CHALMERS

A Modular Shelf System Enabling Growing and Storing Fresh Produce

– A project within the field of Experience Design in collaboration with Electrolux in Singapore

Master of Science Thesis in the Master Degree Program, Industrial Design Engineering

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Abstract

Product perception is changing all over the world and new expectations and trends create higher demands. It is crucial for companies to differentiate themselves and their offers to be successful on an increasingly competitive market. High functionality and usability on products is more or less taken for granted and consumers are requesting new ways of satisfaction, beyond these rather solely 'pragmatic' aspects. As a result, *design for experience* is becoming extremely relevant, and a way for companies to strengthen their brands, stay competitive and gain market power.

The annual "Electrolux Design Lab" is a competition for design students held by Electrolux. The 2012 edition was focusing on new product experiences in the home environment and how this possibly could be achieved with inspiration from professionals. The same brief became the starting point for this master's thesis work that was carried out in collaboration with Electrolux's design department in Singapore. The aim of this project was to design a concept that would facilitate for new experiences in the future kitchen environment (~10 years from now), with inspiration from professionals and the South-East Asia region, fitting the core brand and design values as well as future market segments of Electrolux.

The project resulted in a visionary concept named "Misto". It is a modular shelf system that enables growing and storing of fresh herbs, vegetables and fruits in the home environment. The concept may have the potential to break new grounds in the way people live, cook, socialize and pay attention to our surroundings in the future. It relates to global trends and living scenarios, and is inspired by South-East Asia, yet possibly targets a global market.

Acknowledgements

Contents

1. Introduction

1.1 Background

The emerging interest in user-centred design has stimulated a shift of focus from the users' behaviour and cognition to the users' affective experience of (and involvement in) the human product interaction (Desmet and Hekkert, 2007). Today, most consumer durables are comparable with respect to their functionality, quality, and usability. This makes it difficult for companies to differentiate their products from their competitors. To gain a competitive advantage, companies and designers need to focus more and more on the 'emotional responses and experiences' that products can generate, rather than only on their functional benefits. (Mugge et al., 2008)

We are living in a world where interactions between people, and between people and products are becoming increasingly complex. Designers need to explore new visions, new methods and new tools in order to create meaningful interactions with new products. By taking experiences and emotions as starting points designers could create both different and relevant products. (van Erp, 2008)

Due to this, Electrolux annual Design Lab competition was in 2012 focusing on *experience design*. The brief of 2012's edition of the competition inspired the starting point for this thesis work that was carried out in collaboration with Electrolux design department in Singapore.

From Electrolux point of view, the world of professional cooking is all about experience. The design brief challenges students to design home appliances that will provide a fuller sensory experience with inspiration from professional experience creators like chefs, architects, interior designers etc.

Electrolux claims that experience is luxury. The most common experiences people are spending money on today are vacations and travelling. However, the perception of luxury is changing and experiences closer to the home become increasingly popular. As a result to the digital world (where we spend more and more time online) a new appreciation for authentic experiences and interactions have emerged.

1.2 Problem description

The increasingly competitive global market makes it important for companies to differentiate themselves and their offerings to be successful (Mugge et al. 2008). Trends and expectations create new demands from the market and product perception is changing all over the world. Today, functional and usable products are regarded as 'standard', and people are seeking new

ways of satisfying their minds. Higher expectations challenge companies to design for experiences. This, however, prerequisites both great functionality and good usability, which makes the fundament of a quality user experience. (Electrolux, 2012a)

Except the importance of a pleasing product experience there are also other demands to pay attention to in the future: people are getting more and more aware about health and the environment; the way we eat and get food has already started to change as well as the way we live; a growing urbanisation makes it even more important to care about natural resources, space and energy (Electrolux, 2012a).

1.3 Question formulation for the master's thesis

Using the idea of experience design as a way to stay competitive on a global market, a few but broad question were formulated to guide the project:

- *How can we facilitate for new experiences in the kitchen environment?*

- *How can we add joy and meaningful value to future homes?*

- *How could we strengthen Electrolux as an innovative company with the Scandinavian heritage?*

1.4 Purpose

The purpose of this thesis work was to get deeper knowledge in experience design. By focusing on a future scenario the project could work as a conceptual and innovative reference project for Electrolux, which possibly could inspire the company's future product development.

1.5 Aim

The aim of this master's thesis work project was to design a concept that facilitates for new experiences in the future kitchen environment (~10 years from now), with inspiration from professionals and the South-East Asia region, fitting the core brand and design values as well as future market segments of Electrolux.

1.6 Methodology

Due to the project's nature methodology relevant for experience design was applied during the process. Everything during the process have been evaluated and many iterations have been done in a structured product development process. This process consisted of three main phases: *pre-study*, *ideation* and *development*.

An experience-driven design approach requires a designer that begins with understanding and modelling the desired experience before designing a specific product. (Keyson, 2008)

An experience designer could be seen as an author who writes the script and story, which later can be told through a product or a service. Important is to think about the actual experience that should be delivered – think later about the way to materialize and contextualize it. It is also crucial to listen to people's actual needs when designing for experiences. There are archetypal stories all people can relate to even if it seems very subjective. The basic needs are the same for all the people and everybody has a story to tell. Therefore, it is important to design with a dialogue. The designer needs to negotiate with the user about what the product or object would be. The product should tell a story and create a discussion around it. (Hassenzahl, 2010)

Mark Hassenzahl uses a simple model to describe the core of experience design. It is built with three words; *What*, *How* and *Why*. 'What' is about what the user can do with a product. 'How' is how and in which way the user interacts with a product. Mostly all products involving any form of interactions of use include these two steps. However, the 'why' is the most important and essential step in experience design: *Why are we doing the things we do?* 'Why' relates to the true needs and the important emotions involved. (Hassenzahl, 2010)

Pre-study

Due to the broad project scope several data collection methods were used to gather a considerable amount of information from which to draw conclusions and make valuable insights. Understanding the user is fundamental when designing for experiences, and it is therefore important to be out on the field to observe people in their real contexts (Hassenzahl, 2010). Field trips and interviews were very important for this, which led to many valuable insights. These in turn built up the base for the coming ideation and development phases. The observed users and contexts were analysed to comprehensively know whom to design for.

Ideation

The ideation phases became a creative part of this project. Due to no priorly defined list of needs, requirements or demands in combination with the broad scope from the brief it was possible to work broadly and cross boundaries to find innovative ideas that could be transformed to possible solutions. Many ideation methods were used to enhance the creativity and create a big amount of ideas. The output was evaluated to ensure the relevance and its link to the findings from the research, and selectioning was made in structured way with relevant methods.

Development

First, the desired experience was created and refined, then it was translated into concrete output. A lot of inspiration during this phase came from nature and helped greatly when designing the product's aesthetics. With computer software, photo realistic imagery was created to present the final concept in its intended context.

1.7 About Electrolux

Electrolux is selling more than 40 million products a year to customers in more than 150 markets which makes the company the global leader in household appliances and appliances for professional use. The Electrolux group have many brands in their portfolio beside the Electrolux brand, for instance AEG, Eureka and Frigidaire. The founder of Electrolux, Axel Wennergren, established the company's principles that are still in use; the company focuses on thoughtfully designed innovations, based on extensive consumer insights, to be able to meet the needs of consumers and professionals. (Electrolux, 2012b)

The Electrolux brand is positioned in the premium segment. The slogan *Thinking of You* is a way to communicate the never-ending focus on the consumer – that being a question of product development, design, production, marketing, logistics or service. The tagline *Thoughtful Design Innovator* communicates the company's attention to details when developing their new products. Electrolux claims they never design just for design's sake – the design must always increase the usefulness of the product in one way or another.

Electrolux has many design centres spread around the world. The hub is in Stockholm in Sweden where the design centre is co-located with other group functions. The other design centres are situated in North America, Brazil, Italy, Australia and Singapore.

The continuous dialog with chefs and supplying restaurants and hotels around the world provides valuable insights for the company's product development. The insight from professionals and the Scandinavian design heritage plays a major role in the creation of the products' design and in developing new and sustainable appliances. (Electrolux, 2012b)

The Electrolux brand is fundamenting on four core brand values: *Empathy, Insightful, Progressive* and *Ingenious*. Empathy is to have compassion for others thoughts, feelings and experiences. Insightful is about being anticipatory and perceptive, and to create value for the customer. Progressive implies new and challenging conventions and to deliver future shaping concepts. Ingenious is about creating original experiences and clever solutions. (Electrolux, 2011)

2. Theory

This chapter covers the theory relevant for the project's process and its final results. Some specific theory related to the different concepts can be found in *Chapter 6: Ideation* and *Chapter 7: Concept Development.*

Experience design is the layer outside the more established user-centered design realm. In user-centered design, parameters such as meaning, pleasure and delight have been more or less neglected – the *person* was condensed to be a mere *user*. The realization that these and other parameters are fundamental ways for companies to differentiate their products in positive ways has engendered the area experience design. (Battarbee and Koskinen, 2008)

2.1 Design for pleasurability

Patrick W. Jordan (2002) has linked the development of ergonomics and other human factors disciplines to Maslow's hierarchy of need (see figure below), with the implicit belief that the accretion of one level automatically and quickly leads to a desire for the next. Usability has moved from being a 'satisfier' when present, to being a 'dissatisfier' when absent. Therefore the issue of a holistic view of the human/product interface and interaction is raised. At a purely operational level, there are not too many unpleasant products produced by the major manufacturers today from a functional or usability point of view, and their differences instead become defined by the 'joy in use' factor, also known as *pleasure*.

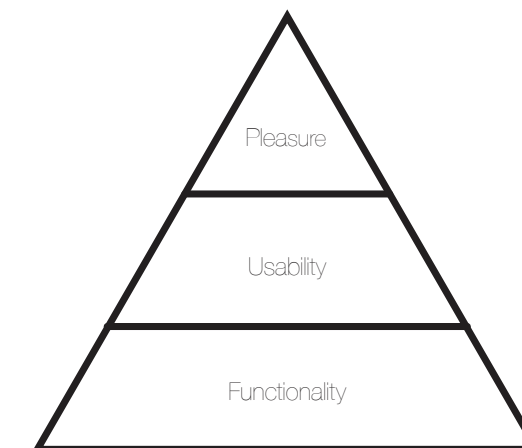*Figure 1. A visual representation of Jordan's link of human factors disciplines to Maslow's hierarchy of need.*

The definition of pleasure is "a feeling of satisfaction or joy: sensuous enjoyment as an object of life". Pleasure does not subsume usability, nor does usability alone generate pleasure. Pleasure and joy in use is a 'beyond usability factor', which though requires good functionality and usability. (Bonapace, 2002)

2.2 Designing for emotions

Emotions are very complex and many factors influence their arousal. Understanding the processes behind the emotions facilitates how to design with the intention to evoke or prevent certain emotions. Each time a user comes across a new object, he or she reacts not only upon how it works but also by the aesthetics, the self image, loyalty as well as the memories it evokes in us, which are very different from person to person. We tend to experience a product positively when it is aesthetically appealing as well as plays to our ideas about the society and ourselves. This means that a product that is attractive make people feel good which make them think more creatively, thus, a product that is perceived as more aesthetically appealing than its competitor, but with the same functionality, tends to result in higher usability. (Norman, 2005)

Donald A. Norman states that there are three levels of design to be aware of; *visceral* design, *behavioural* design and *reflective* design.

The visceral design level is focusing on the appearance of an object. We are tuned to receive emotional signals from the environment that automatically get interpreted at the visceral level.

The second level is behavioural design which is about the pleasure and effectiveness of using a product or object. This level is about use and appearance doesn't really matter whilst performance does. This means that the first thing to evaluate on this level is if the product actually fulfils needs, meaning that if a potato peeler can't peel potatoes nothing else matters. (Norman, 2005)

Reflective design is dealing with the self image, the personal satisfaction as well as memories. This level is very broad and is about culture, the meaning of the product, and its use as well as the message the product communicates. (Norman, 2005)

It is important to be aware of these levels in the design stage. A good design should address all three levels and each level plays its part in shaping the experience. (Norman, 2005)

2.3 Definition of the concept "Product Experience"

According to Desmet and Hekkert (2007), the definition of 'product experience' is the collection of all possible affective experiences involved in human-product interaction. An experience is not a property of the product but the outcome of the human-product interaction. When interaction ends, the experience ends.

Human-product interaction refers to *instrumental interaction* (e.g. using, operating, or managing a product), *non-instrumental interaction* (e.g. playing with or caressing a product), and *non-physical interaction* (e.g. fantasizing about, remembering, or anticipating usage of a product). An

experience is formed by the characteristics of the user, the characteristics of the product, and the context in which the user interacts with the product. (Desmet and Hekkert, 2007)

There are three levels of product experience: *aesthetic pleasure*, *attribution to meaning*, and *emotional response*. Consequently, the more elaborated definition of product experience is "the entire set of affects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning) and the feelings and emotions that are elicited (emotional experience)". (Desmet and Hekkert, 2007)

In everyday experiences, the three levels are intertwined and often difficult to distinguish from each other. People experience the unity of emotional involvement, sensuous delight, and meaningful interpretation – ultimately this unity is what makes the experience. (Desmet and Hekkert, 2007)

2.3.1 Aesthetics

The aesthetic level considers a product's capacity to delight one or more of the senses (e.g. a product can be beautiful to look at, make pleasant sounds, feel good when touching etc.). Included in this level is also the concept of 'aesthetics of interaction' – the beauty of use; the beauty a user experiences when interacting with a product physically, i.e. the tactile and kinaesthetic sensation. (Desmet and Hekkert, 2007)

2.3.2 Meaning

The level of meaning comprises cognitive processing, such as interpretation, memory retrieval, and associations. This makes the user able to recognize metaphors, assign personality or other expressive characteristics, and assess the personal or symbolic significance of a product. Such experiences of meaning are for example *attachment*. However, the involved cognitive processes of the level of meaning are exposed to individual and cultural differences, thus, for example a product that creates strong attachment for one user, may not create any attachment for another. Studies have shown that people become more attached to products with a personality that is similar to their own personality than to products with differing personality. (Desmet and Hekkert, 2007)

2.3.3 Emotion

The emotional level refers to affective phenomena such as love and disgust, fear and desire, pride and despair etc. Emotions pull people toward certain people, objects, actions, and ideas, and pushes away from others. Pleasant emotions pull a person to products that are (or are perceived to be) beneficial, and push away from products that are the opposite.

An emotion is elicited by an evaluation of a situation or an event as potentially harmful or beneficial, and is a result of a cognitive process which is often automatic and unconscious. An appraisal evaluates the significance of a stimulus for a person's personal wellbeing. Different individuals who appraise the same product in different ways will experience different emotions. Additionally, in order to understand emotional responses to human-product interaction, it is crucial to understand the users' concerns given the context in which the user interacts with the product. (Desmet and Hekkert, 2007)

2.3.4 Product personalities and product customization

Products are expressing personalities in the same way as humans: a cold object is expressing a cold personality and a flexible product is mostly being seen as having a flexible personality. Due to a product's personality, it becomes a social entity that evokes feelings and emotions that usually only apply to the interpersonal domain, like feelings of sympathy. People seem to feel sorry for objects that seem sad (due to a broken part for example).

People are also experiencing products as having intentions – they are displaying a specific physical behaviour in interaction. Objects want (or refuse) to take care, to cooperate, to play and to be explored as an example. A product that doesn't react is seen as refusing or reacting.

Product experience is also based on earlier experiences and familiarity that grow over time, which means that a person's perception of an object is much dependent on past experiences, which in turn makes product experience something very subjective. (Schifferstein and Sonneveld, 2008)

We use all of our senses to explore the world around us – all our senses interact with each other to create an overall experience. The results of several studies claim that the more senses that are being stimulated, the richer our experiences will be (Schifferstein and Spence, 2008). Normally today however, vision and touch dominate the product perception and the resulting experiences.

A product with similar personality to its user results in a strong user attachment, and the user can express him- or herself with these products that share the same personalities. In this way, the product gains a special meaning and an emotional bond between the product and its user can be created. By implementing product personality in the product design it is possible to stimulate product attachment through the determinant self-expression (Mugge et al., 2008).

Studies show that people become more attached to products they have personalized themselves. Product personalization means that the appearance or functionality can be changed to better suit its users' needs or desires. During the personalization process, a person is actually responsible for the design of his or her personal product. This strategy creates products that can

be more personal and unique in order to express its owner's personality. Personalized products will fulfill the need for self expression and often represent a personal accomplishment to the owner. The user can more or less create a product that better fit their unique preferences (at least what is *perceived* to fit better) and therefore become more self-expressive (Mugge et al. 2008).

2.3.5 Cultural impact

As mentioned, product experience is subjective and based on a person's past experiences. Another powerful factor that controls the experience is the cultural differences. Religious and moral taboos have the most dramatic influences on product experience (Cupchik and Hilscher, 2008). Cupchik and Hilscher (2008) mean that even if the aesthetic principles are universal, this does not automatically lead to universal agreement on people's choices of objects. People's tastes are predominantly shaped by the culture to which they belong. There is evidence showing that Asian people have a more holistic style of perceiving scenes and objects while Americans tend to see objects in a more analytical mode of processing, for example. (Cupchik and Hilscher, 2008)

Studies also show that people from different cultures are systematically holding different standards and values like the degree to which people see themselves as connected to others (collectivistic), or separated from others (individualistic). For example, if looking at logotypes one can see that predominantly individualistic (United States, Germany) cultures use more angular shapes compared to collectivistic cultures (Hong Kong, Japan) which prefer more harmonious, rounded shapes. (Cupchik and Hilscher, 2008)

2.3.6 Contextual impact

As mentioned before, the context have a massive impact on how a product is experienced. For example, studies show that food served in a restaurant tastes better than the same food served at a hospital – products in fine restaurants are expected to be better by its customers and expectation theory shows that products that are expected to be better often rate better than the same product with no expectations. (Meiselman, 2008)

2.4 Summary

The area 'experience design' is in its infancy and is being developed continuously, and it is still a quite fluid concept. The definitions of the concept both overlap and complement each other, and the approach for a project such as this one could be to use a mix of the different definitions, and thus making the project itself explorative in terms of what 'experience design' may or may not stand for.

3. Pre-study

The aim of the pre-study was to find inspiration and discover experience design possibilities related to the kitchen and its activities. Studies were made to discover trends and to find areas to work with that would fit the future scenarios. Semi-structured interviews were held with master chefs to get their insights about the creation of experiences related to cooking and dining. Numerous field trips and study visits were made, for example to restaurants – both Asian and international. This was to get insights about food cultures as well as getting inspiration from professionals by observing them in their real contexts. The collected data was gathered and later clustered with a KJ-analysis to find areas that could work as the base for the subsequent ideation phases.

3.1 South-East Asian cuisine

The one common thread running through the Asian soul is undoubtly food and people's relation to food. Food is seen as the binding factor of Asian people. It is a passion and a way of living, and it represents everything that makes Asia so different and opens up a window to the continent's past, present and future. (Asian Food Channel, 2012)

It is difficult to talk about Asian food as a united concept since the Asian cuisines vary greatly. Asian food varies not only by country, but also by ethnic, religion and tradition – even the South-East Asian countries have remarkable variations. (Roman and Russell, 2009)

During the research in Singapore the project group was mainly able to explore the South-East Asian food culture by field trips, interviews and observations.

3.1.1 Hawker centres, Singapore

Field studies in a variety of so called "hawker centres" were made during the pre-study in Singapore. A hawker centre is a traditional food market one can find all over Singapore and the concept is an important part of the culture. It is the true melting pot of all different food cultures and becomes a good basis for observing different kind of food and cooking styles.

No matter which hawker centre you go to in Singapore the kitchens are all very small and simple. There are no advanced cooking equipment and the cooking style is very traditional. During the visits it was observed that the open fire is common in Asian cooking. The fire is a big part of the cooking style and many ingredients are mixed in the same cooking pan. Recipes are seldom used and the cooking is more about fresh ingredients, cooking experience and feeling. The cooking style is simple, fast and requires only little preparations.

The hawker centres are a connecting factor in Singapore and everybody takes part of this traditional food culture – no matter position or personal status. This is where people meet and get reminded of the past in an otherwise hyper-modern country. The hawker centres form the food-soul of Singapore.

3.1.2 Eating in Chinatown, Singapore

Three visits to the district in Singapore called Chinatown were made to gain knowledge about how people dine in this culture. Photos and notes were taken to document the observations.

The dining ritual in this context is rather simple in terms of the environment (sitting on the sidewalk, plastic chairs, noisy traffic nearby), the way the food was put on the plates and the way it was served. However, interesting was to observe the way people share a number of platters of food in the middle of the table where everyone in the gathering can pick and eat what they want – something called 'communal dining'. This phenomenon was observed at practically all tables at the restaurants during the three visits to Chinatown.

3.1.3 Cooking and dining at home with Singaporeans

A couple of dining events were arranged with young (between 20 and 30 years old) Singaporean people where the aim was to see how food is being prepared, cooked and dined in the home environment.

From a Scandinavian point of view, only a few tools were used and not so much effort was put into the serving or the layout of the food on the plate. However, taste was very important, but no recipes were used – they were inherited from older generations far back, and were "stored" in the minds of the cooks. However, all participants enhanced the importance of fresh groceries and the right kind of ingredients.

3.1.4 Street food in Hong Kong

Hong Kong has many similarities with Singapore; it is like Singapore a 'melting pot' of different cultures, and a fusion with the Western culture. Everything from the world's most exclusive restaurants, to simple street food can be found here. Like many other urban areas in East Asia, Hong Kong is different compared to Europe and much of the Western world where "the home is our castle". Because of small homes in Hong Kong, the home is only somewhere to sleep, and people are preferable eating and socializing with there friends out on the streets (Leung, 2012).

Field trips to different food markets and traditional street food restaurants gave insights about similarities with the Singaporean food culture. The traditional cooking in Hong Kong (and much of China) is simple and fast, and the open fire is also here an essential part of the cooking.

The Hong Kong food culture is strongly rooted in the Chinese culture and religion. Eating the traditional "Peking Duck" at a genuine Hong Kong restaurant is a true journey through the Chinese culture and history; the 'ritual' starts with the waiter showing the roasted duck to the guests to confirm that the duck is good; the dish is then served with the cutted meat on one plate and the roasted duck's skin on another. The dinner then starts by eating the skin together with a traditional sweet sauce and vegetables, then to be finished with eating the duck fillet in rolls made of something similar to crèpes. By the entrance of the restaurant, the roasted ducks are hanging visible in the open ovens and should do so according to tradition to keep away ghosts and spirits (Ng, 2012).

Seemingly, alot of tradition and rituals are connected to eating and cooking in Asia, which thus should be something to be aware of when designing for this market.

3.1.5 Malaysian archipelago

In Asia, there are different styles of eating food. In India and the Middle East, as well as South-East Asia, people eat food with their hands (Roman and Russell, 2009). It is a very direct way to experience the texture of the food. Normally, only the right hand is used, so that one knows to keep it especially clean. This was observed during the field trips to the Malaysian archipelago. As in Singapore, the communal eating style is common and was also observed during these field trips.

Similar to China and Singapore, the cooking style in Malaysia is very simple and tied to old traditions and habits. There is also here a strong focus on the fire, as well as the importance of the freshness of the ingredients available; in this part of South-East Asia fresh seafood is prominent, which is often simply put on the grill with very little or no preparation.

3.1.6 Dining in little India

Little India is part of the old districts in Singapore where the Indian culture has been accessible to anyone; anything from simple Indian street food to more exclusive dining can be found here. There is also many similarities with South-East Asian food culture: just like the hawker centres there are only few restaurants in this area that focus on the dining environment that surrounds the meals. Seemingly, many restaurants do not focus on their interiors at all, and the light setting is primarily functional.

3.2 Dining Experience

Understanding what the dining experience really is and what parts it consists of is extremely important to be able to target and design for this. Study visits were arranged to create an understanding of what the conception stands for.

3.2.1 Savour 2012 food exhibition

The Savour food exhibition is an annual food trade fair in Singapore where master chefs and food producers from all over the world meet. Visitors get the chance to take part of cooking classes and taste new as well as traditional food from all over the world.

During the study visit at the Savour food exhibition, semi-structured interviews were held with four master chefs running their own restaurants in different parts of the world. The aim was to get insights about successful food and restaurant experiences in general.

Günther Hubrechsen (2012), the owner and master chef of a French cuisine restaurant in Singapore, enhances the importance of the taste of the food. Many chefs spend too much time on making the dish look beautiful and they therefore don't prioritize the perfect food temperature, he says. He adds that adults are 'simple like children': they frankly never grow up ("food-wise") and the most important is the taste – not the look. Günther Hubrechsen is also convinced that the most important parts of a meal are the beginning and the end of it; "That is what you will remember and therefore you have to provide something taste sensational that won't be forgotten."

Alvin Leung (2012) is an experienced Chinese master chef working in his own two-star Michelin restaurant in Hong Kong. He agrees with Hubrechsen that the most important thing about food is the taste. The food also have to give you comfort, according to Alvin: "We eat food because we have to feed our bodies". However, there is a difference between eating and dining he explains: when eating you satisfy your body – when dining your satisfy your mind. Alvin therefore tries to provide something that is exciting but still comfortable in his restaurant: "I excite your mind but provide comfort to your body". He also sees the importance of providing healthy food since people are much more conscious today than 10 years ago.

Tatiana Szeles (2012) is a Brazilian chef working in her home country. She also sees comfort as the keyword for a good food experience: "When you think about food the first thing is the way you see the food – that it's beautiful. But more important is the flavour and the food has to give you comfort". She also points out that ingredients are the most important thing when cooking: "with good ingredients you can do whatever you want".

Douglas Tay (2012) is a Chinese chef having his own international cuisine in Singapore puts a

stronger focus on the service in the restaurant environment: "When you walk into a restaurant the first thing you experience is the service – it's not the chef and it's not the food". He agrees with the other chefs that taste is central, and that the food has to give you comfort. This was also emphasized in interviews with chef Manuel Bartrina (2012) and Thai restaurant owner and chef Kalaya Thaicharoen (2012).

3.2.2 Günther's

Contact with Günther Hubrechtsen was established during the Savour 2012 food fair in Singapore. The aim with the study visit at his exclusive reastaurant in Singapore was to follow and observe him and his colleagues during a lunch rush at his restaurant and follow their work. Semi-structured interviews were used to collect data about Günther's opinions and thoughts about professional cooking.

The study visit at Günther's gave many valuable insights. Günther stresses that cooking in a professional kitchen is all about teamworking – he and his colleagues are like a soccer team and they need to collaborate well to be successful. Knowledge and experience are other key elements for superior cooking. Günther also explains that it is not about fancy and exclusive cooking equipement but rather about knowledge and experience, together with the right and fresh ingredients that forms a successful output.

3.2.3 One Altitude

One Altitude is the world highest roof-top bars in the world and it has become a way to escape from the warm, busy and noisy Singaporean street life. Drinking a well-mixed mohjito with a 360 degree view over the city of Singapore accompanied by ambient music from the speakers gives an explosion in sensory perceptions – it is an unforgettable experience. But is the actual taste of the drink better than anywhere else? Chef Douglas Tay, priorly interviewed at Savour 2012, claims that the environment will definitely effect the food and drinking experience, in either a good or bad way. This field study, as well as many others field studies to luxury restaurant and hotels, gave insights about how surrounding factors can affect the food experience in many ways and thus something to be aware of as a designer.

3.3 Trends

New demands and perception

The perception of luxury is changing around the world as a result of the global brand expansion. Luxury brands are becoming more present in emerging economies where consumers are demanding more sophisticated products. The new luxury means more time and greater expe-

riences, and the most common experiences people are shopping for today are vacations and travelling. As the perception of luxury is changing, services and experiences close to home are becoming increasingly popular.

Consumers crave for professional skills, and seek for products that make it easy to perform activities at home in professional ways. Skills and knowledge as status symbols have began to challenge objects – showing off your skills is beyond showing off material things.

Also, people are seeking ways to disconnect from technology and the everyday life; people are looking for more "non-digital" interests as a result of being stressed and always connected. (Electrolux, 2012a)

Showing awareness

People are more conscious about health and the environment today compared to 10 years ago. This results in a big appetite for healthy and environmental friendly products, which in turn has raised people's expectations on quality. There are also increased demands for "transparent brands" that let consumers judge products and services on premises like health and environment, as a few examples.

Organic products and natural ingredients are becoming increasingly popular, as well as locally and ecologically produced products. People want the transparency and are becoming more concerned about food content and nutritions. However, even if people are seeking for healthy and less harmful alternatives they still want the intense pleasure from the things they eat, drink and do. There is definitely a hunger for authentic food and consumers' expectations will continue to rise. People want the best ingredients and the best quality in what they consume and are willing to pay extra for organic food to get all of its benefits. (Electrolux, 2012a)

New ways of living

The way we live in the future will change, which creates new demands on housing solutions. The urbanization is globally growing and the number of urban-dwellers will increase by around 50% the next 40 years in the developing world. Therefore, there is a need to improve quality of life, including ecological, cultural, political, institutional, social and economic components to be able to create sustainable future cities. The number of single households is also increasing which creates new demands on living solutions. There is an obvious need to find interior design solutions to be able to fit people's decreased living spaces. Future interior concepts are focusing on integrating different rooms and change the idea about having separate rooms, such as kitchens.

The growing global population implies increasingly limited resources. We are already spending 30% more renewable resources than the Earth can reproduce and a change is crucial for a sustainable future. At the same time, around one third of all the food produced for human consumption is being lost or wasted during the supply chain. This also leads to unnecessary CO_2 emissions, which increase global warming. (Electrolux, 2012a)

The heart of the home

The kitchen is where we wish to socialize with friends and family: it is the 'heart of the home' and the room of being, leisuring and living. It has long had the role as the connecting hub of the home, but with new technology the kitchen also becomes the control, information and media centre of the home. Future homes have high functionality, but with the technology hidden. The kitchen may also become the new living room where it is more integrated with the rest of the home. Open space solution are still prominent and elements from the rest of the home like sofas are moving into the kitchen. The functions and activities are getting more and more incorporated in the kitchen environments.

Being conscious about food and skilled at cooking are big trends today. Therefore, there is little doubt that the kitchen will continue to have the important role of the home. (Electrolux, 2012a)

3.4 Target Users/Personas

To be able to know whom to design for, the Electrolux design office in Singapore uses two different personas to specify their target users. This project focuses on these personas – they form a guideline to evaluate against, and consequently, facilitates for the results to fit the desired market. Designing for the personas was one main criteria in the process when ideas and concepts were to be evaluated.

