14 June 2016). This informant might choose

aesthetically stylish bulbs over eco-friendly ones any day, but nevertheless, she still includes ecology into her equation when deciding which product to buy. This leads to tensions between the registers of *aesthetic* and *environmental concerns*. Valuing light becomes a matter of either sacrificing stylish lightscapes to appear more eco-friendly or as in this case, the other way around. Having to decide between these two registers in a buying situation, might express some form of desire towards an aesthetically and eco-friendly light bulb.

5.2.4 Atmosphere & easy-to-use

Within the registers of *atmosphere* and *easy-to-use,* good light can be valued as something being both practical and atmospheric. When asked about where light would be most important this informant said, "*If I don't have proper light in the bathroom, I can't see what I'm doing. When you put on mascara, it's not really pleasant to feel your way through. But yeah, It's really important with nice light in the living room, because you spend so many hours there."* (Informant 6 14 June 2016). In this case, good light is valued as something that can facilitate specific practices and create a certain ambience. A light source that could fulfil both needs might be appreciated and welcomed. The informant's idea of good light, really depends on the practices in which she needs a certain light function. Buying separate light sources for each room with different specifications can be a frustrating endeavour as we have seen it in other examples. Since this informant chose two rooms when asked to choose one, she clearly finds herself in a predicament and tensions between the registers that are in effect.

This concludes our take on tensions between registers of valuing. We have seen how valuing is more than just a matter of price, aesthetic or environmental concerns alone. Consumers carry a lot with them in the practice of buying light and have highlighted how different activities affect the choices of products. Value in certain practices are either being prioritised or overlapped by others. There are an endless amount of tensions and relations between registers of valuing and we have just presented a small part of the many we identified from our workshop and interviews. Still, we believe this selection of tensions to be sufficient when underlining the complexity of what good light is and how good light can be seen as being multiple (Mol 2002). We also aspire to use these tensions in our attempt to intervene in the practice of buying light.

Criticism towards various aspects of light purchases and light usage have been aired, and this is also one of the intentions of the *critique* phase regarding our work with Future Workshops. There are struggles to be found when consumers are unable to achieve the right lightscapes due to the lack of technical knowledge and also problems in general, when acquiring the right light bulb. Criticism is needed as we, with the informants help, can turn it into fantasies and ideas about how to accommodate the exposed areas of critique. While our informants criticised certain areas for various insufficiencies and shortcomings, they also shared many ideas about how and where to improve and some directly requested favourable changes. The reason why we call this part the *critique* phase and stresses its importance, is due to its part in the step towards the construction of a stable and dynamic network: the practice of buying light. In the next section we shall look into the many wishes, ideas and requests presented by our informants.

6 The dream

In this section, we will present some of the many wishes and requests that our informants told us about throughout our workshop. For the most part, they focused on the improvement of packaging, less confusion at the stores and an easier way to read and understand technical specifications. All of these wishes and requests originate from the various registers of valuing and highlight how consumers would like to improve certain aspects within the practice of buying light. The statements in this section will be interpreted with some of Bruno Latour's notions within Actor-Network Theory, as we strive to embrace as many wishes and requests as we can and make them useful in the *realisation* phase. This will be elaborated in the next part. Our reason for using ANT here is to identify the many ongoing negotiations, inscriptions, translations and spokespersons, which are apparent in the informants' dreams of a better practice of buying (3.2). This part carries the project into the next phase of the Future Workshop model, and a step further in the construction of a stabilised network of the practice of buying light. We will now present a selection of wishes and requests from our empirical data and conceptualise them with ANT terms.

6.1 Wishes and requests

The first wish relates back to the register of *easy-to-use*. Here an informant said: "*Reflectively I think it would be nice when you look at a new light bulb which is not displayed turned on, to have some tools to show how the light is"* (Informant 4 14 June 2016). This informant requests some form of depictions that describes how the light bulb will actually light up when turned on. What this informant is unaware of, is that the information can already be found on the packaging, although it is presented to him in an incomprehensible way. So, the task ahead of us, could be to create intuitive illustrations or icons that would mediate the numerical specifications, which often are only understandable to semi-professionals and professionals working with light. As said before, our aim is to stabilise the network of the practice of buying light, so to accommodate the request from this informant, we will translate it into a wish for better inscriptions. The inscriptions are already there, so what needs to be changed is their shape or expression. An example of this could be to redesign Kelvin numbers into actual pictures of how the colour temperature would look like from a lit light bulb.

Another informant stresses something similar, which also relates to the register of *easy-to-use*: "*I would rather just have the specifications that I find relevant printed on the packaging*"

(Informant 7 14 June 2016). Here the informant requests a simpler packaging with less information printed on it. He only desired information that he found relevant, which in this case was Ra, lm and K. As we experienced in the register of valuing, section 5.1, a lot of informants had issues with the amount of information on the packaging. Now we see a specific request to have those eliminated or at least somehow minimised. This informant does not wish for better inscription, but rather a reduction in the amount of inscriptions. This leads to a prioritising of the many visible inscriptions on the packaging. However, which inscription to cut off? Are the consumers looking for the same information when they find themselves in a buying situation? This could be interpreted as a wish for translations within the network. It might be possible to compound some inscriptions just like Anne Bay suggested in section 5.1.6.

Stores like IKEA only include 2700 K light sources in their assortment, and having Kelvin written on their packaging, might send consumers on a wild goose chase if they think that there is a variety in Kelvin. Instead of talking about K, Ra and lm at the same time, it might be possible to eliminate Kelvin on the packaging and let lumen represent both K and lm instead. To create such a translation, lumen in raw numbers could be imagined as an indexation of luminosity with a strong, medium and weak group. A suggestion we take into consideration in the *realisation* phase.

Looking at the next informant's statement, we also see a wish for better packaging designs. He said, "*I do not know anything about it, so I would like some help. Like, is it great for the bathroom, bedroom, oven or refrigerator? I mean, more guidance for typical usage instead of those numbers which I can't relate to*" (Informant 8 14 June 2016). This informant has little knowledge about the technology, but specific demands to his light sources. He would also just like the packaging to contain some kind of intuitive indication, telling him where the exact light source would create good light. We see how some packages have a translation from lumen to warm white on the front. Some consumers find this very useful. We see this here: "*I would buy this one because it reads 60 watts!"* (Informant 11 14 June 2016). Adding an icon that indicates where the light bulb is useful might accommodate requests from many consumers. This could be universal icons like a bed, a toilet or a cooking pan.

