

*Master Thesis*

# Product Design of a Measurement Solution for Cooking & Baking

*Katy Ho & Martin Petersson*

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*Division of Machine Design • Department of Design Science  
Faculty of Engineering LTH • Lund University • 2013*



**LUND UNIVERSITY**



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## **Preface**

This report describes the process and result of a Master Thesis Project in Mechanical Engineering with Industrial Design at the division of Industrial Design and Machine Design at Lund University.

This project was made for Hammarplast Consumer Ab. Catharina Cronsjö has been our contact and supervisor and has provided valuable comments and feedback during the process. Per-Olof Johansson has been our contact from the manufacturing side of the company and provided guidance and support.

We would like to thank our supervisor at the division of Industrial Design and Machine Design at Lund University, Per Liljeqvist for inspiring conversations and advice.

We would also like to give thanks to our assistant supervisor, Katarina Elnér-Haglund who has been a great support during the project.

We would like to thank Per Kristav and Karl-Axel Andersson for their contributions and comments to the result of this project.

Thanks to Soniya Sjöberg and Lisa Förare Winbladh for sharing their expert knowledge in the field of cooking.

Thanks to all the people who were kind to let us observe them while they were cooking.

Lund, June 2013

Martin Petersson & Katy Ho



## Abstract

This report is part of a Master Thesis Project in Mechanical Engineering with Industrial Design at the Faculty of Engineering LTH at Lund University. The project was performed in collaboration with Hammarplast Consumer Ab, a Swedish company founded in 1947 manufacturing household items in plastic. Hammarplast Consumer Ab is part of the Orthex group, which is the leading Nordic company within the field of household items.

The goal of this project was to design and develop a consumer product for measuring dry and liquid ingredients in the context of cooking and baking. The project concerned the design of appearance and functionality as well as technical requirements and considerations.

The preparation of cuisine always requires measuring to some extent. Recipes provide guidelines for inexperienced chefs with instructions and quantities of the ingredients that make up a meal. The act of cooking relates to cultural identities and traditions. The project commenced with an exploration of the concept of measuring and measurement systems. Further investigation into the attitudes of chefs at home and professionals followed. Interviews and observations were used to gain knowledge of the user, the environment and context in which cooking and measuring of ingredients is performed. A market analysis of products for the kitchen and brands operating in the field of kitchen appliances was performed. The market research revealed a saturated market and presented a challenge to come up with an innovative solution.

Knowledge gained from observations and interviews was the point of departure for the ideation process. A persona was formed to gain a clear target for aesthetic and functional design considerations. Initial concept designs were further developed through subsequent evaluations with supervisors at Hammarplast Consumer Ab and the division of Industrial Design and Machine Design at Lund University. Among four concepts presented at the mid-point of the project, two were further developed. The final concept was decided upon in discussions with the company.

The result of this thesis is a production-ready design concept for measuring of dry and liquid ingredients. A user-centered design process revealed that measuring devices present an interface between users and ingredients. This insight led to innovative features in the final product.

**Keywords:** Measuring, Kitchen utensils, Plastic, Product design, Product development



## Sammanfattning

Denna rapport är en del av ett examensarbete inom civilingenjörsutbildningen Maskinteknik med Teknisk Design på Lunds Tekniska Högskola. Projektet utfördes i samarbete med Hammarplast Consumer Ab från mitten av januari till slutet av juni 2013. Hammarplast Consumer Ab är ett företag som utvecklar och tillverkar hushållsprodukter i plast. Hammarplast Consumer Ab ville utöka sitt produktsortiment för varumärket Gastromax som står för högkvalitativa köksverktyg för hemmakocken. Uppgiften var att utveckla en produkt för mätning av torra och flytande ingredienser.

Varumärket Gastromax har funnits sedan början av 90-talet. Stekspadar, skedar och andra produkter i plast har på senare år utökats med en serie knivar såväl som stekpannor och grytor. Produkten som det här projektet omfattar skulle tillverkas i plast och med formsprutning. Gastromax står för kvalitativa, robusta produkter med funktionalitet och innovation som ledord.

Projektet initierades med en undersökning om mätning som fenomen. Existerande mätsystem analyserades tillsammans med kokbokslitteratur. Studier av attityder kring exakthet och mätande gav kunskap om hur en produkt kan underlätta för användare. Intervjuer och observationer följde analysen av litteratur. För att få en tydlig bild av hur människor tillämpar mätning inom matlagning och bakning bestämdes det att både professionella kockar och hemmakockar skulle besökas. Testpersonerna fick laga ett förutbestämt recept med ett antal mätmoment. Observationer av deras utförande såväl som miljön i köket följdes av fördjupande intervjuer.

En marknadsanalys genomfördes i vilken en stor mängd butiker för köksprodukter besöktes i Köpenhamn och Malmö. Stor vikt lades vid att tillgodogöra sig kunskap om material och uttryck hos produkter. Ytor, textur och uttryck såväl som funktionalitet hos produkter låg till grund för att sedan kategorisera dem. Fyra uttryck blev definierade som rådande bland köksprodukter på marknaden: *lekfulla*, *uppfinningsrika*, *formella* och *konventionella*.

En trendanalys utfördes för att bredda den marknadsundersökning som tidigare utförts. Här gavs utrymme att undersöka bredare strömningar med ett fokus på konsumentprodukter. Slutsatserna av trendanalysen gav inspiration och vidare kunskap om vad som skulle kunna skapa en framgångsrik produkt.

De tidigare utförda intervjuerna och observationerna sammanställdes och analyserades. En tydlig persona formulerades för att rikta produkten mot. Den fiktiva

karaktären fördjupades med ytterligare information om vanor, boende och vänner. I den här fasen skapades flera bildkollage för att skapa en tydlig visuell representation av för vem produkten var ämnad.

Med intervjuer och observationer, persona och bakgrundskunskap som grund skapades en funktionsanalys där den framtida produktens nödvändiga och önskvärda funktioner definierades. Idégenereringsprocessen inleddes med utgångspunkt i denna funktionsanalys och områden som identifierats som viktiga genom observationer av hemmakockar och professionella. Ett omfattande arbete lades ner på att generera en stor mängd koncept genom brainstorming och snabba skisser. Efter en utvärdering mot funktionsanalysen kasserades flera koncept. De återstående grupperades efter teman som funnits viktiga och återkommande under idégenereringen. En fördjupning av hur användare och i synnerhet projektets persona använder sig av mätverktyg följde. Flera viktiga insikter i den här fasen ledde till att en mängd idéer visualiserades genom skissmodeller och skisser för att tydliggöra och validera dem. Slutligen sammanställdes fyra designkoncept som presenterades för företaget. Företagets åsikter värderades högt i den här utvärderingen och av de fyra togs två koncept vidare och utvecklades ytterligare.

De två vidareutvecklade förslagen var snarlika i funktionalitet och har distinkt formade kärler där en rak yta möter en cylindrisk form. Efter vidareutveckling av koncepten presenterades förändringar som gjorts för företaget och beslut togs att vidareutveckla ett av koncepten ytterligare. Valet baserades på flera faktorer varav möjligheter till att optimera tillverkningsprocessen var en del. Det valda konceptet har fyra enheter som utgörs av tesked, matsked, 1-deciliter samt 1/2-liter. De tre mindre enheterna har långa skaft som med en organisk form ansluter till kärlet.

Det valda konceptet skrevs ut med 3D-skrivare och användartester utfördes för att validera funktionaliteten hos produkten. Två testpersoner fick med hjälp av produkten tillaga en rätt som anpassats för att kunna observera hur mätproblematik löstes. Tre olika utformningar av grafiska element som text och markeringsstreck utvärderades också med testpersonerna.

Resultatet är ett underlag för en produktionsklar design som presenteras i tekniska ritningar såväl som renderingar. Den slutgiltiga produkten presenteras i två olika färgval. Formen är anpassad för att erbjuda hög funktionalitet och uppvisar kontraster mellan organiska ytor och skarpa geometrier. Funktionsmässigt har greppet och kommunikationen med användaren varit i fokus. De långa handtagen möjliggör för användaren att komma åt i alla typer av förpackningar för att fylla kärlet med ingredienser. Samtidigt kan hög stabilitet erbjudas genom att greppet lätt och bekvämt kan flyttas till precis intill kärlet, om exempelvis vätskor ska hanteras. I mötet mellan den raka ytan som bryter den cylindriska formen skapas två pipar för att underlätta tömning av kärlet för både höger- och vänsterhänta användare.

I diskussionen framgår att processen delvis varit mer iterativ än tidigare förutsett. Djupare insyn i företagets strategier angående produkten och varumärket hade troligtvis underlättat projektet. Ytterligare möten med produktionstekniker på

företaget hade också varit önskvärt om tidsramarna tillät det. Vidare bestämdes förpackningsdesign och distribution ligga utanför projektets ramar, något som också hade varit högst önskvärt att fördjupa med ökade resurser.





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# 1 Introduction

*This section defines the background and context, which is essential to the subject of kitchen utensils in general and especially measuring devices. A short history of Hammarplast Consumer AB and the Orthex Gastromax brand is also presented.*

## 1.1 Background

When looking at systems and concept for measuring, one will inevitably come across a myriad of different ingredients and also the results of almost infinite combinations. A meal could be defined as a combination of ingredients. By popular definition, a meal could also be defined as any of the regular occasions in a day when a reasonably large amount of food is eaten. The word *mæl* has Germanic origin and implied a fixed timeframe or measurement [1]. The ingredients of a meal are the result of cultural and social context in which the meal is served. Contents and description of a meal is also typically different at different times of the day e.g. *breakfast* being different in content and name to *dinner* in western culture.

Humans are omnivores which inevitably begs the questions of what to eat and why. There are different approaches to answer that question. The content of our meals is debated among scientists as well as journalists. On one hand, the ingestion of nutrition can be seen as the main function of *eating* while on the other hand, it can be seen mainly as a cultural and social event. While the latter view does not exclude ingestion of nutrition, it does put it second to cultural and social values perceived. While the possibilities of what to eat are many we generally tend to be conservative concerning our consumption of food but there are of course national, regional and demographical differences in attitude. What is *edible* is a social agreement, which is in constant change. [2]

## 1 Introduction

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Before anything is eaten, we are generally fond of preparing raw ingredients in one way or the other. Meat is often grilled or fried, possibly minced or cut into pieces before cooking; vegetables are chopped or cut into shapes whilst other raw ingredients require much more elaborate processes in several steps to reach a desirable refined state. The preparation of raw ingredients is a process in which we transform, what is essentially energy for our bodies, into a form dependent upon technological as well as cultural and social context. Humans are unique among animals in the use of fire for preparing food. The result is the application of heat upon raw ingredients, a concept generally described as *cooking*. [1]

Cooking, defined by application of heat upon raw ingredients, involves countless methods e.g. *baking*. Measuring in this context is a way to reproduce proportions of a dish or meal but it is also, as part of a recipe, a bearer of cultural significance and traditions. More precise measuring requires tools such as measuring spoons or scales. All measuring in a cooking and baking context is to be examined in this thesis with the aim to develop a product for the measuring of dry and liquid ingredients.

### 1.2 Hammarplast Consumer AB

This thesis and the final result is conducted in collaboration with Hammarplast Consumer AB. Formerly known as Hammarplast AB and founded in 1947 by brothers Carl & Hugo Hammargren, Hammarplast Consumer AB is now part of the Orthex group [3]. Production is still situated in Tingsryd and the main product categories of products are storage products, products for the garden, kitchen utensils and other household items.

Other consumer brands also belonging to the Orthex group are produced at facilities in Tingsryd and elsewhere. Among them, Orthex Gastromax is a consumer brand for kitchen utensils. The brand was initially founded in Gislaved and focused on producing kitchen tools in polyamid enabling chefs and home cooks to use non-stick frying pans and casseroles without damaging them. Today, products carrying the brand are knives, frying pans and cooking pots but products in plastics are also an essential part of the product portfolio. At this point, the brand is in a re-imagining phase with several new products and new packaging in development. The result of this thesis is a product carrying the Orthex Gastromax brand.

## 2 Goal

*The goal of this project was defined with a brief and a scope in collaboration with Hammarplast Consumer AB.*

### 2.1 Brief

In collaboration with Hammarplast Consumer AB the aim of this thesis is to develop a product for measuring dry and liquid ingredients in a cooking and baking context. Catharina Cronsjö, Product development lead at Hammarplast Consumer AB, and Per Liljeqvist, designer and lecturer at the division of Industrial Design at Lund University will act as supervisors throughout the project. Assistant supervisor, for her expert knowledge of plastics, is Katarina Elnér-Haglund at Machine Design at Lund University.

Preparing cuisine sometimes requires tools for measuring of both dry and liquid ingredients. These tools are considered basic requirements in most households. Cooking and baking is part of a cultural identity. We are exposed to cooking as a lifestyle through literature, television, magazines and the Internet. The web enables anyone to quickly find inspiration as well as publishing recipes or conversing with other people interested in food. As a consequence, smart, sustainable and well-designed products for the kitchen are in high demand.

The result of this thesis will be a product carrying the Orthex Gastromax brand. The current product portfolio consists of knives, cooking pots (stainless steel products) and various kitchen utensils (primarily plastic products). The product developed in this thesis is to be manufactured through injection moulding of a plastic material.

### 2.2 Scope

During 20 weeks, the master thesis is carried out at Lund Institute of Technology. The product development process is conducted in collaboration with Hammarplast Consumer AB. The project will include market research: an investigation and identification of competitors as well as other existing products for measuring. It is

## 2 Goal

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also crucial to gain a thorough understanding of the user's relationship to measuring while cooking and baking.

The focus of this project is the development of a kitchen product for measuring. In addition to functionality and aesthetical aspects, technical requirements should be considered nonetheless. The final concept is to be designed to be production-ready, defined in agreement with Hammarplast Consumer AB. The development of packaging, distribution channels and brand strategy is not to be considered part of this project. However, as consumer products cannot be designed without keeping this in mind, considerations will be made, but explicit attention will not be given.

The target group for the Orthex Gastromax brand is demographically broad, defined by an interest in food and cooking and an urge to effortlessly carry out this interest in their home. According to Catharina Cronsjö at Hammarplast Consumer AB, products carrying the Orthex Gastromax brand are positioned as *massmarket premium*, its distributors being the owners of leading retail store chains in the Nordic countries, Coop, Bergendahls, Axfood and ICA Gruppen AB.

*Massmarket premium* implies that within the confines of mass-market consumer products, the Orthex Gastromax brand is positioned at an above average price point. However, *premium* is nonetheless limited only to price. The concept of premium and what constitutes a *premium product* depends on a multitude of factors in relation to the context of which a product operates. The consumer's perception of a product's value is complex and constitutes an extensive research. Such research is not within the scope of this project. However, in discussion with Hammarplast Consumer AB, a set of attributes to keep in mind during the design process was developed:

- Long-lasting quality
- High functionality
- Robust
- Innovative

Measuring in a cooking context is carried out within present cultural frame of references i.e. measuring systems and traditions. In Sweden, *The International System of Units* or SI is the standard most often used to define amounts of liquid and dry ingredients in recipes. Kitchen measurements are traditionally derived from tools present in the kitchen, e.g. tablespoons or teaspoons. In the pre-study, three systems of measuring are thoroughly looked upon: US Customary Units, SI and UK Imperial Units. While doing market research, measuring tools carrying any kind of measurements are to be examined. Concerning market research, all types of kitchen tools are to be examined, mapping well-known expressions of products for the kitchen and to get a thorough understanding of consumer choices regarding aesthetics and practices in the kitchen.