> A persona is a fictive character thas is made up to be able to communicate and create a common picture on how a target user thinks and acts. This is helpful in the idea generation to get a better idea of how the user wants the product to be designed and it could also be used for evaluation in the same way. (Karlsson, 2007)

The two personas Electrolux in Singapore is working with are the "Social Aspirer" and the "Self-Expressionist". The social aspiration persona is outward driven and a bit more conservative. She is also strongly driven by the symbols of status and brands that symbolise these attributes. The self-expressive persona is inward driven, confident in her expression and less brand sensitive. She is modern and forward looking with minimalistic inspirations.

Persona #1 – Social aspiration

"Married with kids"

Mai is a full-time homemaker and her life revolves mainly around her husband David and their daughter Molly. Even though Mai has a lot of responsibility as a supporting house-proud wife and mother, she has a comfortable life. The weekend is the time for Mai to relax and be with her family. Then, she likes to take a break from cooking and go out and eat. However, Mai and David like inviting friends to their home to entertain and arrange parties.

Their home is a huge source of pride and self-esteem and they have an inviting living room with an impressive dining area. The living room is the heart of their home and is the room where they gather their family or entertain friends.

Beyond is the kitchen which is spacious and well-equipped. Mai thinks it is important that her home makes a statement reflecting her personal style, her family's success and her achievement as a dedicated mother, wife and homemaker. When entertaining at home, that's Mai's moment to really shine. She is well adept in the kitchen and has good culinary skills. Mai takes pride in and responsibility for the preparation of the entire meal. She likes sharing new experiences and connects to what's current.

Persona #2 – Self expression

"Married without kids"

Ann has been married to Josh for 4 years and they live in a spacious 2-bedroom apartment just outside the business district where they both work. They do not have any kids (yet) and Ann's daily life revolves around her hobbies, friends and her family. A typical week involves working until 6 or 7 pm and then heading home for dinner and relaxing in front of the TV. Sometimes they meet out for dinner with their friends as they like checking out the latest restaurants and hotspots in town.

Ann and Josh's apartment is a sanctuary and a showcase of Ann's personal style – it's chic and minimalistic, yet comfortable. Ann is putting a lot of effort in choosing the furnishings and constantly updating the decor – she is proud of her uniquely stylished home. The living room is their favourite spot and that's where most evenings are spent. The kitchen is small but functional and opens into a small dining area. However, they do not often invite friends over to dinners because the kitchen and dining area are not ideal for large gatherings. For Ann, it is

important to be involved and in control of her household at all times even if she gets help with major things by her maid. Ann loves cooking and sees her appliances as partners that she can rely on. She appreciates the value of exclusive, premium quality appliances that also boast beautiful, harmonious design.

3.5 Conclusions

It takes a lifetime to even grasp all the different cultures, lifestyles and religions in Asia, or even South-East Asia (Asian Food Channel, 2012). Therefore, this project is *inspired* by South-East Asia and focuses on the global market.

Inspiration factors are, for example, the social values of Asian dining as well as the craftsmanship and importance of fresh ingredients in cooking. These aspects were found to be extremely important even in Western cuisines when creating memorable food experiences. The importance of skills, collaboration and inspiration in professional cooking is always stronger than fancy equipment or a huge kitchen (Hubrechsen, 2012). In common for all cultures is also the importance of taste and comfort that food needs to offer (Leung, 2012).

The environment is an important aspect. The dining experience will be greater when more senses are activated: a drink tastes better in a breath-taking open rooftop bar than in a regular home environment (Schifferstein and Spence, 2008).

Global future trends have a great influence on this project. Due to urbanisation and the increasing world population, the ways of living and eating have already started to change. The perception of luxury as well as interior trends are changing which create new demands as well as business opportunities for companies. People are seeking for new ways to satisfy their minds which increases the interest in cooking and the pursuit of professional skills. (Electrolux, 2012a)

The pre-study information became an important inspiration source in the early phase of the project to define the broad project scope. This was complemented with literature studies on relevant theory.

4. Basis for the concept development

To be able to narrow down the project and refine the project scope, the research data from the pre-study was clustered into numerous interesting concept areas using the ᴋᴊ-analysis method. The concept areas were presented and discussed with Electrolux – a discussion which created the base for the concept development phase. Further, more specific research was done to get deeper insights around the chosen areas and to be able to create a basis for the ideation phase.

The ᴋᴊ-analysis is useful when a big amount of data needs to be structured and analyzed. Important output, keywords or cites from the collected date is written down separately on post-its and then clustered, into groups, on a board to get a good overview. Those groups can later be used for further ideation or be formulated as demands for the future project as an example. (Karlsson, 2007)

4.1 Concept areas

Insights from the first research phase led to numerous interesting concept areas. All areas were related to food and cooking, but were on different levels specific to South-East Asia. Some concept areas were later chosen for further development, either alone or combined.

Kids and health

There is a prominent global health trend which may be the response to the growing obesity problem around the world. Alot of people are willing to spend more money to be able to keep a healthy lifestyle, but others do not have the time, interest or the knowledge to care about it as much. To decrease the risk for a health downfall it is important to focus on the young people in the society that are still learning and forming their habits. We can already see this trend in an increasing amount of cooking shows on television involving children. By creating an interest for cooking it would be easier to make children care and be conscious about what they eat.

- *How could we make children more conscious about the food they are eating?*

- *How could we increase the social value of cooking, involving people of any age?*

Small homes and big families

Field studies and research gave insights about the Asian style of living, and that people live together with their families longer before moving out compared to in Western countries. However, Asian kitchens are very small and all family members have different time schedules depending on their age and occupation.

- *How could we make living convenient when there is a lot of family members in small homes with only one small kitchen?*

- *How could we make it easier to prepare food at home?*

Social aspects of cooking and dining

Due to the globalization, a lot of people in all ages are studying and working away from their home countries which in one way or another could separate families. Especially in the Asian cultures, the family is extremely important and the dining event is a great time for socializing.

- *How could we maintain the social aspects of cooking and dining when friends and families are separated geographically?*

Communal dining

Dining is about satisfying out senses and it is a time for friends and family to gather and socialize. The social aspect is extremely important in Asia where communal dining (sharing the dishes with each other around the table) is a common part of the everyday.

- *How could we make it even more social and fun to dine at home?*

- *How can we make it more easy to share food and keep it warm around the table?*

Food waste

Food waste is a growing problem around the world. Each year, a huge amount of food is thrown away which not only causes increased landfill but also causes a serious fresh water wasting problem. Meanwhile, a big amount of the world's population is starving and lacking drinking water.

- *How can we prevent and reduce the food and fresh water waste, and make people conscious about this issue?*

South-East Asian cooking

The South-East Asian cooking is very traditional and the open fire is the focal point. There is only few cooking equipment, and the more important parameters are cooking temperature and techniques. Recipes are seldom used and the craftsmanship is of high importance.

- *How can we make the cooking more innovative but keep the same feeling as when cooking over open fire?*

Restaurant at home

Many people go to a restaurant to dine in order to avoid time consuming preparations, cooking and not least to avoid cleaning; others don't have the self-confidence or the inspiration in the kitchen at home. Even if you are a professional chef it could be hard to create a restaurant-like total experience in the home environment.

- *How can we facilitate for and establish a restaurant experience at home?*

- *How do we make it easier to prepare exclusive dinners at home, and produce a total experience including not only the food experience?*

4.2 Selection of concept areas

The aim was to select one or a couple of concept areas that would fit the project's scope and aim. These would preferably have great innovation potential, yet still be broad to enable further exploration.

All concept areas were evaluated together with the design people at Electrolux in Singapore. The evaluation dialogue was on whether the concept areas were relevant for the project and the Electrolux brand.

Restaurant at home was initially favoured mostly due to its strong potential for designing for experiences, and the potential level of innovation. *Kids and Health* was interesting in the way it addresses many of today's trends and problems such as healthy living – this concept area could be seen as inspiration for *Restaurant at home.*

Food waste was the second concept area that was highlighted during the evaluation meeting due to the growing global issue related to the topic, and because Singapore and South-East Asia should have considerable potential for improvements as the recycling system is poorly developed and sustainable thinking is in many ways missing. This concept area may not have obvious experience design connections relevant for the Electrolux brand, but was well worth researching on more to evaluate its potential.

Finally, the chosen concept areas became *Restaurant at home* and *Food waste.* The decision to continue with the two concept areas was to let them influence each other to get a rich and interesting second research phase.

4.3 Complimentary research

During the pre-study, a lot of information was gathered on the *Restaurant at home* area whilst *Food waste* was only identified as being a major issue but was not more deeply explored. Therefore, more research was needed to create depth to the chosen concept areas, in turn to enable initiating the ideation phase.

4.3.1 Survey

A web-based survey was created to gain general user-based knowledge around the two chosen concept areas. The questions were made to be easy to answer without going too deep and the outcome became both quantitative as well as qualitative. Using Facebook, the survey reached around 80 people with different nationalites. See Appendix II for complete results of the web-based survey.

A survey can be seen as an indirect interview in written form which is sent out to people where their answers are collected in a questionnaire. Surveys are mainly used to collect data from a large amount of people, as well as to validate data that could have been gathered priorly in interviews for example. A survey is an effective way to get information from people that are hard to reach in other ways than mail, e-mail or social medias. (Karlsson, 2007)

The findings from the survey within the two areas:

Restaurant at home

The survey verified many of the findings from the pre-study. It also gave knowledge on why people choose to eat in restaurants and at home respectively, and what the pros and cons with each of these choices are.

People choose to dine in restaurants because of the new environments and the whole experience related to escaping the normal routines. Half of the respondents were eating out because it is convenient and because they are able to try new food. The answers also show that there are drawbacks with dining in restaurants as well: it is often hard to customize for the guest for example, at least that is what is perceived. Also the high expenses, as well as the often rather "stiff" environments are aspects that the participants mentioned in the survey as drawbacks with dining in restaurants.

People choose to dine at home due to the relaxing and comfortable environment, being economic, and the entertaining aspects of cooking yourself. However, some experience it being hard to socialize with friends in a relaxed way while having to prepare and cook the dinner at home. Doing dishes and cleaning up are other tasks that are time consuming, and reasons why it could be difficult to relax and socialise with friends or family.

A high percentage of the participants also likes cooking and perceive themselves as being experienced in the kitchen, which could be a result of the growing global food and cooking trend.

The survey showed that almost all the participants care about health and nutrition when buying food, which could confirm the growing health trend.

Food waste

The survey showed that the main reason why people are throwing away food is because it looks unappetising and/or because it is outdated. Almost all participants try to save the leftovers for the day after or make a lunchbox out of it if. However, the food is often thrown out directly if it is too little to bother keeping.

4.3.2 Litterature studies

Complimentary litterature research was done to get more information and depth on the two concept areas. This would also function as fundament for the coming ideation phase.

Restaurant at home

The professional is moving into our homes: consumers are seeking products as well as skills that make it possible to carry out activities in a professional way in the home environment. There is a desire for professional skills, and amateurs consequently crave professional products. "Out of home" services at home are also becoming increasingly popular. Skills and knowledge as status symbols have began to challenge consumer products – showing off skills is beyond showing off material things, thus, people want to express status by increasing their skills. However, people are still consuming products – professional products that increase the users skills without necessary being a professional. Photography is one example where people are spending huge amounts of money to use advanced products. Coffee machines have lately become such a product: without having to be a proffessional barista the user is able to deliver perfect coffee right in the home environment (Electrolux, 2012b).

Bringing the restaurant experience into the home environment is far more than just having skills and professional products at home. Just as important is the dining environment, the convenience factor, the right ingredients for the cooking, as well as the social aspects (Tay, 2012).

Food waste

There is a difference between food waste and food loss. Food loss takes place at production, post harvest and processing stages in the food supply chain. Food waste occurs at the end of the food chain (retail and final consumption) which relates to retailers' and consumers' behaviour. (Steinman, 2010)

Food losses and food waste are issues of high importance considering the efforts to combat hunger and improve food security in the poorest areas around the world. Food losses also mean wasted resources used in production like land, water and energy. Producing food that never will be eaten means an economic loss and creates unnecessary CO2 emissions as well. (Cederberg et al., 2011)

Around one third of all the food produced for human consumption is lost or wasted globally (Steinman, 2010). This occurs throughout the entire supply chain, from initial agricultural production down to household consumption stage. Overall, much more food is wasted in the industrialised world compared to the developing countries. In countries with low income, food is mostly lost during the early and middle stages of the food supply chain. However, in countries with medium to high income, food is also wasted a lot at the consumption stage. Parsimonious and limited harvesting techniques, poor storage, cooling and packaging facilities as well as the infrastructure are all causes to the food waste in low income countries. In medium and high-income countries the causes to food waste mainly relate to consumer behaviour as well as a lacking coordination between the different actors in the supply chain. Insufficient planning, expiring "best-before-dates" and a careless attitude of people that can afford wasting food economically are all factors that increase the food waste at the consumer level. (Cederberg et al., 2011)

Food waste often ends up on landfill where the lack of air and light makes it generate methane gas which contributes to global warming. (Steinman, 2010). There are several more sustainable ways to deal with food waste where the most important being to change people's behaviours. If food needs to be wasted it could successfully be composted instead of thrown on landfills. Composting is a natural and inexpensive process that will tranform kitchen and garden waste into valuable nutritions and soil. Food waste could also be broken down by anaerobic digestion which is a natural process. Microorganisms break down organic matter, in the absence of oxygen, into biogas and digestate. The process is totally free from greenhouse gas emissions and other advantages are for example that the biogas can be used to generate heat and electricity (DEFRA, 2012).

4.4 User scenarios

The understanding of the user in its contexts is essential when designing for experiences, and it is important to imagine how the persona could act in different situations. The following scenarios were made to get a even better idea of the user, the context and some of the possible events of interaction.

4.4.1 Restaurant at home

Birthday dinner at home

Ann and Josh have invited friends to celebrate Josh's birthday. It's important that this day becomes special – Ann wants to create something extraordinary to impress their friends.

They go to the grocery store early the same day to buy exclusive ingredients for a three-dish dinner. Back home they start to prepare and later in the day Ann sets the table to be well prepared. The appetizer and the dessert should be made and they make those dishes in advance. This means a lot of dirty equipment and dishes that have to be done before cooking the main dish. This should be warm and Josh plans to do the major part of it when the guests have arrived and are having a drink.

Even if the couple thought they were well-prepared it gets stressful in the end – as usual. They need to shower and dress up and suddenly the guests arrive. Now there is both a pressure on socialising with all the friends and at the same time being successful with the cooking. The meat should get the right temperature and colour, vegetables should be stir fried, the sauce should be made – and the timing of everything is crucial.

This time everything worked out fine and finally the dining can begin. Everyone loves the food and both Josh and Ann feel very delighted and satisfied. Finally, they can now enjoy the company and the birthday in their relaxed home environment. For occasions like this one, it is definitely worth all the dishes that have to be done tomorrow.

Friday hangout with friends

A bunch of Mai's friends gather on a Friday afternoon to enjoy cooking and dining together at Mai's place, when David and and the daughter Molly is away on a small trip. This Friday, Mai is responsible for the grocery shopping and passes by the local grocery store on her way home from work. She is heading home satisfied with a lot of unique and exclusive ingredients that for sure will add that little extra to the cooking experience. All guests arrive in time and everybody gather in the kitchen to socialize and to start the preparation of the food.

Mai is the leader in the kitchen this night and explains her plan for the dinner. Everybody is then helping out and it gets really crowded in the small kitchen. Somebody is stir-frying vegetables, others are cutting meat and others are preparing the little appetizer. It is a relaxed atmosphere and the cooking is more important than the actual result. It's not embarrassing if something goes wrong and this is the time when they really can try new cooking styles and increase their skills in the kitchen.

After one and a half fun hour in the kitchen it is time for dining. Everyone feel satisfied that they all helped preparing the excellent dinner they are eating together. They love the communal dining and there is a lot of chatting about what they could do better next time and which dish that was the best. After a memorable night Mai is left tired with a messy kitchen and a lot of dishes to do – now the tedious and boring part begins and she wishes her husband were home to help her.

4.4.2 Food waste

Too much ingredients and leftovers

When Ann and Josh invites their closest friends to their home for a dinner on a Friday night they want to create something special. Therefore they buy a lot of ingredients so they make sure that they will not run out food.

However, whilst cooking some ingredients are not used so Ann puts them back into the fridge again. After the dinner there is a lot of leftovers. "Good", both Ann and Josh think, because the worst thing that could happen is to run out of food when having guests. But at a second thought, what should they do with the leftovers? Is it enough to keep or should it just be thrown away which is the easiest way of getting rid of it? The time is late and both Ann and Josh are too tired to take care of the leftovers so they decide to throw them away to quickly be able to washing up and clean the kitchen. A week later some ingredients from the birthday event appears to have been forgotten in the fridge but are far too old to be used, which means more food waste.

Different tastes and times

In the home of Mai, David and their daughter Molly, there are different food needs and habits.

David and Mai have sometime different time schedules and Molly is often picky with the food and usually wants her own dish for the dinner. This means that the family eats at different times and that Ann has to buy and cook different food. However, this Wednesday the family is having dinner together. Mai has been cooking a spicy chicken dish for her and David. Molly is not keen on hot food and therefore gets her own dish.

When the dinner is over there are many partly used ingredients that are put back into the fridge. The cooked food is not entirely consumed and the leftovers are put in boxes that Ann puts in the fridge. However, some leftovers she consideres to be too small to keep and are, therefore, thrown away.

The next following days some of the leftovers are eaten but some gets too old to keep and are later in the week thrown away as well.

4.5 Conclusion

The complementary research gave many valuable insights that were needed to start the ideation phase on the concept areas *Restaurant to home* and *Food waste*. As more data was collected, the potential to design innovative concepts around the areas increased. It is obvious that people care more and more about skills and experience today than just individual products. The *Restaurant to home* area then seemed to be extra interesting when it means development of a true experience which includes products and services. The research about the area *Food waste* problem increased the knowledge around the topic. This made it even more interesting when it is clear that the seriousness of the problem is massive.

Combining the knowledge from both topics could be an interesting challenge, which could potentially lead to breakthroughs regarding experience design, sustainability and innovation.

5. Ideation

The purpose of the ideation phase was to generate ideas and conceptual solutions on and around the chosen main concept areas; *Restaurant at home* and *Food waste*. The goal was to sum up this phase with one or a few potential concepts to continue on in the coming development phases.

5.1 Workshop

The ideation phase started with a workshop with the Electrolux design team in Singapore. All research material from the pre-study were used to create many questions and topics for discussion to catalyse a creative workshop.

5.1.1 Preparing the workshop

Restaurant at home and the *Food waste* formed the basis for the workshop sessions. Presentation material was created which summarised research data from the pre-study, and this was used to introduce the participants to the two concept areas. The material was sent out to the participants in advance to start up their minds prior the actual sessions. To support and ignite the workshop ideation, a few concept ideas on both concept areas had been created in advance. (See Appendix IV for complete workshop material)

5.1.2 Conducting the workshop

The workshop was held during two days at the Electrolux design office in Singapore. Six designers participated.

The first day was divided into one creative session on each concept area, the noon session on the restaurant at home concept area, and the afternoon on the food waste concept area. The conecpt areas were presented to the group together with a list of questions that could support the brainstorming phase. Presentation material was printed out and put on the walls to let the participants take part of the information throughout the workshop.

The ideation phase started with individual brain writing where the participants sketched ideas on Post-It notes that afterwards were explained to the group.

> Brain writing is and idea generation method where all the participants sit one by one and try to generate as many ideas as possible. When the idea flow is slowing down or after a decided amount of time all the ideas are shared to the group to create inspiration. The ideas could also be passed over to other participants during the next session for further idea development. (Österlin, 2003)

5.1.3 Evaluating the workshop

All Post-It notes were on the second day clustered into different groups to get a good overview and to be able to see the link between different ideas. The groups were created with the different phases of cooking in mind which became a timeline starting with preparation and cooking to dining and post-dining. This gave a good overview over all the phases of cooking and all working stages related to food and cooking.

Figure 2. Design team performing brain writing.

To connect the groups to each other, the "Red string mapping" method was used. All participants collaborated and tried to form links between the different groupings. This created different stories which contained a variety of conceptual ideas. Those stories created a bigger picture which later was used for further development.

> The red string mapping is a complimentary evaluation method to the KJ-analysis used create a story around the clustered groups to be able to create a bigger picture. This is done by using a red string to connect the different KJ-groups that relates to each other and in this way mapping out different stories. Those stories could later work as broader fields with enhanced possibilities for development compared to the individual KJ-groups. (Tan, 2012)

Figure 3. Red string mapping about to begin.

5.1.4 The outcome of the workshop

The result of the workshop created a good basis for the concept development phase. The used methods enabled creating a good overview over the huge amount of ideas. All ideas were combined to 10 main groups on different levels of abstraction, all still very broad and on a conceptual level.

Cooking top

The "cooking and dining island" concept encourages people to collaborate and interact during the cooking of meals – this leads to people having fun together while learning about cooking and improving their skills. After a meal has been prepared, it can be enjoyed communally on the same surface – the island turns into a dining area (everything from a lonely breakfast and a one-on-one date, to a six people buffet-based dinner) with a cosy environment. The link between cooking and dining is seamless, and the cooking can still go on whilst dining (like for example Japanese teppanyaki, Chinese hot pot etc.).

The surface of the island is using inductive technology. Its glassy surface is easy to clean and technology, such as touchscreens, can be incorporated in it, providing for example cooking tutorials, calendar overview, shopping lists or anything useful for the hub of the home.
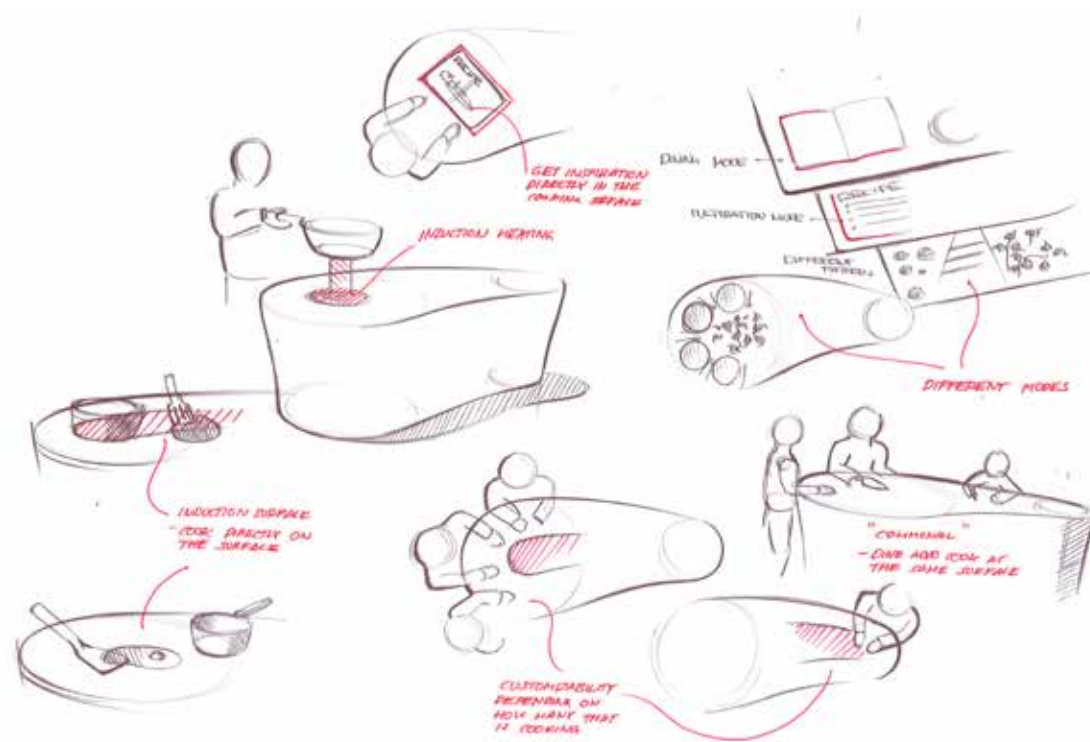
Figure 4. Sketches of the cooking top concept.
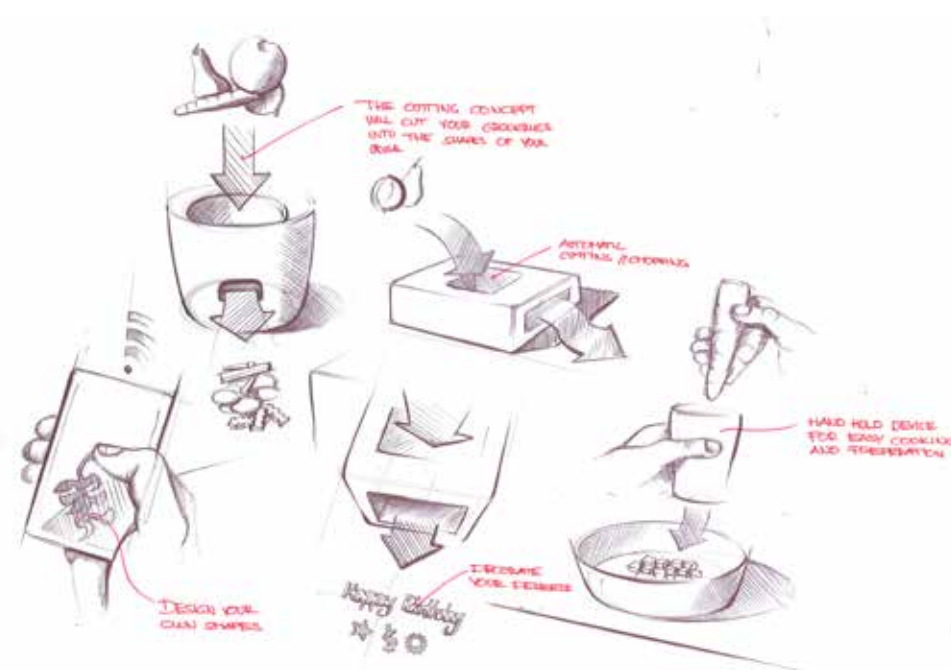
Figure 5. Sketches of the cutting tool concept.

Cutting tool

The "cutting tool" concept does the monotonous chopping work for you – and saves you a lot of dishes as at the same time. With rapid and efficient cutting technology, your vegetables, fruits etc. will be peeled and cut into pieces. A fresh fruit salad in the morning takes 30 seconds to make – and the only washing up you'll have to do is the device – no more messy cutting boards and dirty knives. Create wok mixes of your fresh vegetables instead of throwing them away when they go bad, and put your homemade mixes in the freezer and you're ready when you crave for some wok!

The tool would not only save you time but also make you more inspired to cook since you can focus on the fun parts – the actual cooking. No more worry of smelly hands days after dicing onions or garlic. Last but not least, the device could also possibly help you design your desserts: cutting and garnishing the cake nicely is made easily.

Smart sink

The "smart sink" concept is truly a smart sink. Leaving dirty dishes in the sink is something most of us do and it is a result of our laziness. Thus, by transforming the sink full of dishes into a dishwasher this "bad habit" will be nothing but the good habit! A solution like this will save a lot of space as well. The concept can be developed into a double dishwasher, meaning that you can have a couple of dishwasher compartments so that you can always run one and empty the other one simultaneously.

With a water waste management system added the dishwasher water can be used for watering plants etc. And by putting the lid on top of the sink in flush with the bench, the working area increases considerably.
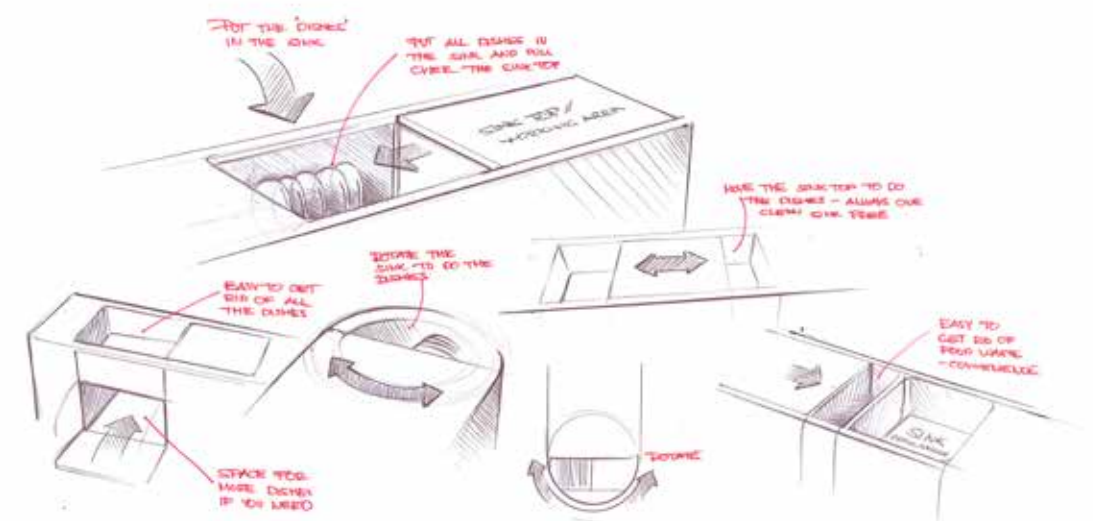
Figure 6. Sketches of the smart sink concept.

Flexible mat

The "flexible mat" concept makes great room for spontaneity and flexibility. By providing smart cooking surfaces in modules that you can put together your way (like Lego or a puzzle), you can bring teppanyaki to the coffee table, boil homemade dumplings on the romantic picnic, or make your own ice cream right on the beach.

The module can also be used for temperature maintenance or defrosting – the stored energy can be used in a variety of ways. Your phone is running our of battery? Wrap it in the modules and it will be charged thanks to the inductive energy transportation!