The statement from informant eight relates to the first statement in the *dream* phase. Here we experience a wish for intuitive guidance and indication of how the light will look in action. In

the construction of a network this could be a translation between actors. Letting a simple icon talk for a light bulbs illuminance in a room or letting the icon/packaging talk on the behalf of the technology. The consumers would not have to go home and try the light bulb; instead, there would be a great chance of a successful purchase in the first place. Successful translations are contributing to the stabilisation of the network that comprises the practice of buying light, and it is a step in the process of creating black boxes (3.2.3).

Another informant, who participated in a group, told us: "*I would like to be able to see the light bulb and the socket to get an idea if this bulb is actually the one that I am looking for*" (Informant 6 14 June 2016). This is a statement that exemplifies the informant's process when searching for a light source. She is obviously into visibility and likes to see the exact light bulb even though it should not be necessary if she was able to read the specifications on the packaging. She is definitely not the only consumer purchasing this way. Our observations in the different stores, witnessed how many packages containing light bulbs were broken due to consumers wanting to see the light bulb before buying it. Professionals with relations to the lighting industry may not have the same need for visibility, as they are confident with the technical specifications and features. An informant who works as an electrician, told us how he only operates with light sources in pure numbers, he has no need for pictures or other illustrative indicators. He receives the products in plain brown boxes with black text, no icons, no colours (Informant 14 14 June 2016).

6.2 The packaging as a spokesperson

Through earlier studies we have experienced manufacturers who are not always proactive when including consumers in product development. This sometimes results in the neglect of the consumers perspectives, which may lead to difficulties in the buying situation. Taking knowledge about light technology for granted may, in worst case scenario, result in unawareness of the consumer's needs, which in this case is visibility. This again relates to the register of *easy-to-use* and we begin to see how it makes sense to think of the packaging as a spokesperson in the network of the practice of buying light. A strong and successful translation from the light bulb to the packaging is the actual task that needs to be addressed. We can see the packaging as a spokesperson due to the many translations that happens between the inscriptions and the packaging, which indicates the features of the light bulb. Without the packaging the consumer would have slim chances of buying good light. This

indicates that we might also be able to see the packaging as a obligatory passage point in the network (3.2.2).

As informant six said earlier, she would like to be able to see the actual bulb through the packaging. In this situation, the light bulb is not able to talk for itself regarding shape and appearance and therefore it relies on a successful translation. The core feature of the packaging is to protect the light bulb from external harm, which challenges the idea of an exhibited bulb, since the packaging materials must capture more than one physical feature, such as transparency and sturdiness. To accommodate the wish for a successful translation from bulb to packaging, we have to consider the build quality and design later in the *realisation* phase

The next quote also underlines the importance of the packaging design in the practice of buying light. An informant said "*...But this is also such a mess to open up and I really dislike that. I know it protects the light bulb, but I am afraid to crush the bulb when I have to use force to open it up."* He continued by adding: "*And then I can see the socket because it is open in the bottom. I like that. Packaging should include this more! And then, one of the sides contain information about energy usage. So this is the most approachable"* (Informant 5 14 June 2016). We see how the shape of the packaging and the build material has an effect and communicates with the consumers. Many factors have a say when consumers choose. The informant also values practicality when buying light. He discarded one of the presented light bulb at our workshop because it was difficult to open and he was afraid to break the bulb. The segregation has nothing to do with the light technology or the shape of the light bulb itself; it is the composition of the packaging that does this. He is not a fan of plastic packaging. However, in the attempt to accommodate the wishes from as many consumers as possible, the challenge of choosing materials emerges.

If the consumer wishes to see the shape of the light bulb through the packaging but prefers cardboard build material, compromises must be made. As said before, these considerations regarding packaging material and design must be accounted for in the *realisation* phase. Informant five also values the visibility of the socket, just like other informants. The packaging in front of him, fulfilled some of his requests. He appreciated that a whole side of the packaging is used to show the use of energy. However, he was still not able to see the

shape of the light bulb and opened the packaging. This is not the ideal packaging, but does have certain qualities that can be rallied around.

One of the light bulbs in our assortment at the workshops stood out due its packaging. It was green and a label was attached reading *'Do your part to reduce the emission of CO_2'*. It was covered in plastic, so it was one of the "hard to open" packages. Nevertheless, this product was notice by one informant who stressed, "*Yeees! I very much like when the companies make an effort to explain. Here it says 'Do your part to reduce the emission of CO_2 ' And then it says something about these bulbs containing zero liquid mercury and that makes me think GREAT! That is great for the environment. That is extra information that I would gladly pay for and that more companies should do!"* (Informant 6 14 June 2016). The packaging tells a story about the product and relates to tensions between *environmental concerns* and *easy-to-use*. The label is a good and successful inscription, as the informant understands the purpose of it. It tells something about the amount of mercury, which is zero. However it also tells a good story, the good story about a green product. We see the same trick used on other products in supermarkets, an example of this, is milk. The brand Arla supplies a significant portion of the milk sold in Denmark. To remove the mass production image, Arla started to add pictures and descriptions of the small local farms where the milk originated. The aim of this is to tell a good and credible story that was attractive to the consumer. It suppressed the feeling of buying dairy products from a multinational company and instead made the consumers feel that they directly supported Mr. and Mrs. Farmer (Arla 2005).

This trick is comparable to the packaging of this green light bulb. The informant is willing to pay extra for something she can understand and easily relate to. In this case, it is something that reminds her that she is buying a product that also supports a good cause. It does not necessarily have to be the environment, but she is willing to pay for strong and narrated information. A good inscription and a strong translation seems to be the wish from this informant. This statement is not directly a wish for the future, but rather a comment on the current situation. Still, we can use these comments for future designs because it underlines a need or wish for clear and intuitive information displayed on the packaging. The colour coding here is used as a tool in the communication to the consumer. It is a translation since the green colour symbolises "eco-friendliness". In the *realisation* phase, we need to pay close attention to this informant's statements, as we also aspire to embrace both credibility and intuitive information.