## **3 Method**

*This chapter describes the method and different steps implemented into the project. Vilda idéer och djuplodande analys by Jan Landqvist [4] and Design Methodology by Claus-Christian Eckhardt [5] are the foundation of this project's workflow.*

### **3.1 Brief**

Design brief of this project will be stated in agreement together with the company. It will include task description and the desired result of the project.

### **3.2 Project Plan**

In order to make the workflow efficient and comprehensible, a project plan was created. The project plan also aids as a communication tool among involved parties. The design process is an iterative process; consequently some activities will overlap as described in the project plan, see appendix A.

### **3.3 Pre-Study**

An extensive research is required in order to get a thorough understanding of the topic. An investigation of attitudes towards precision in cooking is to be conducted. A short overview of existing measurements outside of Sweden will also be presented.

#### ***3.3.1 Target Group Research***

To be able to find and understand the consumer of the upcoming product, target group research is essential. The research is to be carried out through observations and expert interviews. A selection of subjects to study is to be based on gained knowledge from a secondary research. The aim is to identify customer needs. The final step in this section is to define a persona to serve as a design target.

#### ***3.3.2 Market Research***

Market research is necessary in order to explore competing products for measuring of dry and liquid ingredients. A benchmark is to be performed through visits at stores in Malmö and Copenhagen. An online selection of products is to be explored as well.

### **3.4 Analyse**

The analysis of data gained during the pre-study. The aim of this section is to gain knowledge that will aid as a point of reference further on in the development process.

### **3.4.1 Trend Analysis**

A short analysis on the new and next in consumer product design is to be conducted. A broad investigation into movements in society and technological development is to be the foundation for this analysis.

### **3.4.2 Function Analysis**

A function analysis is to be performed with the purpose of listing necessary and desirable functionality. This will aid as a basis together with the design brief, to evaluate concepts further on in the project.

### **3.4.3 Material**

Literature and discussion with supervisors will be used as guidance during a secondary research. A primary research will also be conducted in order to gain visual and physical understanding of material qualities.

## **3.5 Visualise**

Key insights and opportunities gained during the pre-study- and analyse phase will be visualized as conceptual designs in this section.

### **3.5.1 Ideation**

Ideation revolves around the generating of ideas through short and intense brainstorm sessions. The ideation phase will likely include the building of simple prototypes of mock-ups for verification of concept designs.

### **3.5.2 Evaluation**

An evaluation will be performed continuously during the process of ideation. The evaluation will primarily be based upon the function analysis and discussions with supervisors.

## **3.6 Realise**

When a concept is refined and evaluated in the stage of visualisation, it is time to put the concept into context. Computer aided design (CAD) and rapid prototyping was used. The goal of this stage is to produce technical drawings of the final concept to make it production ready.

### **3.6.1 Prototypes**

Simple prototypes will be made with using 3D-printing of ABS plastic. Prototypes created with this method will be relatively rigid and tough. The surface finish will however be of low quality; hence the focus for these prototypes will be functionality aspects.

### ***3.6.2 User Testing***

User testing will be conducted in order to gain valuable insights. Functionality of the design will be a key focus of this testing.

### ***3.6.3 Further Development***

Final modifications will be made based on user testing, prototypes, manufacturing limitations and discussions with supervisors.

### ***3.6.4 Conclusion***

Reflections and conclusions of the project will be stated. Recommendation for future development will be discussed.



## 4 Measuring

*Measuring involves magnitude, dimensions and uncertainty. It is of interest to identify in who and in what situations measuring is needed while preparing food. The most established approach to use measurements within the field of food and cooking is in recipes. The definition of recipe is a set of instructions for preparing a particular dish, including a list of the ingredients required. These instructions can be found in cookbooks, cooking shows or websites.*

### 4.1 Existing Measurements

Recipes commonly specify the ingredient by mass, volume or count. The unit given varies depending in what part of the world a recipe is written or published. A unit is a fixed magnitude of a physical quantity that is used as a standard for measurement. [6]

When looking at the modern western part of the world, there are three major systems of units. This includes the international system of units, the imperial units and US customary units. Most of the modern systems have evolved from traditional ways of measuring, based on dimensions of the human body. See table 4.1 for an overview of the most common unit used in Sweden, The United Kingdom and The United States.

#### 4.1.1 The International System of Units

This system is widely adopted throughout the world and was originally based on the metric system in France, introduced in 1791. The International System of Units or SI is still referred to as the metric system, although this includes many early versions of the original metric system that was founded in France. When designing the system for global use, it was decided that measurements are based on logical rather than empirical relationships. Decilitres and litres are used when measuring volumes, while grams are used when measuring mass. [7]

#### 4.1.2 The Imperial System

Imperial units first came into use in the British Empire. Even though Great Britain has officially adopted the metric system in the 20<sup>th</sup> century, it is in practice only partially adopted. The imperial system was introduced 1842 in Great Britain. Similar to Great Britain, most countries having once used the imperial system are now officially using the metric system, but imperial units are still in limited use. However, Canada is an exception for still using the Imperial System as their official system of measurement.

In traditional British measurements, weights are measured using ounces and pounds. Volume is measured using Imperial gallons, quarts, pints and fluid ounces.

### 4.1.3 US Customary Units

This system originated from English units, which were the predecessors of the imperial units. US customary units are almost identical to the existing imperial system, however there are several differences. The United States belongs to one of few countries in the world that has not adopted the International System of Units as their official system. However, the metric system is present in some sectors such as science, medicine and government. Currently both the Imperial System and US Customary Units are defined in the terms of International System of Units. When baking and cooking in the United States, pounds and ounces are used for weights. Volumes of both dry and liquid ingredients are measured in teaspoons, tablespoons and cups. In recipes, these units are also often stated in halves, thirds, quarts or eighths. [8]

### 4.1.4 Measurements in cooking and baking

When looking at various cookbooks, units of measurements only found in the context of cooking and baking was also encountered. These units rarely require preciseness when used; they are all to some extent informal. This could include the tablespoon, teaspoon, dessertspoon or cup. These measurements define volume and can be used with both liquid and dry ingredients. Although measurements share the same names, there is little consistency with the defined quantity in between countries. In Sweden a tablespoon is defined as 15ml, while a tablespoon in the United Kingdom is defined as a somewhat smaller volume. On the other hand, a tablespoon in the US is a somewhat larger volume than a tablespoon in Sweden. [9]

### 4.1.5 Vague measurements

Some measurements in recipes are vague and locally or culturally dependent. These measurements can vary considerable geographically and socially. Examples of measurements having a strong local dependency are jars, packages, or sticks. Some recipes also states the size of ingredients as a measurements e.g. *two big potatoes*. Other vague measurements often present in recipes are based on the human body e.g. *a pinch of salt* or *a handful of parsley*.

**Table 4.1** Shows the most common units based on secondary research of cookbooks, the units are divided into three different regions: Sweden, The United Kingdom and The United States.

### Common Units

	Sweden	UK	US	Abbr.
<b>Volume</b>	Teaspoon	Teaspoon	Teaspoon	tsp
	Tablespoon	Tablespoon	Tablespoon	tblsp
	Kryddmått			
	Kaffemått			
	Deciliter	-	-	dl
	Liter	-	-	l
	-	Fluid ounces	fluid ounce	fl oz
	-	Gill	gill	gi
	-	Pint	Pint	pt
	-	Quart	Quart	qt
-	Gallon	Gallon	gal	
<b>Mass</b>	Gram	-	-	g
	Kilogram	-	-	kg
		Pounds	Pounds	lb
		Ounce	Ounce	oz
		Cup	Cup	
<b>Length</b>	Millimeter			mm
	Centimeter			cm
		Inch	Inch	in
		Foot	Foot	ft
<b>Other</b>	Jar			
	Package			
	Handful			
	Pinch			

Green= UK  
variations may  
occur

Blue = US  
variations  
may occur

### 4.2 Attitudes in Recipes

The attitude towards measuring and preciseness is not consistent throughout all kinds of cooking. The act of preparing food is diverse, e.g. baking, boiling, frying, microwaving, roasting and smoking. Which method to use can vary greatly depending on the context where food is prepared, e.g. at home, at a restaurant or at a school kitchen. It can also vary according to whom is preparing food, e.g. an expert or a homemaker. Consequently a need for exploring attitudes concerning measuring within cooking emerged. To attain this, available secondary resources was looked upon through a screening among cookbooks, food magazines and food blogs. The resources were picked with as much variety as possible in the context of baking and cooking.

#### 4.2.1 Results

The result of the exploration was a categorisation of literature [see appendix B]. Sources are placed along the axis depending on how concerned about precision it was perceived to be. Texts were judged based on how detailed the instructions of the recipes were stated, the units and dimensions used as well as the overall language. Literature that ended up on the *not concerned* side of the axis, tended to be more historical and entertainment oriented. Among those were historical cookbooks with recipes from the 19<sup>th</sup> century, which were very vague in stating the quantity of ingredients. *Barnens bästa fest!* Written by Anna Lind [10], mainly concerned the joy of a child's party and shared the same vagueness in instructions.

The majority sources were placed at the middle section of the axis. Most texts at the middle section concerned lifestyle and health food. Many blogs and magazines fall into this category, promoting a certain lifestyle rather than presenting precise instructions. Many celebrity chef cookbooks also fall into this category since their target group are often non-professionals.

Lastly, the most precise instructions are found in text about bread, pastries and gastronomy. Examples among these are *Pâtisserie* written by Michel and Albert Roux. [11] The quantities of the ingredients are often stated in weight, detailed instructions of how to execute each step and recommendations of what kind of tools to use are common.

This scanning is unavoidable subjectively performed. However, the scanning provided an insightful look into the climate of recipes writing. This is essential to the project, since measuring in cooking is highly connected to recipes.

## 5 Market Research

*This section is concerned with measurement devices as well as other kitchen products found in physical stores and web shops, analysis of aesthetics and brands encountered.*

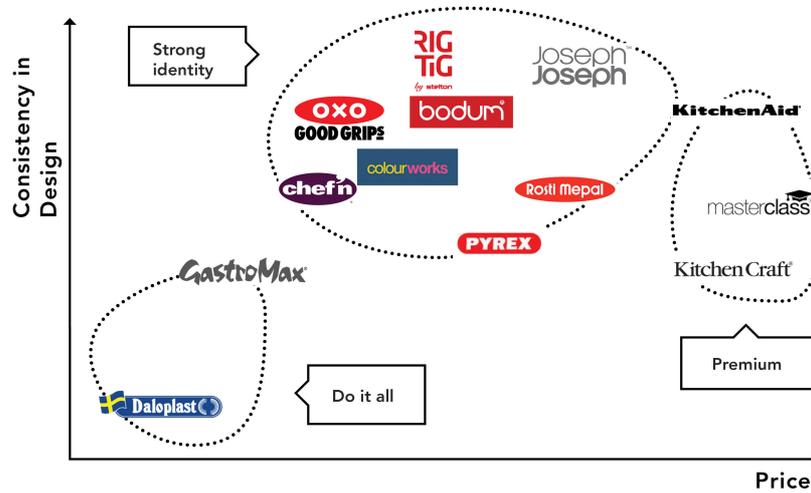
Since this chapter discusses perceptions of consumer products for the kitchen and brand values, concepts such as *premium* and *basic* are used. These are complex concepts, dependent on the consumers' preconceptions and knowledge.

### 5.1 Benchmark

Benchmarking was carried out to get a grip of the range of products for the explicit task of measuring liquid and dry ingredients, as well as kitchen products in general. The start of the market research was an extensive look through stores with kitchen products in both Malmö and Copenhagen. Stores were chosen to cover what is available to the customer looking for premium products as well as those searching for basic kitchen appliances. Getting a feel of different materials and their attributes associated, as well as a technical solutions applied is crucial in understanding the customer when deciding on a certain brand or product. An extended benchmark was carried out on web shops operating on a global scale.

### 5.2 Analysis of brands and identified aesthetic expressions

Summarizing impressions from Copenhagen and Malmö, a categorization of products as either *basic* or *premium* was not sufficient. Three classifications to more accurately describe the positioning of brands encountered were identified: *Do it All*, *Strong Identity* and *Premium*. See figure 5.1



**Figure 5.1** Diagram showing brand positioning in terms of consistency in design and price.

Further categorizing the impressions from the benchmark, four aesthetic expressions, which were deemed most prevalent and influential, is presented below. Some products do not entirely represent one or another aesthetical expression, instead they are made up of combinations, see figure 5.6.

Bold shapes and saturated colours categorize *Playful*, see figure 5.2. This is a style, which makes kitchen tools almost resemble toys. Products from this category are almost always put to be highly visible in stores where they are present. Colour is important for product visibility and instant attractiveness. Plastic is the typical material. Different polymers are sometimes combined in the same product e.g. Polyamide together with a Thermoplastic elastomer.



**Figure 5.2** Identified characteristics of the aesthetic expression *playful*.

## 5 Market Research

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*Inventive* is an expression where the proposed *smart* use scenario is the main selling point, see figure 5.3. The products are often designed to solve a very specific task e.g. measuring of sticky substances. The design is often complex and it is common to decrease the perceived complexity with a minimalist styling. Ergonomics are often touted as a primary feature.



**Figure 5.3** Identified characteristics of the aesthetic expression *inventive*.

Some kitchen products have a *Formal* expression, where shape and form is cold and austere, see figure 5.4. Materials are metals, glass and plastics. Performance and quality of materials is important but designs are often conventional and self-explanatory.



**Figure 5.4** Identified characteristics of the aesthetic expression of *formal*.

## 5 Market Research

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*Conventional* kitchen products are products that are un-exceptional in appearance and functionality, see figure 5.5. The material is often plastic. Colours are used sparingly and products are made to first and foremost be functional and useful. Their appearance is consciously restrained.



**Figure 5.5** Identified characteristics of the aesthetic expression of *conventional*.

### 5.3 Conclusions

Measurement devices for the kitchen, represented by volume measurements in the chart below, were mapped out according to appearance. Both low and high price points exist among all four identified expressions.

Playful and Conventional designs are generally popular. An inventive or Formal approach is less common among kitchen measurement devices.

Brands of *premium* and *do it all* categories are slightly more common to use a *Conventional* design while *Strong Identity* brands are leaning towards using a *Playful* or *Inventive* expression in their designs.