Ever wondered what makes that extra feeling of luxury that you sometimes get at a restaurant? Well, often it is just as simple as receiving the plates tempered so that the food temperature will be maintained. With this concept's modules, you can put the plates on top and get the right temperature of the porcelain – or the gin and tonic for that matter (with a module as a coaster)!
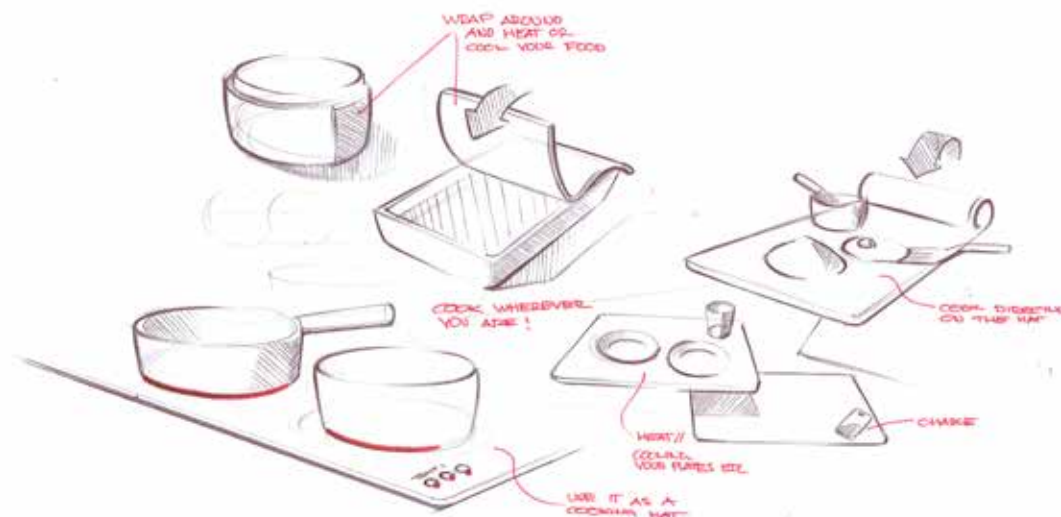
Figure 7. Sketches of the flexible mat concept.

Frying surface

The intelligent "frying surface" concept will ensure you'll deliver the perfect steaks (or fish, poultry etc.) to your guests (or yourself and your beloved for that matter) – let them pick rare, medium, well-done or whatever they want – the intelligent frying surface will tell you when to flip the meat right on time! Not only this, you can remotely command that you want the steaks to be perfectly ready in a given time (say 20 minutes, so that your party can finish the starter and the chatting before the main dish) – a notification will be delivered to you some time ahead so you'll not have to stay standby in the kitchen but lets you socialize instead.

The interface is intuitive and the technology invisible. Perhaps, voice commanding and eye tracking would be a convenient way of instructing the surface what steak should have what rareness (since you so often have too few hands in the kitchen)? The interface will not only let you know when the cooking is done, but also give you useful information about the current state etc. – information that likely will increase your interest and skills in cooking.
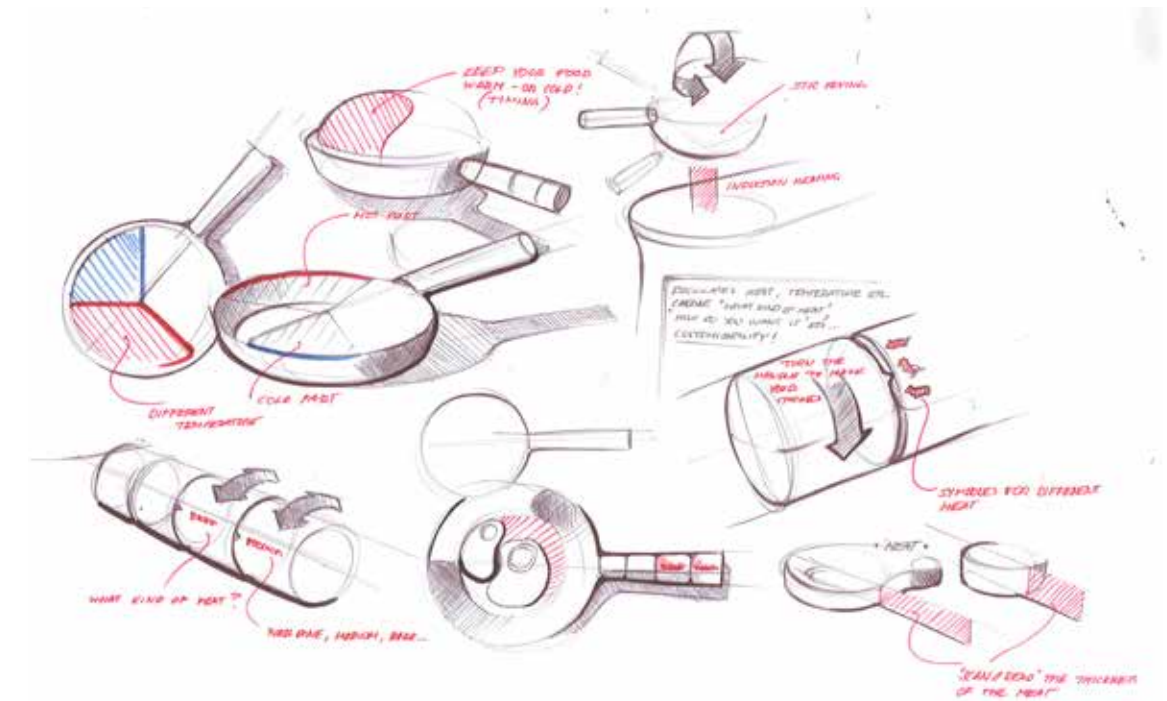
Figure 8. Sketches of the frying surface concept.

Monitor device

The "monitoring and timing" concept helps the cook to carry out perfect cooking. This by timing the meat and its temperature, with the rest of the meal's components so that it all will be ready at the same time. No more anxiety to fail on the night of your date or other important dinner! Forget spoiling expensive meat or serving half-cold dishes!

The monitoring function makes the "passive cooking" (watching the themometer, "guarding" the oven, etc.) much easier so that time can be spent on something else, for example socializing with the guests. It will also provide a safety feature because it will automatically communicate to the stove if something is burning and then shut off the stove and send a warning notification to the user's portable device (i.e smartphone).

This concept will not only facilitate and make the cooking more pleasant but also inspire to improve your skills by inviting you to take your cooking to new levels! Perhaps you will now dare to buy that raindeer meat that you've heard is so good but so difficult to cook..?
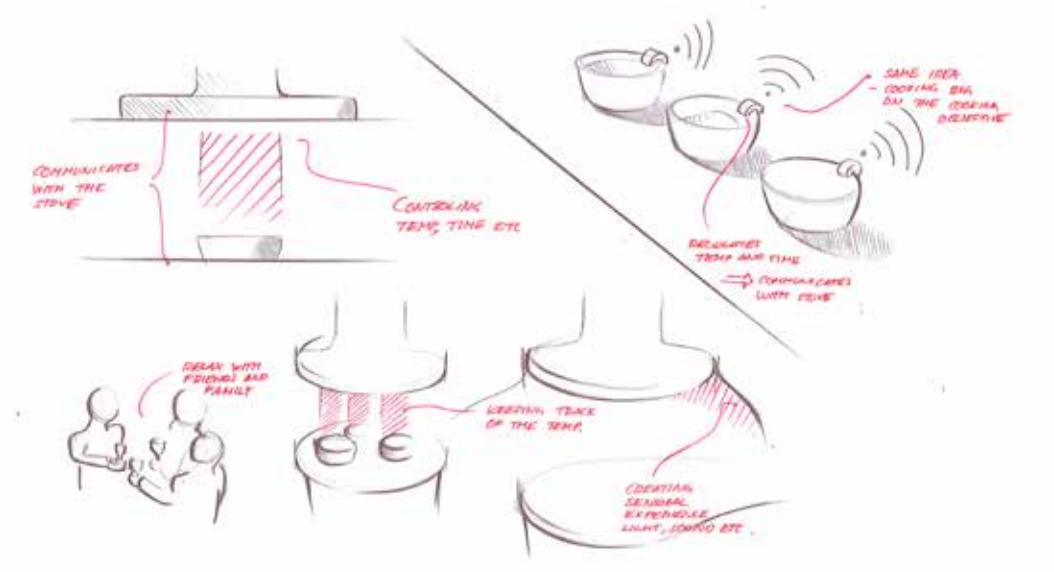
Figure 9. Sketches of the monitor device concept.

The level of automation (and thereby level of educational moment) is adjustable so that the concept fits everyone: from people who don't care at all but want to cook good food for their friends, to the "wanna-be-chef" person.

Smart storage

The "food storage" concept collects all groceries in one place and helps preserve groceries longer by providing optimal storage conditions. Managing the compartments is easy and cleaning takes no time. This concept includes the possibility of growing one's own spices and herbs since one compartment provides perfect conditions for plants.

Metering systems keep track of both the written best-before date but also the actual "freshness" level. The system warns or indicates when something is about to be outdated. The transparency of the storage makes keeping track of what you have at home visually pleasant.

A scanning system keeps track of what is inside the storage, and this information will (together with amounts and best-before dates) be able to access via for example a smartphone. This will facilitate the planning of grocery shopping as well as provide inspiration of "what to cook for dinner"; the system includes a "dinner tip" feature, which will help you make something out of what you have at home (or give you information about dishes you can make if you complete with this and that). Or share with your friends what you have in your storage, and that you're willing to co-dine!

Information technology could offer a multitude of features/apps to increase convenience, save time, inspire, and last but not least decrease food waste and overconsumption.
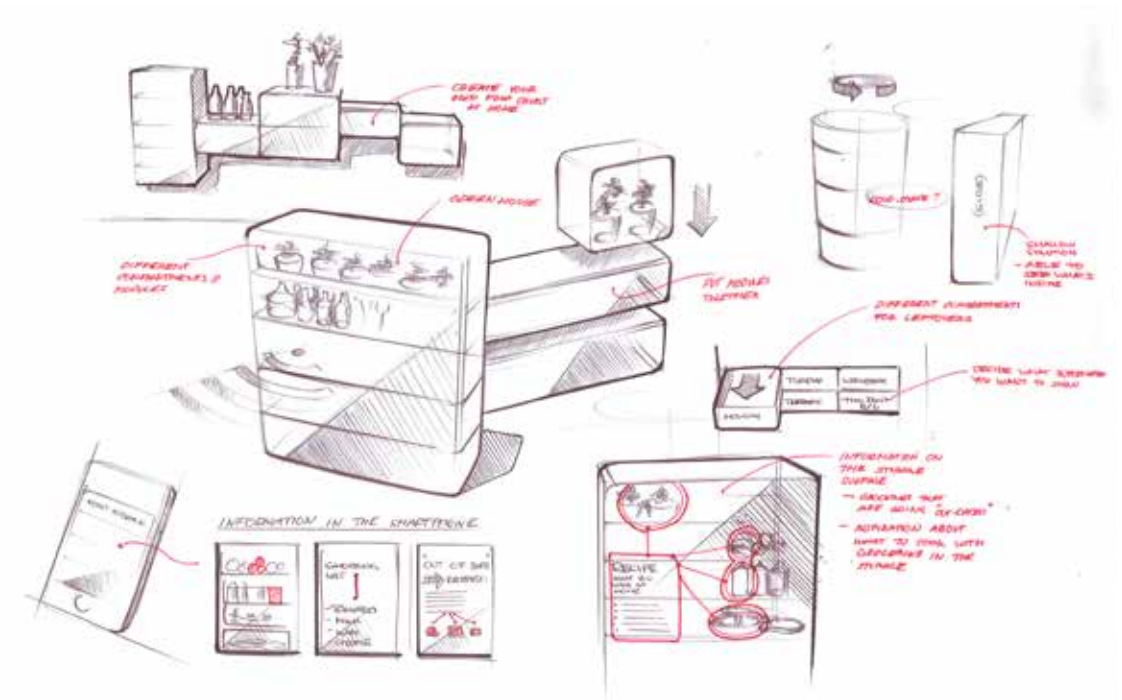
Figure 10. Sketches of the smart storage concept.

Thermo Bowl

The "thermo space" helps you maintain the temperature of food/groceries, warming/defrosting and cooling. The device creates a space anywhere on the workbench with the preferred conditions: vacuum to insulate and keep the food warm, cool temperature for the cheesecake to stay fresh that you serve outside on the veranda in the warmth, or helps you defrost the chicken breast fillets so that they'll be ready to cook when you get home after work. The device includes a timer feature (i.e
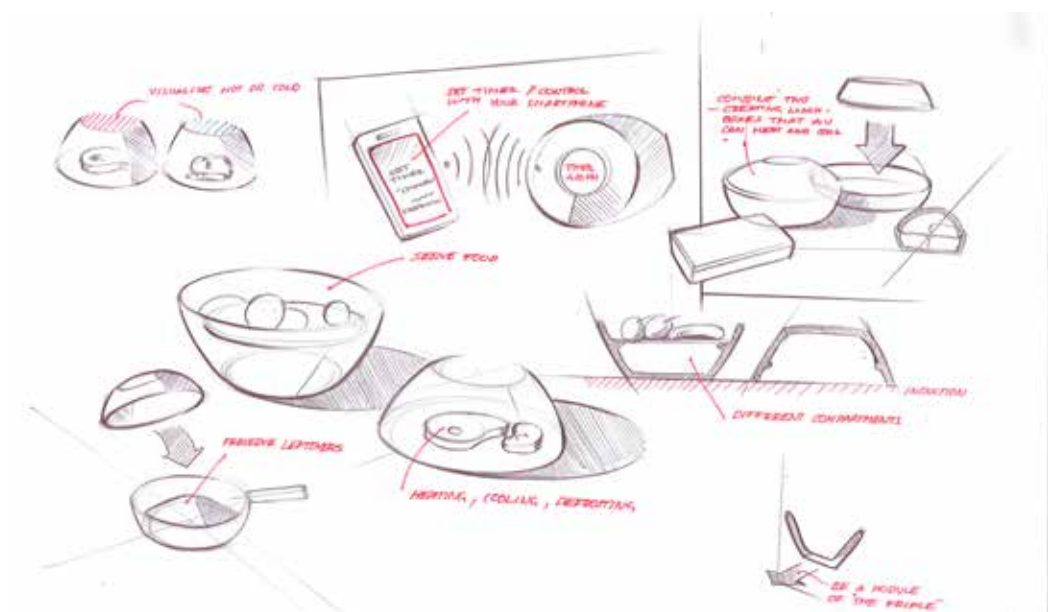
Figure 11. Sketches of the thermo bowl concept.

for the defrosting mode) that you can set and control remotely, via smartphone or similar.

The "temporary leftover" storage feature becomes a visual reminder that you already have prepared food, and that you should eat this before you cook a batch of new food.

Virtual chef

The "virtual chef" concept will invite you to the world of professional cooking – in a pedagogic and interactive way. Learn from the proffessionals in your home environment, in your own kitchen, and in your pace – and stop bothering with cooking books that are hard to understand and doesn't show you anything on *how* to perform different actions.

Ever wanted to know how you'd actually poach an egg perfectly? Or roll that maki sushi? Well, you could now invite Jamie Oliver or Gordon Ramsey to your kitchen to personally show you how to do these and many other things!

Your virtual chef will also help you to record your cooking live or retroactively. This would be the future way of writing recipes and collecting them! So whenever you want to cook that amazing thai soup that you did last summer – well, now you can let yourself be guided – by yourself. Also, share your master cooking sessions with your friends through social networks!
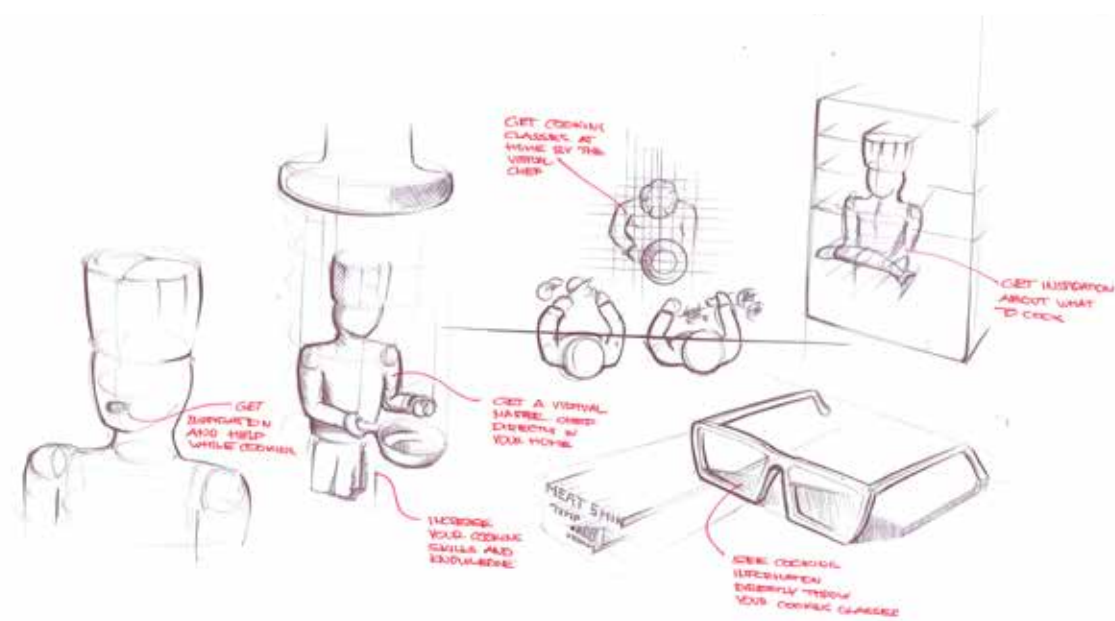
Figure 12. Sketches of the virtual chef concept.

Green House

The "green house" concept brings nature into the kitchen. With optimal conditions for plants you can grow your own supply of herbs, spices, fruits and vegetables in the kitchen right where

you need them. The idea is to let the plants provide a source of oxygen production, fresh scents, and a calming visual appearance as well.

The concept incorporates a composting unit where you easily can compost and produce your own naturally rich soil for your greenhouse. Thereby, your food waste turns into soil, that then turn into food again – a closed circuit!

The water for the plants is provided by water collected when rinsing vegetables etc. This reduces water waste. The watering system is automated to make maintenance as convenient as possible. Yet, it invites those who has green fingers and really enjoys the art of growing things. This is optional, so the concept will is attended to appeal also the person who solely is looking for fresh herbs within reach when cooking.
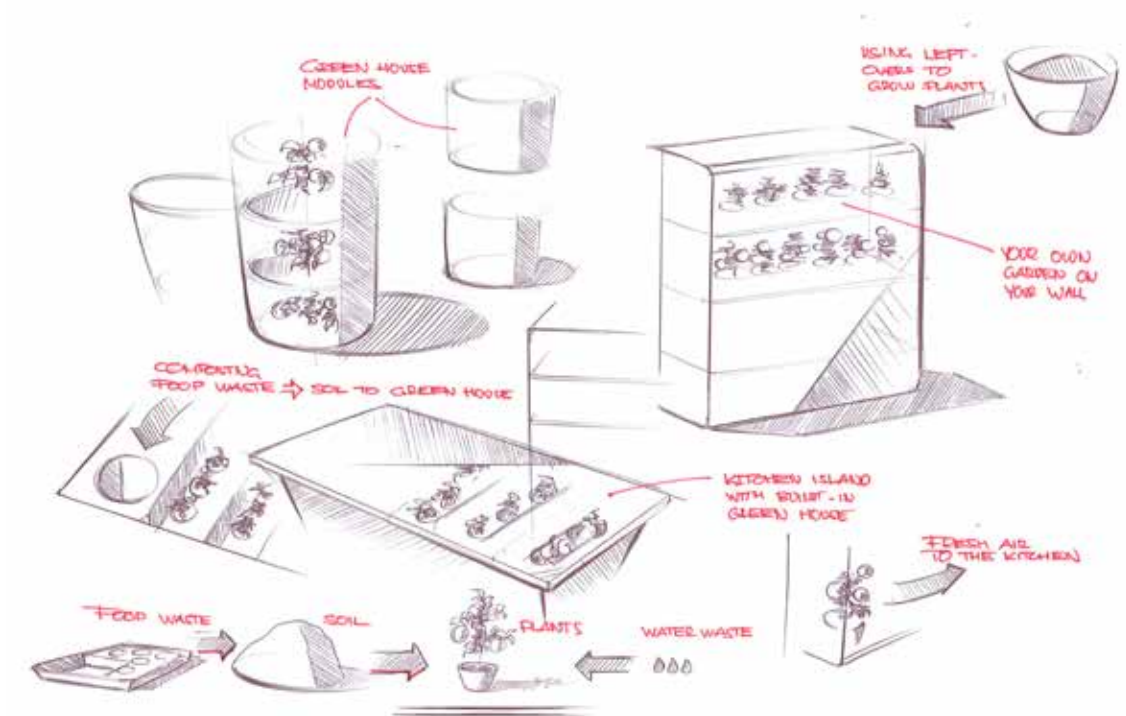
Figure 13. Sketches of the green house concept.

5.1.6 Concept evaluating and selection

All ten concepts were evaluated against certain criteria in form of a Pugh matrix (see Appendix V) and was given points depending on how well they fulfilled the criteria. The Pugh matrix was created as a combination of the most relevant requirements that were found during the prestudy. The storage concept scored highest mostly because of the strong connection to both research areas. The disadvantage with this concept was however that many previous projects had already been made within this field – both by other design students as well as competitors. The

virtual chef concept scored second highest. The cooking top concept came in the third position and was seen as a very interesting concept that could be developed further in a combination with other concepts. The green house concept didn't score high in the Pugh matrix but was considered to have a strong development potential. It ties to the future trends of urbanization, locally produced food as well as relates to healthiness aspects and growing global population issues.

> The Pugh evaluation method is good way to select a concept for further development with a good certainty of success. The core of the method is a matrix which lists different concepts that are evaluated against certain criteria. All concepts should be listed on the top row of the matrix and all the criteria on the left side. Each concept are then given score depending on how well it fulfils the criteria (if possible, in relation to a reference product), and the one with highest score is the winner. (Karlsson, 2007)

The concept areas were presented to the design team at Electrolux in Singapore. The green house concept was favoured due to its "human" values and the way it links to the two research areas as well as to the identified trends. This concept area was also a new market challenge for Electrolux which was considered positive. The storage concept was still interesting but could be made a part of the green house concept area. The project group was also advised to research more on each of these concepts to see what already had been done within each area and what the potentials would be.

A final decision was made to go for the green house concept in combination with the storage concept.

5.2 Conclusions and implications

The ideation phase with the workshop became very successful. Out of 10 concepts, two were chosen to continue with; the concepts that focus on growing and storing fits the project scope and future trends. It ties well to both research areas in several ways:

Restaurant at home

This concept could enable fresh produce in cooking as well as making it easy to garnish the meal with own produced delights. This will increase both the visual experience as well as the taste of the food. The concept could change the home environment and there is a potential to play with light and sound as well as flavours and scents from the plants.

Food waste

Waste of food and water could turn useful and be used to give nutrients which are needed in the growing process. The concept has a potential to be educating and give insights about how food is being produced which can make people be more aware of this and affect their consumption. The food waste will also be directly reduced when growing at home were the user could use only what is needed for the moment, which would lead to less of no overconsumption.

6. Concept Development

The aim of the concept development phase was to develop the chosen concept areas – *green house* and *storage* – into more concretized concepts with the potential to be evaluated against more defined criteria. Many iterations were made during this stage, and the activities formed two subparts divided by an important evaluation stage, and a decision regarding in which direction the project should continue was made.

6.1 Concept development phase 1

The concept development phase started with the two selected concept areas *green house* and *storage* as the basis. Another creative part of the project was now to begin where different ideation methods (such as brainstorming and idea sketching) were used in different environments to be able to get maximum inspiration. Ideation sessions were often held in restaurants, coffee shops and other public spaces around Singapore to get in the right mood and to get inspiration from the Asian atmosphere. A cheerful mood can enhance the creativity (Norman, 2005) and was shown to be very important, especially in this part of the project.

A huge amount of ideas came up during this phase which were later sorted and categorized by conducting a KJ-analysis. Ten new concepts within the two concept areas were formed and evaluated.

Brainstorming is a method used to create as large quantities and variety of ideas as possible. Preferable ideas are the craziest and the ones that are out of the box which mean that no criticism are aloud during the brainstorming phase. However, the ideas could be further developed by other participants and there are many different ways of doing this idea generation method (Österlin, 2003).

Sketches are used to effectively generate, communicate and document ideas during the product development phase. Two dimensional sketches can be made with different levels of details depending on purpose. Idea sketches are used to communicate simple ideas and thoughts and are usually small, fast and sketchy. Sketches can be developed more and more to become final renderings which can be used as presentation material and sell in a final concept (Österlin, 2003).

Modular shelf

The "Modular shelf" is a shelf system that is enabling growing and storing fresh vegetables, fruits and herbs in the home environment. It is expandable and could fit different households – from small to big. Due to its modularity it is easy to customize the design and create a personal look. Mount the shelves on the wall or place it on a plane surface, such as a table. The concept gives the opportunity to store all different kind of foodstuffs which will be gathered on the wall and give a good overview for the user. It ties well to both research areas; *food waste* and the *restaurant at home*.

Piccaboo system

The "Piccaboo system" is a modular storage and growing solution that is installed behind the back of the cooking benches in the kitchen. With a swipe of the hand the compartments will move up and the user will be able to get a good overview of the whole food storage as well get a home garden. With this concept the user has many ingredients and fresh vegetables and herbs within reach when cooking. This means high functionality and usability as well as it adding a decorative and organic element in the minimalistic kitchen of the future. It enables the opportunity to alternate "tiles" and wallpaper and it gives a new ambient light that all together creates a new visual experience in the kitchen environment.

Green house front row

This "Green house front row" solution has much in common with the "Piccaboo system" but is more a fixed solution. It is functional by letting the user get an overview of the whole food storage and provide everything within reach when cooking. It is intended to be decorative and it goes in line with future interior trends where less overhead storage plays a great role. The shelves are shallow which gives a good overview over the groceries, thus, minimizing food waste.

Sliding doors

The "Sliding doors" concept is a combination of food storage and home garden. It creates a decorative and organic element that also can work as an expandable wall to divide the room. The solution is easy to customize depending on how much space the user has. In any way, it gives a good overview of what's in storage.

Green house doors

The "Green house doors" concept is a developed fridge door that make the fridge more attractive and engaging. The green house doors is intended to hide the dull storage compartments with living green plants making it aesthetically appealing. This concept also strengthens the perception of healthiness and local production.

Cooking island

The "Cooking island" concept is a combination of a home garden and a cooking island, in that it provides fresh and locally produced herbs and vegetables conveniently while cooking. The element in the centre of the kitchen that it becomes creates a new dining experience when you can actually eat on top of your own "plant field". The concept has the potential to be used for water and food waste management: the water could be used to water the plants, and the food could be composted and transformed into nutrient-rich soil in which the plants are growing in.

Modular storage

The "Modular storage" concept has the potential to fit any home thanks to its modular design. The modules are placed on top of each other and can be chosen depending on what the user wants to grow or store inside of them. The concept can either be suspending from the ceiling, or be wall-mounted depending on the design. With this solution a new food hall experience is created where you can make something beautiful of your food storage. The solution can be placed anywhere in your room and also plays the role as a decorative element wherever the user decides to place it.

Green house hood

The "Green house hood" solution is a combination of a regular stove vent hood and a green-house which means that it is easy to reach herbs when cooking. It is also space efficient since it uses the space of an existing element in the kitchen. There is a possibility to combine the light that is needed for the plants with the light used when cooking. The design has the potential to make the vented air being perceived as fresh with herb scents emitting from the hood.

Suspending green house

The "Suspending green house" concept has a strong focus on decorative aspects rather than on high usability or functionality. It adds an artistic design element to the interior and the user has the freedom to place the suspending solution anywhere in the home. The design enables the scents of the growing herbs to fill the room and the solution will also work as an ambient light in the room.