Returning to the buying of milk, another example of a well-functioning packaging system is the milk cartons. In this case, you do not even have to read the carton to know whether it is skimmed milk, semi-skimmed or whole milk. Dairy companies have implemented a system that indicates the content based on a specific colour. It is intuitive and it works. The system is also transferred from the practice of buying milk to practices at home. If you are making rice pudding and need milk, you can trouble-free wander into any supermarket and choose the dark-blue carton, which will contain whole milk. You do not have to go home and try it before you know whether the whole milk fits for the rice pudding. The packaging is familiar and recognisable. It is a standard that most Danes understand and are accustomed to. The milk packaging system is a very strong and stable network. All actors have strong relations and many translations have occurred through endless negotiations within the network. It is a black box and it is not questioned. To construct this kind of network regarding the practice of buying light is our aspiration. We are aware that the milk packaging systems is a national system, however constructing a universal system that is recognisable would be valued by this consumer: *"I think this looks familiar. So there is definitely something about recognisability"* (Informant 10 14 June 2016). He made his choice of light source at the end of the workshop because it looked familiar and he thought that it was something he already had at home, but he was not sure.

Many informants had wishes for improvements of the packaging. Another informant stressed: "*Regarding the packaging, then I want something that I can throw directly into the bin and not something that I have to sort out in four different bags"* (Informant 12 14 June 2016). So here we see how the material of packaging becomes crucial and this informant is concerned with the sorting of his trash. He wants this process to be as easy as possible. Here it is clarified how the valuation of a product continues outside the store. It is something that he considered in the store and in our workshop. This informant is concerned about the environment and the quote could also have figured within the register of *environmental concern*. So could the following statement from another informant: "*So the simple packaging I like. Simple cardboard boxes*." He continues: "*I like the idea of cheap and reusable packaging*" (Informant 13 14 June 2016). The first part of the quote relates to both the register of *easy-to-use* and *environmental concerns*. This is yet another example of the endless amount of tensions that can be identified in the generated data. The last part of the question is also an expression for an environmental concern, which is obviously shared by many consumers. We can see these kinds of wishes as a request for a strong translation between the

environment and the packaging. The informant would like the packaging to talk on behalf of the environment, letting the environment have a say.

So, what we found by investigating the consumers' dreams and asking how they would like the practice of buying light to be, it is clear that improvement is needed. We find that many of their requests are realistic and are supported by observations from the stores. By translating the many requests into ANT terms, it is our aim to identify where in the constructed network we find the biggest challenges, which actors lead to the instability and how we might intervene directly. We see that many of the requests are implicit, that is, a wish for black boxes and spokespersons within the practice of buying light. Many informants point at the information printed on the packaging. We call this information, inscriptions. They all somehow find the packaging tricky to understand, but it is not necessarily the same thing they find problematic. By using the term inscriptions, we are able to create some sort of order within the network. The informants have problems with the inscriptions and we find this to be a barrier in the network.

We find many translations and inscriptions connected to the packaging, which indicates that the packaging might be a very powerful and at the same time a problematic actor worth looking into. We find a lot of activity around the packaging. On the packaging, in the packaging and the packaging itself. There are so many actors represented through, on and in it. From the first two phases, we have come to the fact that a transformation of the packaging could create a change in the current network that comprises the practice of buying light. Changing the design of the light bulb packaging will affect a large number of actors. Knowing that light is a multiple phenomenon and being aware of the many wishes from the consumers, we have created a good basis for experimenting with a potential new design. This concludes our *dream* phase and leads us into the final phase of the Future Workshop model: the *realisation* phase.

7 Realising designs

We have investigated how light is enacted in everyday practices. This is important for us to get an understanding of the practice of buying light. Through the *critique* and *dream* phase, we have achieved a good idea of how this practice actually occurs and what the realities are. They infiltrate each another and we have identified the base for the decision-making, which we will aspire to change. Some of the things that the informants wish for are; clear and understandable information on the packaging, less and simple information, intuitive icons guiding to the right place of use, being able to see sockets and shape before deciding, clarification of energy-use, telling a story about the product and the packaging being recognisable.

In the following section, we will make an attempt to construct the requested network, that is supposed to change and optimise the practice of buying light. It is our aim to do this through a direct intervention. To construct a stable network, we have to be thoughtful about our approach. By investigating the generated data through a *critique* and *dream* phase we see points of criticism and wishes, which leads us to our intervention, a new packaging. We believe that the wish for successful translations, better inscriptions and a strong spokesperson can change the existing network into having more stability and thereby aid the consumer in the practice of buying light. Doing this should increase the uptake of LED light as requested by DCL (1.3).

Furthermore, the packaging is one of the manufacturers' most efficient communication lines with the consumers (Philips pers comm., 12 July 2016). The packaging is what the consumer bring home, the packaging is what the consumer can recognise and the packaging contains the information needed to obtain good light. It is also where our informants are struggling the most and where frustration is found.

Many factors are in play when the consumers buy light. Changing the display of the light bulbs, rearranging a lighting department, doing an advertising campaign or many other things might have led to a change of the practice of buying light. However, a thorough analysis of our empirical data has led us to one choice. We cannot be sure that a change of packaging will construct a stable network, so this is an experiment. The consumers will arguably always experience tensions when dealing with valuation, so inventing or designing a new packaging

fulfilling all expectations, wishes and erase all points of criticism, is not a goal. Instead it is our aim to move from very messy realities towards more order and stability (3.4). If this is possible through a redesigned packaging or possible at all is unknown. To accommodate the many realities presented by us through Annemarie Mol's theoretical framework in one product, can seem like an impossible task, and it might be. However, this is why we chose to use Latour in the attempt to create order within the network. Latour's theoretical terms allow us to standardise and conceptualise the movements and negotiations taking place in the practice of buying light.

7.1 Prototyping packaging

To investigate the potential of a redesigned packaging, we will use the product development tool Prototyping as described in (4.4.1). In Tim Brown's chapter *'Building to Think, or, The Power of Prototyping'* he writes about how they used prototyping when redesigning the company IDEO, he writes: "*As the prototypes unfolded, we learned that a story needs to be repeated many times before people understand how it applies to them and many more times again before they change their behaviour.*" (Brown 2009). This is not because people are stupid, but to change their incorporated practice can be difficult. We have seen this when investigating the practice of buying light. Shifting from the traditional light sources to LED has not been easy. When a consumer tries to understand how to buy the right light source they keep translating back to wattage, even if it is the 10th time they buy light. So we are aware that a transitioning period is unavoidable and that is what the consumers are in right now. They are moving from watts to lumens and from incandescent bulbs to LED technology. We do not expect our product idea to end this transitioning period but rather make the technology shift easier and possibly aid in shortening the period slightly. We want to create some order in the messiness.