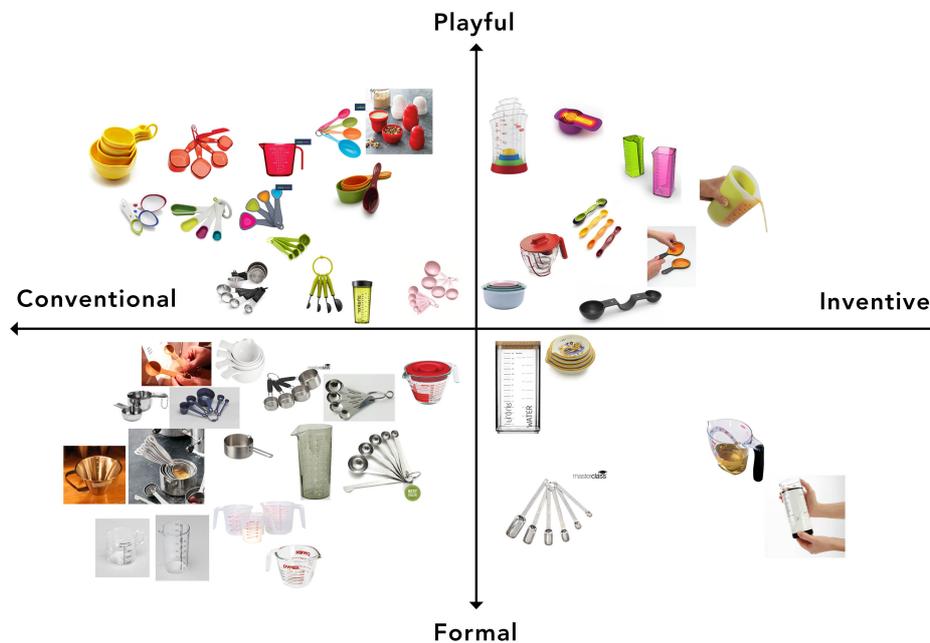


Figure 5.6 Market position diagram.



## 6 Trend Forecasting

*This section describes a search for broad movements in science, society and technological development, widening the scope of research beyond kitchen products.*

### 6.1 Methods and sources used

Searching and identifying change in attitudes and movements in science, technology and society, involved intuition and reasoning. The method was inspired by *The trend forecaster's handbook*, by Martin Raymond [12]. The aim was to take in relevant information in order to predict future scenarios. In order to take in relevant information, time must be spent to detect patterns or shifts in e.g. attitudes, mind-sets or lifestyle options according to Martin Raymond. Considering the timeframe of this project, only digital sources were being observed. The digital sources were global trend forecasting and related sites, which have the ability to collate, interpret or log trends. Three wide and multifaceted areas (*Fusion, Friends and Family* and *Surrealism and Escapism*) were identified and each of them represented by products or concepts.

### 6.2 Fusion

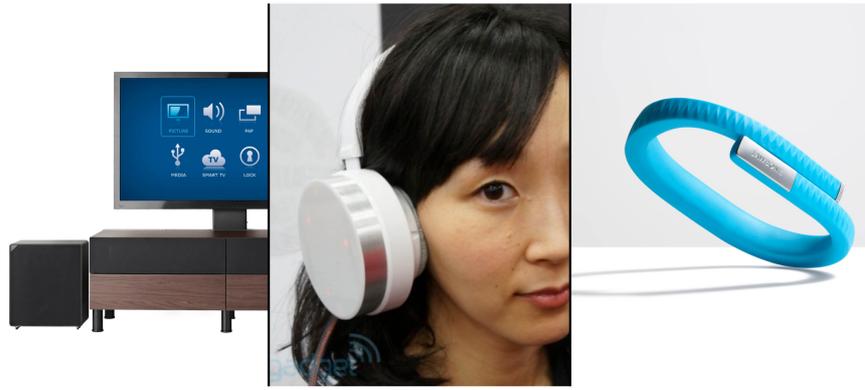
*Fusion* means combining different entities into a whole. In the context of consumer products and services, combining concepts or ideas are hardly uncommon. However, technology is enabling integration between services and products in every part of our lives at a higher degree than ever before.

The *Uppleva* TV-system from IKEA [13] consists of a TV and speakers as well as a combination Blu-ray/CD/DVD drive. But most importantly, the technology is integrated into an easy to assemble stand/furniture. IKEA is offering an all-in-one solution by the fusion of high-tech with low-tech into an inseparable unit. Another product symbolizing an integrated experience is the *Jawbone Up* [14]. The product is a fitness companion device, in the shape of a bracelet, with a microcomputer inside, tracking your activities and sleep patterns. It can also vibrate to tell you to get up and do work out, if it finds out your being inactive. The product is supposed to be worn at all times of the day. Putting technology closer and in sync with our bodies is even more tangible in *Mico Brainwave Speakers* [15]. These brainwave-controlled headphones communicate with a smartphone to select music based on the users' mood. This product puts the experience in the front seat and serves as an amplifier of the users current feelings.

## 6 Trend Forecasting

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Fusing of experiences and functions means an increase in complexity. Therefore a minimalist expression is an aesthetic which might become mainstream in consumer product design. Multiple use scenarios in a single product might be more common and combinations of diverse functionality could become mainstream. Content and/or experience will be of top priority in products and services.

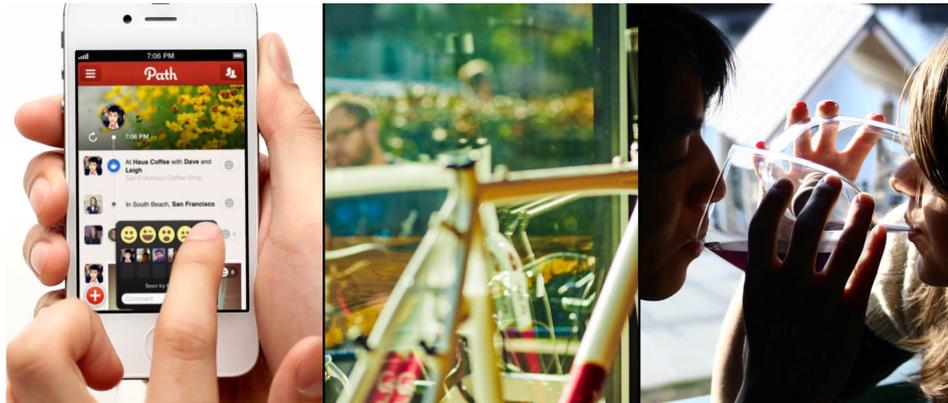


**Figure 6.1** Evidence of trends, *Uppleva IKEA*, *Mico Brainwave Speakers* and *Jawbone Up*.

### 6.3 Friends and Family

Looking into the development of relationships between people in an increasingly complex communication environment. The lines between work and free time are blurred. Digital social networks are continuously restructuring the way people communicate and connect with friends close and far. Going forward, digital communication will seem less intrusive. *Path* [16] is an example of a smartphone application connecting the user with only close friends and family for sharing experiences in a seemingly safe environment. The concept of physical meetings between friends is important and the design of consumer products reflects upon this idealisation. Usefulness is being put second in products such as the *Two-person glass*, which is unusable if not used together with another person.

Product design could benefit from looking into how people interact and idealise around themes of nostalgia as well as putting social encouragement ahead of function.

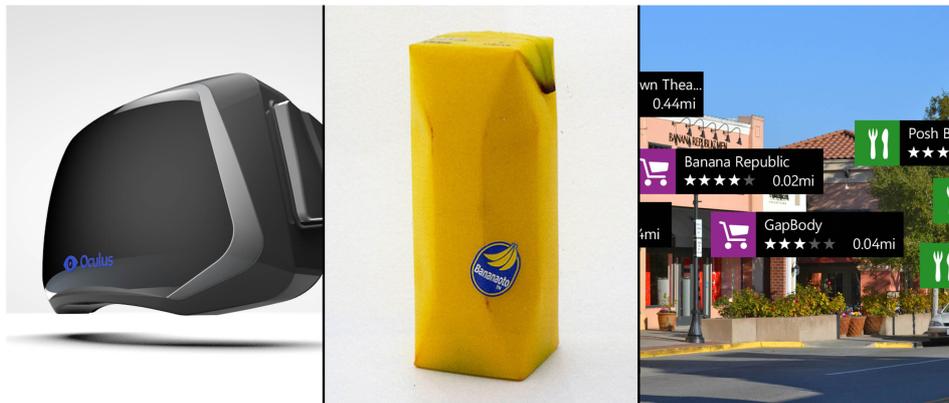


**Figure 6.2** Evidence of trends.

### 6.4 Surrealism and Escapism

Technology enables new experiences and functionality for our minds. Escapism is in effect at different degrees through products and services going mainstream. A head-worn virtual reality display, the *Oculus Rift* [17] is gathering attention from technology journalists and mainstream media for offering a relatively realistic escape from reality. *Nokia City Lens* [18] is an augmented reality application by Nokia for smartphones. It enables the user to see an overlay of their surroundings, with information for shopping as well as other purposes. This kind of service blurs the lines between digital and reality. Also blurring the lines of reality is the fruit juice packaging of *Naoto Fukusawa*. [19] Inspired by the fruits that make up the contents of the juice, these packages look as if the skin of a fruit has been moulded into a rectangular juice package. The product questions conceptions of reality but also serves as an example of the importance of an element of surprise in consumer products.

Surprise and delight is the key to toggle consumer's curiosity. The blurring of reality and the digital world could create a longing for awareness and mindfulness.



**Figure 6.3** Evidence of trends, *Oculus Rift*, *Naoto Fukusawa's* fruit juice and *Nokia City Lens*.

## 7 Target Group Research

*In order to gain further knowledge and specify the target group of the project, observations and interviews were conducted on a wide audience. The approach was at first vague, exploring attitudes towards preciseness and later narrowing to an identified persona with specific needs.*

### 7.1 User Observation

Sometimes it is preferred to perform an observation instead of an interview. Observations can reveal information of what actually happens in a situation, while interviews give information of what the subjects perceive. It is however important to be aware that interpretation of observations can vary depending on whom the observer is. According to *Doing Your Research Project* by Judith Bell [20] it is important to understand the meaning of an activity for those who are involved in it.

#### 7.1.1 Approach of Observation

The reason for conducting an observation is to identify attitudes towards preciseness and measuring during cooking and baking; to look for patterns within age, experience and context of the persons involved.

All subjects that were chosen to participate in the study were not necessary part of the primary target group, some operated rather as a source of inspiration. Although the brand Gastromax's target group is not for professionals, the behaviours of the professionals were nonetheless insightful, because of their experience handling kitchen utensils and being exposed to them on a daily basis.

There were five subjects in total; two of them had no professional experience with food, while the other three had an occupation relating to food. One of them was a pastry chef, the other two worked as chefs.

The study were initiated with the presumption that baking required more preciseness than cooking according to previous secondary research chapter 4.2, for that reason there was a need to separate cooking and baking. The subjects were handed a predetermined recipe; some received a baking recipe and others a cooking recipe. The recipes should require at least four measuring steps and the dish or pastry should be familiar to those living in Sweden. The chosen recipes were *Le cake au chocolat* by Sébastien Boudet and *Biff à la Lindström* by Leif Mannerström. [See appendix C]

The subjects did not know beforehand what kind of product this project was developing, in order to avoid biased behaviour. It was of importance to make the subjects feel relaxed while being observed; therefore the location was chosen to be

## 7 Target Group Research

the kitchen they spent the most time in. In this case it was either in the subject's kitchen at home or at work. This was also suitable in order to gain knowledge of what kind of equipment the subjects owned and observe how they stored and used them.

The approach of the study was deliberately chosen to begin as vague and open-ended, to prevent any preconceptions. Therefore doing an unconstructed observation [20] was suitable, because of its relaxed and open-ended nature. Definitions, structures and patterns were not defined until the observations were completed. All the observations were video recorded and field notes were taken.

Video recordings of the observations were analysed together with notes that were taken during the observations. Behaviour and statements that were considered relevant to the aim of the study were being translated into needs, see appendix D.

### 7.1.2 Analysing and Interpreting Data

Patterns and categorizations were identified among the interpreted needs from the observations. Three major themes were identified: *surroundings*, *execution* and *tools*. Within each theme, the needs are grouped into sub-themes.

**Table: 7.1** Identified themes and sub-themes from observations and interviews.

OMGIVNINGEN	UTFÖRANDE	REDSKAPEN
Dekorativt Kök	Inget till spillo	Estetiskt tilltalande samtidigt som funktionell
Rent Kök	Trygghetszon	Enkla att hantera
Ordningsam förvaring	Kontroll	Redskap nära till hands
	Mer kunskap	Betalar gärna mer för uppfattad som högkvalitativ
	Fysisk beröring	Ett mångsidigt redskap
	Improvisera	
	Enkelt & Opretentiöst	
	Precision	
	Bakning mer exakt än matlagning	

### 7.1.3 Conclusions

It was evident that the subjects that did not have cooking or baking as a profession cared for their surroundings in a higher degree than the professionals. The subjects [1, 4 and 5, see appendix D] that cooked/baked at home were very neat and cared for the appearance of their kitchen. They kept certain kitchen utensils for display at their kitchen counter, however it turned out that the displayed utensils were not always necessarily practical. Subject 5 did not use any of the kitchen utensils he kept on display; instead he took out another set of utensils he kept hidden in a drawer.

Regarding the theme *executions*, the observations indicated that subjects with less experience followed the recipes carefully. Both subject 2 and 3 who were both professionals, improvised to a high extent. They stated that they never used any measuring tools when cooking. However, when it came to baking, all of the subjects treated it with a more precise attitude. Both subject 4 and 1 weighed their ingredients when baking.

All of the subjects wanted a relaxed and no pretentious attitude towards cooking. The inexperienced chefs did cook according to the recipe, however they all strived for improvisation. Improvisation could be assumed as a feature that is desired and is linked to high experience. The professionals trusted their senses instead of recipes; they tasted their food continuously and had physical contact with the food while cooking. The professionals were also very careful not to waste any food; they scraped all the spoons and bowls very clean, since some ingredients tend to stick to the utensils.

The last theme, *tools*, explored attitudes towards kitchen utensils being used. The inexperienced-chefs reflected upon their utensils much more often, with both positive and negative statements. The professionals were not familiar with any brand of the utensils they were using. They did not have any particular statements about them either. It can be assumed that the professionals rely on experience and knowledge rather than the kitchen utensil's functionality.

## 7.2 Expert Interviews

There was a need to gain a thorough understanding behind the attitudes towards preciseness and measuring when baking and cooking. Expert interviews acted as a support to the observations in terms of giving a better understanding of the previous subject's behaviour in the kitchen.

Two persons, who were considered experts were interviewed, both have a vast experience working with food. The first expert was Soniya Sjöberg, she is a chef at the restaurant *Östra Grevie konferens & logi*. Besides being a chef she teaches cooking classes and compose recipes. The second interviewee was Lisa Förare Winbladh, a food journalist at the Swedish daily newspaper, *Sydsvenskan*, a published writer of her own cookbook and an influential blogger. Besides writing, she also lectures on themes concerning food.

### 7.2.1 Conclusions

According to Sonyia Sjöberg there is an unawareness of how to handle measuring tools and how they relate to each other. She has met a lot of people who does not know how many tablespoons goes into one decilitre and how heavy one decilitre of flour might be. These are issues more people ought to know when baking according to Sonyia. Another issue that she brought up was the difficulty to judge the volume of a measuring cup only by the looks of it. Sometimes she has a hard time believing the measuring cups for being the right size; proportions of the cups can make a huge difference according to Sonyia.