Decorative element

The "Decorative element" concept targets the decorative aspects of having a home garden. The design invites people to take part and follow the growing process in a visually aesthetic way. There is a strong possibility to work with the sound of the pouring water, the fresh scents of the herbs, the natural colors and the ambient light to create a true nature-like experience in the home environment. The concept will contribute to make the dining area more interesting and unique.
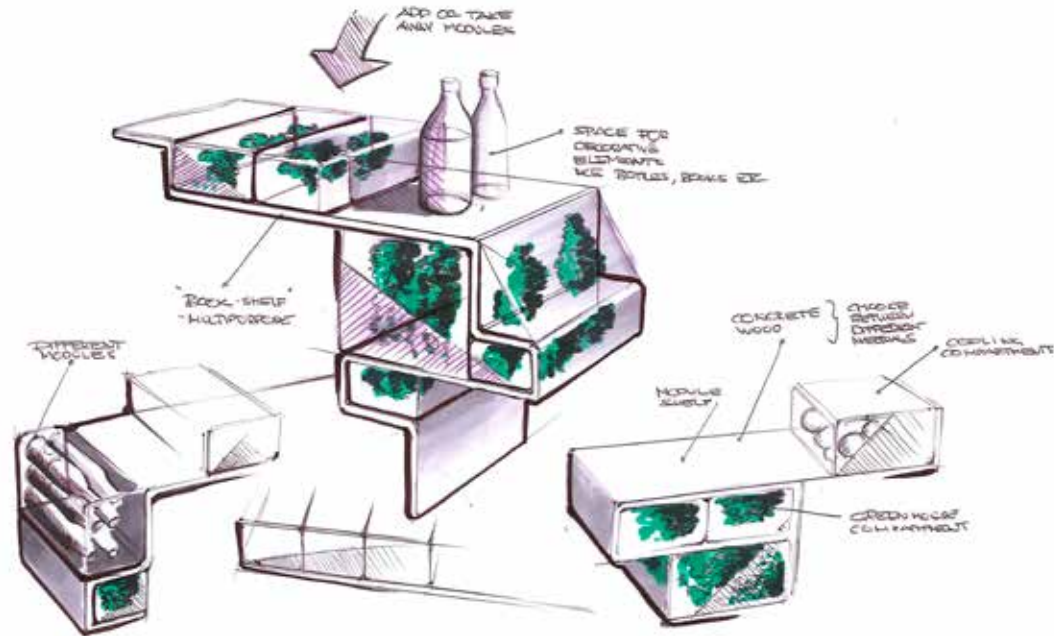
Figure 14. "Modular shelf"
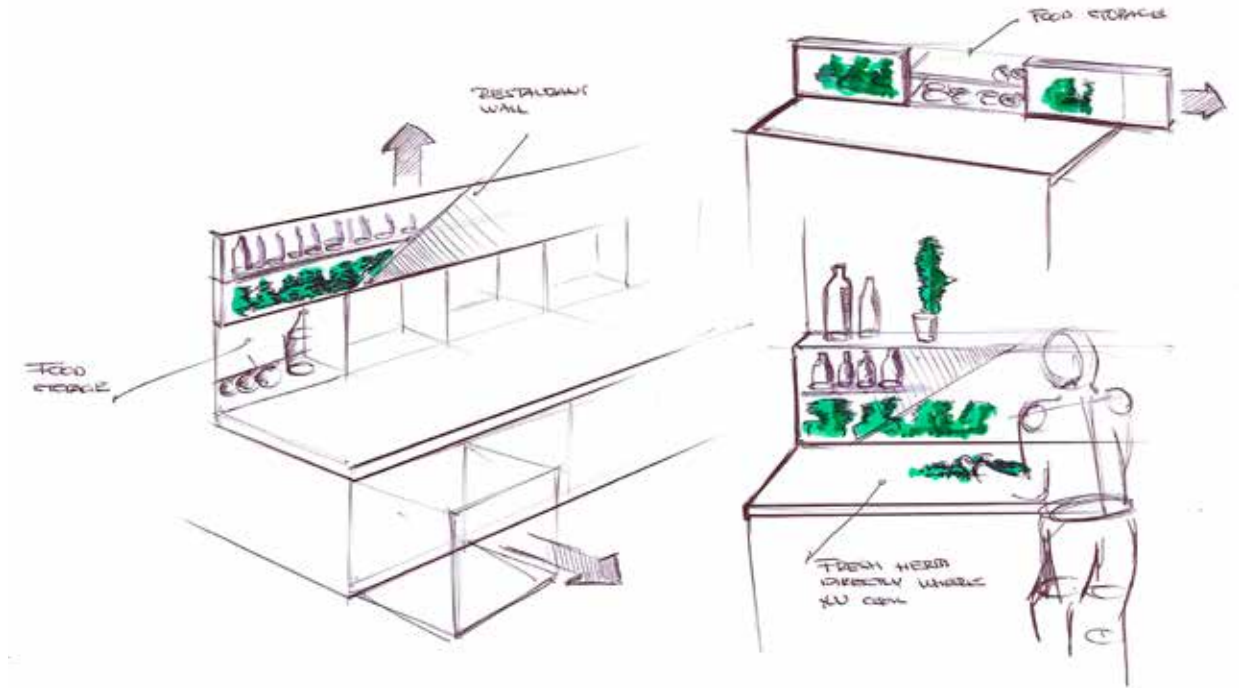
Figure 16. "Green house front row"
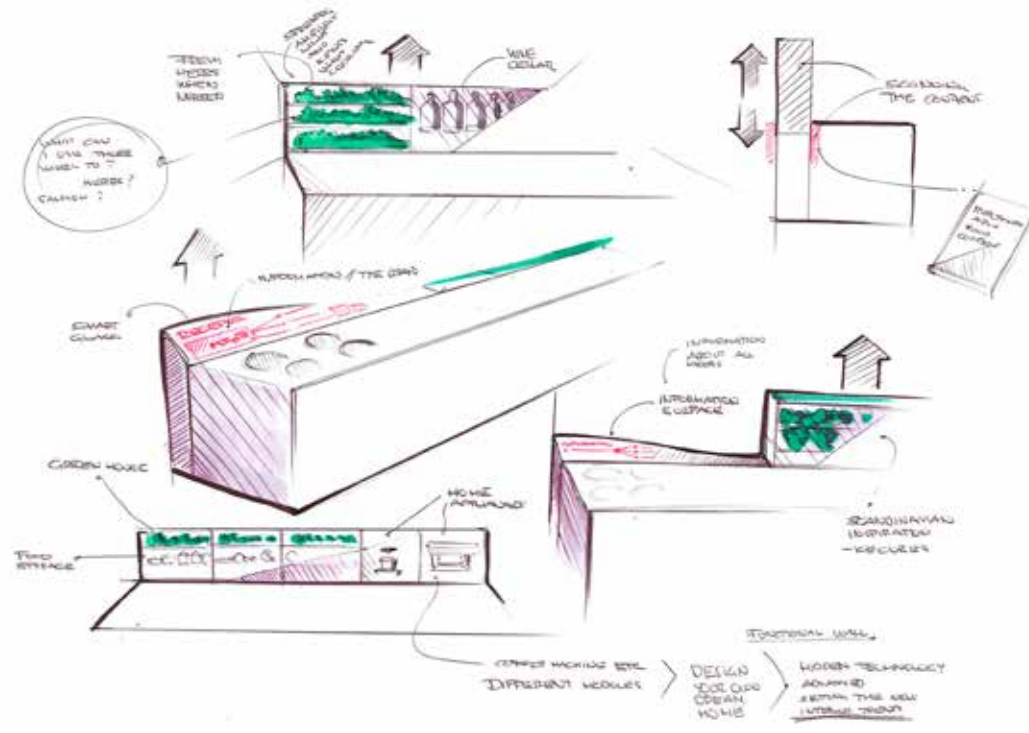
Figure 15. "Piccaboo system"
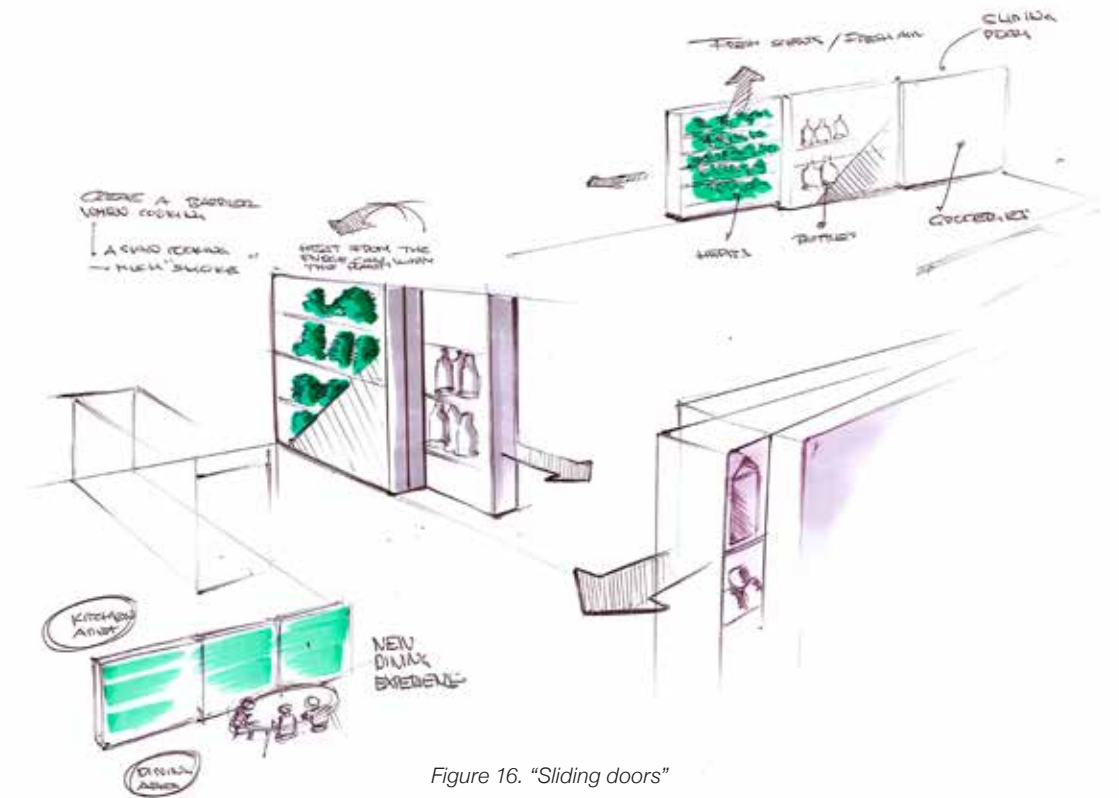
Figure 16. "Sliding doors"
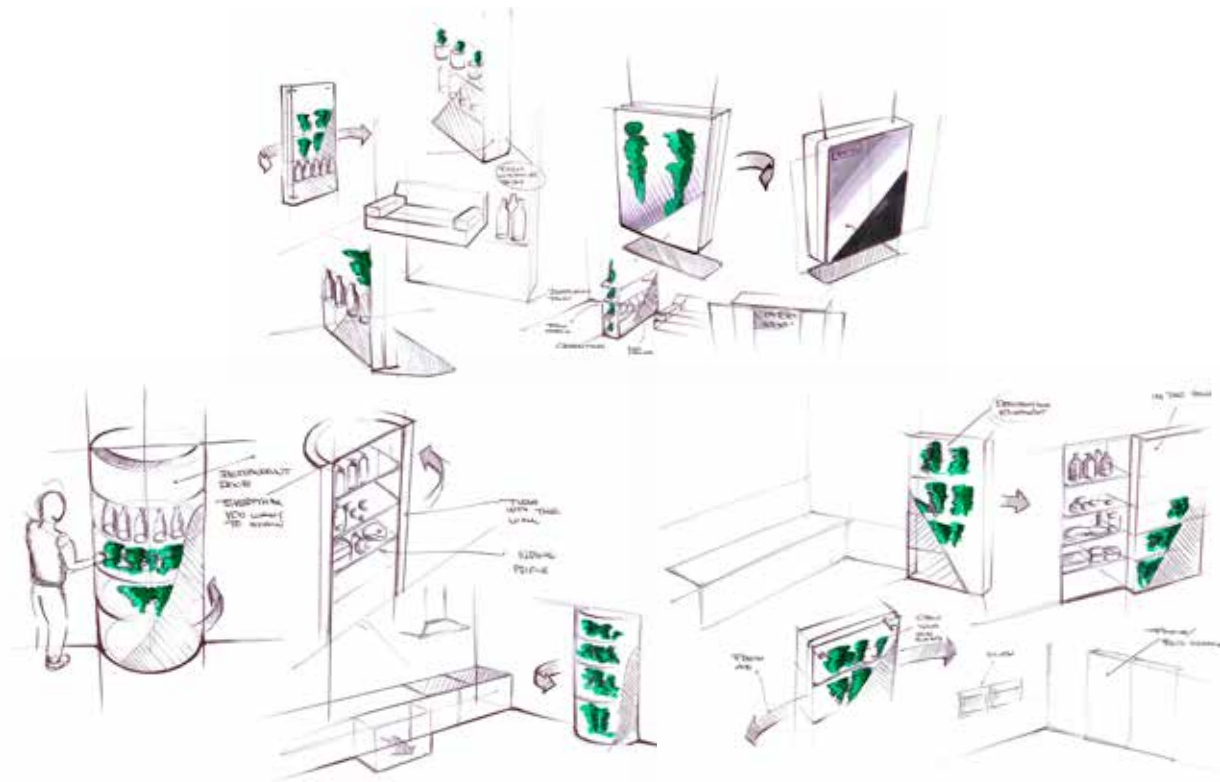
Figure 17. "Greenhouse doors"
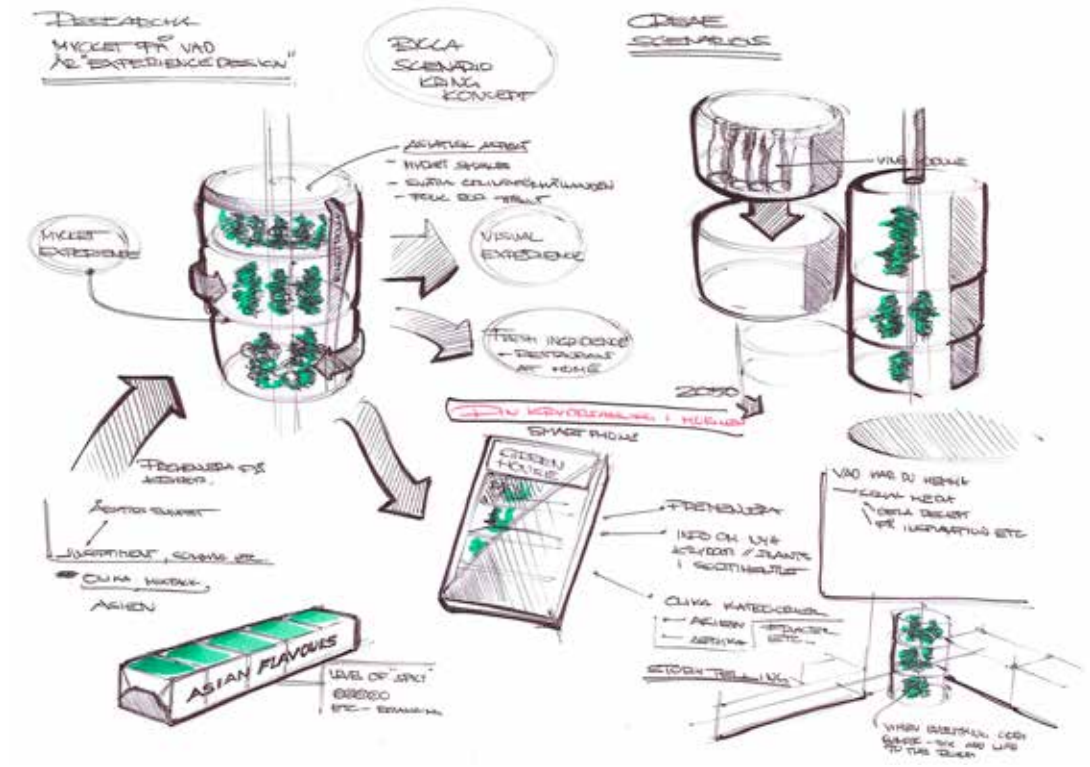
Figure 19. "Modular storage"
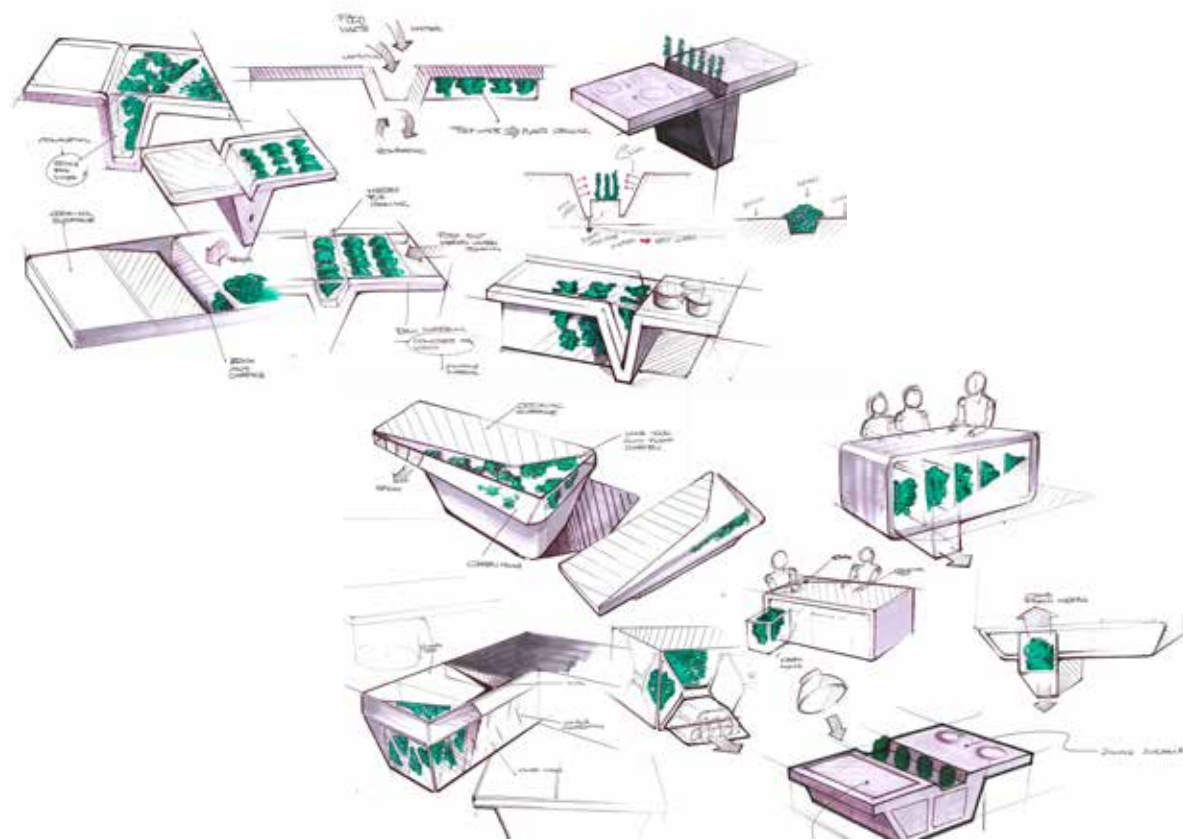
Figure 18. "Cooking island"
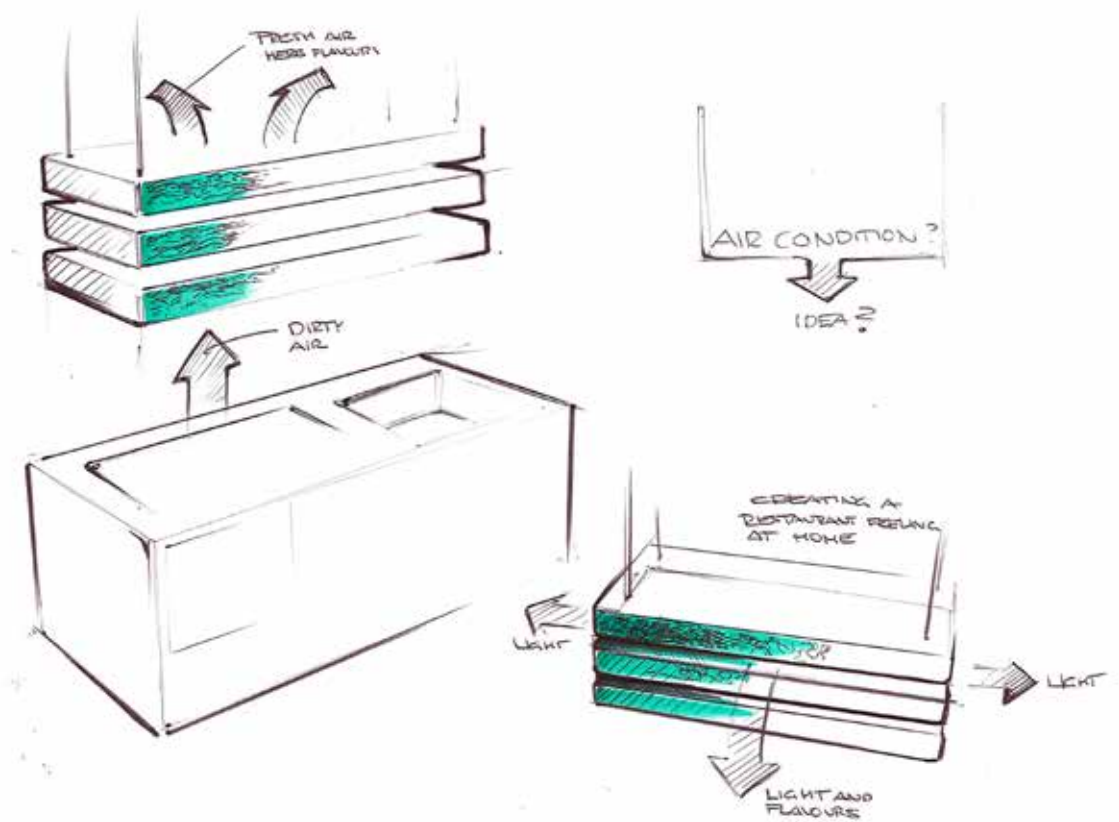
Figure 20. "Green house hood"

Figure 21. "Suspending green house"

Figure 22. "Decorative element"

6.2 Evaluating and selecting phase 1

6.2.1 Evaluating with defined criteria

An evaluation phase was held after the 10 new concepts were formed. Another Pugh matrix with more specific criteria relevant to the concept areas was created and used to see how well they fulfilled the set criteria (see Appendix V).

The "Piccabo system" scored the highest in the Pugh matrix. The high score was because of the way the concept fits new interior trends as well as being extremely space efficient. However the solution didn't seem as easy to implement in the home interior as the rest of the concepts. The "Modular shelf" solution scored second highest, mostly because of its viable properties. Also, from its possibilities to be customized depending on different user needs could be important from an experience design point of view. The "Cooking island" concept was next on list but seemed to be less innovative regarding the design.

6.2.2 Feedback from Electrolux

The feedback from Electrolux on the concepts gave new insights which slightly changed the results of the Pugh matrix. One parameter that was found missing in the scoring was how well the concepts would be able to fit current kitchen standards regarding design and measurements. The "Piccaboo system", for example, may change the whole kitchen design in a way that may not be feasible only 10 years from now. However, the "Modular shelf system" seemed to be able to fit a variety of homes and kitchen styles which made it more attractive to the Electrolux design team.

6.3 Concept development phase 2

The "Modular shelf" was selected, and a last concept generation phase was held to develop this concept further.

6.3.1 Complimentary research

Deeper research was required to be able to develop the concept track in the right direction. Literature studies gave insights about relevant and innovative technologies that could become useful and different study visits gave inspiration and more "user-based" insights. A trip to the Botanic Gardens in Singapore is an example of a full day study visit which gave good knowledge about plant biology and inspiration later implemented with biomimicry design principles.

6.31.1 Growing techniques

For a seed to germinate, and the plant to grow, there are three vital components: nutrients,

water and light. These enable photosynthesis to occur, which is plants' way to create energy for survival and growth. Photosynthesis requires parts of the light spectra: mainly the blue (400-500 nm) and red (600-700 nm) intervals. (Campbell, 2006)

Growing in soil

Growing in soil is by far the most common way plants grow in nature. The soil provides the plant with physical support but more importantly, it provides the plant with nutrients, minerals etc. that are essential for the plant to grow. Water is most commonly provided through rainfall or water deposits, such as lakes or rivers. The sun – which light contains all necessary wavelengths – provides the light energy.

Hydroponics

The term 'hydroponics' was coined in the 1930's by a California researcher, Dr. William F. Gericke, and refers to a principle of growing plants without soil. By providing the roots of the plant with water, oxygen and nutrients, these hydroponically grown plants mature faster and produce higher yields than traditional soil-and-water growing.

The hydroponic principle can be applied either where a plant is growing in a pot, bag or bed with a non-soil, inert medium (such as sand, gravel, rockwool, perlite etc.), or, it can be applied to setups where the roots of a plant, with its stem supported, are submerged in a reservoir with water-nutrient solution. Hydroponic setups are often complemented with artificial light to ensure full photosynthesis even during seasons when the sunlight isn't sufficient. (Kopolow, 1991)

Orchids in South America is an example of the hydroponic principle occurring in nature. There the orchids do not use any soil but instead use the bark of trees as growing media. Water that is pouring along the side of the tree when it is raining is absorbed by the roots of the orchids. (Kopolow, 1991)

Aeroponics

The aeroponics growing principle enables plants to grow in an air/mist environment that is free from soil or an aggregate media. It is similar to hydroponics with its soil-less principle, and can be regarded as a further development and optimization of hydroponics. The basic principle of aeroponic growing is to grow plants suspended in a closed or semi-closed environment by spraying the plant's hanging roots and lower stem with an atomized, nutrient-rich water solution. Aeroponic equipment involves the use of sprayers, misters, or other devices to create a fine mist of solution to deliver nutrients to plant roots. The size of the water droplets is crucial for sustaining aeroponic growth. Aeroponic setups are – like hydroponic setups – often complemented with artificial light to ensure full photosynthesis even during lowlight seasons. (Janvier and Lockney, 2006)

Compared to growing plants in soil, the aeroponic method can reduce water usage by 98 percent, fertilizer usage by 60 percent, and pesticide usage by 100 percent. The crop yields can at the same time be maximized by 45 to 75 percent. (Janvier and Lockney, 2006)
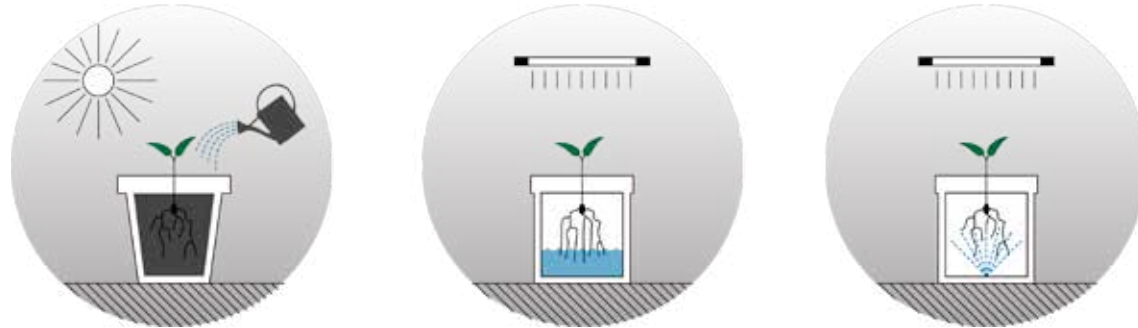
Figure 23. Schematic illustrations of growing in soil, hydroponics and aeroponics.

6.3.1.2 Storing

Even after harvest, fruits and vegetables continuing their biochemical processes including ripening. The continued ripening process eventually leads to spoilage, thus, preservation of mature fruits and vegetables implies stopping or at least braking the ripening process.

There are three vital elements to controlling the ripening process of fruits, vegetables and other fresh produce. These are temperature, humidity, and ethylene gas. (BluApple, 2012)

Temperature (peltier technology)

For most fresh produce, a storage temperature of 3-9 degrees Celcius is optimal for decreasing the rate of which the produce is ripening. Hence, this temperature interval will keep the procude's level of maturation the best (BluApple, 2012). To accomplish this temperature in a storage compartment that is placed in an indoor home environment, the use of thermo electric cooling technology is a viable solution. Thermo electric coolers (TEC:s) have no moving parts and small in size, highly reliable and flexible in design to meet particular requirements. (TEC Microsystems, 2012)

Humidity (silica gel)

Ideal humidity for storing is neither too dry nor too wet. Fruits and vegetables put in cold storage often generate moist due to condensation, thus, to control the humidity a humidity absorber is needed (BluApple, 2012). Silica gel is a porous, granular form of silica, synthetically manufactured from sodium silicate, and is today the highest capacity adsorbent. Comprised of tiny inter-connecting pores, silica gel attracts and holds moisture by adsorption and capillary condensation. Silica gel is inert, non-toxic, non-flammable and safe to use to protect foods, medicines and other sensitive materials as examples. (The Rust Store, 2012).

Ethylene gas (sodium permanganate)

Ethylene gas is a harmless odor- and colorless gas that has a profound effect on the freshness of produce. Fruits and vegetables produce ethylene as they ripen. Not yet scientifically proven, the purpose of ethylene gas may have an evolutionary explanation and acts as a signal to other plants to synchronize and coordinate ripening, thus maximizing the appeal of the plant to their seed disseminators (e.g. birds) and assuring the dispersal of their seeds. (BluApple, 2012)

The ethylene gas molecule is very reactive and is readily oxidized into a state harmless to fruits and vegetables. A simple and safe method of neutralizing ethylene is to "oxidize" it with sodium permanganate. Sodium permanganate ($NaMnO_4$) is a safe, inert compound that when combined with ethylene gas will react and change into a harmless manganese and carbon dioxide. (BluApple, 2012)

6.3.1.3 Materials

Biodegradable plastics

The term biodegradable means that a substance have the properties to brake down into simpler substances with help of activities of living organisms. Therefore, the substance is unlikely to persist in the environment. Traditionally plastics are not biodegradable because their long polymer molecules are too tightly bonded together and too large in size. Due to this, the molecules cannot be broken apart and assimilated by decomposer organisms. However, plastics that are based on natural plant polymers derived from either corn starch or wheat have molecules that can easily be "attacked" and broken down by microbes. (BioSphere Plastic, 2013)

Starch is a white, granular carbohydrate produced by plants during the photosynthesis and is processed to produce polyactide (PLA). There is also another possibility to produce biodegradable polymers by bacteria. Bacteria are then grown in cultures and produce granules of a plastic called polyhydroxyalkanoate (PHA). However, biodegradable plastics on the market today are from 2 to 10 times more expensive than traditional plastics (Australian Academy of Science, 2002). Biodegradable plastics are slightly more expensive to produce, but have many advantages compared to normal plastics, with less impact on the environment being one of the strongest advantages (Connecticut Plastics, 2012). A lot of effort is also put into finding low-cost options to produce biodegradable plastic and we could expect much cheaper solutions on the market ten years from now (Australian Academy of Science, 2002).

Corian®

DuPont™ Corian® solid surface is one of the most versatile materials in the global marketplace today. It is composed of alumina trihydrate and acrylic polymer. Therefore, Corian® can be

thermoformed by heating it to around 150 celsius which allows the creation of complex and unique shapes.

Due to its non porous quality, Corian® is approved to be used in environments with high demands such as hospitals and laboratories. Corian® creates many possibilities; it is possible to engrave it, colour it, and thermoform it. All Corian® products can be integrated to create an illusion of a single and solid surface and with a cove-backsplash there are no cracks that can collect moisture or dirt. Corian® is therefore also easy to clean and certified for food contact. Proper cleaning also make Corian® resist the growth of mold, bacteria and mildew according to the manufacturer DuPont. (DuPont, 2012)

Coco coir

Coco coir is produced as a by-product when the coconut husks are processed for the extraction of the long fibres. The coco coir is actually the binding material which comes from the fibre fraction of the coconut husk. Coco coir has a consistent and uniform texture which is composed of millions of capillary micro-sponges that are able to carry eight times of its own weight in water. The coco coir naturally contains trichoderma which is a natural rooting and growth agent which makes it ideal as an environment for microbial life to flourish. Plants will both root and grow faster. The material is also 100% organic and compostable (Flower of Life, 2012).

Shape Memory Polymers

Shape memory polymers (SMP:s) are polymeric smart materials that have the capability of changing their shape due to different external stimulus. Almost all SMP:s that exist today fall into three major categories depending on which kind of stimulus that is needed to induce the shape memory effect (SME). Thermo-responsive SMP are reacting to heating, including inductive heating, joule heating, mechanical heating and light heating. Photo-responsive SMP are reacting upon light and chemo-responsive SMP are sensitive to different chemicals. However, the SME can be triggered by other stimuli too. One example is Polyurethanes that can change its shape by exposure of heat, water and ethanol. (Kelch and Lendlein, 2002)

6.3.1.4 Future interior trends

An interview with Gunnar Svensson, who is working at architect agency Wingårdhs in Sweden was held to get knowledge about future interior trends.