In the following section, we will present some of our prototypes that have been created during this project and have led us to the prototype that we will take further into the world in order to get feedback from potential end-users (Brown 2009). We will herein account for the origin of the idea and how it will work. We will make an attempt to evaluate the prototype to find out if it has any functional value. A part of this process is to identify which wishes or critique-points it will accommodate and which new tensions it may contribute to.

7.1.1 Prototype 1

Figure 9

Our first prototype is a play with shape. Trying to break the thought of the regular box shaped packaging. It has the shape of the light bulb, which makes it fixed. The top and bottom is open, which makes a part of the light bulb visible. Further, it has a handle that associates with a basket. The purpose of the handle is to make it easy to place in a store. In many stores, the light bulbs hang on a wall, just as we have seen in Føtex. When designing packaging this is worth considering.

We have seen how packaging can be designed for a certain company. An example is IKEA. Some informants talk about buying big boxes of light sources in IKEA. They have an association with bulk buying. However, many of the light bulbs in IKEA are packed in plastic, and are flat. It is not very decorative, but the flat packaging, allow many light bulb in one box, this is a part of the arrangement in IKEA, having many products in limited space.

During our observations, we found that many consumers look at the socket. Sometimes they even open a sealed box to check if the socket fits their needs. This observation is actually a bit surprising, since the icon or term for the socket has not changed for many years, and has nothing to do with shifts in the technology. E14 and E27 are the most common sockets. When asking the consumers, those numbers might as well be converted into, small or large socket designations. This inspired the idea to leave the bottom open, for the user to be able to see the socket. Some of the existing packaging shows the socket, which is appreciated by the consumer. Since the top of our prototype is left open it also enables the consumer to get an idea of how the light bulb looks aesthetically. Here, this point of criticism is met in the design.

Through prototyping, we imagine that the concerns within the register of '*easy-to-use'* would be significantly reduced or maybe even cease to exist if the prototype were accepted as a good idea. It can be made out of cardboard and is very easy to open. However, it would also meet

some challenges in the stores. Having it fixed only by being wedged in cardboard, might not be a long-lasting solution, since it might become too flimsy. Further the shape and construction might not be ideal since it takes up a lot of space. We are not convinced that this packaging model would be beneficial in the construction of a stable network, since we did not experience much functional value. Further evaluation is not necessary.

7.1.2 Prototype 2

Figure 10

Our second prototype is a little more complex and might take a little more explanation to understand. The main idea is on the contrary not that complex. Informants told us, and observations showed us, how the size of the socket is important and that has been the main focus in the construction of this prototype. The red top is a lid and can be removed. This allows the consumer to see the top of the bulb. This is also where the light bulb comes out of the packaging. It is partly open in the bottom, the socket is visibly but protected by a semi hard cardboard tube with no bottom. To open the packaging and release the light bulb, you remove the red lid on top, press on the socket and the light bulb pops out.

The part of the packaging that keeps the bulb safe is also made out of hard cardboard, which has a protective value. We actually showed this prototype to a consumer who said "*I do not have to worry when packing my shopping bags. I am not afraid that it breaks during transportation*" (Informant 22 17 August 2016). A light bulb is often made of glass and thereby a fragile product. This hard but still appealing material is worth further consideration. To protect the light bulb was not our intention when constructing this prototype, but was the first thing our informant noticed when seeing this prototype. This is a good example of how prototyping can be inspirational and what might happen when you make ideas tangible. New ideas can arise.

The shape of the packaging is round, which is a bit untraditional however it looks good and feels good to hold in your hand. On the other hand, the round shape can be difficult to stock and hard to place in a store. The space for information is limited and the surfaces are not that

useful. Further, the idea of having a removable lid is also untraditional. The lid has an aesthetic value but not much functional value. Having removable lids in a store with people opening and closing them is not practical as the lids may become misplaced, leaving the light bulb unprotected.

The prototype relates to the register of *easy-to-use*, since it is easy to handle. At the same time it can be made of cardboard, so it can also change the register of *environmental concerns*. To enhance the consumer's experience of this packaging, it could make sense to construct the middle part in a see through material, which could be plastic. This way we could construct the desired translation between packaging and light bulb, this would decrease some registers and meet many wishes. However, it would also create new tensions in the valuing of good light. Potential tensions arise for those who wish to see the bulb through the packaging, but still value an environmentally friendly packaging.

7.1.3 Prototype 3

Figure 11

The main thought behind our third prototype was to comply with a common wish from many different consumers, a wish for a strong translation between packaging and light bulb. The idea is to make the light bulb and socket as visibly as possible, which was actually achieved with this model. The packaging occupy quite a lot of space, which can be a downside when displayed in the store or stacked in a stockroom. The Z-shape inside the frame keeps the bulb safe, fixed and easy to open. The consumers do not have to be afraid to crush it when unwrapping it. Since it is constructed from one long piece of cardboard, it can be opened from one side and unfolded.

The composition is simple and the material is cardboard. The idea was to leave it in brown raw cardboard colour, without a lacquered surface. This thought is based on the register of *environmental concerns*. This should help the consumers to identify that it is an environmentally friendly product they are about to buy. We have observed how the consumers often do not look at the energy label, so using the packaging material as a symbol

for the energy label might be beneficial. This might be a successful translation between energy use and packaging material.

The bulb and socket is visible from both sides. It makes the design look very light. The frame around the light bulb is quite wide and has four sides. This leaves a lot of space for information, like lumen, Kelvin, Ra, energy labels and so on. Here the art is to keep the packaging simple. When having that much space for useful information and marketing it can be tempting to use it. Our thought was to keep it brown with only black text, and keep the icons as simple as possible. The construction of the packaging should tell the story itself. This will only be possible in a network with a serious amount of black boxes.

We believe that a black and brown open cardboard design could accommodate part of the register *easy-to-use* and e*nvironmental concerns* on a theoretical level, however the consumer might not find the design that attractive. It is very different from how we see light bulbs presented today and we doubt that consumers will get the intended associations and the network will not become stable. However, what we learned from this prototype was that it would be possible to change the agency of the packaging material. This prototype might not be the right way to do it, but it has been inspirational and it drove us forward in the design process.

7.1.4 Prototype 4

Figure 12

Our fourth prototype is not a box in the same way as the others. It is what we could call, a bulb-holder. The light bulb is firmly fixed in the cardboard construction. It is presented very aesthetically and the consumers are able to view the whole product before buying it. Here we already see how registers and wishes are met. This is a very simple prototype but also a very simple idea.