Lisa Förare Winbladh talked fondly of her kitchen utensils. She easily picked which ones she preferred with strong motivation. The mortar and the grater were her favourite tools. It can be presumed that Lisa was not afraid of using tools to help her achieve her goals in the kitchen, unlike the professionals in the previous observation [see chapter 7.1.3], who did not acknowledge their utensils to the same extent. During the interview with Lisa, she revealed that her attitude towards measuring was very precise. She has written a cookbook together with Malin Sandström called *Matmolekyler: Kokbok för nyfikna* [22]. The book has an ambition of teaching readers what happens at a molecular level when cooking. She believed that there was a lack of preciseness when people cook or bake at home and other recipe authors ought to be more precise in their instructions. To state why certain steps and amounts in the recipe should be precise is of importance; otherwise people will ignore the precise instructions according to Lisa.

### 7.3 Personas

The product will be offered under the brand *Gastromax*, which has a broad target audience. To be able to please as many as possible, it would be a greater success to focus on one single person to design for. Pruitt and Aldin states in their book *The Persona Lifecycle: Keeping People in Mind Throughout Product Design* [23], that designers often tend to take design decisions based on themselves, having a persona is a way to prevent this happening. A persona can aid as a clear target to design for, a memorable, engaging, and actionable image to serve as a design target. Personas are also a good tool for communication between members of the project, but also with external contributors.

#### 7.3.1 Persona of the project: Alfred

Alfred is 28 years old and pleased with his first job as a landscape architect. He is living together with his girlfriend in a two bedroom flat with balcony. The kitchen is small but neat, it has become the natural venue of the flat.

Alfred has several hobbies that he practices at home, among those growing his own chili. He also does photography and reads a lot. He often spends the weekends

meeting his few but close friends. The outcome is regular dinners around his wooden table in the kitchen. Alfred looks forward to these occasions and enjoys going to the local market hall and get inspired for the coming dinner.

Alfred is very curious about cooking and especially bread baking. However he is not very experienced in the kitchen yet. He wants to learn more and is always looking for new recipes and methods to explore.

Spontaneity while cooking is something Alfred would allow, he does not mind if the result is not exactly what he has imagined, as long as he gets to learn something new. He tastes the food continuously while cooking, this way he can be certain that the food he is cooking will taste good.

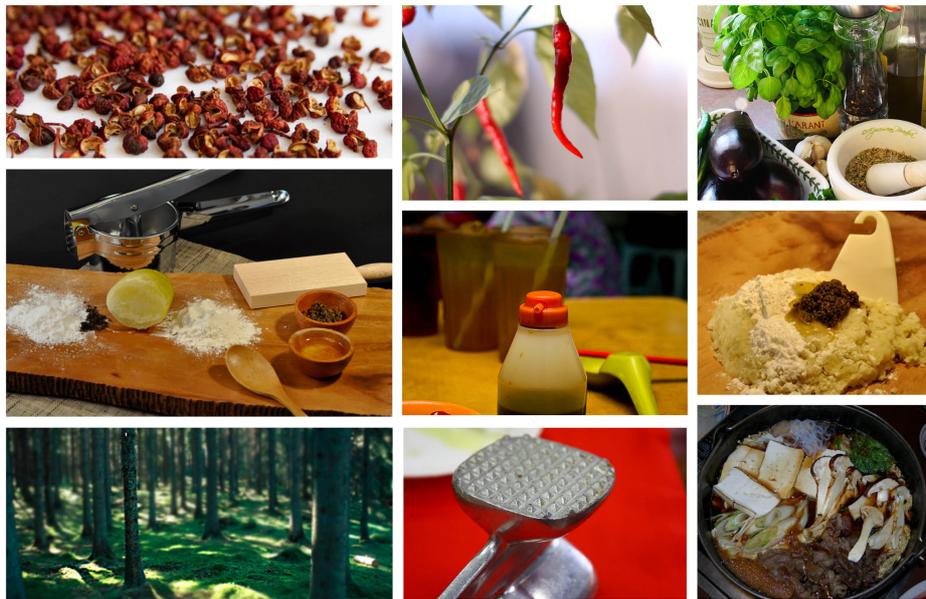
### **7.4 Image boards**

An image board is a compilation of inspiration elements. The inspiration derives mainly from the previous stated persona *Alfred*. Three themes emerged: *matbröd*, *desserter* and *husmanskost*. These three themes illustrate what the persona *Alfred* enjoy doing when spending time in his kitchen. In this sense, the themes also reflect the personality of Alfred and in extension, the expression sought in his kitchen. Most important to Alfred is *Matbröd*.



#### 7.4.2 *Husmanskost*

This main course contains experimenting with spices and herbs from far away. However, there is also an urge of keeping the traditional and basic elements of Scandinavian food. Tools are an important factor in this category and can sometimes be seen as a driving force of experimentation by enabling new methods of cooking. See figure 7.2.



**Figure 7.2** Image board of *Husmanskost*.

### 7.4.3 *Dessert*

When the main course is finished, a sweet course will enter the table. This particular dessert often comes in small individual portions and is made with great delicacy. It often involves fruit with its natural sweetness but also some experimental elements. It is ideally an experience of surprise and delight. See figure 7.3.



**Figure 7.3** Image board of *Dessert*.

## 8 Function Analysis

*A function analysis was performed and the purpose was to list all the needs and wants the product strives to satisfy. This was used as a foundation together with the design brief, to help evaluate concepts further on in the project.*

A list of wants and needs were identified through the pre-study, e.g. observations, expert interviews, literature etc. The ways the functions are phrased and compiled are based on Landqvist's book Vilda Idéer [4]. The reason for stating the functions only as verbs and substantives were to prevent spending time on expressing the functions and restrict the flow of ideas. Only functions concerned with usability were included because of the same reason to keep any restrictions as low as possible in the early phase of the project.

## 8 Function Analysis

**Table 8.1** Function analysis of usability.

Funktion		Klass	Anmärkning
<b>Funktionsområde: brukarfunktioner</b>			
Mäta	<b>Ingredienser</b>	HF	Torra och flytande ingredienser
Underlätta	Rengöring	N	
Erbjuda	Volymmått	N	
Underlätta	Hantering	N	
Kommunicera	Tydlighet	N	I funktion
Minimera	Antal komponenter	N	
Erbjuda	Enkelhet	N	I utförandet
Erbjuda	Grepp	N	
Förhindra	Fastsättning	Ö	Av ingredienser
Utstråla	Robusthet	Ö	
Underlätta	Förvaring	Ö	
Erbjuda	Stöd	Ö	I matlagning/bakning
Kommunicera	Relation	Ö	Mellan mängder
Uppmuntra	Spontanitet	Ö	I köket
Uppmuntra	Interaktion	Ö	Mellan människor
Uppmuntra	"Baknings/matlagnings glädje"	Ö	
Medge	Stabilitet	Ö	

## 9 Material

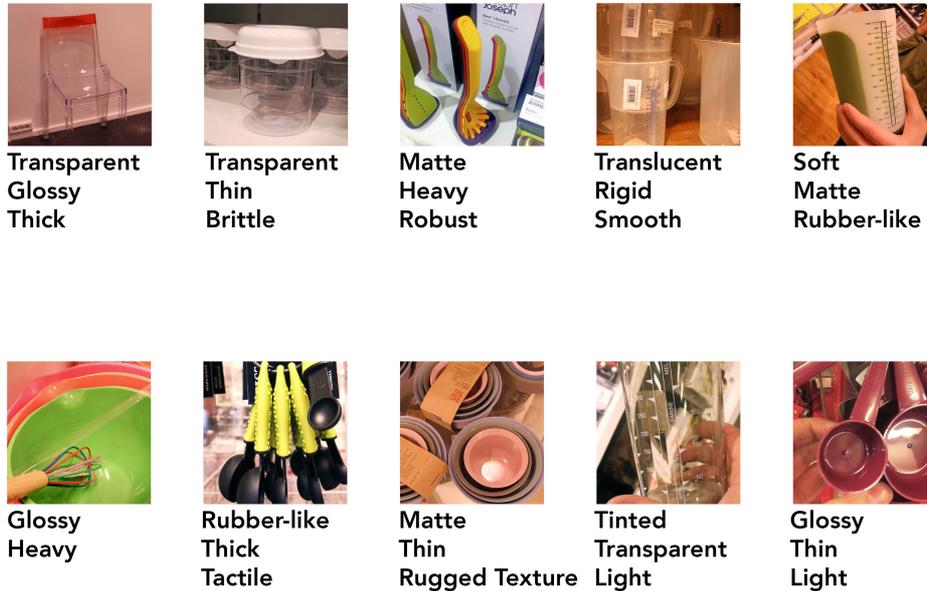
*The material of choice for this project is to be a polymeric material. Polymeric materials contain very large and broad classes of compounds. In this chapter the most relevant polymeric materials will be explored together with criteria that should be fulfilled. Literature and discussion with supervisors will be used as guidance during the evaluation and exploration process.*

### 9.1 Material Exploration

An exploration of existing plastic products in the market was carried out in order to get material inspiration. Visiting stores to be able to experience the products up close was a suitable method to achieve this. It was interesting to observe how products communicate through their material only. The products being observed were consumer products, furniture as well as home appliances and kitchen utensils.

#### 9.1.1 Insights

Texture of materials played an immense role in how products were perceived. A highly glossy surface was encountered in expensive products as well as among do-it-all brands, with a lower than average price point [see chapter 5]. Kitchen products from do-it-all brands are however more than often light and thin walled compared to glossy expensive products. Combinations of materials with different qualities e.g. hardness, glossiness, reflective qualities or different surface structures was encountered in several products. Figure 9.1 aims to summarize the impressions of different materials encountered during the benchmark. The material exploration aided as a point of reference in discussion with Hammarplast Consumer AB as well as a guide for future material choice evaluations.



**Figure 9.1** Material expressions benchmark

### 9.2 Criteria

The material that will be used in the product should fulfil certain criteria; either pre-determined in the brief or as a result of the pre-study. A compromise will be made between price, aesthetic and functionality. The main criteria to be considered when choosing material are,

- Recyclability
- Safe with food
- Microwave resistant
- Injection moulding capabilities
- Dishwasher safety

It is desirable that the product should be recyclable. This kind of products would presumably have a phase of existence less than thirty years depending on various influences, e.g. wear of the product or the user's change of needs. It would consequently be of no reason to use a material that is not recyclable; it is a waste of potentially useful material when the life of the product ends.

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Because of the products involvement with food, a toxic free product is a must. According to *Livsmedelverket* [24] phthalate and adipate that are both used to soften PVC (polyvinyl chloride) are gradually phased out of many products because of health concerns. Migration of chemicals from plastic into food should be kept at the lowest possible level.

A measuring tool will not be directly subjected to immense heat for a prolonged period of time. It will however presumably be temporarily exposed to heated ingredients, e.g. boiling liquids. Based on our target group research [see chapter 7], convenient cooking is prioritized. The product should allow users to use a microwave oven for simple cooking procedures. Therefore it is important that the material can handle temperatures slightly above 100°C for a short period of time.

### 9.3 Injection Moulding

Manufacturing using injection moulding has been determined in the brief of the project [see chapter 2.1]. This was the most evident method to implement, since the material to use was plastic. Injection moulding is an old method that was introduced for the first time in 1872 in the United States. The early methods of injection moulding used piston machines. It was not until 1950 screw based machines came to Sweden. The principal design of the machine used today is highly similar although it is a fully automated process.

Injection moulding allows manufacturing of complex shapes in plastic without requirements of post processing. The method has a high production pace, making it a cost effective choice. However, tools and the machine require an initial high cost. Consequently, it is only profitable to produce large quantities using injection moulding. Draft angles and shrinkage of the detail must also be considered when an object is being injection moulded. Shrinkage when the plastic cools and hardens can later cause tolerance issues.

The injection-moulding machine consists of two parts: an injection unit and a lock unit. The injection unit is usually a hopper that dosages plastic into a barrel. Inside the barrel there is a large screw, which heats and feeds the material forward into a mould cavity. The mould is primary separated into two components, and is locked together with the lock unit, which is typically a hydraulic piston. [25]

### 9.4 Material Candidates

Plastic is synthetically produced materials consisting of long chains of monomer molecules. The majority of plastic is composed of organic monomers; carbon and hydrogen are the two dominant chemical elements in a plastic. The inorganic monomers that appear in plastics can be found in e.g. silicone that is composed by chains of silicone and oxygen atoms. Nitrogen, Sulphur, Chlorine, Flourine and Phosphorus are the other five chemical elements that can be found in plastics.

Plastics are generally divided into two types, thermoplastics and thermosetting polymers. In thermosetting polymers the molecule chains are bonded together with cross-links. These types of bonds are so strong that they do not break during heating; hence the material cannot be melted. Thermosetting polymers come in both liquids and solids. When a thermosetting polymers is hardened it cannot be reheated and melted back to a liquid form, therefore it is difficult to recycle.

On the contrary thermoplastics melt when heated up to a certain temperature. It is easy to process with several manufacturing methods, e.g. injection moulding, which is the most common method for plastic details. Thermoplastics are also recyclable, due to their capability of melting. Because of its benefits of being recyclable and easy processed during manufacture, thermoplastics will be chosen to be the dominating plastic to use in this project. The suggested material candidates all satisfy the criteria written in the previous chapter 9.2. [25]

#### 9.4.1 Polypropylene

Polypropylene (PP) is one of the most common used plastic in the market. It is a non-transparent plastic; however it can achieve a translucent result if desired. PP is used in a wide range of applications, e.g. packaging, house ware, stationary and reusable containers of various types. The material is tough, has a good chemical resistance, is safe in connection with food and has a relatively low price. The working temperature of PP can be 100°C continuously and 140 °C in a short period of time. This is however dependent on the quality of PP. [25]

#### 9.4.2 ABS

ABS is an abbreviation for acrylonitrile butadiene styrene; it has a shiny and impervious surface. Transparency can be achieved with ABS. The mechanical properties of ABS are high impact resistance and toughness. It has however a relatively low heat resistance with a working temperature up to 80°C. Examples of applications are toys, kitchen appliances, details for vehicles and shells for electronic devices such as computers and televisions. [25]

#### 9.4.3 Polyamide

There are several types of polyamide; PA6 and PA66 are the most common ones. Polyamide is very rigid at high temperatures and has a high working temperature of 120°C. However it absorbs large amounts of moisture from the air, which affect mechanical properties by an increase in toughness and a decrease in stiffness. Typical field of applications are within the automotive industry, casing to electrical hand tools as well as in textiles. Kitchen utensils such as spoons, ladles and turners are also often constructed out of Polyamide because of its heat resistance properties. [25]

#### 9.4.4 Styrene-Acrylonitrile Resin

Styrene-Acrylonitrile Resin or SAN, is an optically transparent and a brittle material. It's mechanical advantages are good stiffness, resistance to scratching and high working temperatures of above 100°C. SAN is commonly used in food containers, kitchenware, computer products and packaging material. [25]

#### 9.4.5 Tritan (Copolyester)

Supervisor Catharina Cronsjö at Hammarplast Consumer Ab introduced a plastic called Tritan, which the company are currently using in products under the brand *Orthex*. Tritan is a trademark name of copolyester produced by the chemical company Eastman Chemical Company. Tritan is a clear plastic with good heat and chemical resistance. A common field of application is packaging, consumer goods, and food storage because of versatility, clarity and toughness. [26]



## 10 Ideation Phase One

*The process of ideation in this project is divided into three sections. The first phase of ideation describes the foundation and methods used.*

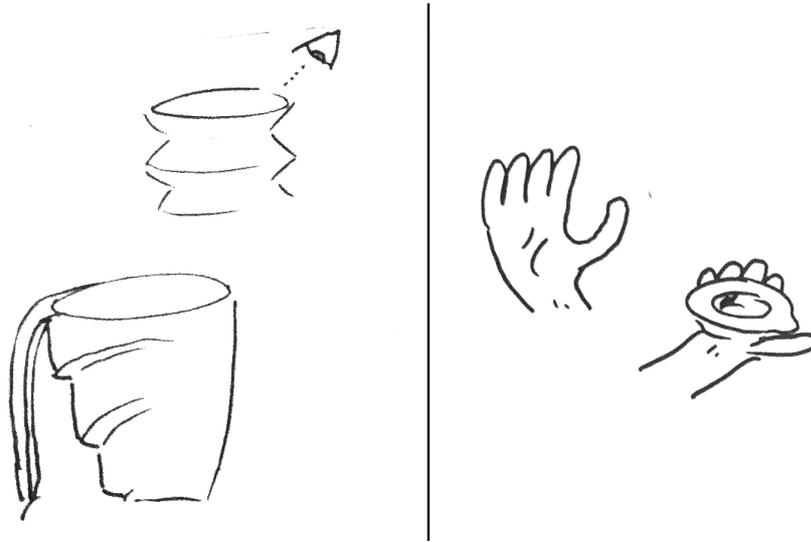
### 10.1 Brainstorm

In this phase, ideas were generated with imagination, previous experiences and knowledge gained through the project so far. The implemented method was inspired by Landqvist's described brainstorm in his book [4]. To prevent disturbing the flow of ideas according to Landqvist, ideas should be documented as fast as possible with simple sketches or words.