Keywords for future interior trends from Scandinavia are transparency, simplicity and pure materials. Constructions will be more visible and reveal the materials actually used. Finished surfaces will more and more change to raw materials such as concrete or unfinished wood to create a more human and natural feeling. Contrast is important and could be created with a change in materials and meeting surfaces with different textures and colors. Gunnar Svensson (2012) is convinced that open spaces will continue to be prominent in the modern home and also that hidden technology is getting more and more popular. (Svensson, 2012)

6.3.2 The growing experience

Interviews

Interviews were held with three hobbyist growers in Sweden to get general insights about the positive and negative aspects related to growing. It was found that there are many steps involved in growing, and the first one is planning. First, one has to decide what to grow and buy the seeds for those plants. This is considered being a fun part characterised by curiosity, engagement and expectations. However, the next step is the preparation part which from a majority of the interviewees was regarded as time consuming, dirty and boring.

The curiosity starts to build up and the real excitement begins in the subsequent phase: the observation phase. This is where the grower can see the plants starting to grow. However, good results are not guaranteed due to varying weather conditions, pests and germs which often take away the fun part. Many plants are growing slowly and the excitement fades out of after a while.

The true satisfaction is in the end of the process when the hobbyists growers proudly can use their own, locally produced fresh vegetables, fruits or herbs in cooking. Nothing tastes as good as home produced food and not least the story around can be the explanation to this, the interviewees claim.

Experience graph

An experience graph (see figure 24) was made to visualize the outcome of the interviews and to communicate the project's vision. The graph is divided into the main steps of growing and the y-axis illustrates the level of joyable experience. The first curve in the graph is showing the growing experience today, and the second graph in the rear is showing the project's vision about creating a more joyable growing experience for the user.

6.3.3 Modular growing concepts

The research about innovative growing technologies gave new possibilities; aeroponic and hydroponic technologies became the basis for the growing principle to be able to reach for the growing experience visioned in the experience graph in Figure 24. Following are the developed modular growing concepts.

Figure 24. The experience graph.
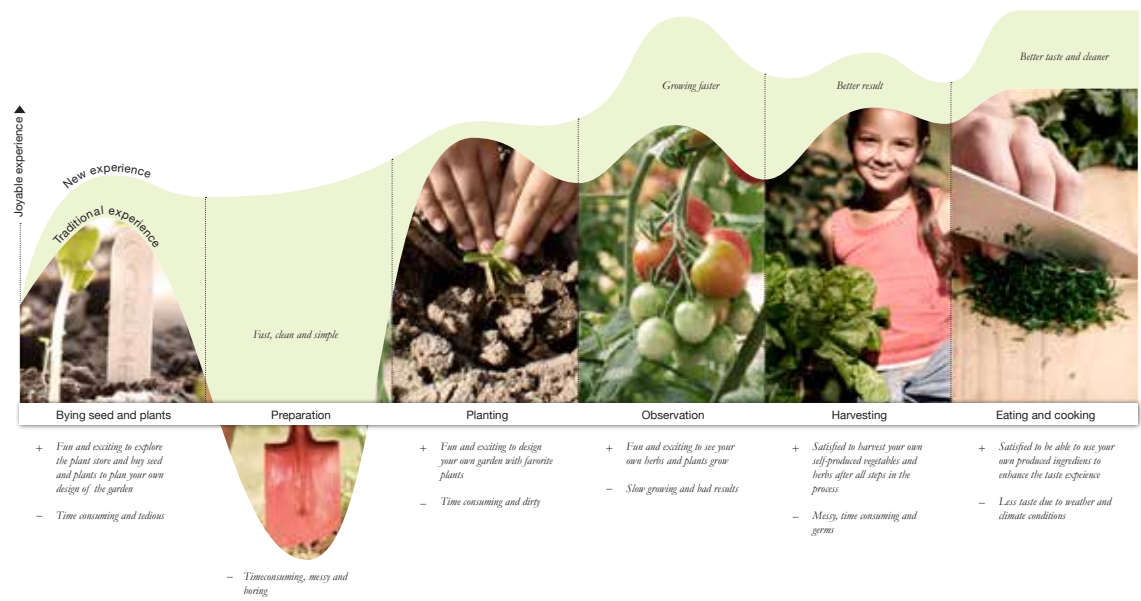
Rubix

This concept (see Figure 25) is a modular hydroponic solution which can be used to create a whole garden system or grow a couple of plants in the kitchen area. The outer part is a frame where different kind of modules fit. The growing module is a water tank that distributes water to the roots of the plants. The module has small holes where the seed pods are put. The seed pods contain plant seeds. With the water absorption material in the pod the seeds are able to absorb water and nutrients needed to grow from the water tank.

The outer frame could fit other storage compartments that could be used to store what the user has grown in the system (or food, wine or other groceries from the supermarket). The outer frame could also be used on its own and work as a normal shelf surface. The cubic shelf modules could be placed on top of each other or side-by-side to make up a whole wall depending on different growing and storing needs.

The Module

This concept (see Figure 26) is also a hydroponic system that has much in common with the Rubix concept. However, this concept is a shelf system containing different top and bottom modules as well as wall modules. The top and the bottom modules can be either hollow or massive depending on different usages. The hollow part works as the water tank in the same way as the Rubix concept with holes for the seed pods. The user will use these modules for growing, and the solid parts can be used as conventional shelves. With a combination of all pieces it is possible to build up a hydroponic system with space for storage as well.

The Mist shelf

The Mist shelf concept (see Figure 27) is using aeroponic technology for growing. It is designed as an innovative book shelf. The shelf modules as well as the rounded parts all have a water pipe running through them. The shelf modules are connected with each other with a water pipe and the system can be designed in many different ways due to the modularity.

The shelf surfaces have spray nozzles distributed along the surface on which the user is able to put a hollow pot without a bottom surface. The seed pods are placed in the pot's top hole and the nozzle sprays the water-nutrient solution into the pots where the seed pods can absorb it which makes the seed start growing.

The system has an end module which has space for a water tank and a pump to pump out the water to the system's nozzles, and eventually into the pots and the seed pods.

6.4 Evaluating and selecting phase 2

A last evaluation session was held and the concepts were weighted against criteria such as Electrolux's corevalues, potential for experience design and future trends.

6.4.1 Concept evaluation

The Mist shelf got by far the highest score in this last Pugh matrix evaluation. This was mostly due to its customizable design which makes it possible to fit many different interior trends as well as being space efficient. The fact that the users are free to design the system depending on the home environment and their different needs also increases the experience aspects of this concept; studies show that people will be more attached to products they have customized and personalized themselves (Mugge et al. 2008). The two other concepts have many similarities but seemed to be less innovative considering the defined criteria.

The Mist shelf was favoured also by Electrolux. The feedback from the discussions, however, was focusing a lot on the storing aspects of the concept. More ideation had to be done to figure out a functional and customizable design for some sort of storage compartment, with the aim to be able to store what the users have grown in the system, as well as other groceries that do not necessarily have to be put in the regular fridge. How should this be done and what kind of technology should be used for this?
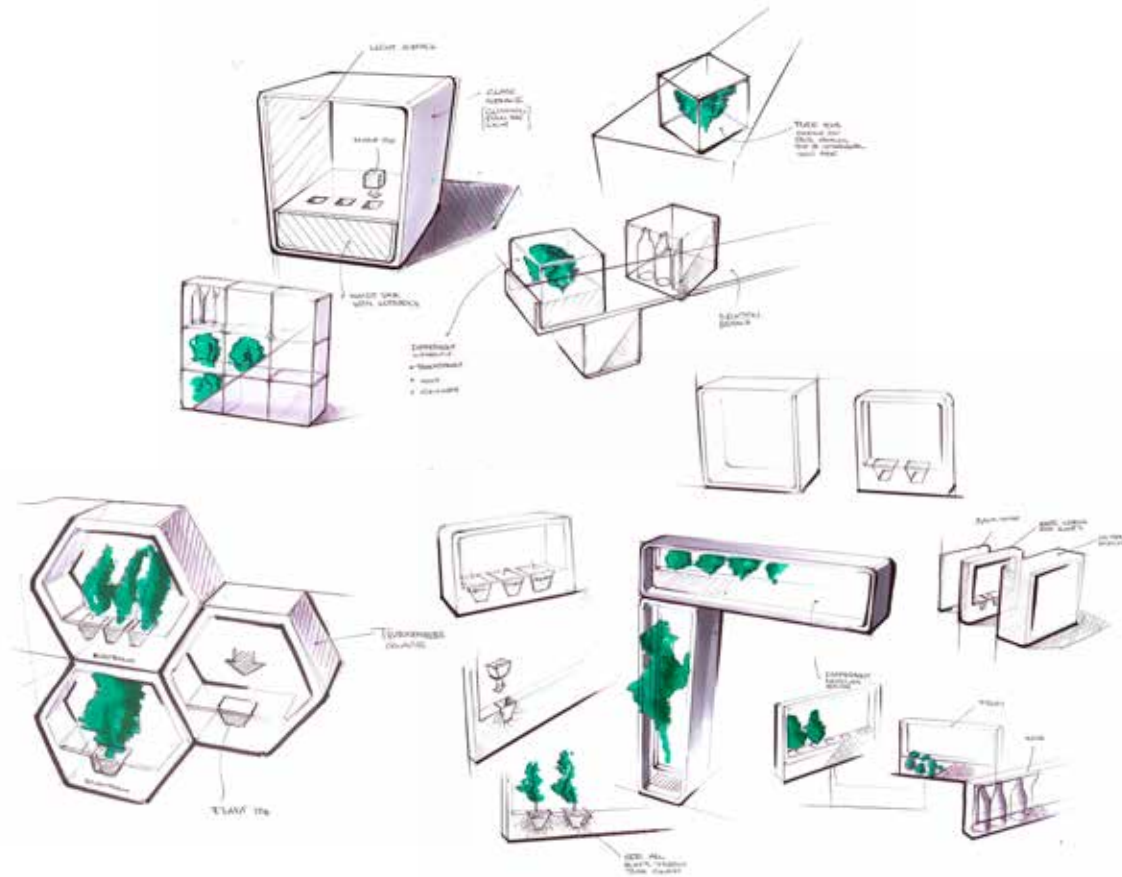
Figure 25. "Rubix"

Figure 26. "The Module"
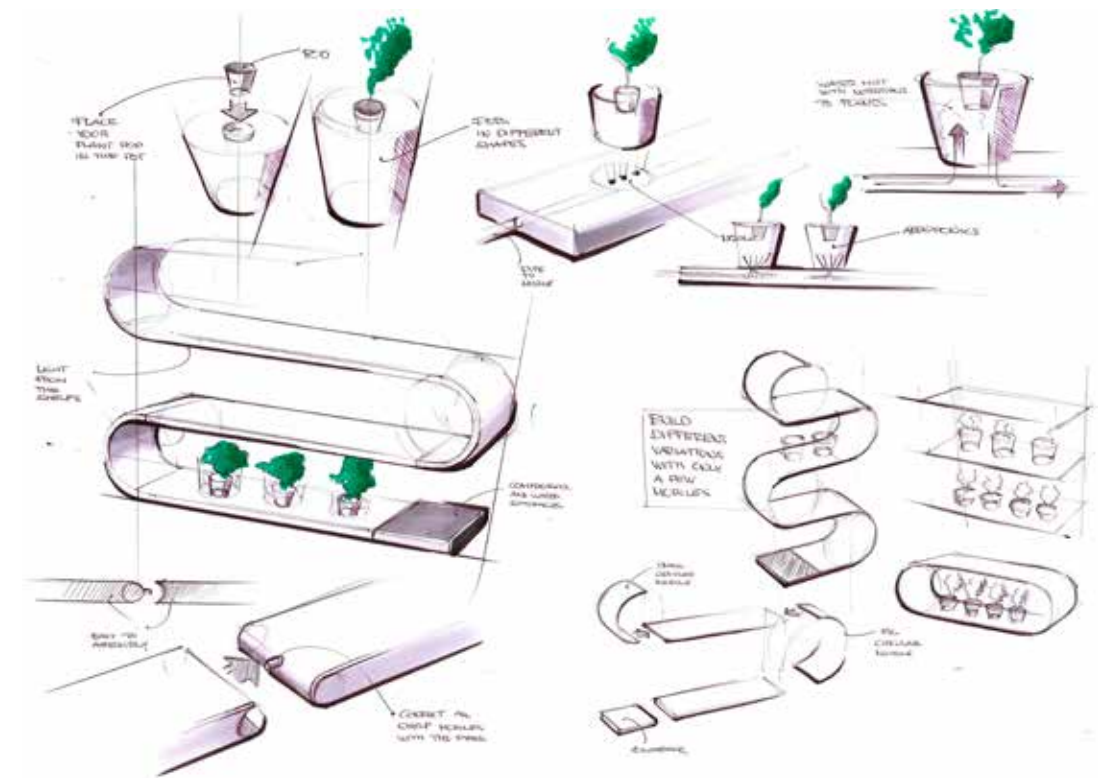
Figure 27. "The Mist Shelf"

6.4.2 Chosen final concept

The Mist shelf was chosen mainly because of its great fit with Electrolux's core values and the potential level of "humanized" innovation. Also, the concept is considered to be very sustainable – it uses pure materials, it is easy to assemble and disassemble, it would potentially result in decreased food waste when you can use only what you need, it educates about and encourages local production of food and finally it is energy efficient. It also incorporates a potential new way of storing foodstuffs that may also contribute to reduced waste of food.

6.4.3.1 Modularity

Thanks to the modularity of the concept, the user spectra is considered very broad – everyone from a single person household to a large family (or even a restaurant) can arrange a system that fits their needs. The modules offer also the possibility of expanding the system.

The user also has the possibility to choose their own style or design. He or she can choose to arrange a simple shelf with no round edges or create a complex shape that cover a whole wall. Either way, the idea is that the user do this online or in-store with CAD software. This software could also calculate the price of the system and the price of running it, and the potential of your production.
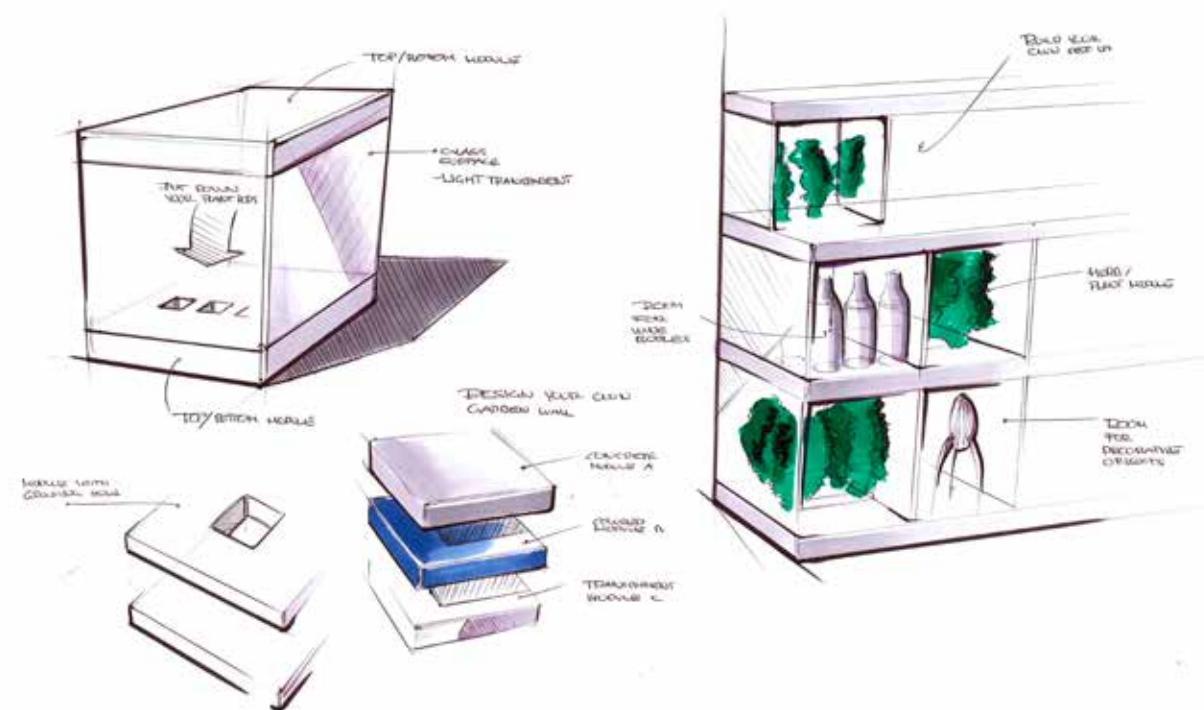
6.4.3.2 The pots

Once the shelf system is installed, the user can put any of the differently designed pots on the shelves. The shelf is pressure sensitive, so it will know where to spray nutrition solution and where not. The user can bring the pot to the table when dining for that extra final touch, and easily put it back on the shelf afterwards (but not necessary on the same spot), or put them out on the balcony or in the window during the summer months, when the UV-light from the LED:s is not needed. The use is of the pots is very much like traditional pots, making the use intuitive.

6.4.3.3 Joint venture opportunities

In addition to the minimalistically designed pot collection, "artistic" collections could be released: e.g. Alvar Aalto vases for the shelf system, Orrefors glass bowls – and so on. In the future the user might be able to design own pots/vases/bowls that fit the shelf system. As long as the top hole has the same design, the pots could be of any shape, which invites creative designs and a variation of materials for the pots. This could therefore enable the user to keep the home styling coherent and according to his/her taste.

6.5 Conclusions

The concept development phase focused on the chosen concept areas and resulted in a developed concept. The work was carried out with help of a variety of design methods.

Design for emotion played an important role in this work, as did design for analogies – the pot is one example that makes the concept evoke memories and thus creating a greater experience for the user.

Modularity as a basis for the development not only makes the concept able to fit many different users, but also invites the user to be part of the design process and thereby increasing the level of experience further. Letting the user being part of the process and personalize their product would lead to users feeling greater attachment to the product. (Mugge et al., 2008)

The selected final concept has great potential for further development. However, before going deeper and deciding on the visual design of the eventual product, the "experience story" needs attention and development.

7. Final concept development

The final concept developmemt phase contained a lot of creative work where several tools and methods were used with the purpose to guide the process in the right direction. The *Modular Shelf* concept needed to be fully developed both regarding its shape and expression, as well as the system's functionality and its components. The aim was to finish this phase with a final concept ready to be visualised with CAD and rendering softwares.

A storyboard was created to define the concept story and what components that were needed to create a successful experience. Inspiration boards were developed to guide the form development. Similar inspiration tools (such as the bandwidths) also gave good insights about which expression the final concept should communicate to fit its contexts and users in the future scenario. Sketches and CAD were used back and forth to communicate and evaluate the design, and to get feedback from Electrolux.

7.1 Creating the story

To be able to create a common vision around the possibilities with an aeroponic concept, a storyboard was created. The story was based on all the insights from the pre-study and was helping the project group to envision the total experience and the complete journey that the concept will offer. It was also used as a communication tool with Electrolux and as a inspiration source in the following development process. The vision was to create a "total growing experience" that considers all the possible steps of growing, and that connects the user to the experience more than just to the isolated product. The concept should become a new way of living and create an engaging activity for all different kinds of households and their family members.

7.2 Developing the product-service system

The aim of the final concept development was to make all the parts of the concept create a unity expressing a design language in line with Electrolux's design values.

The project team started with designing the whole product instead of focusing on single details. This was to create a unified appearance and to avoid visual imbalance and inhomogeneity. The playful and winding but still simplistic shelf shape became the basis for the final design. The form would fit in many different contexts without interrupting and highlighting what is supposed to form the main focal point of the system: the potted own-grown plants. To offer a personal touch and make the product ever fashionable, the pots come in collections of many colors and textures.

INDOOR GARDENING IN SHANGHAI 2020
A STORY ABOUT GROWING HERBS IN URBAN AREAS

IT'S FRIDAY AFTERNOON AND MAI IS SITTING ON THE MRT STATION AFTER A LONG DAY OF SHOPPING IN TOWN. WHILE SHE IS WAITING FOR THE TRAIN SHE CHECKS HER FACEBOOK AND HER GREEN HOUSE APP ON THE PHONE. SHE'S BROWSING THE VIRTUAL PLANT AND SEED SHOP AND STOPS IN THE ITALIAN HERB ASSORTMENT.

IT AWAKES MEMORIES FROM HER AND DAVID'S TRIP TO ITALY LAST SUMMER, SHE RECALLS THE FRESH ROCKET SALADS AND THE TASTY BASIL WHICH ENHANCED THE WHOLE TASTE AND AESTHETIC EXPERIENCE EVERY TIME THEY HAD DINNER ON THE MAGNIFICENT RESTAURANTS. SHE HOPS ON THE TRAIN WITH A SMILE ON HER FACE.

BUY NOW!

"THAT WOULD BE SOMETHING NICE TO HAVE IN OUR APARTMENT HERE IN SHANGHAI", SHE THINKS. SHE THEN DECIDES TO TAP THE BUY BUTTON BEFORE JUMPING OFF THE MRT TRAIN WITH STRONG ENTHUSIASM.

THE NEXT DAY MAI RECEIVES A SMALL PACKAGE AT HOME. SHE INSTANTLY REALIZES WHAT IT IS BECAUSE OF THE DISTINCT VISUAL APPEARANCE. SHE STARTS TO OPEN THE PARCEL AT ONCE AND SHE CAN ALREADY SMELL ALL THE FRESH FLAVORS OF ITALIAN HERBS.

To: Ms Mai

Electrolux Grow Home

WITHOUT ANY MESS OR SOIL, SHE STARTS TO PLANT ALL THE 'HERB PODS' IN THE GREEN HOUSE TOGETHER WITH HER DAUGHTER MOLLY.

WHEN SHE SEES HER DAUGHTERS HAPPY FACE SHE'S REMINDED OF HER OWN CHILDHOOD WITH HER GRANDPARENTS ON THE COUNTRY SIDE OF CHINA WHERE THEY GREW THEIR OWN VEGETABLES AND HERBS. THIS MAKES HER FEEL HAPPY WHEN SHE NOW CAN OFFER THE SAME EXPERIENCE TO HER OWN CHILD EVEN THOUGH THEY LIVE IN A BUSY COSMOPOLITAN CITY.
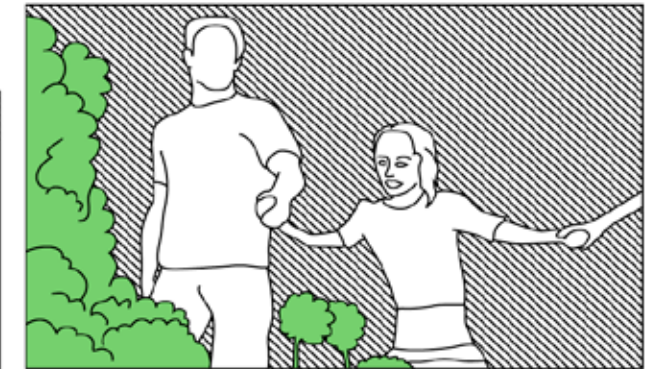
THE EXCITEMENT FOR THE WHOLE FAMILY BEGINS AND THEY CAN NOW FOLLOW THE VEGETATE PROCESS OF THE HERBS THE NEXT FOLLOWING WEEKS. IT BECOMES A COMMON AND ENGAGING CONVERSATION TOPIC AND THE KITCHEN AS THE HEART OF THE HOME BECOMES EVEN MORE INVITING WITH THIS ORGANIC ELEMENT IN THE OTHERWISE VERY MINIMALISTIC KITCHEN.

THE WHOLE FAMILY ENJOYS A GOOD START OF THE DAY WHEN HAVING BREAKFAST IN THE KITCHEN WHICH IS FILLED WITH FLAVORS OF FRESH HERBS AND THE NATURAL LIGHT FROM THE ILLUMINATED PLANTS. IT'S ALMOST LIKE WAKING UP IN TOSCANA SITTING OUTSIDE ON A TERRACE.
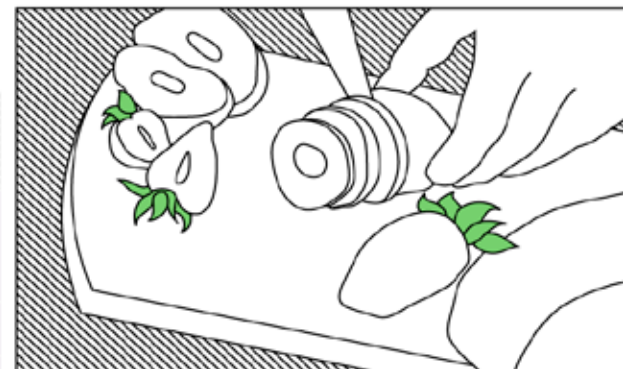
SOME OTHER FRUITS MAI AND MOLLY PLANTED SIX WEEKS AGO ARE NOW READY TO BE HARVESTED, SO THE FOLLOWING MORNINGS OFFER FRESH FRUITS AND JUICES. THE JUICE TASTE SO GOOD - ESPECIALLY WHEN KEEPING IN MIND THEY KNOW THAT IT IS AS FRESH AS IT CAN POSSIBLY BE. THIS EVOKES MEMORIES FROM THEIR YEARLY TRIP TO THE BEACHES OF THAILAND WHERE MOLLY LOVES TO DRINK THE FRESH FRUIT JUICES IN THE MORNING SUN.

AFTER THE EXCITING TIME WHEN THE WHOLE FAMILY HAS BEEN ABLE TO FOLLOW THE VEGETATE PROCESS OF THEIR NEW ITALIAN HERBS, IT'S SOON TIME TO USE THEM IN THEIR COOKING. IN THE SMART PHONE APP THEY HAVE BEEN ABLE TO SHARE PHOTOS AND VIDEOS OVER THE PROCESS ON FACEBOOK AND OTHER SOCIAL MEDIAS, SHOWING THEIR PLANTS' PROGRESS.

facebook
👍 8
💬 3

Good day, Mai!
Your basilica will be ready in a few days – here are some recipes for inspiration on what you can cook with it:
• Caprese
• Pesto Genovese
• Italian Margherita

Have a nice day!
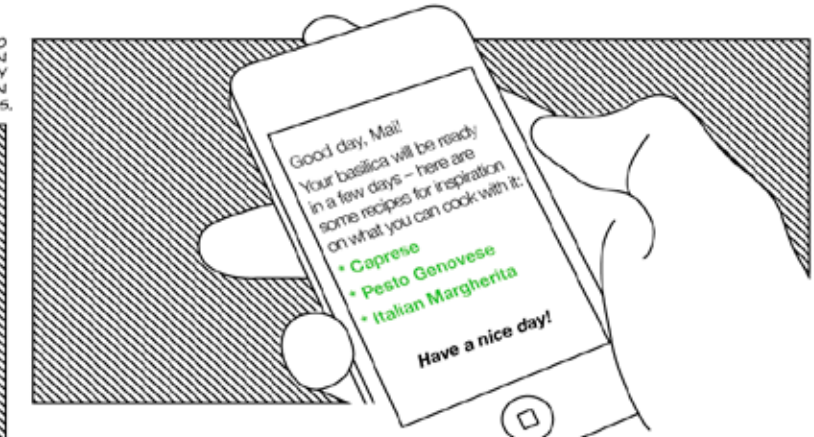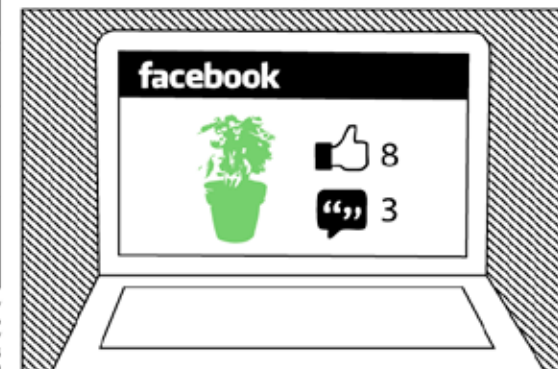
IN THE MIDDLE OF THE WEEK MAI RECEIVES A NOTIFICATION ON THE PHONE SAYING THAT THE ITALIAN HERB ASSORTMENT IS NOW READY TO USE. SHE ALSO GETS INFORMATION AND INSPIRATION ABOUT NEW RECIPES THAT WILL USE THESE FRESH HERBS TO GET THE PERFECT TASTE AND LOOK.

ON SATURDAY IT'S TIME FOR DINNER WITH FRIENDS AT MAI'S AND DAVID'S PLACE. IT WAS A LONG TIME AGO SINCE THE LAST TIME AT THEIR PLACE, SO THE NEW INDOOR GREEN HOUSE BECOMES AN ENGAGING TOPIC OF DISCUSSION. MAI NOW GETS HER MOMENT TO SHINE AND SHOW OFF HER KNOWLEDGE ABOUT ALL DIFFERENT KINDS OF PLANTS AND HERBS THAT SHE GOT FROM THE SMART PHONE APP.

THE CONVERSATION CONTINUES AROUND THE TABLE WHEN MAI GETS A LOT OF APPRECIATIONS FOR THE EXCELLENT AND TASTY DINNER. DAVID RAISES HIS WINEGLASS AND MAKES A JOKE SAYING: "MORE LOCALLY PRODUCED THAN THIS IT WILL NEVER GET!" AND EVERYBODY BREAKS OUT OF LAUGHS.