There is not much space left for information and it will be difficult to even fit in the energy label. Making text or symbols too small can also been an issue, since one of our informants already stressed that he found the text too

small, and was not able to read it (Informant 13 14 June 2016). So having good surfaces on the packaging is worth considering for further designs or prototypes. Adding a bottom and a top will give extra space for information but also remove the lightness and minimalistic feel of the design.

In this instance, the packaging allows the bulb to be visible through a translation. It might be a translation that the consumers have wished for, but it can still be discussed how successful it is, or if it contributes to the stability that we are aiming for. Presenting the light bulb in this design makes it visible but also very exposed. The bulb is still fragile and will break if something hits it directly. It is protected from all sides by the three dividers that holds the light bulb, however, if something gets in between the bulb, it will break easily. This is one of the reasons stores like Føtex, IKEA and Fakta might not find this design very attractive. We can imagine them looking for something more sturdy. We do not see this kind of design in the current scenarios, which make sense. This model might be more suitable in a speciality store without self-service.

7.2 The next generation

After a good cut and paste process where the different prototypes have been measured and weighed, will we now make an attempt to create a prototype that can be taken into the world. Here it will meet the potential end-users and gain feedback. It is an experiment with the aim of getting a feeling of how the product will manage in the practice of buying light. At the same time it is a test of our analysis. Not that the analysis or thesis has failed if the feedback is not positive. Rather it is a test of how suitable our methods and theoretical approach are for a process in product development. The combination of the *multiplicity*-oriented and the *strategic*-oriented approach, in preparation for the development of a product has not been seen in this context before. It might work in theory but we cannot be sure if it has any effect on the practices of buying light.

Even though a prototype should not be too much of a finished product, we put an effort into creating a packaging that resembles a finished product. Still, we have to remember to be open and take in any critical feedback or suggestions for further changes. In the previous sections we have attempted to construct networks from different prototypes and then evaluated them

with the purpose of finding the weaknesses and strengths of the product. This is done to refine and get inspiration for the next prototype.

7.2.1 Our design

In the following section, we will identify the strongest elements from the examined prototypes. Following this, we will begin the design process of a product that we think has the best chances of changing the practice of buying light. The product should also be designed to contribute to stability, strong inscriptions and more successful translations, all based on our empirical data and analysis. To guide our readers through our next prototype we decided to deal with the process in a chronological order, describing the pathway from the manufacturer who produces the light bulbs and packaging, to the consumer's home. The steps are based on the practices where the packaging gains agency. This thesis is centred around the consumer. How they perceive light and the practices of buying light. However, we are aware, after talking to Philips, that they do deal with practical issues that limit certain design possibilities, which we need to take into account when designing an optimised packaging (pers comm., 12 July 2016). This is the reason why we chose to split the journey into steps. Pictures of the prototype can be seen in the end of this chapter.

7.2.1.1 The manufacturers

Starting with the manufacturers, the first element that we chose to realise, was the shape of the packaging. We decided to utilise a rectangular box with inspiration from one of the existing packages from our workshop. The reasons for this are many. At Philips, they told us how the production cost of the packaging is important (pers comm., 12 July 2016). As the LED technology improves it becomes cheaper to produce the light bulbs for the manufacturers. When this happens it becomes necessary to decrease the cost of the packaging. Philips is about to release a new collection of light bulbs and packaging. In the development of this design, it has been a goal to decrease the cost of the packaging. Is does not make any sense for the company to have a product where 50 percent of the total production price is the packaging, it is not cost-effective. Making it inexpensive is therefore important (pers comm., 12 July 2016). To meet this request we chose to make the packaging out of cardboard, since it is a cheaper material compared to the many plastic packages we see on the current market.

Another way to decrease the cost of the packaging is to make an easy construction, something that is easy to produce and use a minimal amount of packaging material. Our way to deal with

this concern was to make a template which can fit onto a piece of A4 paper and still fit a standard LED E27 light bulb.

Returning to the boxed shape, it is also chosen due to the surfaces it creates. Even though there is a window on the front, it still leaves three plain sides, and a top and a bottom, which the manufacturer can use to communicate with the consumers. This space is used for information and marketing, which will also be the purpose for our prototype.

The manufacturers also find it attractive to have their light bulbs in practical packaging. The rectangular box is a simple construction and it does not have any details, which disturb the shape. At the same time, it is a quite small package, which does not take up a lot of space. This is practical since it allows many light bulbs in one shipping box. This is also handy when transporting the product to the shops or retailers, which leads us to the next practice, the transportation.

7.2.1.2 Transportation

Looking at our prototype it is important to underline how this is only a prototype and not the finished product. It is not ready to go on the market yet. Is needs to be tested and refined, maybe even more than once. As said, we chose to make the packaging out of cardboard but the current cardboard is still not the same material as the finished product. The real thing should be made out of thicker material that makes the construction sturdier. The light bulb is still a fragile product since it is made out of glass and thereby needs a certain amount of protection, especially during transportation. The packaging containing the light bulbs are fixed in a shipping box during the transportation due to the rectangular shape of the packaging. If the packages were not fixed, we could imagine that they would be more exposed since they might rattle and end up broken upon arrival.

We chose to fix the bulb in the packaging, again to avoid rattling and decrease the chance the bulb would be damaged. We added one piece of thick cardboard with a hole, the same diameter as the socket, in the bottom and another piece of cardboard with a hole that fitted the top of the bulb. The frame of these pieces were the same size as the top of the packaging and had the purpose of fixing the light bulb inside. We have seen this characteristic in other, existing, packages, and therefore chose to adopt the idea.

7.2.1.3 In the store

The next practice is the product arrangement in the stores. For a product to be successful and well functioning it should also be attractive to the stores. Light bulbs are sold in many kind of stores however we will focus on stores in the same category as IKEA, Føtex and Fakta, where the product is freely available and self-service is a part of the concept. This demands a certain degree of sturdiness. To accommodate this actor's requests, we wanted a product that is easy to handle and place on the shelves. Again we found the rectangular box beneficial for this purpose. The packages can be placed side by side, without occupying a lot of space.

7.2.1.4 First impression

The first impression is the outside of the box. With this in mind, we consider what is done to attract the consumers in the first place. Again, we will return to the shape of the packaging. We chose this exact shape with many actors in mind, which should be clear in this evaluation. Having the consumers in mind, two things are worth mentioning regarding the shape. The front and the bottom. First, the rectangular box which allow us to expose the light bulb through the packaging. This means that the consumer is able to see the light bulb from a distance. This is how we construct the translation between packaging and light bulb, which quite a few informants wished for. On the printed template we made a window with the same height as the glass part of the light bulb.