The brainstorm was initiated around three identified categories from the target group research: *surroundings*, *execution* and *utensils*, see table 7.1. Each category was also divided into several subcategories.

## 10.2 Categorizing Ideas

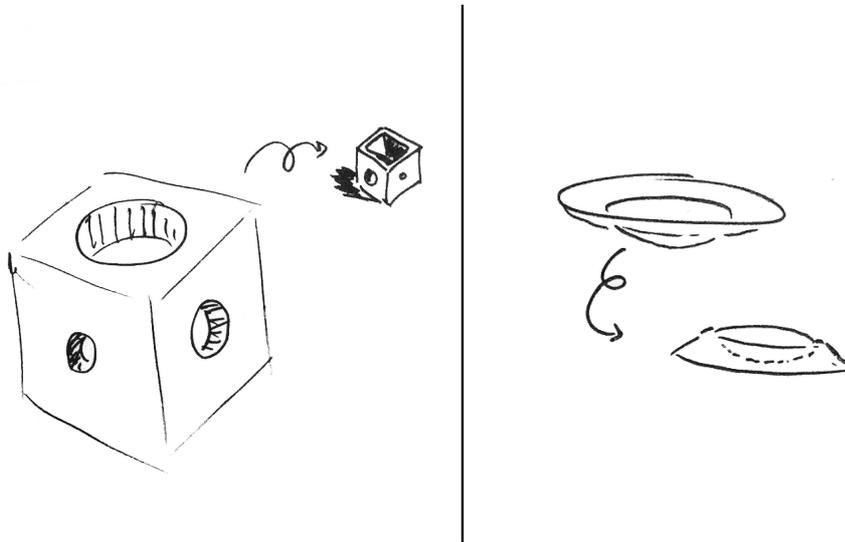
Among generated ideas, new categories were identified. These were organized into three groups: *Multi-functional*, *All-in-one* and *Functional features*.



**Figure 10.1** Rough sketches of concepts representing the *Functional features* category.

### 10.2.1 Functional Features

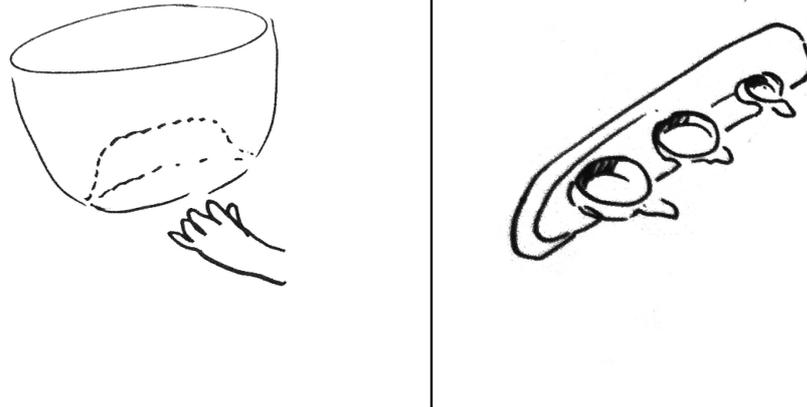
The majority of ideas did not describe a fully realized concept, but features, which could be combined to make up a future concept. An example is the design of the vessel in the shape of an open hand to enhance the grip. Another example is the design of the vessel with steps to enhance reading measurements while looking down into the vessel, see figure 10.1.



**Figure 10.2** Rough sketches of concepts representing the All-in-one category.

### 10.2.2 All-in-one

It was interesting to explore the idea of having only one unit to measure all quantities. One concept design was a cube with different volumes submerged on each side. Another concept was described as a spoon with a reversible surface to enable measuring of two different volumes. Having several quantities in one single unit would make it easy to store and keep track of, see figure 10.2.



**Figure 10.3** Rough sketches of concepts representing the Multi-functional category.

### 10.2.3 Multi-Functional

Observations from user research inspired ideas of incorporating functionality other than measuring into the product. The incorporation of a spatula with measuring spoons was explored in different manifestations. Another common tool used in the cooking process and together with measuring tools are bowls. Several designs with measuring tools incorporated into bowls were explored, see figure 10.3.

## 10.3 Evaluation

During this early phase of ideation when ideas were unrefined, the approach of the first evaluation was to avoid constraining the flow of ideas. Consequently, the evaluation process was relatively vague and the function analysis was used as a foundation for discussion rather than a checklist.

Based on the persona, three functions were chosen from the function analysis [see chapter 8], *communicate relations*, *simplicity* and *communication*. These functions were being prioritized in this early phase of ideation for an overall evaluation of concepts.

## 11 Ideation Phase Two

*This phase was highly important in the ideation process, analysing in detail how the persona, and other users, interacts with measuring tools in the context of baking and cooking.*

While the first phase of ideation mostly concerned conceptual product design and no evaluation of their actual functionality, phase two represents the creation of guidelines for further development. Ideation phase two presents insights, which vitalized the product development process. The persona, *Alfred* [see chapter 7.3], was the starting point of all guidelines created in this phase of ideation.

### 11.1 Kitchen Scales and Measuring Spoons

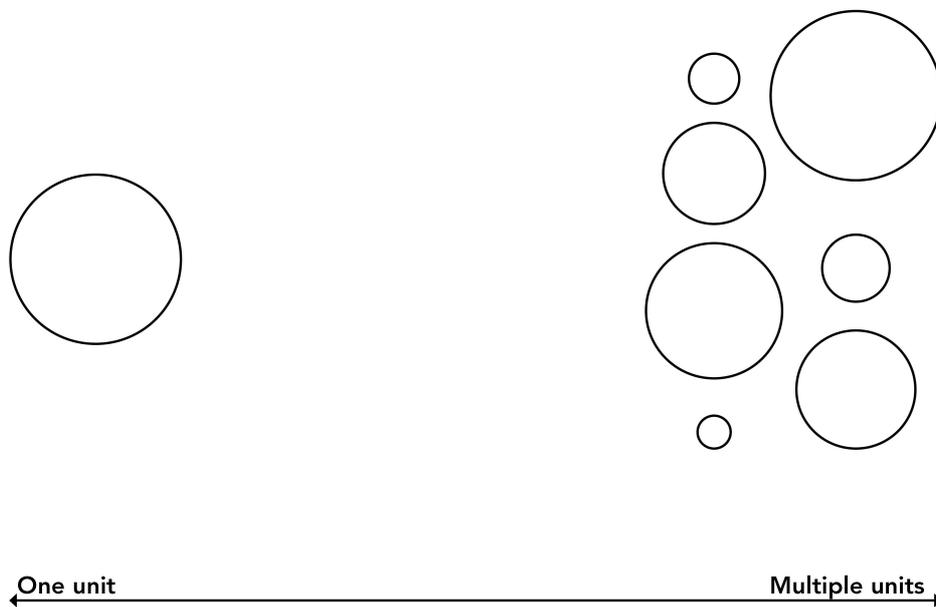
Among available products offering measuring solutions, the digital scale is generally referred to as a very precise and helpful tool. Although a digital scale presents a precise and easy to use setup, it was found that it could not replace a set of volume measuring spoons. Instead of replacing a kitchen scale, measuring spoons can act as a complement. The typical digital scale consists of two components: a bowl for ingredients and the actual scale on which the bowl is put. Measuring spoons, on the other hand, often come in sets and offer containers of different sizes in which to put ingredients for measuring purposes. Measuring spoons are often used as a vessel for transporting ingredients from the chopping board or food packaging to a centralized part of the cooking process e.g. stove or mixing bowl. As such, they are vital in getting the right amount of ingredients together in a fast and reliable way. Transporting liquids from bottles or a tap is made easy with a small container such as a measuring spoon. In summary, measuring spoons presents a quick and spontaneous way of getting a certain dish together, when the preciseness of a digital scale is not needed.

Looking back at Alfred, it is almost certain that he already possesses a digital kitchen scale because of his strong interest in bread baking where preciseness is a must. Consequently, guidelines for further development were created with these insights in mind:

- Measuring spoons will not and cannot compete with a kitchen scale in terms of preciseness.
- Measuring spoons are used for different purposes than kitchen scales and should therefore be designed with these uses in mind.

### 11.2 Exploring Different Implementations of Measured Units

Looking at Alfred and his kitchen, it is preferable that a measuring solution is compact but also decorative. The size and implementation of how units are measured is crucial in defining the features of a set of measuring spoons. Without going into aesthetic details, one possibility is to use a single vessel with markings for a vast number of measurements. On the other hand there is the possibility of having several vessels, each one measuring only one or few units of measurement e.g. a vessel with the volume of a kitchen spoon and another vessel with the volume of a teaspoon and so on. A visual representation of this concept is seen in figure 11.1.



**Figure 11.1** Number of units

Before settling on a number of vessels for a set of measuring spoons, it is preferable to decide upon what quantities are to be measured. Using data from research of cooking literature and observations made in primary research (see chapter 7: *Target Group Research*), as well as looking at the interests and cooking habits of *Alfred*, it was decided that a preferable set up would contain the following quantities of measurements:

- A teaspoon
- A tablespoon
- A 1-deciliter volume
- A larger volume in the range of 3-10 decilitres

These four measured volumes were to be seen as absolute necessary in any design created going forward. Behind the reasoning of this set up there was also an acknowledging of points stated in the *functional analysis*, where *simplicity*, *relations* and *clarity* were identified as standout functions.

Deciding upon numbers of vessels according to figure 1.11, it was stated that a design that displays simplicity of function as well as clarity must strive for a minimum number of components while still retaining a high usability. The product should therefore aim to be positioned in the left half of figure 11.1.

### **11.3 Measuring Tools as an Interface**

Acknowledging the fact that Alfred already has a kitchen scale in his possession, details relating to the usage of measuring spoons were looked upon thoroughly. It has been established that measuring spoons cannot compete with a kitchen scale in terms of preciseness; however, a measuring spoon is not inaccurate and presents a fast and reliable way of measuring by volume. Measuring spoons are also used for transporting ingredients from packaging into the cooking process. Executing such a task is done by filling the container with an ingredient, transporting ingredient to the cooking process (e.g. mixing bowl or pot) and emptying the contents of the container into the cooking process. The procedure of emptying and filling represent an interface of which further study was performed. This study was comprised of data from observations in primary research and the screening of cooking literature [see chapter 4.2] as well as personal experience.

#### **11.3.1 Filling a container**

Filling a container with ingredients be executed in several different fashions depending on a number of identified factors:

- The size of the container to be filled.
- The ingredients.
- The design of the container.
- Other i.e. personal preference or a time limit concerning the cooking process.

Looking closer at a certain quantity e.g. a tablespoon and a typical product used for measuring tablespoons, some conclusions can be drawn. Among kitchen measurements, a tablespoon is a relatively small quantity and as such a product for measuring tablespoons is often small. The filling of a vessel for measuring tablespoons is often executed by digging into packages, jars or bags. The same conclusions can be said for a typical product measuring 1-deciliter. However, a larger quantity i.e. 1/2-litre or 1-litre, requires a larger vessel. This vessel is generally filled with content by pouring ingredients into it since it is too large for digging into food packages.

The design of small and large vessels is crucial in supporting a reliable cooking procedure and can alter the way a vessel is filled with content; a handle would afford

digging into packages and the absence of a handle would afford the pouring of ingredients into the container.

### *11.3.2 Emptying a container*

Depending on the contents of the container, the size of the container and other factors e.g time limit or personal preference, emptying is performed in different fashions. The emptying of liquid substances requires control to avoid splashes and a slow tilting is often preferred. A spout may increase control by allowing liquid substances to flow in a steady stream. However, the design of a spout is to be carefully considered as to not hinder any other functions such as the filling of the container.

## **11.4 Conclusions - Guidelines**

With the user in mind, the design of any container shall first and foremost focus on being unobtrusive and in support of a joyful cooking procedure. The close examination of measuring spoons in relation to the persona, Alfred, was summarized into a set of guidelines for further development:

- Alfred possesses a kitchen scale.
- Measuring spoons acts as a complement to kitchen scales and they are exclusively used for some purposes.
- Measuring spoons can support a quick and spontaneous way of getting a certain dish together.
- Teaspoon, tablespoon, a 1-deciliter volume and a larger volume in the range of 3-10 decilitres are decided upon as measurements to be included in the final product.
- A minimum number of components (units) with a high usability are preferred in the final product.
- Measuring spoons interact with food packaging and the cooking process. Depending on certain factors, a container is filled and emptied in a certain way.

## 12 Ideation Phase Three

*The third phase of the ideation process concerned visualization of ideas and concepts. A presentation and evaluation of 4 detailed concepts conclude this chapter.*

After the first and second phases of ideation there were a multitude of ideas and concept designs with different directions in form and function. This final phase of ideation aimed at distilling these into 4 concepts.

### 12.1 Paper Mock-Ups and Handle Design Screening

The creation of paper mock-ups using cardboard, paper, glue and tape aimed at making ideas tangible for comparison and evaluation. Building a physical model put focus on volumes and proportions between different designs. Different volumes, angles and areas were tried out to explore how a certain expression was to be executed. A screening was also carried out among kitchen utensils in general as well as other tools of the home. The reason was to map out different handle design and their motifs. Our findings concluded that while handle design should offer a comfortable grip, a primary focus on ergonomics of the hand is not needed for this product, since forces exerted on the user are small and not continuous over time.