ELECTROLUX THESIS WORK PROJECT
ANDREAS FOLKESTAD & JONAS KRISTIANSSON
SINGAPORE 2012
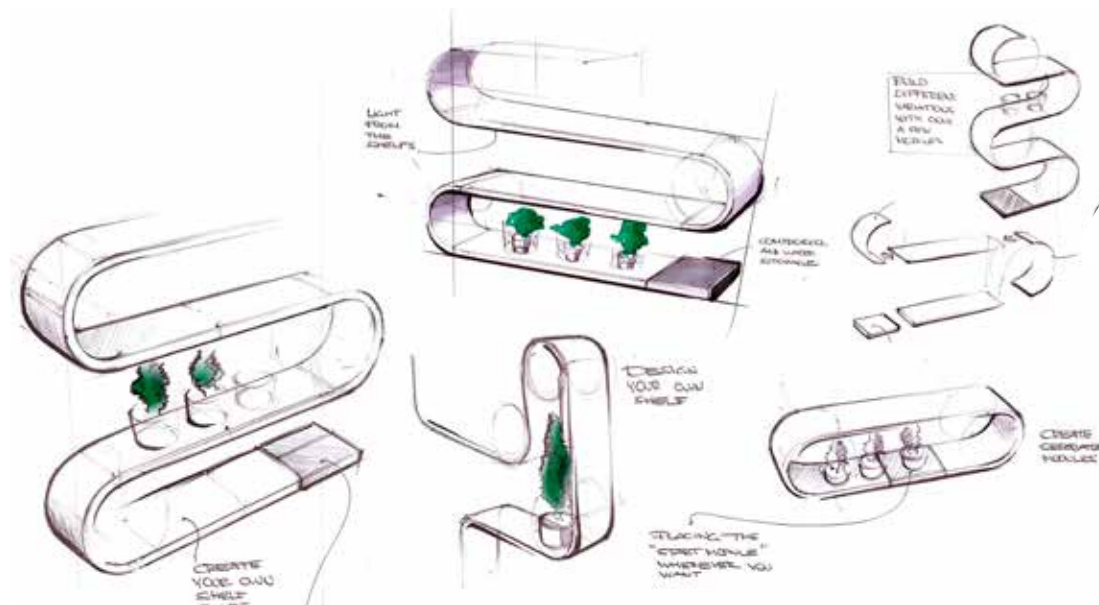
Figure 28. Designing the shape appearance of the modular shelf.

7.2.1 Shelves

Designing the shelves began with adopting the analogy of traditional shelves: planar faces, proportions, shelf thickness, and edge roundings. Thinking in terms of analogy involves the transfer of prior knowledge from a familiar situation (Casakin, 2004). The analogy of a traditional shelf would give the shelves of the final concept a multi-purpose. The shelves will not only facilitating for the growing pots, but for storing other objects of the user's choice as well.

Basing the whole product on different modules allows the users to decide and design the product in the way they would want it. It would make it possible for the product to fit many different personas and many different contexts – large or small, simple or playful. The idea was also based on sustainability aspects: if a user designs the product him/herself, the efficiency of usage would be high and number of unused features low; and modules with few materials would be easy to recycle or even reuse. (Tristiyono, 2011)

To unite the shelves and evoking an organic feeling, round quarters were added as modules to connect shelf levels to each other. By offering two different radii of these quarters, the user will be able to design many different shapes and shelf heights. The shelf and the round quarters were decided to be 200 mm deep: this would fit regularly sized pots and their plants. The relation of the lengths of the shelves and the sizes of the quarters' radii were set due to the Fibonacci spiral, which can be found in the proportions between the different shelf heights. Plenty of experimenting with different module sizes and system assemblies were made to determine suitable module dimensions (see Appendix VII). Realized was that even a few modules have the potential to create a multitude of shelf shapes.

In discussions with other designers, the insight and conclusion regarding future interior design (and design in general) would not be about the futuristic, space-inspired, robotic appearance often seen in future-based movies etc. On the contrary, the presence of raw natural materials was predicted to become even more common in the future. Also, the need and demand for multi-use products would be bigger due to smaller living spaces and increasingly limited resources. It would therefore be potentially promising to develop the project in a product-furniture hybrid direction, which would fit the predicted future context.

7.2.2 Seed pods

The design of the seed pods was founded in the research on the chosen aeroponics growing technology; the seed needs a stabilizing medium to grow in. By taking advantage of the design opportunities, the seed pod could be designed in a way so that its size would be easier to handle than small seeds.

The research on plant growth showed that seeds need high humidity and high temperature during germination. This can be achieved with a transparent plastic cap on top of the seed's growing medium, which would keep humidity and temperature high underneath. However, when the seed has germinated and started to grow, the cap has to be removed. The users could do this manually, but the project team wanted to establish something more astonishing or memorable even on this detail level. By using a shape memory polymer – smp – it would be possible to achieve a change in the shape of the polymer with help of a magnetic field or a change in temperature, humidity or light for example. The design opportunities when this was discovered were many. By using biomimicry when designing this sequence, a flower-like shape was developed. This would mimic a flower bursting into bloom and automatically open up the top to let through the plant in the seed when it starts to grow. Thanks to this automated event, there would be no need to add a user-based action which would have spoiled the story of growing and product convenience.

Inspiration for the idea of seed pods, their beauty in themselves, and the system around them (ordering, delivery, etc.) came from the home coffee maker company Nespresso. Nespresso not only made their system easy and convenient for the user, but also paid attention to details down to the single coffee pod which in itself is nice to look at and touch, and evokes curiosity.

The first versions of the seed pod adopted a pill-like shape that included the growing medium, the seed and transparent top cap. This form was unfortunate since the look gave the concept bit of a "science laboratory" feel. The desired expression was natural and organic, which resulted in a new design, that ended up in a seed pod silhouette that resembling of a natural seed. This would not only fulfill the wish for a natural and organic expression, but also make great symtial-

bolism that would make the planting even easier to understand – the seed is put into the pot, just like when putting seeds in a pot or garden with soil. The engraved Misto logotype on the ring's perimeter also denotes the up-down direction.

The upper chamfer of the ring offers space for an indication of what plant that eventually will grow from the seed pod, much like the small notes usually put along the seeds when growing in soil to remember what was put in and where.

The shell of the bottom half of the seed pod was given holes for the roots to grow out from. First, the idea was a shell that would have to be removed to "activate" the seed prior to planting. The idea was that the shell was made from paper, having a perforation that would break when the user gently twisted the shell. This would however add a step to the planting process that is not present in the story of traditional growing therefore this idea was discarded and instead holes were cut in the bottom shell and enriched the design with its graphic look.

The seed pod shell is made from eco polymer to enable recycling, resulting in minimal environmental impact. The core of the seed pod is made from coco coir which has very good properties for facilitating for plant root growth: it mixes water and air perfectly, and there is almost no risk for pest and funghi.

7.2.3 Pots

To make the users feel comfortable, to understand the function well and to evoke memories from traditional growing, the analogy of pots became an important part of the concept. Besides being a familiar element, this also had other positive effects: mobile pots would increase convenience further since it would be possible to bring the pots with the plants to the stove when cooking, or to the table when dining etc. Pots are far better also for achieving a natural feeling instead of growing right from holes in the shelf for example that may create a laboratory feeling.

The pots are made from one single material without any movable parts which isbe good from a sustainability point of view as they are easy to recycle. Functional needs, such as making the aeroponic principle work, determined that the pot had to be hollow with a hole in the bottom for the mist to enter, and a hole in the top.

First, ideas of different sizes of the pots, modular pots, and multi plant pots came up. For the final result however, a simple design was selected to express clarity and simplicity. The focal point of the design is, and should always be, the actual plants and their produce. The only thing that actually constrains the pot design is the shape of the holes in the bottom and the top. Therefore the pots can potentially be designed in an artistic and expressive manner, perhaps by external pot designers and makers through joint ventures.

By adding the pots to the system, the user is also given the opportunity to customize the appearance and add a more personal touch to the shelf system with the different colors offered in the pot collections.

Figure 29. Hand sketches and early CAD renders of the seed pod.

7.2.4 Water distribution rails

The purpose of the water distribution rails is to deliver atomized water-nutrient mist to the roots of the plant, via the hollow chambers of the pots.

An initial idea was a solution where a rail was placed in a channel of the shelf units. The rails would be flush with the shelf surface to not obstruct the analogy with a traditional shelf. The rails would have multiple holes with valves that would open by magnetic field created by the bottom of the pots when the pots were put on the shelf. By this, the user wouldn't have to put the pots perfectly in place or in any specific designated sites on the shelves, but could put them anywhere and still only the vents under the pot's bottom hole would be activated and spray. Due to the flush surface, the shelves would enable traditional shelf usage since other objects wouldn't activate the water flow from the rails.

However, to be able to recycle any excess water an idea of a raised rail design was then developed. The pots should then be placed on this rail which would act as a ditch collecting any excess water, and then bring it back to the water system. A raised rail would require a cut in the bottom of the pots, matching the shape of the rail. With this idea the shelves wouldn't any longer be flush surfaces and the use of them as normal shelves would be impaired. It was then decided to include plain shelf modules to the system to offer normal shelf surfaces as well as shelf surfaces for growing. The assumption behind this was that users would probably not buy shelves with a growing functionality and thereafter not use them as designated, i.e. as growing areas. The plain shelves would, like all the other shelf modules, include the water tubing and electrical wiring.

Figure 30. Renders used for sketching and testing different optical properties of glass pots.

Further research on aeroponics revealed that the spray nozzle and its performance is a crucial component of the principle. It would be hard to include these all along the rail in a way so that the pot wouldn't have to be put in a specific position. Therefore, finally it was decided to lock the pots in place also sideways. Added were then bumps that would have the same shape as the bottom of the pots for perfect fit. This would not only featherbed the development of the excess water recycling function further, it would also result in better usability and perfect feedback when the pots were put in place. Finally, the pots would with this solution not have to have any cuts in the sides of the bottom rim and a classical pot shape would remain. The last step was to design the bumps of the water distribution rail. Initially the design language from the seed pods with their chamfered ring was applied but this made the bumps look very technical and too distinct. A more organic and sweeping bump shape was then designed to express softness and naturalness (nature = soft, sweeping shapes). In their unused state, the bumps would appear soft and not interrupt the appearance of the shelf system, but instead evoke curiosity. With these bumps, the shelves can in fact act also more or less as normal shelves, which was the advantage of the initial idea.

7.2.5 Growing light rails

As a result of the modular shelf system, the upper surface of one shelf module can act as the underside over another shelf module, and vice versa. The channels of the water distribution and the growing light rails would then preferably have the same connecting design, to make the modular shelves and their manufacturing efficient and reducing the number of parts having to be manufactured.

Growing lights that were "invisible" when not operating were desired and therefore the design of these were made so that they would fit flush into the channels of the shelves. Hereby, the appearance would be anonymous and "invisible" when turned off, and yet only very subtle when turned on.

A natural feeling was desired, and therefore a white sunlight-like light color was chosen. White light includes all the required wavelengths for growing and could furthermore be implemented into the system not necessary only as growing lights but also as decorative lighting for paintings or other objects in or around the shelves. It was found that light emitting diode (LED) panels would suit well: they are space-efficient, energy-efficient, and emit harmless light with a uniform and homogenous distribution without spots of bright light.

Figure 31. Sketches and renders of the water distributions rails and the pot's fit to them.

7.2.6 Central control unit

To enable the aeroponic system to function, a pump and compressor connected to a water tank is needed pushing water through the system. Also, for the growing light rails and the storage compartments supply of low voltage direct current power is required. These two central functions were put into what became the central control unit.

To enable uniform and closed shapes of the shelf system, the central control unit had to be the size of any of the shelf modules, otherwise the system would end up inbalanced and impossible to create "closed" designs. Estimations of water tank volumes showed that a central control unit of the smallest (300 mm) shelf module would be sufficient. A tank of approximately 1 liter would be possible with this module size and the volume would last for approximately one week's watering of a normal sized system (6-9 pots).

The next challenge would be to design the appearance of the central control unit, and the first question was then if the design should stand out from the rest of the system or not? Initial ideas were to illustrate the water flow. Added were transparent areas where the water flow inside the central control unit would be visible, and decorative illumination would emphasize the pulsating flow when the unit operated. The project team finally decided to base the central control unit's level of predominance on how much and how frequent the user would interact with this part of the system. The interaction with the central unit is when the user sets the growing and decorative light settings, and refills the water tank. This is no more than a couple of times a week, and therefore the design guideline became keeping it simple, but stand out in a way so that the part expresses functionality.

The size based on the smallest shelf module made the central control unit melt into the whole appearance well, but with a contrasting colour to express that this is an active part compared to the rest which are passive shelf modules. Black parts became active parts where interaction occurs, and white parts the passive ones.

Swiping the hand along the rounding will open up the central control unit with proximity sensors, enabling refill of the water and nutrient tank. The round appearance has the same design language as the rounded bumps of the water distribution rails, and visually ties these areas together.

An illustration of system activity was wanted. A decorative, pulsing light was added that distributes soft light on the sides of the central unit when the system sprays the pots. This light was designed so it could be turned on or off via the touch panel on the central control unit. Aligned with this decorative light are lights lighting up the glass pots through the docking bumps of the water distribution rails, which will light up the pots when the spraying occurs. This light effect is also selectable and can be turned on or off for a exhibitionistic and a anonymous appearance respectively.

Initially, the idea was to enable aeroponic spray nozzles through bumps also on the top of the central control unit, this was intended to make especially smaller systems area efficient. However, the project team wanted to give the central control unit pondus and not let it go together visually too much with the rest, so this area was left plain. Also, technical constraints would make it hard to squeeze the spray functionality into this part. The surface instead became a perfect location for the Electrolux logotype, which is subtely engraved underneath.
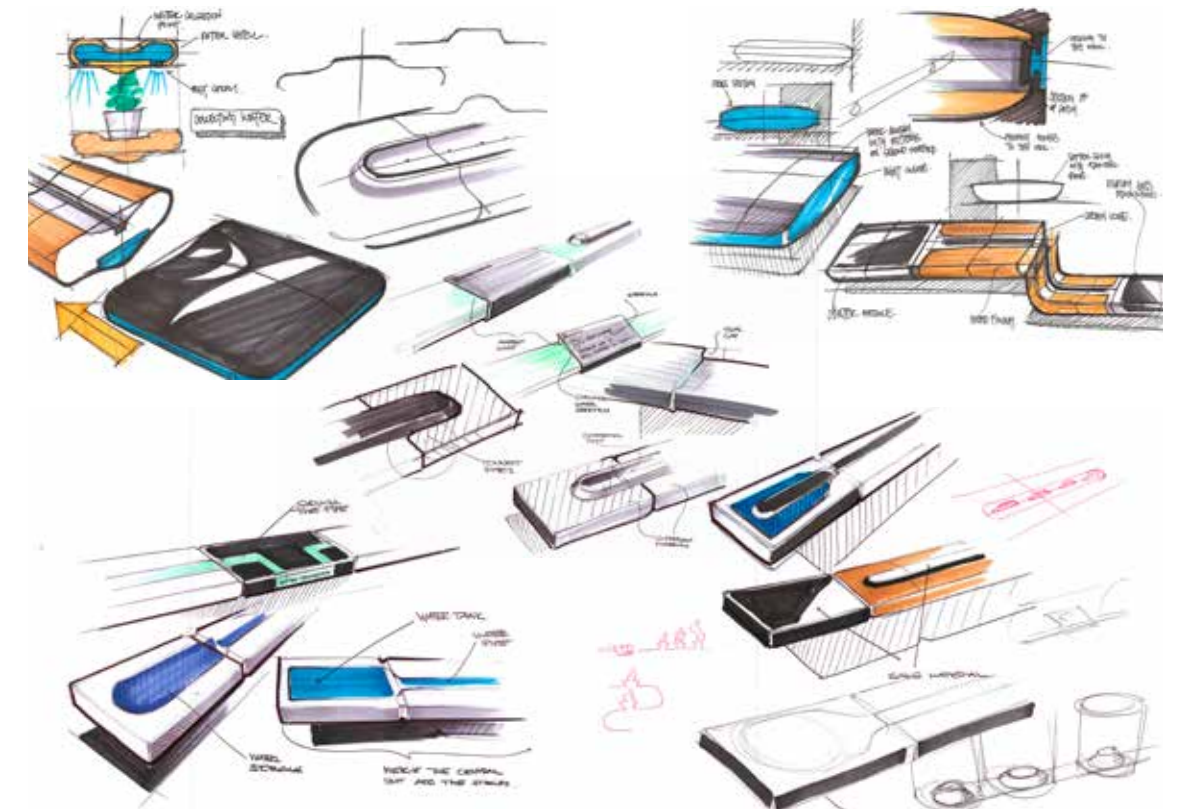
Figure 32. Sketches of the central control unit.

7.2.7 Storage compartments

The aim of the design of the storage compartments was to make them as natural parts of the sweeping, rolling design of the shelf systems. The measurements were given of the height and diameter of the large round quarter radius (=400 mm; the small one, 250 mm, would result in insufficient storage volumes). The depth of the storage compartments was set to 200 mm, so that all parts of the shelf system would stick out the same distance from the wall.

Transparent glass for the surface facing outwards was decided, since the transparency was concidered to provide great overview of the contents as well as expresses cleanliness. The black rim of the storage compartments indicates – as with the other parts which includes user interaction – that this it is an active part, contrasting to the other "passive", white parts.

The storage compartments come in two sizes: one cylindrical design, and one oblong with one half-circle shaped end fitting the rounded quarters' inside diameter. Especially the first one is intended as a contrast to traditional storage solutions such as refrigerators, which normally are box-shaped. Instead, this cylindrical design resembles of a fruit bowl. The idea and advantage of the round ends are that it uses the available space very well, since the shelves include the roundings. The big compartment is designed to make a unified, large setup when used in pairs.

The next question was how the compartments would be mounted into the shelf system. The solution was to connect these to the shelf channels similar to the mounting of the water distribution and growing light rails. The channels would then also provide the storage compartments with the required power.

To regulate temperature, low voltage peltier elements are used. They have sufficient cooling properties for this need, and they are very space efficient and would fit neatly in the back of the

Figure 33. Sketches and early renders of the storage compartments.

storage compartments. Humidity is regulated by silica gel, which absorbs excessive humidity. The compound silica gel will have to be replaced, but estimations show this would only have to be done a couple of times a year during normal use. The silica gel surface is mounted in the back of the compartment.

Ethylene gas which contributes the most to overripening is absorbed by sodium permanganate through oxidation. This compound is mounted as a filter on the back wall of the storage compartments, and during normal use they will only have to be replaced twice a year.

Next up was to design how to open the storage compartments. Glass surfaces easily get messy with fingerprints. Thus, wanted is to avoid direct contact. Also, one can imagine someone having their hands full of fruits or vegetables which he/she wants to put into the compartment. Therefore, proximity sensors along the whole glass surface are incorporated to enable "touch-less" opening. The first thought was to let the glass "doors" swing open. After discussions with Electrolux this expresses fragility and would be hard to implement in the same way for the small and big compartments, which then would give a non-uniform expression. Decided was instead to go for the analogy of traditional drawers which translate straight out when they open. Everyone is familiar with this operating and it is much easier to design a robust design using this principle.

7.2.8 Smartphone application and Misto user community

To be able to create a stronger experience for the customers, a service was developed around the concept. The purpose of the smartphone application and the Misto user community connected to it is to provide the user with services tying together the Misto system. The application will provide the possibility to order seed pods and pots, get cooking help and inspiration as well as getting access to service and maintenance instructions in an accessible and simple manner. The user community will also connect Misto users to each other, by using a wiki-based information exchange where tips and tricks will be collected and could be shared among the users. The user community would also enable the possibility to invite Misto users to public events, such as Electrolux hosted farmer's markets where users can trade their Misto produce in real life.

By adapting the content of the community to the specific user's Misto system, the navigation and relevance of the content will be optimal for each user. This would, for example, enable the application to give the user advice and recommendations based on the user's setup of current seed pods: How long time until harvest? How to best use the produce? Which plants should be put together and which should be separated etc? The application could also help the user monitoring their system's performance and efficiency: How much money have they saved on growing with Misto instead of buying at the supermarket and how much water has been saved, as a few examples.

7.3 Conclusions

After extensive iterations the final shape and functionality was decided upon. The design work was mainly focusing on the outer shape and parts of the concept that are important for the true product experience. Manufacturing details and cost efficiency didn't receive focus due to the project's conceptual scope, and limited recourses. A lot of work was on the other hand put on visual details that would increase the users experience and the level of innovation. The challenge was now to visualise the final result in a way that could communicate and express the level of detail and surprising element in an aesthetically appealing way.

8. Final results

This chapter present the final results in a visual way mainly using CAD renderings. The aim was to communicate Misto in its context to express the actual story and experience tied to the concept. Due to the projects visionary and conceptual nature, mainly pictorial material on the interaction, aesthetics and experience are chosen to present. The chapter is a step by step story to see the true potential with Misto and how it addresses the future scenarios and trends.

8.1 What is Misto?

Misto is a modular shelf system that facilitates growing and storing herbs, fruits and vegetables in the home environment. Thanks to the modularity and the user's possibility customize the design, Misto fits many different users' requirements, needs and personalities. The user's engagement in designing the system with the different modules gives a feeling of accomplishment (Norman, 2005), as well as enabling the user to expand their system after time (Tristiyono, 2011). At the same time, the number of available modules is quite few – too many would result in a too complex customization offering possibly making the "design-your-own" event annoying or even prevent the user to engage in it at all (Norman, 2005).

Figure 34. An overview of a Misto shelf.

The growing of plants is made possible with aeroponic technology, which gives fast, good and pest-free results. Aeroponics basically means that a water-nutrient solution is sprayed into an atomized mist, which then will be absorbed by the plant's roots which grow in air. By providing supporting growing light to the growing areas, plant growth is ensured all year round – day and night – independent of climate or season outside.

The optional storage compartments control all the three contributing factors to fruits and vegetables' ripening processes, and thereby prolong the lifetime of these, thus, reduce the waste of spoilt groceries. The contributing factors controlled by the storage compartments are temperature, humidity and ethylene gas.

Misto survives the passage of time, stays functional and usable, and gives joy over time. This by making an emotional promise when the system is initially designed, fulfilling the promise when enabling growing and storing the produce, and finally ending the experience in a memorable way: enabling the growing cycle to repeat over and over again, in a variety of ways, just like in nature (Norman, 2005).

Misto inspires a conscious living that results in a better world. The positive emotions that Misto has potential to evoke are of critical importance to learning and to maintain the user's curiosity about the world and how things work together. The positive emotions make living worthwhile and make users strive to do better. (Norman, 2005)

8.2 System modules

The Misto system consists of several different parts: shelf modules, water distribution rails, growing light rails, central control unit, storage compartments, pots, seed pods, smartphone application and website.

8.2.1 Shelves and quarters

The shelves are designed using the analogy of normal shelves: dimensions, roundings and interaction is the same as with traditional shelves. The shelves come both with plain surfaces for normal shelf usage, and with a cut channel in the middle. This channel is fitting the water distribution rails and the growing light rails for the shelf areas where the user wants to enable plant growing.

The shelves are made from the solid surface material Corian® created by DuPont which comes in many different colors and textures – opaque, semi-transparent, glossy, matte etc. Thanks to the material's properties, there are practically no limitations in terms of manufacturing any shapes. For the final concept, Corian® Glacier Ice is used. This has an elegant translucency with pale and pure white color expressing cleanness and minimalism.

The shelf modules come in three different lengths: 300, 600 and 900 mm long. They are all 200 mm deep and has a thickness of 25 mm. The edges has a 2 mm radius rounding, which is a common standard for normal shelves.

The quarter modules are – like the flat shelf modules – made from Corian® Glacier Ice and come

in two different radii: 125 and 200 mm. This gives the user the ability to create many different shapes and shelf heights of the system.

The shelves and quarters connect easily to each other with a principle similar to a USB connector's male-female principle. When connected, water and electricity will be distributed through the pipes and wirings inside the modules.

8.2.2 Water distribution rails

The water distributions rails distribute water from the pipes inside the shelves, with cut channels, to the pots. The rails fit smoothly into the channel of the shelves and are made from glossy transparent acrylic with glossy black paint on the inside. When the water distribution rails are installed, their surface is flush with the shelf surface to create a smooth and organic feeling and appearance.

The bumps on the water distribution rails are the docking areas for the pots. Once a pot is put on top of a bump, the middle part of the bump will be pushed down and the spray nozzle will then activate. The water from the pipes in the shelves can then flow to the nozzles and spray into the pots. The spray nozzles atomize the water into tiny droplets.

Any excess water that may not be absorbed by the roots of the plant will be recycled. This thanks to the excess water's ability to pour down back into the water system via the perimeter of the down-pushed part of the bumps.

The water distribution rails come in three lengths fitting the channels of the three different shelf lengths; the rails have 2, 4, and 6 pot docking areas respectively.
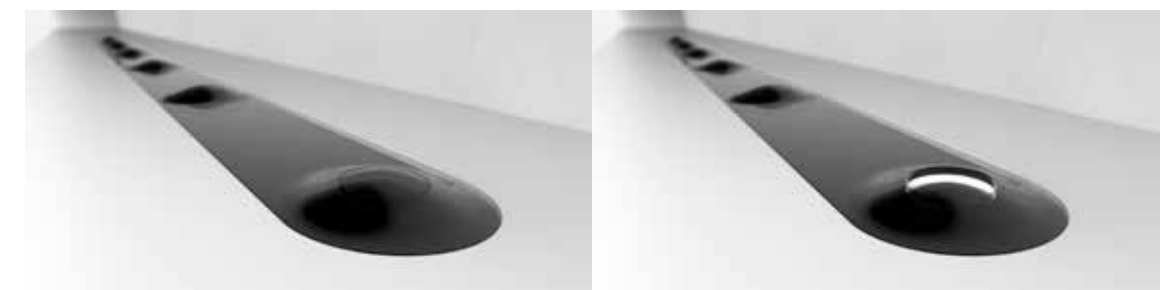
Figure 35. The water distribution rail – activated to the right.

8.2.3 Growing light rails

The growing light rails provide supporting growing light to the plants. The light is created by LED (light emitting diode) panels which give a uniform white light containing all necessary wavelengths for full photosynthesis for any plants. For photosynthesis to work, normally only light from the red-orange and the blue interval of the light spectra is needed. However, white

light was chosen to establish a natural look (white light is more similar to sunlight). White light contains – by definition – all the visible wavelengths of the light spectrum.

The growing light rails can be turned on, off or put in "auto mode". "Auto mode" means that the lights will automatically turn on when surrounding light (i.e. sunlight) isn't sufficient for optimal plant growth. This is controlled by a light sensor that is located inside the central control unit. Thanks to the LED technology, only low voltage direct current is required, and the light is very energy efficient.

The growing light rails come in three lengths fitting the channels of the three different shelf lengths. When installed, the surface is flush with the shelf surface for a sleek and anonymous look.

Figure 36. A glimpse of the growing light rail.

8.2.4 Central control unit

The central control unit is "the brain" of the Misto system. It distributes high-pressure water to the spray nozzles in the water distribution rails via the pipes in the shelves. The pressure is generated by a compressor inside the central control unit, which also contains a one-litre water tank where premixed water-nutrient solution is poured inside. For larger Misto systems, the water tank may be extended by attaching a specially assigned shelf module which contains additional tank volume that connects to the central control unit with water pipes.

The central control unit also distributes low voltage direct current (12 VDC) to the growing light rails and the storage compartments. It has a surrounding light sensor which controls the state of the growing lights when they are put in "auto mode".

The central control unit is made of glossy black painted steel with a glass cover. The Electrolux logotype on the top is engraved from the inside of the glass.

The user interacts with Misto with help of the control unit: the user will be notified on the LED-panel (and optionally also via the smartphone application) when the water tank has to be filled

and whether the level of nutrients in the water is good or should be regulated. The touch control panel of the central control unit also enables the user to set the growing light setting to on, off or auto, and to turn on or off the decorative lights.

To open up the central control unit, the user swipes the hand in front of the panel from left to right. This is possible thanks to the proximity sensors located inside the panel, which also increases the panel's brightness when the user is standing in front of it. This to achieve a human expression with the sense of presence.

Figure 37. The central control unit.

8.2.5 Storage compartments

The storage compartments come in two different shapes: a cylindrical (diameter 400 mm) shape, and a larger, extracted shape. Either shape, they work in the same way: temperature is regulated by two-way thermostat controlled peltier elements; humidity is regulated by silica gel; and a sodium permanganate filter absorbs ethylene gas emitted by the fruits and vegetables. This makes the storage compartments unique and complement traditional storage solutions such as refrigerators.

The storage compartments are made of two-walled, clear glass. Between the glass walls is vacuum for optimal insulation.

Holding the hand in front of the proximity sensors located around the whole area facing outwards opens up the storage compartments smoothly. In the same way, the proximity sensors are used to close the compartments. Thanks to this, opening and closing the storage compartments is possible even when the user has their hands engaged by other things such as carrying fruits or vegetables.

Figure 38. The storage compartment.

8.2.6 Pots

The pot's function is to provide an enclosed space for the aeroponic mist to spray into and then reach the roots of the seed pod which is suspended from the top of the pot. Thanks to the pot's mobility, organizing the growing areas is easy, and it enables the user to bring the pots to the stove when cooking, to bring the pots to the table when dining etc.

As long as the pots have the bottom shape that connects and activates the spray nozzles on the water distribution rail's bumps, and has a top hole fitting the seed pods, the shape could be varied greatly and therefore opens up for great creativity. The ability to modify the system after time by buying new pots, or even, design them yoursel would make the feeling of personalizing Misto even greater (Norman, 2005).

Thanks to the pots' great variation of appearance, the Misto shelf can stay in fashion year after year, by changing the pots to the most recent and fashionable ones (Norman, 2005). This founds a great business opportunity for Electrolux – creating revenues not only at the initial ordering phase but also during the whole lifetime of Misto.

The collection of pots in this case is made of molded solid glass with a simple cylindrical shape with slight chamfers around the top and the bottom edges. The contact surface on the bottom of the pot is rubber coated to avoid any fragile glass-to-glass feeling when putting the pots in place on the bumps of the water distribution rails or on any other surfaces.

Glass has a history of being the material of great craft-based industries (Ashby and Johnson, 2002), where Scandinavia still plays a major role internationally. By using pots made out of solid glass Misto is expressing the Scandinavian design heritage that goes well in hand with Electrolux' design values.

To attract different cultural perceptions of aesthetics, the minimalistic shelf system can express anything between throughout simplicity with the simpler pots, to a more spiced-up, colorful expression with other more decorative and artistic pots. This will bridge the gap between different cultural tastes, which often tends to be rather minimalistic in the western world, and more vivid and colorful in Asian cultures.

Figure 39. Variations of simple, cylindric pots.

8.2.7 Seed pods

The seed pods (see Figure 40) contain the natural seed from which the plant eventually grows from. The seed is located inside a coco coir core, which in turn is encapsulated inside a shell made of blow molded eco polymer. This shell has holes to enable the roots from the seed to grow out in the space of the hollow pots where they are exposed of the water-nutrient mist.

The seed pods have a transparent plastic cap on top which helps the seed to root in the initial stage. The cap is made from shape memory polymer activated by humidity and light that makes it possible for it to automatically unfold in a flower-like way and let the plant to grow through when the germination has finished and the support isn't longer needed for further plant growth.