We chose not to cover it with a transparent material, because the bulb is already fixed inside the box. Adding a transparent material like plastic could create new tensions between the register of *environmental concerns* and *easy-to-use*. It would make the packaging less environmental friendly but would enable the consumers to see the light bulb before buying it. Besides the window, the packaging also allows the socket to be visible from the bottom. It sticks out without disturbing the simplistic shape. This move is also based on requests from informants, since many consumers find it difficult to relate to the technical specifications E14 and E27, which indicate the size of the socket. Instead, the consumers can relate to large and small sockets when looking at the bottom. This is what the visibility of the socket is accommodating. It is also a translation between socket and packaging. It allows the sockets to influence the consumer's choice.

The packaging material is also chosen with the consumers' statements in mind. As mentioned, we chose a cardboard material because many consumers valued an environmental friendly

material, and the plastic packaging at our workshop were not popular. In contrast, quite a few consumers had positive things to say about the full cardboard packaging designs. At the same time this was the reason to avoid all plastic and leave the window open.

We have considered a lot of options regarding the main colour of the packaging. We chose yellow as a main colour with a pattern that creates a play between different yellow tints. We know that many consumers find it difficult to relate to the technical specifications present on the packaging. The specification for Kelvin is especially difficult. We see many attempts to communicate this information on existing packaging, but none of them seems to work. Our prototype is designed for a 2700 Kelvin light bulb. 2700 is supposed to have the same colour temperature as the traditional incandescent light bulb and that is what the colour of the yellow packaging symbolises. This choice is made to accommodate the register of *easy-to-use*. This is a translation from Kelvin to the packaging, which has the purpose of eliminating the need to understand the value Kelvin in numbers. The colour of the packaging represents the colour temperature and thereby the Kelvin of the light bulb.

7.2.1.5 Close up inspection

To understand the features of the light bulb, information is needed. Much of this information is conveyed through inscriptions. From our analysis we found that these can be very hard for the consumer to understand, leaving them with no chance to buy the intended product (5). The inscriptions in their current condition create more frustration than enlightenment. Many of these frustrations relate to the register of *easy-to-us*e in the *critique* phase. However, the majority of our prototype design is based on proposals presented in the *dream* phase.

To accommodate the difficulties regarding lumen and Kelvin, we have added and eliminated different technical specification. All with the purpose of making the practice of buying light more intuitive. The first thing that might stand out is the three candles on the front of the packaging. It is our intention to implement a system with only three options when it comes to luminosity. A soft, medium and strong light bulb. Our prototype contains a medium light bulb, which is indicated by two filled out candles, leaving the third empty. If the packaging contained a strong light bulb all three candles would be filled out. If the light bulb has a soft luminosity, only one candle would be filled out. It is our hope that consumers will adapt without much further explanation. We chose to keep the lumen in numbers since we are in a transitioning period of the technology shift, and it is our intention that the consumers at some

point will be familiar with the specification lumen. In the future we might be able to remove the candles and only having lumen representing the luminosity of the light bulb.

Another way to accommodate the difficulties regarding lumen and Kelvin was a decision to write "Hyggeligt lys" as a headline on the packaging. We have experienced how many consumers are biased regarding LED light sources. Many understand it as being hard and cold light. The aim of writing "Hyggeligt lys" is to avoid this misunderstanding. It is a translation between the text on the packaging and the colour temperature of the light bulb.

On the same side of the packaging we added pictures that show a living room and a bedroom illuminated with comparable warm lighting. Informants have stressed how they would like an icon or guide explaining where the light bulb is useful. We understand that everyone has their own realities regarding light and that light is enacted differently in various practices. However, for this reason we chose a picture and did not just write "*Good for bedroom and living room*". Choosing a picture instead of an icon, gives the consumer a chance to make their own assessment. These pictures should only be seen as guiding recommendations.
This solution relates to both the registers of *aesthetics* and *atmosphere*. The pictures give an impression of how this bulb can create a certain atmosphere or how it will look aesthetically. Some informants told us how they found it annoying, not having a clue about what to expect from a light bulb. This is what we are trying to accommodate through the translation between the illuminance of the bulb and the packaging.

On the left side of the packaging there is a small story about the transition from watt to lumen. The purpose of this story is to enlighten and help the consumers in the transitioning period. We are aware that having much text on a packaging can seem overwhelming and confusing, so we have put an effort into keeping it as short as possible, still making sure that the information is clear. We do not want it to create unnecessary confusion. It is an inscription that has the purpose of educating the consumers.

The opposite side is more or less kept free. On the current prototype the space is taken up by an energy label, which is an necessity in accordance with legal requirements. We will not go much further into this aspect of the packaging design. Instead we are leaving space for this specific kind of information. We are aware that there are quite a few legal requirement

specified by the EU, who also made the incandescent light bulb illegal in 2012 (Energistyrelsen 2013).

This concludes the presentation of our test ready prototype. There are undoubtedly many other options that we could have explored and we do not claim that our prototype is ready to revolutionise the practice of buying light. However, we do feel that we have managed to transform some of the inscriptions and translations into something more appealing to the consumer. It is our opinion that a stronger and stable network surrounding the practice of buying light will eventually increase the uptake of LED light sources. These assumptions will be tested in the final part of our thesis, where we have asked a set of test pilots to give constructive feedback on our prototype.

Figure 13

Figure 14

Figure 15

8 The test

As a final field work activity in the product development of a packaging, we took the assembled prototype out to test it. We wanted to see if our prototype would receive the same type of comments as we experienced in the workshop, or whether it would break with the issues and criticism from the previous informants. We also wanted to test if the prototype would be of interest to the informants, if they were able to buy it today. We decided to talk to people in the main hall at Aalborg University CPH, just as we did in our first workshop. This should secure feedback from the same type of informants as before, though they were not the exact same people. We asked our test pilots to hold the prototype, examine it and tell us how they felt about it. We did not set up a new workshop, but rather sought out people around campus. In all, we received feedback from nine informants. As mentioned before, having an open mind when testing prototypes is very important (Brown 2009). We needed to be receptive to all sorts of criticism even though the prototype resembled "the real thing". And so we did. We experienced appreciation, confusion and dislike from the informants. We will present all the feedback structured by the individual parts of the packaging that received criticism or praise.