### 12.2 Exploring Ideas

Three themes (Communication, Communicating relations, Simplicity) were explored with the help of paper mock-ups and solid modelling with *Solidworks*. The three themes relate to insights gained at the research phase and later developed during previous ideation phases.

#### 12.2.1 Communication

Being self-explanatory by directly communicating function through a clear visual language was explored in different models of which two are shown below in figure 12.1. Communication also refers to clarity and a distinct aesthetic, with minimalism as a sub-theme.



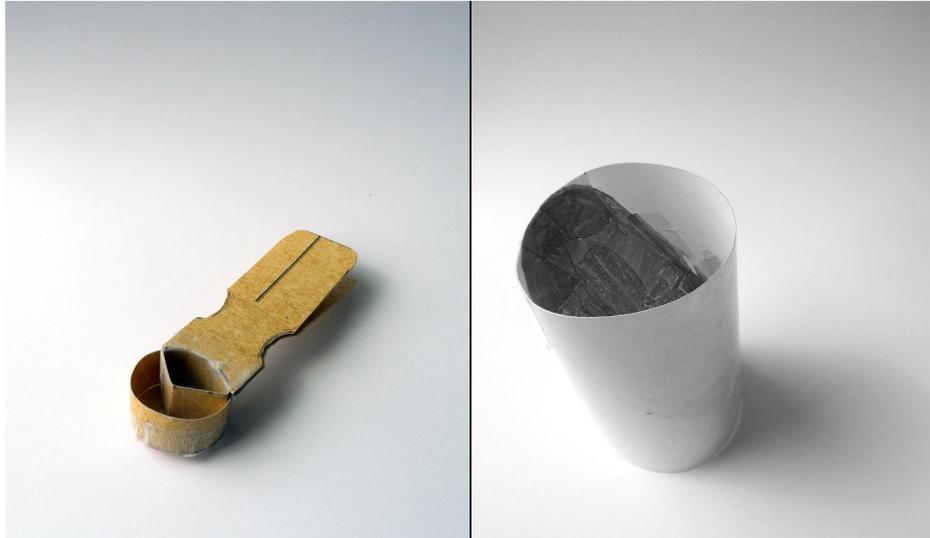
**Figure 12.1** Concept 2 (left) and concept 1 (right).

Concept 1 is described through the paper mock-up shown in figure 12.1. A cylinder is sharply cut with a flat surface creating a direction as well as a contrasting feature in an organic shape. The flat surface indicates that this part of the container has special abilities. The inside of the flat area can be used to display information in a natural way. In comparison with a curved surface, a flat surface has greater potential for dense information display.

Concept 2 explores communication possibilities further with horizontal flat surfaces through a sudden change of diameter in a cylinder shape. Information on the horizontal flat surface is easily readable by a user glancing down into the cylinder.

### *12.2.2 Communicating Relations*

Throughout the ideation phase, the need for relating different units of measurements emerged. These ideas were later expanded and adopted into several concept designs. Visualizing the relations of different volumes to each other can help establish a practical understanding of amounts and proportions in cooking. Concept 3, shown in figure 12.2, consists of two containers measuring a tablespoon and a teaspoon with a design revealing how they relate to each other.



**Figure 12.2** Concept 3 (left) and concept 4 (right).

Different measurements and their relations in a single container were also explored in several concept designs. One such design is concept 4, shown in figure 12.2 where a cylinder design is broken into two containers by a diagonal elliptical surface. This design allows for two different volumes to be measured in small increments and with high accuracy.

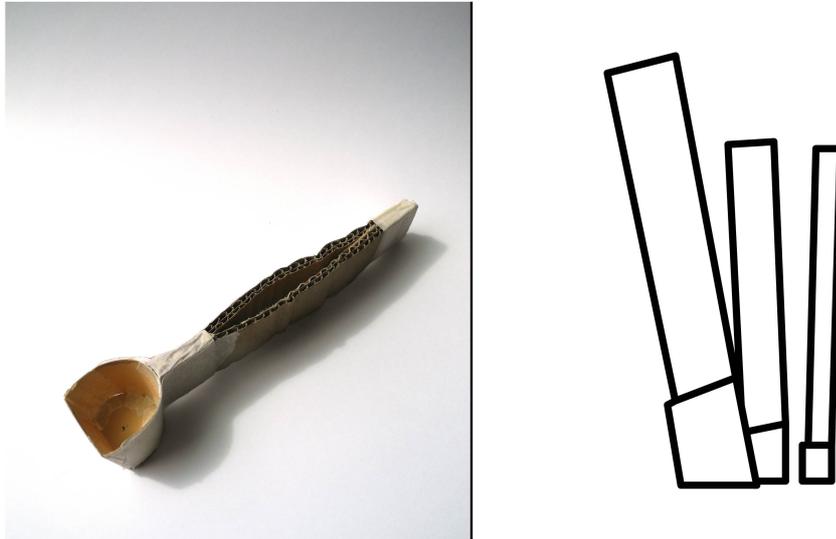
### **12.2.3 Simplicity**

In exploring concepts with a focus on simplicity of function the most important factors considered were perceived stability, precision and practical use as a container and a measurement device. For pouring liquid ingredients, spouts of different designs were tried out on several prototype designs.



**Figure 12.3** Concept 1 (left) and spout design of concept 1 (right).

Concept 1 with a flat surface and a cylindrical container creates a spout where the cylinder and the flat surface meet as shown in figure 12.3. The symmetrical design allows pouring to be easily performed by both left and right-handed users.



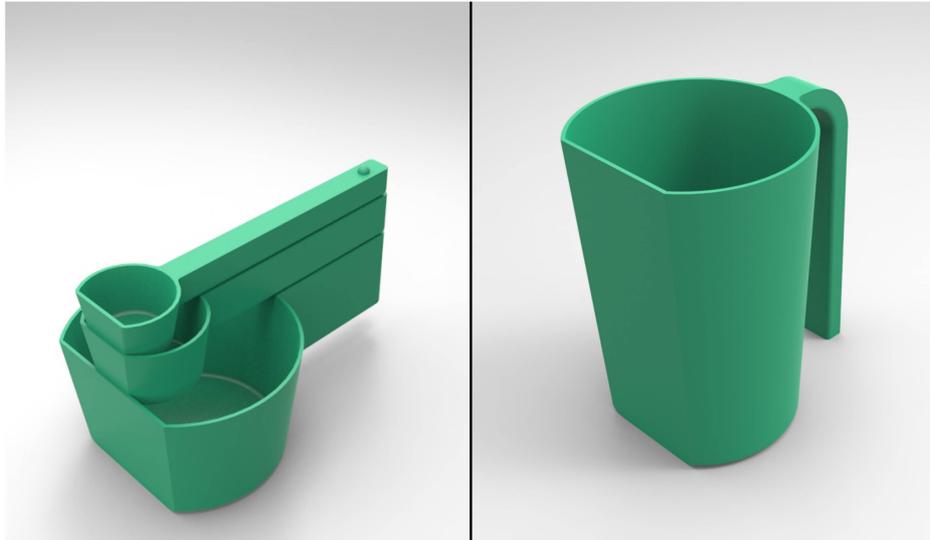
**Figure 12.4** Handle mock-up (left) and stackability exploration (right).

Handle design was explored through different paper and cardboard mock-ups. One such mock-up is shown in figure 12.4. Some exploration of different methods for stackability of containers was also conducted.

### **12.3 Concept Design Suggestions**

The merging of ideas and concepts into developed design suggestions was the last phase of ideation. An important aspect was to gain an impression of accurate size and proportions as well as material experimentation. Sketch renders was also used in the process of distilling ideas into developed concepts. The 4 concepts were shown for Hammarplast Consumer AB as part of the evaluation process. The concepts were not fully developed for manufacturing and renderings represent a sought expression.

12.3.1 Concept One



**Figure 12.5** 1-Deciliter, Tablespoon and Teaspoon of Concept one.

Concept one contains four units, see figure 12.5. The three smaller units measure a teaspoon, a tablespoon and a 1-deciliter volume. A larger vessel measures a 5-deciliter volume. The three smaller vessels have large handles and are stackable, see figure 12.8. The visual style is minimal and austere. Opaque, matte plastic is used for concept one. An image board describing aesthetic inspiration can be seen in figure 12.6. Sketches used to develop the concept are shown in figure 12.7.



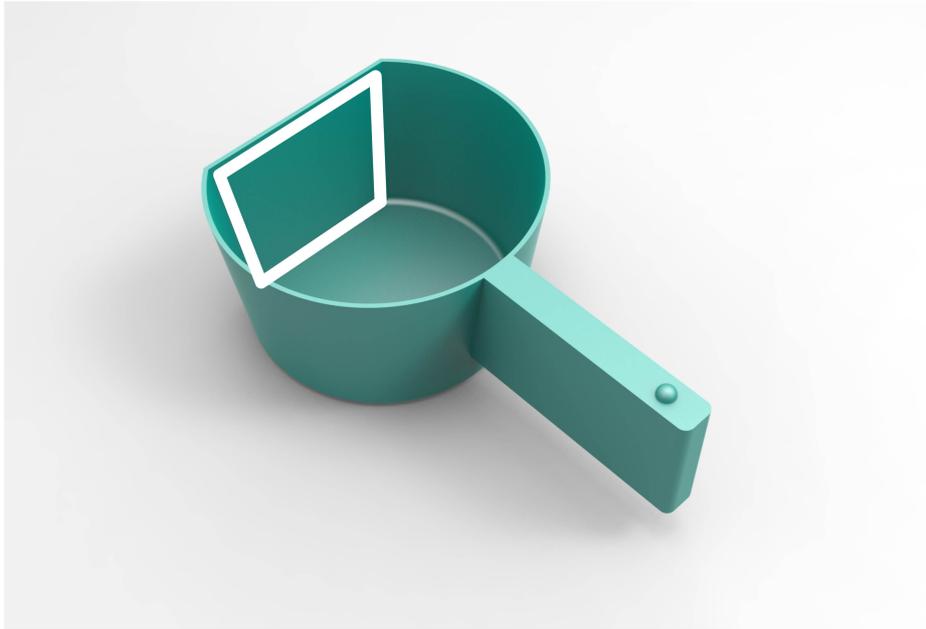
**Figure 12.6** Image board for concept one.



**Figure 12.7** Sketches from the design process of concept one.



**Figure 12.8** The stackable feature of concept one.

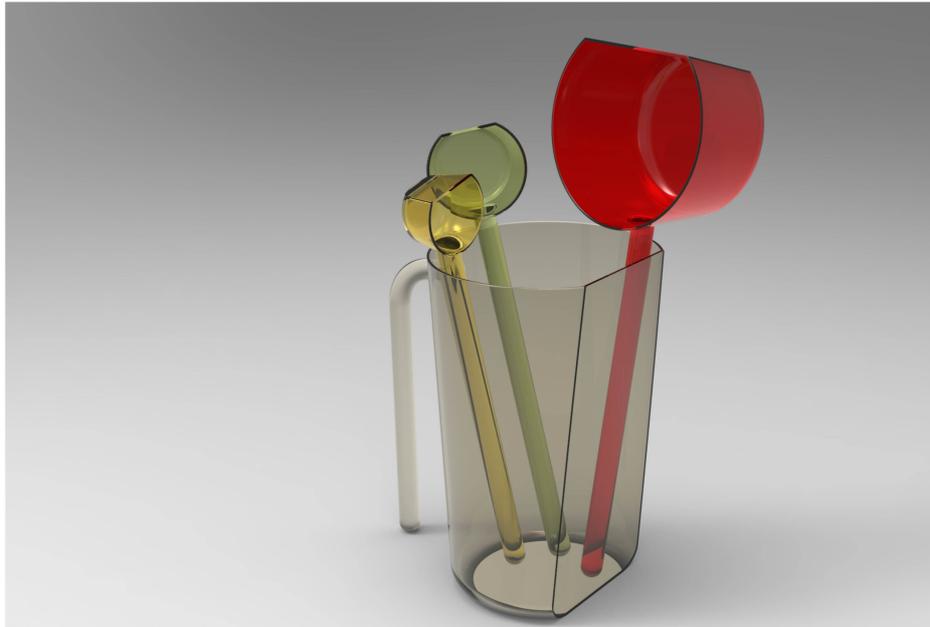


**Figure 12.9** The functional surface indicated by the white rectangle.

#### 12.3.1.1 The Functional Surface

The containers are cylindrical with a flat surface opposite to where the handle is attached, see figure 12.9. The flat surface breaking the cylinder shape is a functional surface, where measurement markings can be read naturally and easily. It is possible to explore having markings for several units of measurements on the same functional surface of a single container. By being flat and in contrast with the cylinder shape, the functional surface indicates preciseness. Breaking the cylinder shape, the flat surface also creates two spouts for precise emptying of liquid substances, see figure 12.3.

12.3.2 *Concept Two*



**Figure 12.10** Concept two.

Concept two contains three similar units and a jug, see figure 12.10 and 12.13. The three smaller units measure a teaspoon, a tablespoon and a 1-deciliter volume. The larger jug measures a 5-deciliter volume. All units have slim, long handles. The set is intended to be stored visibly in the kitchen. An image board used in the process is presented in figure 12.11. Sketches used in the development of the concept are shown in figure 12.12.

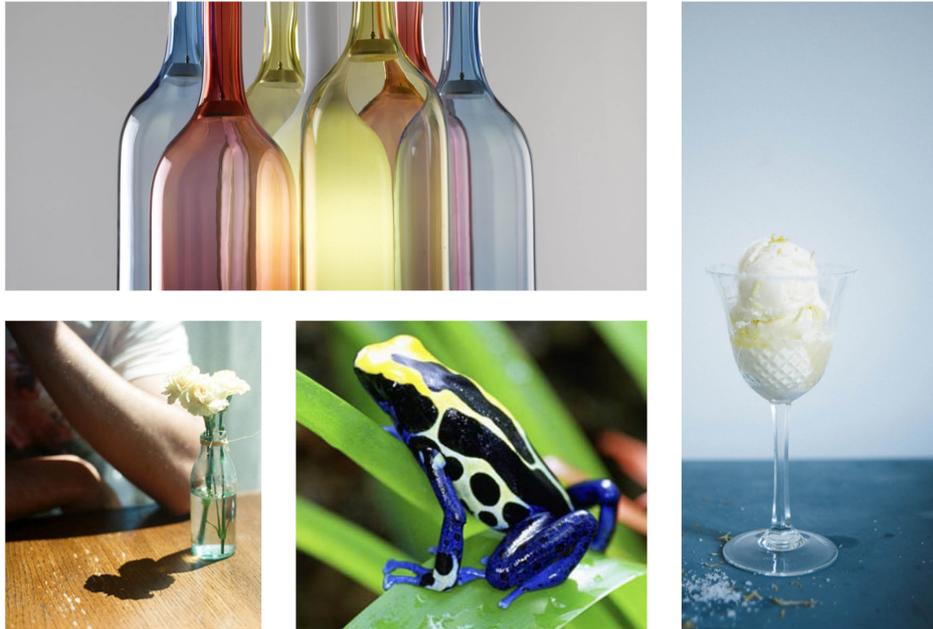


Figure 12.11 Concept two image board.