Figure 40. The seed pod.

8.2.8 Smartphone application

Via the smartphone application the user can order individual seed pods or seed pod kits to their Misto system. The seed pods come in kits such as "Asian flavours" (containing red chili, thai basil, kaffir lime and coriander) and "Italian Delights" (containing basil, rosemary, thyme and rocket salad). The seed kits can also be designed by the user from a vast collection of seed for herbs, fruits, berries, vegetables and even flowers. When ordered, the seed pods will be sent directly to the user's home via mail.

The smartphone application also provides tips and tricks on the usage of Misto, inspiration on what and how to cook your produce, how to store any excess, and the ability to share your results in social media.

Notifications about refilling water and nutrients, and setting the growing and decorative lights are also sent through the smartphone application, if wanted by the user.

8.2.9 Website

The website is the touch point where the user easily and intuitively designs and orders the unique Misto system. There are many presets of Misto systems for the user to choose from designed by Electrolux and other users, in case the user doesn't want to create a personal design.

By simply dragging and dropping the modules on the screen, the user will assemble a system

which can be saved for resuming the designing later or share with friends, or the design can be ordered right away. The shopping experience is convenient and prestigeless.

The Misto community and information centre with the same functionality as in the smartphone application is also available through the website. The community connects Misto users together and invites them to farmer's markets where they can connect, share ideas and experiences, and trade their Misto produce with each other.

8.3 The Misto experience

Misto is not only a product consisting of a set of modules. The following section describes the total Misto experience.

Figure 41. The Misto app.

8.3.1 Designing Misto

The experience starts with the design phase where the user designs their Misto system in a way that fits the user's requirements, needs, passions and tastes (see figure 43).

On the website, the user easily drags and drops the different parts to assemble their own Misto system. It is also possible to import photos of the home interior to see the design simulated in the user's environment.The user can also via the website select the pots from a wide collection. When the user is happy with the design, the Misto system is ordered and delivered to the home where it will be installed by a Misto-certified crew. Now, when the user logs onto the smartphone or website application, the information of the user's system setup will be preset and the content adapted to this.

Figure 42. The Misto website.

8.3.2 Ordering seed pods

Meanwhile designing the Misto system on the website, the user can start planning what to grow in the shelves. The user can pick and choose from a vast array of herbs, fruits, vegetables, berries and flowers and simulate what the plants will look like when they have grown. The chosen seed pods will then be delivered together with the Misto shelf system (see figure 44).

Figure 43. Designing Misto online.

Figure 44. Ordering and receiving seed pods.

The user can also – via the smartphone application or the website – order preset kits with seed pods. These are for example "Asian Flavours" and "Italian Delights". Conveniently, the user can order new seed pods via the smartphone application, when old ones need replacement.

Since the application "knows" about the user's system, it has the ability to recommend plants that will work well together, and give tips on plants that will complement what the user may already have grown.

Figure 45. Sequence of the planting phase of Misto.

8.3.3 Planting

When the Misto system is installed and the user has the pots and seed pods, the planting phase can begin (see figure 45). The planting activity is very easy and clean; the seed pod is simply put into the pot's top hole which has the same shape as the rim of the seed pod. After this, the pot with the seed pod is simply put on top of any of the bumps on the water distribution rails, which neatly activates the spray nozzles with distinct tactile feedback. Thanks to the shape of the bumps and the bottom of the pots it is impossible to put the pots wrongly in place, without it being obvious.

8.3.4 Growing

Now when the pots are put in place on the water distribution rails, the seed can start to germinate and grow (see figure 46). The aeroponic system will spray the water-nutrient solution mist into the pots and the seed pods and reach its seed and its roots. The spraying occurs every 20 minutes for 5 seconds. This for optimal aeroponic effect (that is optimal absorption of the water-nutrient solution to the roots). Any excess water is recycled by letting it pour down the inside of the walls of the pot and back into the system via the top of the bump that is pushed down.

Thanks to the aeroponics technology the growing process will be up to five times as fast as with traditional growing. Therefore, a basil seed for example will grow into a plant ready to be harvested and used within a couple of weeks which then increase the fun part of growing.

8.3.5 Harvesting and using the produce

When the plants have grown and produced the desired herbs, fruits or vegetables the harvesting can commence. Either, the user can pick the desired amount right from the pots standing in the shelves (see figure 47), or the user can bring the pots to the stove when cooking or to the table when dining for superior convenience and experience.

8.3.6 Storing

Some produce might be perfectly ripened but the user may not want to use it right away. Then the produce can be harvested and put into the intelligent storage compartments which will keep the produce fresh (see figure 48). This thanks to its ability to control all three contributing factors to the ripening process: temperature, humidity and ethylene gas.

Naturally, the storage compartments can also be used also for fresh fruits and vegetables acquired at the grocery store or the farmer's market etc.

The filters with the active compounds controlling humidity and ethylene gas (silica gel and sodium permanganate respectively) only need to be replaced approximately twice a year.

Figure 46. Plant growing.

8.3.7 Controlling the central control unit

The user needs to interact with the central control unit when adding water and making light settings. Sliding the outer shell to the side opens up the central control unit and expose the area for adding water and nutritions to the system (see figure 49). The shape let the user poor the water nutrition solution directly on the tilting surface which makes the solution poor down in the angular hole of the water tank. This minimise the risk for splash and creates an water fall like experience. The light indicator on the front side of the opened central control unit gives a flashing light message to give feedback to the user when to stop adding water nutrition solution. The interaction with the interface is done in closed mode. Start interact just by touching the

Figure 47. Harvesting from pots in the shelf.

Figure 48. Easy and intuitive storage.

Figure 49. Effortless and sleek interaction with the central control unit.

Misto logo in the middle which makes the information to the right appear. Scroll between the different light modes depending on different needs. The clean and simple interface creates high usability and a good total experience when controling Misto becomes easy and user-friendly.

8.4 Contexts of the Misto experience

Dining in the living room

Invite friends to an impressive dining event at home in a vibrant environment with a backdrop of your own fresh herbs, fruits and vegetables. Let your guests garnish their dishes with your fresh Misto produce from the stylish pots which can be moved from the shelves right to the dining table.

Connecting living areas

Smaller homes demand space efficient and multi usable products. This Misto system connects your kitchen area to the living room in a smart way. With proximity to fresh herbs when cooking in one end, and aeroponic-managed, beautiful orchids and a sleek fruit bowl as the smart storage compartment in the other, this Misto setup shows some of the many possibilities and opportunities the Misto solution.

Bartender at home

The key to perfect mohjitos is fresh mint. Show friends your skills as a bartender and provide them with some of the most memorable cocktails they will ever have, in an environment designed by yourself with your own produce.

Vertical garden with kids' corner

Large households not only save money by providing themselves with fresh herbs, fruits and vegetables with a Misto solution like this one – it will creative a decorative element and engage the whole family in the growing activities as well. Kids will learn about how plants grow, and they will be able to eat their own-produced, healthy strawberries right from the plants in the shelves. This setup also shows a pair of large storage compartments making up a capacious storage solution with proximity to the home's cooking area.

8.5 Misto fitting different users

Due to the modularity Misto fits all possible user needs as well as all kind of households. Misto even fits in the very limited living solution.

Dine with style and elegance.
At home.

misto
express your taste

Connect living areas.
Re-explore your home.

mISTO

express your taste

Mix amazing mohjitos.
Amazingly fresh mohjitos.

misto
express **your** taste

Engage your whole family.
Conveniently and stylish.

misto
express your taste

Misto can as an example be designed to be placed on top of a kitchen bench. This is a perfect solution for single households wanting just some fresh herbs and vegetables for special occasions.

Misto is pleasing a big variety of desires. It can really be customised to serve a specific purpose or be used for multi purpose with different functionality. One example is the bartender shelf used to create an ambient bar experience in the home with room for everything that is needed to create a luxury cocktail night. Grow herbs like Mint for your drinks, store and display liqueur bottles and keep the fruit fresh in the storing compartment.

Due to the high personalisation possibilities it's easy to fit Misto into all different parts of the home. Misto is not only a kitchen solution and can actually be placed anywhere. Placing Misto in the kitchen gives the closeness to cooking and in the living room Misto can be used more as an decorative element to increase the dining experience with herb scents and ambient light effects as examples.

8.6 Misto – the logotype and slogan

The letters in the Misto logotype (see figure 52) originates from the typeface Helvetica Neue Black, which is also used in the Electrolux graphic profile. However, it was modified through several loops to communicate roundness and resemble of the shelf modules of the Misto system that connect to each other. Small letters were used to express friendliness and humanity, and black and white was used to align the logotype with the Misto modules' colors.

The tagline "Express your taste" bottoms in two meanings. First, express your taste in terms of interior design and the product's appearance in your home. Second, express what herbs, fruits and vegetables you are passionate about by growing and enjoying them at home in an exhibitionistic manner. Experience design is a lot about product personality, customizability and telling stories – it is about expressing oneself.

Figure 50. Different variations and placements of Misto.

misto

express **your**taste

9. Evaluation

In this chapter the final concept is evaluated against the most important criteria for this project. The chapter is divided into subchapters for each important criteria starting with Electrolux's design values to later end with the product experience of Misto. The project group will here argue around how well or not the final concept fulfill the criteria which all are important to make Misto to a successful product.

9.1 Electrolux's design values

Even if Misto is visionary and conceptual, the concept needs to communicate Electrolux's design values to be successful. Therefore, Misto is evaluated against these values to see how well the concept fullfill those aspects. The core values are, as mentioned in the background: Empathy, Insightful, Progressive and Ingenious.

9.1.1 Empathy

Misto invites a broad spectra of users thanks to its ability to fit any user's specific needs, requirements, tastes and personalities with the customization activity the design phase entails. The user is not forced to incorporate and buy any functionality that wouldn't be relevant to him or her. Misto never gets old or outdated – its modular fundament facilitates for expansion due to changed needs like increased family size, moving to a bigger or smaller home etc.

Misto expresses a holistic approach to food production, usage, storage and waste. It is educative and engaging in a way that may project positively on people's habits and lifestyles in a future where everyone has to care about our mutual, increasingly limited resources on Earth. The concept connects people and generations in activities that are fun and pleasurable for everyone, which may catalyze increased momentum in the local produce and food waste movement we see already today.

9.1.2 Insightful

The concept Misto is the extract of comprehensive research on habits, trends, lifestyles, technologies and materials. It aligns with the future's demand on products and services that shouldn't be single task specific. Instead, Misto solves more than one problem, opens up for a multitude of opportunities and acts as a contemporary, organic element of the future home. Trends show that people's urge to express themselves increases which Misto targets well with its customizable and extendable abilities.

The research revealed that fresh produce is crucial to achieve a restaurant-like experience in the home environment where not only the taste of food but also the total sensorial experience fun-

daments on this. A major part of the restaurant experience is the dining environment, which is greatly enriched by the decorative aspects that Misto brings to the home dining area.

By inviting the user to conveniently use only the produce needed, and providing smart storage for harvested fresh produce, the amount of food waste will decrease. This will not only help the user to save money, but will also help the world solve one of today's biggest issues: the waste of food and fresh water.

9.1.3 Progressive

Misto is unique in its purpose. Any existing solutions today either target growing or storage specifically with a narrow scope where only functionality (and in some cases some usability) has been put in focus. Misto combines these purposes in a customizable, stylish shelf solution together with a service system to facilitate for easy, pleasant and enjoyable usage. Besides being a functional, usable and pleasurable utilitarian product service system it is also a stylish, contemporary furniture, designed and customized by the user him/herself.

Until now, combinations or hybrids of functional, utilitarian appliances, and home interior furniture have unfortunately not been very common. The Misto concept is therefore progressive and possibly sets new trends about how development of traditional appliance and furniture may evolve in the future. This would not only make the Misto concept a significant part of Electrolux's portfolio of pioneering markets opportunities, but also align with the multi-use trends.

9.1.4 Ingenious

Using the NASA discovered, high-tech – yet simple in its principle – aeroponic growing technique and its advantages, growing has never been faster, easier, cleaner or more pleasurable than with Misto. The system's hidden technology incorporates everything needed for effortless growing and storing in any home environment.

Growing and storing have been fragmentized down to their basics, and technologies have been developed and incorporated thereafter. This not only makes the functionality and usability superior to any other solutions – it makes an interesting and engaging story about the product that attaches the user to it as well.

9.2 Sustainability

Regarding Misto as a single product and its lifecycle it may not be a sustainable growing solution. However, considering the educating aspects as well as how it affects people's lifestyle it creates sustainable values on another level. Misto minimise food transportation and water waste which are critical topics considering the increased global population.

The product design is created to be very sustainable. All parts are easy to disassembly and Misto only uses pure and recyclable materials. The pots are for example made out of glass that is totally recyclable as an example.

The modular design makes it possible to upgrade or change parts depending on new user needs which increases the lifetime for misto. If the user gets tired of the misto design it´s also easy to update the design with new pot collections instead of bying a totally new product which increase the sustainability.

9.3 Concept areas

Following discussion is about how well the Misto concept ties to the two concept areas that were the basis for the different concept development phases.

9.3.1 Restaurant at home

Misto becomes an organic and decorative element in the home environment, where it enhances the restaurant experience at home with with help of the light and scents from the fruits, herbs and vegetables. Having fresh produce at home also increases the visual experience of the food. Fresh ingredients in cooking is also one of the most important aspects for a memorable and joyable food experience (Leung, 2012) Own produced herbs and vegetables could also inspire people in the kitchen to try new food which is one reason why people dine at restaurants, which was shown in the results from the web-based survey.

The Misto app also encourage cooking and makes it easy with a lot of inspiration about what to cook with your own produced herbs and vegetables and how to do this. The social aspects also increases when the user has the possibility to share recipes and growing results and even trade produce with other misto farmers, with friends and family throw the app and network. Misto makes it fun to cook and easy to be a master chef at home which can make the dining experience at home preferable to dining out.

Bringing the pots to the table also creates an exclusive feeling at home when the people around the table can garnish their own food in a stylish manner. Misto actually engage everyone and increase the dining experience like a luxury and successful restaurant visit.

9.3.2 Food waste

Misto may not directly decrease the global food waste in a greater extent but it is educating and gives insights about the food production chain. This can in longer term make people think more about what they bye and use and therefore change a wasting behaviour in the right direction. However, Misto minimizes the food waste of vegetables and fruits since the user harvests

and uses just what is needed at the moment. The user will not longer throw out herbs, vegetables and fruits because they have been forgotten in the fridge and looks unappetizing. Aeroponics is also extremely water effecient and therefore just a little water is needed for the growing, in contrast to the traditional growing that requires greater amounts.

9.4 Trends

First of all the Misto concept is a direct answer to the demand for fresh ingredients all year around as well as the growing trend about locally and ecologically produced food. This is one step towards being self-sufficient which in turn targets the problem about a growing global population which means limited resources. Misto not only makes it easy to produce plants locally but it is also very water and power efficient.

The concept also considers the growing global health trend in the way the user can grow healty snack all year around in the home environment. The plants will also be totally free from pesticides which you can't guarantee when buying grocieries in the store. "Misto snacking" will be the natural and healthy option to sugar-packed candy bars or similar.

Misto is designed to fit future interior trends which means pure materials, open spaces and less overhead compartments in the kitchen. The kichten is turning more and more into the new living room which means open spaces with room for cross style decoration where Misto can be the link between the appliance and the furniture. Misto will also fit different interior trends with its minimalistic and anonymous scandinavian expression.

Due to the fact that Misto is customizable in size and shape it also targets the trends with smaller home, especially in South-East Asia. Smaller homes and the urbanization trend also mean less open space for outdoor gardering. Misto therefore means new possibilties to grow when outdoor space is lacking.

Last but not least the Misto concept targets the growing professional skill trends significant in many different areas. With Misto at home it is extremely easy and convenient to decorate all kinds of food with fresh ingredients and to use the locally produced herbs, vegetables and fruits in cooking.

9.5 Personas

Misto targets the Electrolux personas that are used as the base for Electrolux product development. Due to the concept's customizability it can be adapted to fit both segments of the personas; the social aspiration as well as the self-expression. Misto's design possibilities creates many opportunities for the user to express her or his own taste. This strategy targets the 'self expres-

sion persona'. However the minimalistic and simple scandinavian design together with quality materials which always creates a premium feeling attracts the 'social aspiration persona' as well. Misto is simple a way of enabling self expression as well as a way of showing status and class.

The customizability also means that Misto fits all different home situations: make it small to fit a smaller kitchen area; decorate the spacious living room; design a plant shelf for the children or expand the system when moving to a more spacious home. All different design possibilities makes the concept fit a broader group of personas than the ones defined by Electrolux, mainly because Misto is a combination of different modules rather than a new appliance.z

9.6 Product experience

Misto offers a whole sequence of engaging and pleasurable interactions through all of its touchpoints and activities: from the design phase and the shopping experience via the website in the beginning, to the convenient and fun way of using and storing the healthy, homegrown produce. The story of plant growth – from seed to produce – is covered and highlighted all through the system.

The incorporated technologies not only make the product greatly functional and usable – Misto is also fun and pleasurable to use. Not least, the pleasure of indulging in own produce as a result of these technologies, and telling the story behind the fresh produce to friends and other people result in a high level of experience, engagement and pleasurability.

The initial design phase – solely – is crammed with engagement and product experience – letting the user design and customize the system not only results in a product fitting the user's needs but it also makes the user connect and fancy his/her own product. Misto reflects the user's personality, tells the story about who the user is and expresses what passions he or she has. Misto is a product service system that is living together with the user, rather than being used rationally only when needed. Misto is merely not just a product – it's a way of living.

Misto engages all senses: from taking pleasure in its visual appearance, hearing its subtle spraying and feeling the leaves of the growing plants, to smelling and tasting the fresh produce. Misto evokes memories from the past when using it. Growing produce isn't something new and groundbreaking in itself – Misto reintroduces it in the home environment in a way that adapts to future living and lifestyles. Everyone can relate to growing something which means that everyone can relate to Misto.

9.6.1 The growing experience

Due to the fact that Misto is just a concept the growing experience can't be totally evaluated. However, the design in combination with already existing solutions of aeroponic systems can be evaluated to get a god picture of how well Misto will fulfil the experience graph that was used during the process.

Due to the high usability of Misto as well as the aeroponic technology the time consuming and dirty preparation aspects of normal growing will be minimised. The growing results will be both better and faster with hight nutrition concentration and guaranteed growing light for the plants. The whole growing process will therfore also be more engaging and more fun to observe when the user sees the result faster. The Misto network will also give inspiration and create curiosity when people can share there experience with help of social media.

However, the growing experience is still geniune and the movable pot design and the planting of seedpods adds recognizable elements, evoking memories and strengthen the growing experience.

10. Discussion

This chapter discusses the project's process and its results. The chapter is structured into the most important stages of the project in a chronological way, starting with the project scope and ending with final results where Misto is discussed from relevant aspects.

10.1 Project scope

Due to the broad project scope, a lot of time was spent to define the project goals in a way so it would fit the time frame of the project. It was also a challenge to define the aim so it would fit the character of Electrolux as well as Chalmers University of Technology.

Due to this it was hard to define relevant research areas which made the first research phase very broad. This was, on the other hand, successful because the project group got useful insights that otherwise might have been missed. However, with a more defined project scoop it would been realistic to assume that the final result could have been more developed and evaluated, such as with working prototypes.

The project group realized quickly that it takes a lifetime to learn and understand the different Asian cultures. There is also nothing called Asian food or Culture – the Asian countries are all too different from each other. Due to this a decision were taken to only get inspiration from South-East Asia instead of developing a concept specific for the South-East Asian market.

10.2 Pre-study

A big amount of quantitative data was collected during the pre-study as a result of the broad project definitions. This, however, helped the project group to stay broad and let the doors open for new ideas.

Performing the pre-study in Singapore had a lot of advantages because the country is the true melting pot for the South-East Asian culture and food. Besides the strong culture with street food and traditional cooking, Singapore also offers some of the top restaurants in the world. Because everything is collected in one area it was extremely easy to get inspiration and do many field studies in the real context.

Singapore was also considered as an interesting place for the research due to its modern character, yet still lacking a well-functioning recycling system. This created many useful insights related to the food waste track.

By coincidence, the Savour food exhibition was held just in the beginning of the project. This created one of the main bases for the research phase and all the semistructured interviews gave an enormous contribution of insights. Besides this the Savour food exhibition connected the

project group to Günther Hubrechsen which later gave some of the most relevant study visits during the whole pre-study.

The negative part of being in Singapore was, however, that it was hard to establish a tight collaboration with professors at Chalmers University of Technology. This could have been useful during the material and technology research.

10.3 Ideation

Workshop

The workshop and its outcome was very successful. However, the outcome could have been even richer if the participants would have more varied expertises and backgrounds. Not so many new ideas that the project group hadn't thought of before came up. This was probably because the project group was more previously engaged to the topics and already had a big variety of ideas in their heads.

Analyzing the outcome with help of the KJ-analysis, that was used to cluster all the ideas into certain groups, was in this case very useful to get a good overview over the big variety of ideas. However, the red string mapping method that was used to see the link between the groups and ideas may not be the best suited for this project.

Idea generation

During this phase the goal was to create ideas with strong development potential without giving them a defined body and shape. This was many times a challenge when the ideas still needed to be able to be communicated. Another challenge was to maintain the creative working flow when the project group only was consisting of two designers. Due to this it was important to switch and combine many ideation methods as well as environment to get new inspiration.

Another challenge was to find and work with actual methods for experience design because this is such a broad field which more is a combination of different components. More traditional methods were therefore used to create a big flow of ideas which later instead could be evaluated against defined experience design criteria.

10.4 Concept development

Design guidlines

During the concept development phase a decision was taken to not do a DFA because Electrolux wanted the project group to think out of the box and implement their own design in the final product. Electrolux design values were therefore used instead as a guideline of what the design

actually need to express instead of the specific shape. The design core values also have a longer lifetime than a DFA-analysis which made them more useful when working with a conceptual futuristic solution.

Designing with the core values in mind gave room for a lot of inspiration from biomimicry and natural elements that still go in line with Electrolux products being "humanized" and using "hidden technology" for example. This was a successful way of working and made the project group more creative in their design instead of focusing to hard on an actual form language which any way will change by time.

Evaluating

Many loops and iteration phases where done during the concept development phase and different Pugh matrix were used as the main evaluating method every time. The hard part was to know how many and which kind of criteria that should be used to evaluate the concept against. A similar challenge was to know how well the actual concept fulfilled or not the criteria and also know how to do the weighting of criteria. All this due to the broad project scope and that their was't an available list of needs and requirements which usually is the starting point for a thesis work.

It was also hard to evaluate each concept idea from an experience design point of view mainly because they were more than something that just solves a specfic problem (functionality) in an easy and user friendly way (usability).

Due to this it was necessary to complement with discussion and feedback from Electrolux after each ideation phase to be able to select concepts for further development. In many cases the winner in the Pugh matrix wasn't the concept chosen for development and the Pugh matrix became more of a guideline and discussion topic with Electrolux. Mainly because it's hard to measure the potential level of experience design on ideas that are no more than just loose ideas. However, further into the project it became easier to evaluate ideas with the Pugh matrix when the chosen criteria were more clear and stated.

All interviews that were done on growing were very useful in finding problems and possibilities within the growing process. However, the outcome would have been even more useful if a wider range of people had been interviewed. However, the insights created a good base for the experience graph on growing. This graph was a good way of communicating the growing experience today and the concept's goal in a more visual way. The graph was very appreciated among the design team and was used a lot as a communication tool to explain the vision.

10.5 Final concept development

Storytelling & storyboard

This method was very useful in communicate the final concept idea in a more visual way compared to a text or a sketch. Storytelling was also very valuable to map out the interaction points but also to remind about the importance of memories connected to growing. This was also a good way to map out personas and people that are connected to the concept idea. Finally the whole story that was created was a good way to summarise the core and the potential of the concept. Both the storytelling slideshow as well as the experience graph was a very good way to communicate our idea but also to go back to and see that the project group always tied new decisions to the project goal and research.

Further research

The project group didn't have the possibility to see all technologies and materials that have been used in the different concept ideas in reality. This would probably be more critical when building working physical prototypes. However, experiencing the technologies and materials in reality may have given deeper insights about possibilities and weaknesses with these as well as more inspiration.

Because of the limited time schedule of the project there wasn't time to evaluate shape and function with physical and working prototypes which instead is a recommendation for further development. Only simple mockups were used during the project to get a picture of size and weight. A lot of time were spent on getting inspiration from the nature and work with shape and materials that evoke memories and make the user comfortable which was a important part when creating a pleasurable user experience.

10.6 Final results

Researching and analysing future trends includes predictions, thus being impossible to verify prior to the day the concept is aimed to be introduced. The final result of this project is based on the validity of the research on the relevant trends. This may then be a source of error which only the future can tell.

Another question is whether the concept will work or not in practice. Will the water distribution work efficiently and will the recycling of water work? Will the water pressure be sufficient in the far ends of the Misto system's water distribution rails? Will the volume of the water tank be sufficient? These are questions rather effortlessly answered after creating and testing a working prototype of the final concept. However, since this is not within the frames of this master's thesis project, it would be the first next step in the next concept development phase. This would also make cost estimations accurate. Due to the fact that there are many practical things that

have to be tested and evaluated, no cost estimation was done in this project.

Another question regarding the final result is whether the seed pods should be made this way or not. Potential buyers would maybe show skepticism whether the seed pod would result in a plant or not. This was one of the main topics of discussion with Electrolux. To create higher credibility it may be a better solution to sell pods with an already existing seedling or plant. Ideas about having a "seedling guaranty" is another example that came up during the discussion with Electrolux. However, this is a detailed part of the project and is not part of the actual scope at this point.

The experience of the concept that is the main focus of the project has however been hard to evaluate. It may be true to say that the total experience have been even more credible and easy to evaluate with a deeper analysis and more user studies. Some may think that the craftsmanship of growing is taken away from the concept with the aeroponic technology. However, due to its broad market and target group it has been a challenge to create a experience that would satisfy everybody's mind.

Whether the aesthetics of Misto is globally acceptable may also be a topic for discussion. Due to it's modularity and personalisation it should however exist pleasing solution for almost all users. In the end, this is neither the critical part of the concept because that's what Misto is – a concept. The idea could take many faces and will off course change appearance and functionality in further development phases.

10.7 Sustainability

A question that comes up is whether the final result of this work is good from a sustainability point of view or not. On one hand yes, the Misto product-service system promotes local produce, self-sustainability and creates awareness through its educative activities (planting, growing, storing, using, waste management) that likely will project on other habits of the user's everyday life. On the other hand no, the sustainability effect will probably never reach to the point where one can defend an entirely new product to be developed, produced and used when traditional growing can be considered a reasonable alternative (which has a lot less ecological impact during its lifecycle – practically zero).

However, if Misto is regarded as a piece of multi-usable furniture the impact then with its multi-purpose use is not much more than any other shelf solution without the function of growing and storing fresh produce. Again thanks to the modular system, Misto will fit well to the actual needs of the user. In many other cases with complex utilitarian products, the product has a lot of unused features. Therefore, Misto has a high level of efficiency in terms of features used by the user and therefore the negative impact on the environment can be considered lower.

11. Conclusions

Misto is an entirely new product-service system. It responds to the aim of the project: "Facilitate for new experiences in the future kitchen environment, with inspiration from professionals and the South-East Asia region, fitting the core brand and design values as well as future market segments of Electrolux".

The final result's multi-use, appliance-furniture hybrid character fits well to future trends and lifestyles, and evokes user engagement and memories in an educative, fun and pleasurable way. The Misto system is functional in a usable way and its story involves a holistic approach of a sustainable future where consciousness and self-sustainability plays a major role.

The project team believes that the project has been very successful in getting inspiration from the South East Asia region, getting to know the company Electrolux and adapting the process and its output to the company.

The structured product development process of the project resulted in a successful final result – although it started with a slightly broad aim. The project team had the opportunity to incorporate prior familiar methodology, combined with new methodology and ways of working from both Electrolux and outside sources.

On a personal level, the project has been very learning for the project team: coming from a multi-disciplinary, technical university background to a pure corporate design environment. Working with people from different countries and cultures has been very interesting and developing – not least truly fun.

The geographic location of the project in Singapore has been incredibly suitable thanks to its role as the melting pot of South-East Asia including cultures of food, eating and cooking. The project team, with its curious Scandinavian perspective, could with great interest see and analyze similarities and differences between cultures and lifestyles and apply these insights to the development process.

The project and its result are radical in its level of predicting future and implementing innovations. Perhaps, the project has catalyzed new thinking within Electrolux to work even more with radical and visionary innovations (in contrast to incremental, market-driven innovations), as well as with systems thinking involving both product and services. Last but not least, the project has shown the potential of working within the area of experience design, which likely will continue to grow as one of the most contributing factors to product and service differentiation. Future problem solving not only requires a high level of innovation but it also requires

people's genuine and sustainable engagement. The Misto concept helps solving our global food waste problem by offering the possibility of providing your own home with fresh produce. At a first thought it may sound contradictive but essentially that is actually what it does in an effective, usable and pleasurable manner. Come join the revolution.

12. Recommendations and further development

Recommended as the first next step in future development of the Misto concept is to develop a working prototype to be able to test, confirm and refine the system's implementation of the incorporated technologies and their functionality. This will answer questions like: will the aeroponic growing principle work efficiently in this concept's execution? Will there be sufficient physical space for the functional parts in the design? Will excess water recycling be possible in Misto's thought manner? Will the seed pods actually work efficiently? Does the seed pod core have too little or too much coco coir for optimal function? Should other growing media be considered and tested? Will the central control unit's water tank be sufficient? Would it be possible to generate and distribute pressurized water from the central control unit throughout the shelves?

Next thereafter would be to finalize and adapt the included parts of the system to available manufacturing processes and materials with attention paid to reasonable costs. Also, development of how the modules and their water and power distribution will attach to each other, and how the shelves should be mounted on the wall will have to be done at this stage.

Concurrently with the testing and realizing of the physical components of the developed Misto calculations on cost, price and margin have to be done to determine the concept's market potential. With the resources of Electrolux, a comprehensive market research would be appropriate in this stage to determine the final product's level of "premiumness".

Seeing Electrolux as the potential "host" of the final development and launch of the Misto concept it may be interesting to look for potential partners for a joint venture or consortium. This may potentially add value to the design and the manufacturing of, for example, the pots which could be produced by some of the famous Swedish glass producers such as Orrefors or Kosta Boda.