8.1 Colouring

The colour of the packaging was something that received mixed reviews. Some found it interesting while most related it to something negative. One informant said: "*The colour is not something I see other companies use. It might require some adaptation*" (Informant 15 1 September 2016). This informant did not like the colour of the packaging. He predicted it to be troublesome when implementing new colour schemes into the existing market, as it did not look recognisable. As mentioned before, our intentions with the colour, was to reflect the colour temperature of the light through the texture and colour of the packaging. In section (6.2) we described the benefits of having a recognisable colouring system like the milk cartons. However, reflecting on this informant's statements, we realised the possible problems with our choice of colour in a transition and implementation phase. Another informant related the packaging colour to something very cheap: "*The colour of the packaging has a discount look to it. It looks really cheap"* (Informant 21 1 September 2016). When handed the prototype, this informant instantly commented on the yellow colour, however she did not relate it to any features of the light bulb.

Though two of our informants had negative remarks on the colour, a third informant said the following: "*I think it's funny with another colour compared to normal and boring white or blues. It looks less futuristic"* (Informant 19 1 September 2016). This informant did not have a problem with the colour. She liked it standing out from the crowd. However, she also did not relate it to the colour temperature. So even with positive feedback we did not achieve our aim with the yellow palette. From these three statements, we are now aware that a change of colour or texture might be needed in order for the translation of Kelvin to be successful.

8.2 Candle icons

The second thing commented by the informants was the small icons of candles, indicating the luminosity of the light bulb. We chose to write "600lm" next to the candles in order to make it less confusing. This however turned out to be less of a good idea. An informant: " *I don't get the small lights. Does it mean how warm the bulb gets?"* (Informant 15 1 September 2016). This statement clearly indicated that our icon designs mediated the wrong impressions. The informant did relate the candles to a feature, but unfortunately it was not luminosity. After presenting the prototype for Charlotte Louise Jensen she said: "*I do not understand the thing about the candles when indicating lumen, I don't think it's clear enough"* (pers comm., 1 September 2016). Again we experience some confusion regarding the exact purpose of the icons. Charlotte did get that the icons represented lumen, but still suggested improvement. She felt that people without the proper light knowledge might not understand it, as candles could symbolise many other features. This again indicates the need for a redesigned icon or maybe a totally different approach to illustrate luminosity. Our informants being confused about icons and not understanding them, relates to the same issues within the register of *easy-to-use* (5.1.6). And despite our efforts to change this register, we ended up not doing so. We need to reconsider our options and icon designs for future prototypes.

8.3 Visibility

The visibility of both the socket and the bulb itself has been a topic of interest throughout the most of the project. It was identified as criticism within the register of *easy-to-use*, turned into requests and desires in the *dream* phase and finally implemented into our prototype design. This seemed to be really appealing to our informants, as all of them cherished this feature. One said: "*I like that you can see the light bulb and the socket in the bottom. It is really hard to estimate based on numbers only"* (Informant 18 1 September 2016). Having a cut-out

window in the front of the packaging was immediately noticed by the informant. He told us that he reall wished for more products that featured this and it helped him a lot more than some other products on the market. Another informant told us something similar: "*It is much better than other products out there. I think it's nice that the packaging is open so you can see the bulb. It's also a great idea with an open bottom"* (Informant 17 1 September 2016). Again we experienced positive feedback regarding our decision to expose parts of the light bulb. The informant instantly compared it to other packaging on the current market and she also mentioned how she liked the small cardboard pieces that fixed the light bulb inside of the packaging. Since all of our informants only had complimentary comments on this feature, it can be argued that a change has been made in the register of *easy-to-use.* The packaging translates the physical features of the bulb while still being fixed to reduce rattling and is something that we will carry into future designs.

8.4 Pictures

When commenting on the pictures of both the living room and bedroom lightscapes, all of our informants expressed positive and constructive feedback. They generally liked the idea to illustrate how the light would appear in different types of rooms. One informant however, suggested to use pictures which resembled classical Danish rooms instead: "*The pictures are a good idea to show how the bulb will light up, but I would maybe like to see a picture of a more traditional Danish living room"* (Informant 19 1 September 2016). Another said: "*The pictures and the text above is super nice. It makes it so much easier to see if the product will fit in my home"* (Informant 17 1 September 2016). These two statements show that illustrative pictures can create changes within the register of *easy-to-use*.

It can be argued how we might have to change the pictures to something more commonly recognised. Using the current choice of pictures, might insinuate a utopian scenario from interior magazines and not something consumers will be able to relate to in their everyday. Still, we were told that the pictures and text helped our informants to understand the products specifications. Charlotte Louise Jensen also commented on the pictures saying: "*I love it! It totally makes sense"* (pers comm., 1 September 2016). This is what we were intending to achieve. The feedback regarding the side with pictures and text gave us the impression that not much needs to be redesigned here. However, we still want to rethink the layout for future

packaging templates, as we want to accommodate the registers of *aesthetic* and *atmosphere* even more.

8.5 Story

On the left side of the prototype, a little informative text enlightens the reader on how to understand the relation between watt and lumen. Most of our informants found this to be very beneficial and gave us some constructive hints to develop the idea. Charlotte Louise Jensen told us: "*Great with this little story. It educates people"*(pers comm., 1 September 2016). Another informant said: "*I do like the information about watt and lumen. Maybe it would be a good idea with a link to a webpage if people would like to know more?"* (Informant 18 1 September 2016). This informant found the information to be very useful. He also pointed out, that we should give the consumers the opportunity to read more, so he suggested a link to a reliable source. Our informants liked that they became able to navigate between different strengths of lumen and watt. However a third informant said: "*I do not know what lumen is. I don't understand it"* (Informant 21 1 September 2016). This debunks the whole idea of having a written short text that explains the relation between watt and lumen. When this informant told us this, we realised that we had not explained the meaning of lumen anywhere on the packaging. As our informants from our workshop did not understand technical specifications, we also see how our way of communicating through inscriptions might not be optimal. To really change the register of *easy-to-use*, we need to expand or rethink the written information on the packaging.

8.6 Packaging material and overall impressions

The final feedback from our informants concerns the packaging material and provides an overall review of the prototype. As we intended to create an eco-friendly packaging, we used cardboard material with no plastic. This idea was welcomed by all of the test pilots, one said: "*Cardboard is great, very easy to get rid of"* (Informant 16 1 September 2016). Another also praised the choice of material, but suggested that we promoted it even more: "*Would it be possible to construct it from recycled material? I mean, so it really radiates eco-friendliness"* (Informant 21 1 September 2016). These comments indicate that having a packaging made from cardboard is appealing to environmentally aware consumers. We do however need to consider whether we should opt for an even more raw looking material.