Figure 12.12 Concept two sketches.

As in concept one, concept two also has containers with a sharp flat surface breaking the cylinder shape, see 12.3.1.1 *The functional surface*. Transparent, tinted glossy plastic is used for concept two. All surfaces are highly glossy and glasslike. Concept two is designed to exhibit visually contrasting elements. The slim long handles have large radii connecting to the centre of the containers height, creating an organic shape. The functional surface contrasts with this moulded and glass-like design.



**Figure 12.13** Concept two.

### 12.3.3 Concept Three



**Figure 12.14** Concept three

Concept three contains four units, see figure 12.14. The units measure a teaspoon, a tablespoon, a 1-decilitre volume and a 5-decilitre volume. All units contain a step, which makes each unit measure two different quantities in an easy manner. The horizontal surface created by the step is used for measurement markings. The units are stackable and stored visibly in the kitchen. Opaque plastic is used for concept three. Surfaces are matte with a coarse texture. An image board used in the process is shown in figure 12.15. Sketches used in the development of the concept are shown in figure 12.16.

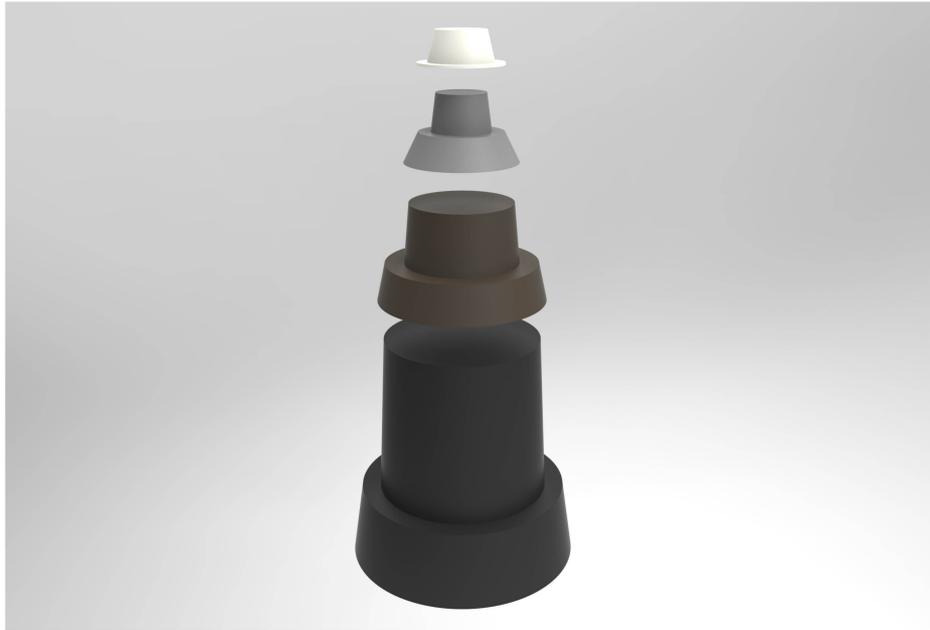


Figure 12.15 Concept three image board.



Figure 12.16 Concept three sketches.

None of the units contain any handles in a general sense, but the variation in diameter creates a natural grip for the hand. This allows the user to get closer to ingredients and the cooking process. While stacked together, the set creates a cone-like shape, intended to draw attention in the kitchen environment.



**Figure 12.17** Stackability of concept three.

12.3.4 Concept Four



**Figure 12.18** Concept four.

Three units make up concept four, see figure 12.18. Being turned upside down, each unit is transformed to measure a different quantity. The smallest unit measures a teaspoon in its smaller vessel and a tablespoon in its larger vessel. The medium sized unit measures a 1-deciliter volume and a 0,5-deciliter volume. The large unit measures a 3-deciliter volume and a 2-deciliter volume. Thin, transparent, matte plastic makes up concept four. An opaque, thick, coloured disc separates top and bottom vessels.

An image board and sketches used in the process are shown below in figure 12.19 and figure 12.20 respectively.



**Figure 12.19** Concept four image board.



**Figure 12.20** Concept four sketches.

Since each unit has two containers with different volumes, an indication of volume measured must be clear and easily readable. The horizontal surface separating top and bottom containers is used to display this information as seen in figure 12.21. The surface is opaque and coloured to easily distinguish units and measurements from each other. The units have no handles but the hourglass shape allows for a natural grip at the smallest radius of each unit.



Figure 12.21 Measurement markings for concept four.

## 12.4 Concept design evaluation

In discussion with Catharina Cronqvist at Hammarplast Consumer AB and Per Liljeqvist, supervisor at Lund University, the four concept design suggestions were evaluated. In this part of the process, the opinion of Catharina Cronqvist was regarded as highly important, since she represents the product development department of Hammarplast Consumer AB. As an experienced designer, Per Liljeqvists opinion was very important in gaining insights for further development possibilities of each design suggestion. A method developed by Per Liljeqvist was implemented in the evaluation process [see appendix E].

### 12.4.1 Evaluation

At this stage of the process, an evaluation table according to methodology from Landqvist [4] was used to gain an overall understanding of how concepts compared to each other.

A scale of numbers is used to evaluate different functions of the functional analysis in each of the concepts. Every function is also weighted. However, in discussion with Per Liljeqvist a method which has developed was also implemented. Putting numbers

## 12 Ideation Phase Three

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on a quality e.g. communication or simplicity, which is not logically quantifiable, can be interpreted as final, when such a decision is not intended. Instead of using numbers, mood indicators could be used to evaluate how a feature of a concept compares to another. The primary function of the evaluation chart with mood indicators is to spur discussion. Consequently, two different charts were used in this first stage of evaluation.

FUNCTION	TOTAL SCORE
Concept one	3,57
Concept two	3,65
Concept three	3,25
Concept four	2,53

**Figure 12.22** The results of the concept design evaluation.

Concept one and two gained the highest scores based on methodology from Landqvist [4]. Functions were weighted in accordance with their perceived importance. The figure 12.22 [see appendix E] represents a compact version of the functional analysis from Ideation phase one. Main functions are absent and some functions from the original functional analysis chart were combined into a single function for a compact overall comparison.

### 12.4.2 Discussions with Supervisors

The four concepts were presented to Catharina Cronsjö at Hammarplast Consumer Ab. Her response was positive overall although she questioned usability aspects of concept three and concept four. Concept three was questioned for its lack of self-explanatory features although it was said to be interesting on an artistic level. Concept two was said to be commercially viable and visually engaging. The stackable feature of concept one also received positive feedback from Catharina.

Per Liljeqvist expressed positive feedback on concept three for its originality in design. The flat surface design of concept one and two also gained positive response from Per as a derivative of the research into measuring devices as an interface. Per had concerns with proportions in concept two.

The concepts were shown and thoroughly explained to Katarina Elner-Haglund, assistant supervisor. Her experience of plastic materials and construction was

valuable to evaluate possible further development and limitations. She pointed out that certain attention should be made concerning the wall thickness and the area where the handle meets the vessel. The wall thickness should not be thicker than approximately  $4 \pm 1$  mm if the manufacturing process should be free of complications. It does however depend on the material choice and other circumstances.

#### *12.4.3 Decisions for further development*

Starting with the evaluation table with mood indicators, discussions around the four concepts practical usage as well as visual identity emerged. A detailed evaluation table with weighted functions followed. Taking comments and opinions from supervisors into account, it was decided that further development was to be carried out on concept one and two.

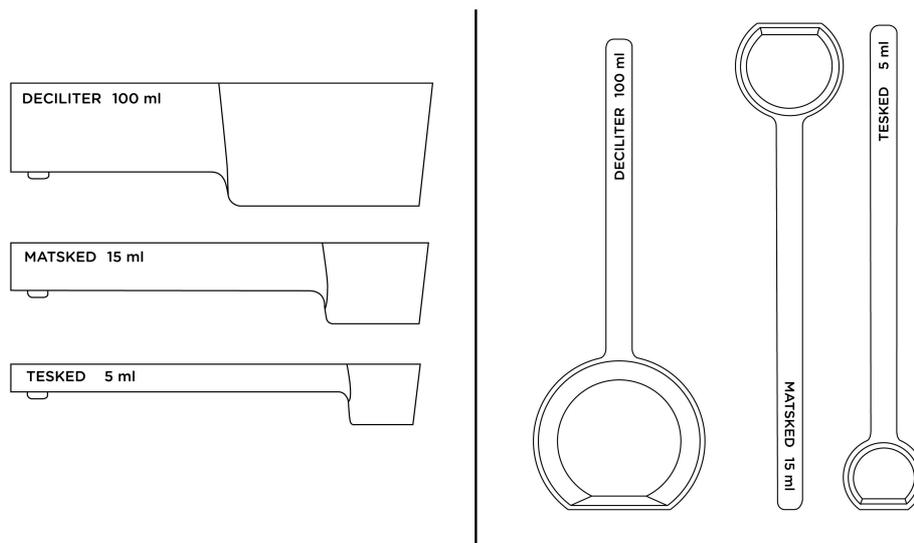


## 13 Further Development Phase One

*This section describes the process of refinement of concept one and two. The application of graphic elements and text onto the designs is explored at this stage.*

### 13.1 Application of Text and Symbols

Concepts one and two have similar containers with a flat surface interrupting a cylinder shape. The flat surface is an information area, with indications for quantities to be measured. Three designs were examined at this stage, see appendix F.



**Figure 13.1** Markings on handles for concept 1.1 (left) and concept 2.1 (right).

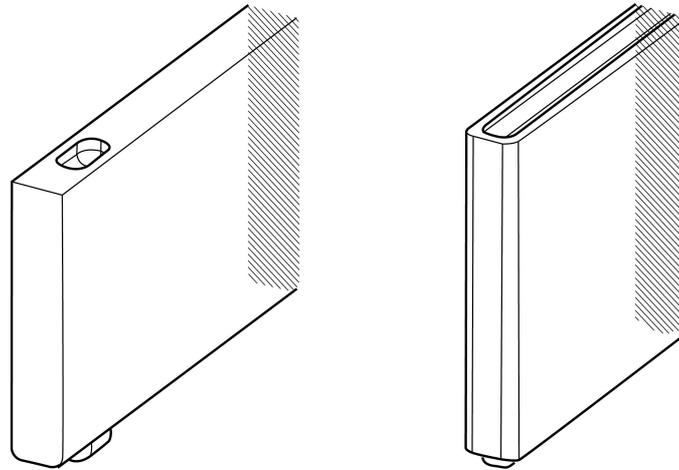
The handles are also to be used for information display. On handles of concept 1.1 and 2.1, each units name is displayed together with maximum capacity of the vessel in millilitres as seen in figure 13.1.

## 13.2 Concept 1.1

### 13.2.1 Stackability

The stackable design was examined thoroughly with the aim to be effortless and visually unobtrusive. The original design featured handles designed with a half-sphere on the top and a matching cavity on the bottom. The feature was found to be aesthetically inappropriate in accordance with the rest of the visual language.

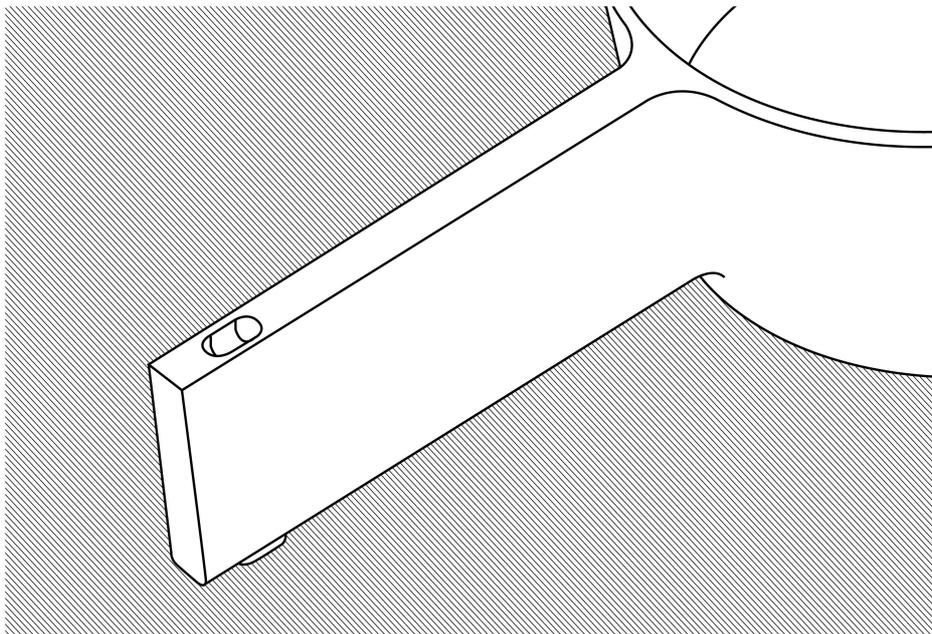
Variations on this feature were tried out as seen in figure 13.2. The stacking of the three units is a space saving feature, although the primary function is not to save space but to conveniently store the units together in a drawer or close to the cooking process in the kitchen. It was decided that an elongated spherical shape on the bottom of handles, with a matching cavity, was to be used.



**Figure 13.2** Design suggestions for the stackable feature of concept 1.1.

### 13.2.2 Refining the design

Handle design went through a refinement in which features was looked upon thoroughly. The top surface of the handles were integrated into the vessels by designing the feature as an uninterrupted, smooth surface, see figure 13.3. Radii were increased at the point where the handles meet the vessels to gain stability and enhance the connection between handles and vessels. See the refined concept 1.1 in figure 13.4.



**Figure 13.3** The connection of handle and vessel on the 1-decilitr unit of concept 1.1

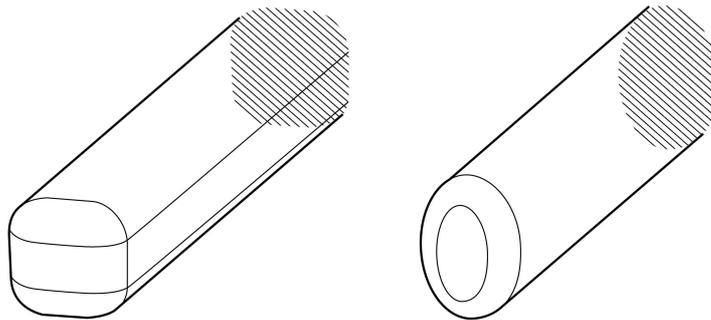


**Figure 13.4** Concept 1.1

### 13.3 Concept 2.1

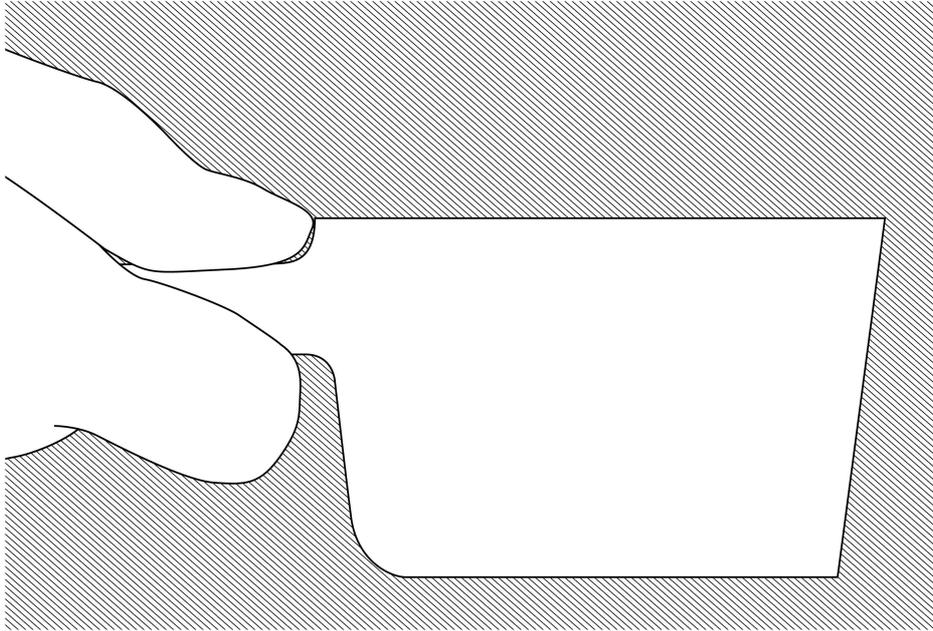
#### 13.3.1 Usability improvements

The long handles in concept two have solid circular cross-sections. This design could have stability disadvantages when put into the hand of a user. Several suggestions were explored to find an alternative solution, see figure 13.5. Among suggestions, a square cross-section with rounded corners was chosen. The square cross-section offers a sturdy grip with increased stability for the user.