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Appendix

dESIGN LAB

ELECTROLUX DESIGN LAB

BRIEF 2012

Electrolux

FORMAT

dESIGN LAB

- From the total number of contributions there will be a selection of nominees, among the nominees we will select 25 semi-finalists who will compete for 10 places in the final event

- The selection will be based on adherence to the brief and the aesthetic and conceptual qualities of the contribution

- The finalists will gain worldwide publicity and several of the previous winners are today employed by Electrolux

Electrolux

BACKGROUND

dESIGN LAB

- 2012 is the 10 years anniversary of Electrolux Design Lab

- The competition is open to graduate and undergraduate design students worldwide

- 10 Finalists are selected by the Electrolux Design Team

- An international jury selects the winners at a final event
  – First prize € 5000 and 6 months paid internship at Electrolux Design
  – Second prize € 3000
  – Third prize € 2000

- Finalist concepts are exposed globally

Electrolux

JUDGING CRITERIA

dESIGN LAB

- A jury of high-level designers and experts, including Henrik Otto SVP Design Electrolux will judge entries based on intuitive design, innovation and consumer insight

- Before submitting your design ask yourself:

- Is it daring, and truly innovative?

- Are the aesthetic qualities good enough?

- Is it something you believe in, rather than something you think we expect?

- Is the concept based on consumer insight?

- Does it truly respond to the brief?

Electrolux

2012 BRIEF

DESIGN EXPERIENCE

Electrolux

BRIEF BACKGROUND INSIGHTS

- We sense the world
  - It's by using our senses we decipher, judge and control the world around us. It's by touching, smelling and seeing something we can tell if it is real or not. In today's information society we tend to experience much of the world by proxy, in front of a computer , iPad or smart phone. What we experience isn't the real world. We're mimicking the real world, or creating a virtual world.

- The visual is just one of many human senses:
  - Human beings have a multitude of senses. In addition to the traditionally recognized five senses we might consider other senses like pain, balance, and acceleration. What constitutes a sense is a matter of some debate. What if we could incorporate our other senses into design? Could we smell who's calling? Or feel what's on TV?

Electrolux

DESIGN EXPERIENCE

- As demonstrated in the Cube by Electrolux, the world of professional cooking is all about the experience. It's not about achieving the perfect inner temperature of a steak for the sake of science or performance. It's about designing the best possible experience for your guests. The creative force behind the experience is the merger of intuitive and innovative appliances, the creativity of the chef and carefully selected high quality ingredients.

- We challenge design students to draw inspiration from professional experience creators (chefs, architects, interior designers, hotels etc.) to design home appliances that will provide a fuller sensory experience. It might be through state of the art technology or it might be through a clever blend of textures and surfaces.

Electrolux

BRIEF BACKGROUND INSIGHTS

- Experience is luxury
  - Vacations and travelling are the most common experiences people shop for. But as consumer interpretations of what luxury is change, services and experiences closer to home become popular

- The Heart of the Home
  - Dining and enjoying food has always taken place in the home, but not necessarily in the kitchen itself which may have been more adapted to practical functions. But the modern kitchen is a place for socializing where we share experiences with our friends and family

Electrolux

BRIEF BACKGROUND INSIGHTS

- Consumers want professional performance
  - Consumers today want products that can provide end results on par with professional equipment. Consumers are ready to pay double or triple price for the same football shoes as Lionel Messi or the same kitchen knife as Jaimie Oliver uses.

- Quest for authenticity
  - As our digital lives "layer" on top of our physical world and we spend more time online; a new-found appreciation emerges for authentic experiences and interactions

DESIGN LAB

DEADLINE FOR SUBMISSIONS

1ST JUNE 2012

Appendix II: Web-based survey

*Why are you going out
on a restaurant for dinner?*

70% - The experience
50% - Convenience
50% - Try new food

*Why are you arranging dinners
at home?*

75% - Relaxed home environment
50% - Cooking is entertaining

Drawbacks with restaurants?

Low customizability
Expensive
Stiff environment

*Drawbacks with dining and
cooking at home?*

Hard to sozialice with friends
Time consuming
Dishes and cleaning up

*Which elements are boring and takes
effort regarding cooking at home?*

80% - Doing dishes
35% - timing
35% cutting / shopping

**"More than 60% of the participants like cook-
ing and think they are good at it"**

**"More than 90% care about health and nutri-
tion when bying food and cooking"**

How can we make it easy to cook new and rare
things at home?

How can we make it more convenient cooking at
home?

• Dishes and cleaning
• Elements like shopping and timing

How can we make it easier for the responsable person to relax and socialize while
cooking?

How can we increase the social and entertaining aspects of cooking?

Elements to keep:

• Relaxed home environment
• Entertaining and fun to cook
• High value for the money
• Customizability

Keep the health and nutrion aspect in mind. Healt and nutriton is an increasing trend today.

78_{svar}

Sammanfattning <u>Se hela svar</u>

Gender:

Male	41	53%
Female	37	47%

Age:

25 22 26 24 23 27 23 27 25 25 24 25 26 20 39 22 26 22 23 26 24 25 27 27 26 22 23 22 23 25 23 25 25 25 24

Nationality:

Swedish Swedish Swedish Swe swedish Swedish SWE Swedish Swedish Swedish swed Sweden Swedish Swedish Swedish Swedish italien Svensk Swe

Relationship status:

Girl-/boyfriend	36	46%
Wife/husband	5	6%
Open relationship	1	1%
Single	36	46%
Divorced	0	0%
Widower/widow	0	0%
Other	0	0%

Type of resident:

Apartment	61	78%
House	14	18%
Other	3	4%

Living with others:

Yes – my parents	7	9%
Yes – partner	26	33%
Yes – friend(s)	18	23%
No – I live by myself	23	29%
Other	4	5%

Do you like cooking?

Yes – and I consider myself being good at it	51	65%
Yes – but I am not very good at it	12	15%
No – however, I consider myself being good at it	5	6%
No – and I am not very good at it	9	12%

Other	**1**	1%

Mention some of your favourite dishes (both restaurant and home cooking):
oxfilé, white fish w. mashed potatoes and gravy, nice healthy crisp salads   Sushi, pizza, salmon.   Asian food in all variations. At restaurant I like to taste new things and home I like communal dining   Tacos   mexican   - Sallads in all ways - Squid   a real nicely cooked slice of meat   Italian food   Simple and plain dishes with lots of flauvor   Salmon tagliatelle, broccoli and blue cheese tart   pasta   Fish, especially salmon, a nice peace of meat with a good salt. With some well prepared veggies.   fish, seafood, mexican, pasta.   Risotto, lobster, steak   Asian food   Don't have any favourite dishes.   agnolotti, gnocchi, piz   ...

Why are you going out on a restaurant for dinner? Please select one or more reasons below:

Convenience (good food without having to cook/do the dishes etc.)	**41**	53%
Celebration	**42**	54%
Want to try some new food	**35**	45%
The experience	**53**	68%
Not good at cooking myself/Don't want to fail on the cooking	**2**	3%
Other	**9**	12%

Eftersom det går att välja fler än en kryssruta kan procentsatsen överstiga 100 %.

Do you care about health and nutrition when buying/cooking food?
yes   YES   yes, I try to avoid pre-made dishes and make meals with healthy combination of of all different groceries   I try to   sometimes   Yes, not for everything but most of the things   yes   Yes, very much   Yes   Yes!   yes   Yes, very much indeed. I found it interesting to cook in such a way that you conserve all the nutrions in the food in the best way.   Yes   Yes, but sometimes I allow myself to eat non-healthy food   Yes   Not more than trying to vary the food.   yes definitely   Ja   Not so much   Yes. I try to use less processed food and no sugar.   Yes   Sometimes,   yes   Not at all. Flavour is priority no.1   Yes. I used to be very aware of t   ...

Are you throwing away food? Please select one or more reasons below:

Out of date	**48**	62%
Looks bad/unappetizing	**42**	54%
So small amounts of food that it is not worth keeping	**34**	44%
I am not throwing away any food	**9**	12%
Other	**8**	10%

Eftersom det går att välja fler än en kryssruta kan procentsatsen överstiga 100 %.

Why are you arranging dinners for you and others at home? Please select one or more reasons below:

Convenient	**13**	17%
Control of content	**9**	12%
Cooking is entertaining	**39**	50%
Relaxed home environment	**56**	72%
Other	**13**	17%

Eftersom det går att välja fler än en kryssruta kan procentsatsen överstiga 100 %.

What do you do with the leftovers after having a meal at home?
keep in boxes in my fridge   Great!   Trying to make lunch boxes   save and eat later...student   bring it to lunch the next day   Make a lunch box, if it is too little i save it and have it as an evening meal or similar.   save 'em for later :D   Bring them for lunch the day after at work!   Lunchboxes and put it in the freezer   Put it in the freezer or fridge (depending on amount mostly)   matlåda :)   Put it in boxes, freeze or refrigerate, heat in the microwave oven and eat it.   Making foodboxes for the next day.   Keep it   Sometimes I save it to have another day if its enough food   Save them in a lunchbox to eat the day after.   p   ...

When preparing a dinner at home, what tasks do you find to be the hardest/require most effort/most boring??

Cutting/chopping	**27**	35%
Rinsing	**13**	17%
Frying	**4**	5%
Boiling	**11**	14%
Timing	**26**	33%
Meat temperature/"meat readyness"	**13**	17%
Tasting	**1**	1%
Spicing	**11**	14%
Putting the food nicely on the plates	**6**	8%
Making the table	**6**	8%
Doing the dishes	**61**	78%
Other	**8**	10%

Eftersom det går att välja fler än en kryssruta kan procentsatsen överstiga 100 %.

Antal dagliga svar

What do you think are drawbacks on dining AT A RESTAURANT?
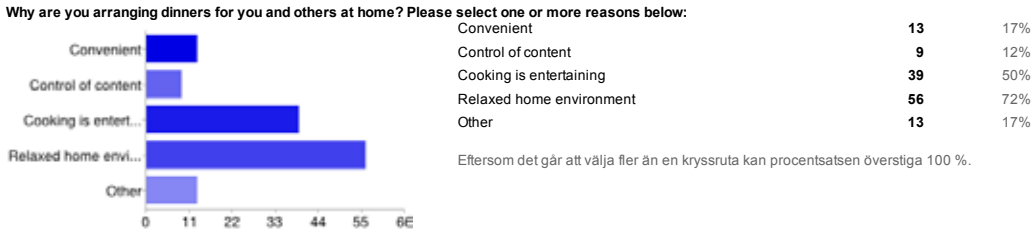expensive, stiff environment, has to wait alot, need to book (often)   .   The price and the "stiff" environment   expensive   expensive you don´t know what you get until after you tried it.   - can't adjust the amount of food, in both ways less or more of somethings - Tend to get tired and then there is no sofa to chill in - High expectations, easier to get disappointed   expensive :P   The cost   Bad service   Expensive, unsureness about taste, loud environment   expensive   Small space, noise and not be able just easily take an extra glas of water or beer of you are thirsty.   The amount of food is not up to you to decide.   ...

What do you think are drawbacks on dining AT HOME?
dishes, you are often too busy with the cooking - no time to socialize fully,   .   The workload   Takes time   you have to do all the steps, and if you have guests you don´t have time to enjoy the company when you have to do everything.   - Someone/myself can't fully relax because one have to serve and look after the cooking in the mean time. However this is also sometimes fun. - Cleaning   allot of work   Doing the dishes afterwards   Dishes   Dishes, time consuming, preparation   time to cook   Difficult to estimate how much food is needed, stress if something is going wrong, and cleaning up.   Doing the dishes. Getting   ...

TECHNOLOGIES

Communication	Visual	Power & Energy	Thermo	Processing
Eye tracking	Flexible displays	Cordless power supply	Induction heating	Laser cutting/engraving
Voice command	Thin paper screens	Smart grids	Vacuum insulation	Property scanning
Spatial gestures	Transparent display glass	Solar cells	Instant cooling	Composting
Remote access/control		Small & powerful batteries		
Mobile applications				
Clouds & Wikis				

MATERIALS (DETAILS)

Construction

Graphene has an extremely strength, you can actually pick up one sheet of atoms in your hand. Graphene is the stiffest known material — even stiffer than diamond. It also beats diamond in thermal conductivity.

Metal foam is a very strong substance that is relatively light, with 75-95% empty space. Some metal foams are so light that they float on water.

Manufactured Diamond is very strong, light, made out of the widely available element carbon, nearly complete thermal conductivity, and has among the highest melting and boiling points of all materials.

Lingin – (an often-discarded element of regular wood) is combined with natural resins, flax and fibres that can be injected into molds and form extremely complex, precision-shaped objects.

Paper Honeycomb is lightweight but strong and can be used in furniture and as packing material.

Transparent concrete – these translucent concrete tiles that contain optical fibers, allows light to pass through.

Temperature Sensitive Glass Tiles – Glass tiles that change colors in response to temperature.

Transparent alumina is three times stronger than steel and transparent. The number of applications for this are huge. Imagine an entire skyscraper made largely of transparent steel.

Ritchlight – 70 percent of the material is made with recycled paper and is available for architectural purposes and to reinforce surfaces like fiberglass.

MATERIALS

Construction		Thermo / Isolators	Other
Graphene	Temperature Sensitive Glass Tiles	Aerogel	Electronic paper
Metal foam		Ceramic Cloth	Electronic textiles
Diamond	Transparent Alumina	Kevlar	Ceramic Finish
Lingin	Ritchlight	Thermoelectric material	Nano materials
Paper Honeycomb	Corian		
Transparent concrete			

MATERIALS (DETAILS)

Thermo / Isolators

Aerogel - It's 99.8% empty space, which makes it look semi-transparent. Aerogel is a fantastic insulator – if you had a shield of aerogel, you could easily de- fend yourself from a flamethrower.

Ceramic Cloth – cloth knit from ceramic fibres, which will insulate against extreme temperatures.

Thermoelectric material - The material can convert waste heat passing through it to usable electric energy

Kevlar – ranging from bicycle tires and racing sails to body armor because of its high tensile strength-to-weight ratio

Other

Electronic paper – a thin, flexible display technology that reveals digital images in full color.

Electronic textiles – imagine talking to people over the "phone" just by making a hand gesture and activating electronics in your lapel, then merely thinking about what you want to say (thought-to-speech interfaces).

Corian - it can be thermoformed by heating it up, allowing unique shapes to be created. Its primary use is in kitchen countertops, bathroom vanity tops, and wall cladding in showers.

BACKGROUND

Restaurant at home

Today's interest in cooking and dining is bigger than ever. Nowadays, TV shows even teach kids how to cook professionally, and there are numerous competitions and events around cooking.

There is a huge trend to develop professional skills in many fields and showing these off – and cooking is one of these fields. Showing off your skills is beyond showing off material stuff.

TV shows
professional skills
new & exciting food
expressing status
less free time
kitchen is a central hub
weakening economy (?)

PERSONA #2

Married without kids

Ann has been married to Josh for 4 years and they live in a spacious 2-bedroom apartment just outside the business district where they both work. The couple doesn't have any kids yet and Ann's daily life revolves around her hubby, friends and family. A typical week involves working until 6 or 7 pm and then heading home for dinner and relaxing in front of the TV. Sometimes they meet out for dinner with their friends as they like checking out the latest restaurants and hotspots in town.

Ann and Josh's apartment is a sanctuary and a showcase of Ann's personal style – it's chic and minimalistic but yet comfortable. Ann is putting a lot of effort in choosing the furnishings and constantly updating the decor – she is proud of her uniquely stylish home. The livingroom is the their favourite spot and that's where most evenings are spent. The kitchen is small but functional and opens into a small dining area. However, they don't entertain much at home because the kitchen and dining area isn't ideal for large gatherings.

For Ann it's important to be involved and in control of her household at all times even if she gets help with major things by her maid. Ann, however, loves cooking and sees her appliances as partners that she can rely on. She appreciates the value of exclusive, premium quality appliances that also boast beautiful, harmonious design.

carrerist
enjoys dining
limited socializing space
trend conscious
in control
loves cooking

PERSONA #1

Married with kids

Mai is a full-time homemaker and her life revolves mainly around her husband David and their daughter Molly. Even though Mai has a lot of responsibility as a supporting house-proud wife and mother, she has a comfortable life.

Weekend is the time for Mai to relax and be with her family. Then, she likes to take a break from cooking and go out to eat. However, Mai and David like inviting friends to their home to entertain and arrange parties.

Their home is a huge source of pride and self-esteem and they have an inviting livingroom with an impressive dining area. The livingroom is the heart of their home and that's the room where they gather the family or entertain friends.

Beyond that is the kitchen which is spacious and well-equipped. Mai thinks it's important that her home makes a statement in reflecting her personal style, her family's success and her achievement as a dedicated mother, wife and homemaker.

When entertaining at home, that's Mai's moment to really shine. She is well adept in the kitchen and has good culinary skills. Mai takes pride in and responsibility for the preparation of the entire meal. She likes sharing new experiences and connects to what's current.

home maker
entertain at home
proud of the home
kitchen adepted
enjoys cooking
"show off"

SCENARIO #1

Birthday dinner at home

Ann and Josh have invited friends to celebrate Josh's birthday. It's important that this day becomes special – Ann wants to create something extraordinary to impress their friends.

They go to the grocery store early the same day to buy exclusive ingredients for a three-dish dinner. Back home they start to prepare and later in the day Ann sets the table to be well prepared. The appetizer and the dessert should be cold so the couple make those dishes in advance. This means a lot of dirty equipment and dishes that have to be done before cooking the main dish. This should be warm and Josh plans to do the major part of it when the guests have arrived and are having a drink.

Even if the couple thought they were well prepared it gets stressful in the end as usual. They need to shower and dress up and suddenly the guests arrive. Now there is both a pressure on socializing with all the friends and at the same time being successful with the cooking. The meat should get the right temperature and color, vegetables should be stir fried, the sauce should be done from scratch – the timing is crucial.

This time everything worked out fine and finally the dining can begin. Everyone loves the food and both Josh and Ann feel very delighted and satisfied. Finally, they can now enjoy the company and the birthday in their relaxed home environment. For occasions like this one, it is definitely worth all the dishes that have to be done tomorrow.

exclusive
extraordinary
preparations
perfection
timing
dishes & cleaning

SCENARIO #2

Friday hangout with friends

A bunch of Mai's friends gather on a Friday afternoon to enjoy cooking and dining together at Mai's place, when David and Molly is away on a small trip. This Friday, Mai is responsible for the grocery shopping and passes by the local grocery store on her way home from work. She is heading home satisfied with a lot of unique and exclusive ingredients that for sure will add that little extra to the cooking experience. All guests arrive in time and everybody gather in the kitchen to socialize and to start the preparation of the food.

Mai is the leader in the kitchen this night and explains her plan for the dinner. Everybody is then helping and it gets really crowded in the small kitchen.

Somebody is stir frying some vegetables, others are cutting meat and others are preparing the little appetizer. It's a relaxed atmosphere and the cooking is more important than the actual result. It's not embarrassing if something goes wrong and this is the time when they really can try new cooking styles and increase their skills in the kitchen.

After one and a half fun hour in the kitchen is time for dining where all friends feel satisfied that they all helped preparing the excellent dinner they are eating. They love the communal dining and it's a lot of chatting about what they could do better next time and which dish that was the best. After a memorable night Mai is left tired with a messy kitchen and a lot of dishes to do, now the boring part begins and she wishes her husband were home to help her.

*new food
collaboration
experimenting
relaxed atmosphere
communal dining
dishes & cleaning*

INTERVIEWS WITH MASTER CHEFS

Conducted during Savour 2012

Günther Hubrechsen

"Adults are like children – the most important is the taste, not the look."

TASTE

Tatiana Szeles

"Comfort is the keyword for a good food experience."

COMFORT

Alvin Leung

"With eating you satisfy your body – with dining you satisfy your mind."

SATISFACTION

Douglas Tay

"The first thing you experience in a restaurant is the service – it's not the chef and it's not the food."

SERVICE

SURVEY INSIGTS

Data from web-based survey

Why are you going out to a restaurant for dinner?

The experience*

Convenience

Try new food

* service, environment, "out of home"

Why are you arranging dinners at home?

Relaxed home env.

Cooking is entertaining

STUDY VISIT: GÜNTHER'S

Inside a Modern French Cuisine

"The kitchen crew is like a football team – we play together in the same direction"

COLLABORATION

"Cooking is more about craftmanship and feeling than high technology"

CRAFTMANSHIP

"The important thing is the temperature of the food – not the temperature of the cooking equipment"

FOOD TEMP.

"Groceries and taste are the most important things to create a good food experience"

FRESH & TASTY

Savour 2012   *Hawker's centre*   *Günther's*   *Sushi restaurant*

*Professional cooking is not about fancy equipment or huge kitchens
— it is all about skills, collaboration and inspiration.*

BACKGROUND

Food waste

According to a United Nations funded study conducted by the Swedish Institute for Food and Biotechnology, one third of all food produced for human consumption goes to waste, amounting to more than one billion tons of waste around the world every year.

The study differentiates between food loss and food waste. Food loss take place at production, postharvest and processing stages in the food supply chain. Food waste occurs at the end of the food chain (retail and final consumption) which relates to retailers' and consumers' behavior.

*global issue
growing problem
ecologic & economic
water crisis
freshness trend
overconsumption*

BRAINSTORMING QUESTIONS

Based on our research insights

How can we inspire and encourage to cook and dine at home?

How can we make cooking at home more convenient?

How can we enhance the social aspects of cooking?

How can we make home dining preferable to dining out?

How can we increase people's cooking skills and knowledge?

WHY IS FOOD WASTE A PROBLEM?

There are many aspects one might forget to think of.

1.3 billion tons food wasted every year

600 km³ fresh water is being wasted

24 million acres deforestation to grow more food

300 barrels of oil on wasted food

1 billion people malnourished

PERSONA #1

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loves cooking

SCENARIO #1

Too much ingredients and leftovers

When Ann and Josh invites their closest friends to their home for a dinner on a Friday night they want to create something special. Therefore they bye a lot of ingredients so they make sure that they will not run out food.

However, whilst cooking some ingredients are not used so Ann puts them into the fridge again. After the dinner there is a lot of leftovers. "Good", both Ann and Josh thinks, because the worst thing that could happen is to run out of food when having guests. But at a second though, what should they do with the leftovers? Is it enough to keep or should it just be thrown away which is the easiest way of getting rid of it? The time is late and both Ann and Josh are too tired to take care of the leftovers so they decides to throw them away to quickly be able to get rid of the dish and clean the kitchen.

A week later some ingredients in the fridge from the birthday event appears to have been forgotten in the fridge and are to old to be used, which means another food waste.

lot of food
many ingredients
unused fresh groceries
leftovers
throwing away
forgotten things in fridge

SCENARIO #2

Different tastes and times

In the home of Mai, David and their daughter Molly, there are different food needs and habits.

David and Mai have sometime different time schedules and Molly is often picky with the food and usually needs her own dish for the dinner. This means that the family eats at different times and that Ann has to bye and cook different food. However, this Wednesday the family is having dinner together. Mai has been cooking a spice chicken dish for her and David. Molly is not keen of hot food and therefore gets her own dish.

When the dinner is over there are many partly used ingredients that are put back into the fridge. The cooked food is not entirely consumed and the leftover are put in boxes that Ann puts in the fridge. However, some leftovers she consideres to be too small to keep and are thrown away.

The next following days some of the leftovers are eaten but some get to old to keep and are later in the week thrown away as well.

many tastes
different times
partly used ingredients
leftovers
'too little to keep'
gets old – thrown away

SURVEY INSIGHTS

Data from web-based survey

Why are you throwing away food?

Looks bad/unappetizing

So little not worth keeping

Out of date
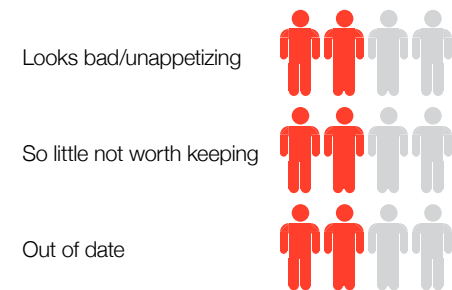
If keeping, what do you do with the leftovers?

Make lunch boxes

Cooking new dishes
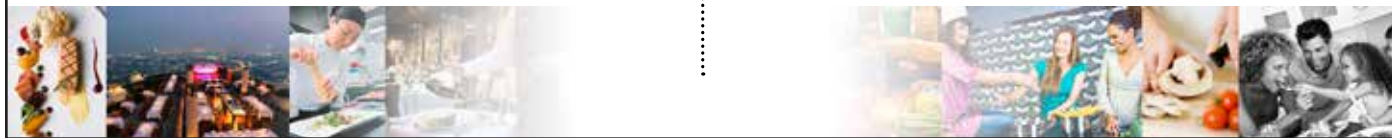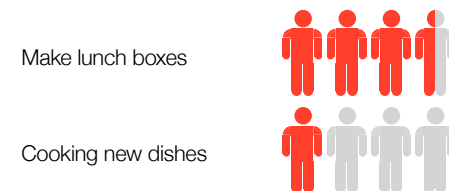
The problem occurs at home where you might need only parts of the fresh groceries you've just bought, and the planning is not as accurate.

STUDY VISITS

Food waste at restaurants?

Savour 2012

Hawker's centre

Günther's

Sushi restaurant

Food waste is not a problem in many restaurants — the rate of food usage is high and adapted.

THE MISSION

How can we minimize and prevent food waste?

One way of dealing with food waste is to **reduce its creation** and there are two major ways to prevent the food waste at home:

#1 – Prevent consumers from throwing away big quantities of food as waste in garbage bags

Change habits
Information
Inspiration
Incentives

#2 – Stopping consumers from buying more food than they actually need

Knowledge of food storage
Information
Planning

"People think that food waste rots down in the landfill but that's wrong! Food waste needs light and air – in the landfill it has neither. Instead, without air and light methane gas is produced which contributes to the global warming"

How can we reduce food waste at home?

– by preventing food waste?

– by post-processing easily and efficiently?

How can we make people conscious and caring about the issue?

– with what incentives?

WHAT SHOULD WE DO WITH THE WASTE?
If we end up with leftovers and unused groceries anyway?

Feed to animals
Biodegrade it:
   - composting
   - anaerobic digestion

OR:

Freeze it!
Buy only what you need
Use up your leftovers in new dishes
Make juice and pickles etc.
Store properly
Reorganize the fridge
"Best before" is not equal to "Toss-by"
Watch your Trash

Appendix V: Pugh matrices

	Smart storage	Cooking top	Monitor device	Flexible mat	Virtual chef	Frying surface	Thermo bowl	Smart sink	Cutting tool	Green house	
THOUGHTFUL											
empathy	5	4	2	3	4	3	3	3	4	3	
insightful	4	3	3	4	3	4	5	3	3	2	
INNOVATIVE											
progressive	5	4	4	4	4	3	5	3	3	3	
ingenious	5	3	5	3	5	4	4	3	2	1	
OBJECTIVE BASED											
futuristic	4	3	4	3	5	3	4	2	1	2	x2
experience based	4	4	2	2	5	2	2	1	1	3	x2
problem solving	5	1	4	1	3	4	3	5	4	1	/2
consumer fit	4	5	3	1	2	4	2	3	2	2	
scope	4	4	3	2	4	3	2	1	1	3	
TOTAL:	**46**	**38**	**34**	**28**	**44**	**33**	**35**	**25**	**21**	**25**	

	Piccaboo system	Modular shelf	Sliding doors	Cooking island	Modular storage	Green house hood	Suspending green house	Decorative element	Green house doors
OBJECTIVE BASED									
Visionary	5	4	3	3			3	2	2
experience based	5	2	4	5			3	2	2
problem solving	5	5	4	5			2	1	1
Feasibility									
Viability	5	5	5	5			3	5	5
Space effecient	5	3	4	4			5	4	2
Trend fitting	5	4	4	4			2	3	3
scope									
TOTAL:	30	23	24	26	0		18	17	15

Too many concepts on cooking islands / Can apply this concept in the piccaboo system
Sliding doors and modular shelf can be incorporated in the piccaboo system

	MISTO SHELF	RUBIX	THE MODULE
OBJECTIVE BASED			
Visionary	5	2	4
experience based	5	3	4
problem solving	5	4	4
Viability	4	4	4
Space effecient	5	4	4
Trend fitting	5	4	3
Maintaince	5	3	3
Sustainability	5	4	4
Customizability	5	3	3
Holistic design	5	4	4
Scope related	4	4	4
TOTAL:	53	39	41

HUMAN .... FUTURISTIC // HITECH

Friendly, Recognizable, Intuitive, Comfort, Inviting, Ergonomic

Updated

Curiousity Welcoming Modern

Coming segments

Advanced, Prerequisits, "State-of-art", Trend setter, New thinking, Unseen

USABILITY

POSSIBILITIES

CHANGING/QUESTIONING PARADIGMS

INSPIRATION BOARD .... FUTURISTIC // HITECH

New thinking
Trend setting
Prerequisits
"State-of-art"
Advanced
Unseen

INSPIRATION BOARD .... HUMAN

Recognizable
Ergonomic
Intuitive
Friendly
Comfort
Inviting

NATURAL TEXTURES

GROWING

IN DIFFERENT MATERIALS, ALONE AND TOGETHER,
VERTICALLY AND HORISONTELLY

PLANT SHAPES

NATURAL DESIGN CUES

MOVEMENTS, LIGHT, FULL OF LIFE, CHANGING

PLANT DESIGN

INTERIOR

RAW / NATURAL MATERIALS, VISIBLE CONSTRUCTION,
COMBINING MATERIALS

PLANT DESIGN

INTERIOR

OPEN PLANNING, SIMPLICITY AND LIGHT

FUTURE KITCHEN TRENDS

OPEN PLANNING, HIDDEN TECHNOLOGY,
FUNCTIONALITY & SIMPLICITY

WORKING SPACE TRENDS

INTEGRATED, MOBILE, TEMPORARY

FUTURE KITCHEN TRENDS

OPEN PLANNING, HIDDEN TECHNOLOGY,
FUNCTIONALITY & SIMPLICITY

MODULAR INSPIRATION

REPETETIVE AND CUSTOMIZABLE

CONTROL UNIT

CONTRAST, SHARPNESS & MINIMALISTIC

SHELF AND POTS

NATURAL, PURE, HONEST