The overall impressions of the prototype were commented with statements like: "*It's simple and it does not contain too much information, so that's nice"* (Informant 16 1 September 2016), "*Good with simple information, normally I don't understand the numbers"* (Informant 18 1 September 2016) *and* "*Great idea. It provides guidance and it makes sense"* (Informant 20 1 September 2016). These comments suggest that our prototype did well regarding simplicity and overview. Fewer inscriptions and translations might be a way to enable the consumers in overcoming their struggles when buying good light. However, we are still aware that we did not include all of the legally required information, so a final prototype might not receive the exact same positive feedback.

In summary, our prototype was well-received by all test pilots. Some did however have trouble with specific inscriptions and some did give us constructive ideas for further development. We were made aware of various matters that we initially did not think of, and this proved the potentials of prototyping. From using this method in the product development of our packaging, we are now able to redesign and adjust various matters from our test pilots statements. We learned the importance of including the end-users in the design process. They are the key to newer generations of prototypes and make us very much aware of even the smallest of details that we might have overlooked. In the next section, we present our final prototype in this project and explain our choices to either redesign, adjust or refrain from changes.

8.7 The final prototype

Figure 16

Figure 17

Figure 18

This is the final prototype that will be presented in this thesis. In the *realisation* phase we described in detail how the prototype was designed on the basis of the *critique* and *dream* phase. This section will regard the changes and adjustments that were made to encompass as much of the feedback received from our test pilots in the test phase.

So what did we change? First we wanted to handle the comments on the yellow colour. We considered the different options, should we change the tint or maybe remove the texture? However, we decided to leave it yellow and instead change the colour of the green fonts. We wanted to find a way to support the yellow tint, so we chose to use a lighter green. This resulted in a less blurred look and the text stood out more. While changing the text colour we also adjusted placement of the various texts to streamline it and make it appear less messy. This was done to reduce the chance of it looking cheap to the consumers.

We also decided to write "HYGGELIGT LYS." in capital letters to make it pop out more and better frame the pictures underneath. On the left side of the packaging we inserted a link to www.lysviden.dk which is an educational webpage developed by DCL. This will give the consumers the opportunity to read more about light from a reliable source instead of googling it. We also wrote "lysstyrke" in the text to tell what lumen is.

Finally we redesigned the front. Though we kept the window in the same size, we decided to get rid of the three small candle light icons. As mentioned before, our test pilots had trouble understanding the icons and related them to other specifications than the intended. We needed to make better inscriptions. We went for small simple light bulbs with "lysstyrke" written above "600lm" with the three light bulb icons on the right side of the text. With three different ways to express luminosity on the front, we hope that it will make sense to the consumers and that they will relate at least one of the inscriptions to something they understand.

This concludes the changes that were made on the basis of the feedback from our test pilots. By utilising prototypes in our product development of packaging, we have learned the value of accommodating the consumers continuously. This way, we might end up with a better product that hopefully resembles the many wishes and requests presented by our informants. Being in dialogue with the consumers in the ongoing design process opens up for new ideas,

improvements and adjustments. By redesigning the packaging, we believe it will aid the consumers in bringing home good LED light.

9 Conclusion

In this thesis we have studied the practice of buying light on the base of the given task from Dansk Center for Lys: *'Why do the Danish consumers not buy LED light source in the desired extent and how can we make them buy more LED for their homes?'* To accommodate this assignment, we have investigated how consumers buy, valuate and enact light in practices. We have discovered that consumers are struggling in acquiring what they believe is good light and that they mainly buy their light sources in supermarkets and DIY retailers. To many, it is considered a staple good and something that ends up next to other groceries in the shopping basket. Many are struggling when examining the packaging of light bulbs. The numerous specifications, figures, terms and designs are confusing to the majority of consumers and the technology shift from traditional light sources to LED, introduces even more specifications. Inadequate knowledge of light technology results in wrong purchases and consumers are then forced to revisit stores in order to acquire the right light source. Furthermore, we have experienced that Danish consumers are very fussy with their light. When shopping for bulbs, they arrive at the store with certain expectations. It might be particular bulb shapes, socket size, luminosity level or something completely different. With the many expectations and lack of technical knowledge, the consumers are obstructed to acquire good light and we see this as a barrier for the uptake of LED light sources.

This generated knowledge, invited us to change and redesign the practice of buying light, through a direct intervention. To arrive at this conclusion, we have performed a workshop with consumers inspired by Future Workshops. Here we gained empirical data regarding the consumer's use of light. We found that the practice of buying light is influenced by other practices taking place outside the stores and often in their homes. Some people find the atmospheric effects of the light appealing, while others found it more important to have their working surfaces illuminated. This is how many realities of good light occurs.

Further we found that the consumers have many wishes and request for improvements for the practice of buying light. Clear and understandable information on the packaging, less and simple information, intuitive icons and packaging material, are some of the generated requests.

By turning the many ideas into prototypes, we found how beneficial it is to include and understand potential end-users in the attempt to communicate and develop new technology. After testing and refining, we finally ended up with one prototype, which we believe will be able to change the practice of buying light. This product will make it easier and more intuitive for the consumer to buy light sources in the future. If our prototype can change the network of the practice of buying light, it will change and increase the uptake of LED. This will further accompany DCL in reaching their goals.

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10.1 Figures

11 Appendix

Overview of field work activities			
Activity	**Location**	**Date**	**Who**
Observations	Fakta IKEA Føtex	March 3rd March 3rd March 3rd	
Interviews	Dansk Center for Lys Office Aalborg University - CPH Philips Headquarters - CPH Aalborg University - CPH	May 17th May 19th July 12th August 3rd	Anne Bay Charlotte Louise Jensen Representative of Philips Mikkel Bille
Workshop	Aalborg University - CPH	June 14th	Informant 1 Informant 2 Informant 3 Informant 4 Informant 5 Informant 6 Informant 7 Informant 8 Informant 9 Informant 10 Informant 11 Informant 12 Informant 13 Informant 14
Test	Aalborg University - CPH Aalborg University - CPH	September 1st September 1st	Informant 15 Informant 16 Informant 17 Informant 18 Informant 19 Informant 20 Informant 21 Informant 22 Charlotte Louise Jensen