**Figure 13.5** Design suggestions for the cross-section of handles of concept 2.1.

The connection between handle and vessel was enhanced and accentuated by increasing the radii and by moving the handles closer to the rim of the vessels. The grip can be seen in figure 13.6. The handle of the jug was changed into a rectangle shape with rounded corners to better fit how a user would grip a jug. See the refined concept 2.1 in figure 13.7.



**Figure 13.6** The grip of the handle for the 1-deciliter vessel of concept 2.1



**Figure 13.7** Concept 2.1

### **13.4 Concept design evaluation**

Concept 1.1 and concept 2.1 were presented for Catharina Cronsjö at Hammarplast Consumer AB. Manufacturing considerations were also taken into account through discussions with Per-Olof Johansson, manufacturing specialist at Hammarplast Consumer AB.

In discussion with Catharina Cronsjö and Per-Olof Johansson, it was decided that concept 2.1 should be further developed into a final design. Aesthetics and usability aspects of concept two were a good reflection of desired attributes of products for the Orthex Gastromax brand. Concept two was also considered superior to concept one in construction flexibility.

In discussion with Per-Olof Johansson, the material was chosen to be Polypropylene (PP) [see chapter 9.4.1]. Uniform thickness throughout all components of the design is required to increase manufacturing efficiency. While keeping with the aesthetic expression, handles of concept two was to be further developed with these requirements in mind.



## 14 Further Development Phase Two

*This chapter describes the development of concept two into a final production-ready design. Development involved user tests and refinement of the design.*

### 14.1 User Test 2

The aim of the user test was to examine the functionality and gain insights of the end users perception of the vessels. The user tests were primarily focused on observation and validation of the following areas:

- Filling of the vessels
- Emptying of the vessels
- Grip of the handles
- Communication

Concept 2.1 [chapter 13.3] was 3D-printed in ABS plastic with the technique, fused deposition modelling (FDM) with the printer *Stratasys Prodigy*. Figure of the 3D-printed models can be found in Appendix G. Tests were to be conducted at a neutral location; therefore the kitchen at *Ingvar Kamprad Design Center* in Lund was chosen. Subjects were handed a recipe, modified to test out a variety of operations related to measuring [see appendix C]. The recipe included small and large quantities of ingredients, given to the subjects in their original packaging. Only steps that included measuring and mixing of ingredients were included in the test. The ingredients were chosen to offer interaction with different kinds of packaging e.g. jar, large bag, small bag and cartons of large and small sizes. Both dry and liquid ingredients were present in the test. Subjects were also handed the physical models of concept 2.1. The subjects were observed while cooking and then interviewed. Part of the interview was dedicated to the examination of three different suggestions for graphic design [see appendix F]. Subjects were exclusively non-professionals with an interest in cooking and baking in the home.

### *14.1.1 Conclusions*

The results showed [see appendix G] that both subjects gave positive feedback on the design of the handles. Both subjects remarked about the length of the handles and how it made it easier for them to dig into packages for ingredients. The flat surface was also perceived as different to other measuring cups seen in the market according to test subjects.

Both subjects preferred graphic design suggestion number one, with the motivation of it being the most easily understood. Both subjects expressed appreciation for the markings for two and five tablespoons on the 1-deciliter vessel. The markings were said to probably be useful for inexperienced chefs.

The user testing helped validate both functionality and communication aspects of the product: the design of handles, vessels and graphics. The result of the test will help future design evaluation. The influence of the results should however be considered in relation to the amount of subjects and the quality of the prototypes.

## **14.2 Design**

### *14.2.1 Trade-offs*

The optimization for increased manufacturing of the design resulted in several trade-offs. The material choice affects texture, weight and mechanical properties. Tritan [see chapter 9.4.5] was suggested but in discussion with Catharina Cronsjö and Per-Olof Johansson, Tritan was discarded at this point to keep costs at a minimum. Polypropylene offers good material qualities and is a popular choice for products in contact with food. However, because of the decision to use Polypropylene together with hollow handles, difficulties concerning the design of handles arose. It was therefore necessary to thoroughly investigate what represented the essence of the original concept. Two features was considered essential:

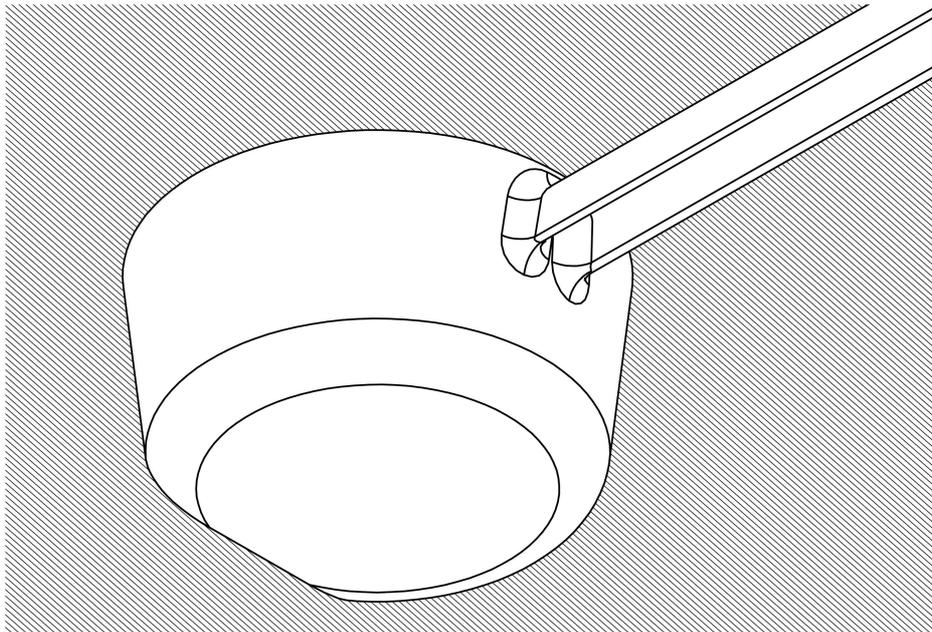
- The length of the handles on the Teaspoon, Tablespoon and 1-deciliter unit.
- The design of the vessels.

To ensure pleasant use of the product, and in extension, a joyful cooking experience, the product should offer a clean and hygienic solution. A hollow handle creates small spaces, preferably avoided to ensure hygienic aspects are fulfilled. The original design with solid handles offers the ideal combination of hygienic aspects and rigidity. However, in discussion with Hammarplast Consumer AB, exploring manufacturing possibilities for solid handles is not considered a viable option at this point.

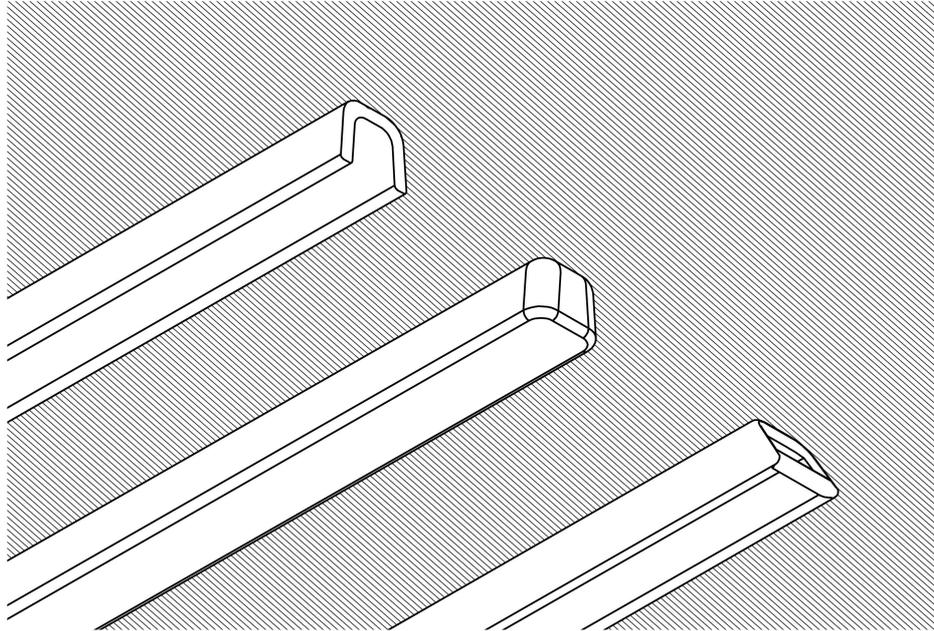
Flat handles would eliminate the creation of small spaces, but they would severely alter the original design. Flat handles would also make the length of the handles suffer, since long, flat handles would not offer a robust design. Keeping the essential features while also considering aesthetics of the final product, it was decided that a reversed U-shape design was considered the best option.

### 14.2.2 Handle design

Handles of the 1-deciliter vessel, the Tablespoon and the Teaspoon were to be designed with a cross-section in a reversed U-shape design to keep with the organic expression, see figure 14.1. The rigidity of the handles was a concern while developing the design. Torsional rigidity is crucial for a robust design. Hygienic aspects were also considered by avoiding the creation of complicated geometry where leftover ingredients can get stuck.



**Figure 14.1** The hollow handle on the 1-Deciliter unit.



**Figure 14.2** Three different designs for the end of handles on the Teaspoon, Tablespoon and 1-Deciliter unit.

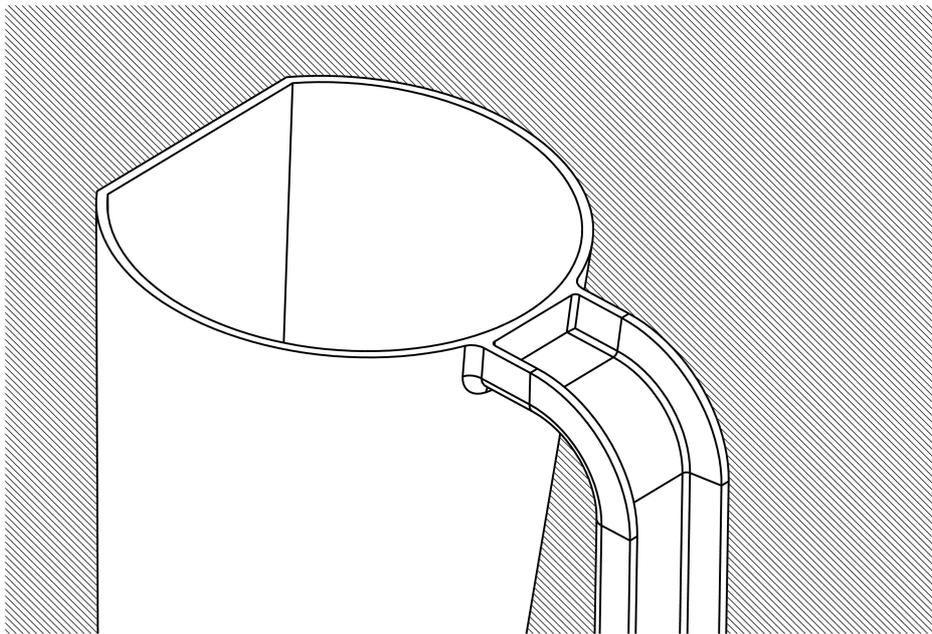
At the end of handles, opposite the vessel, three different designs were considered, see figure 14.2

- An open cross-section
- A closed, curved end
- A semi-closed cross-section

A closed, curved cross-section was chosen for offering the best rigidity, although a confined space would decrease hygienic aspects. Rigid handles were prioritized to keep the essentials of the design.

### *14.2.3 Handle Design for the 1/2-litre Vessel*

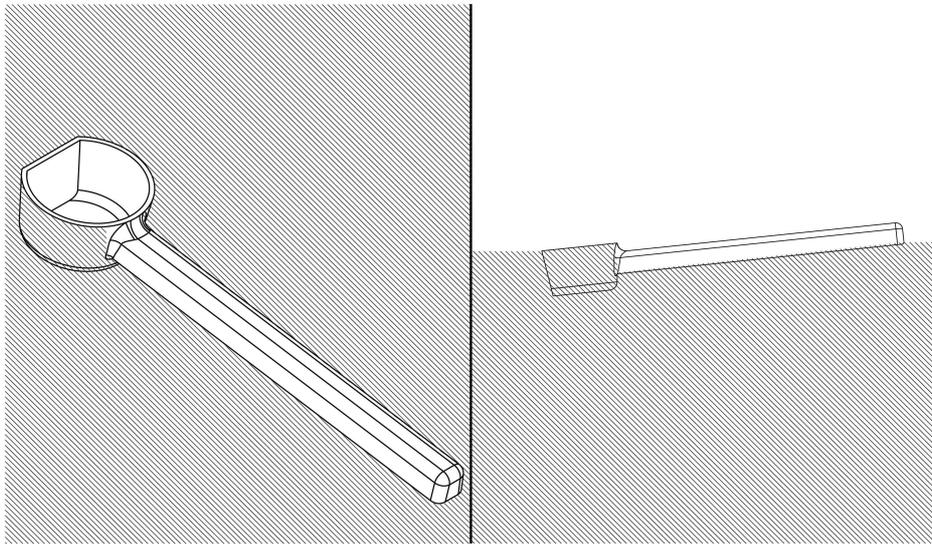
Unlike the handle for the smaller vessels, the handle for the 0,5-litre container was bent at an angle. The handle for the 1/2 litre-vessel was also redesigned in a hollow shape. A U-shape design was utilized in this instance to create a grip, see figure 14.3. The U-shape design creates possibilities of further enhancing the grip by creating a thumb rest at the top of the handle. With the thumb rest taken into consideration, the handle was widened.



**Figure 14.3** The handle of the 1/2-Litre unit.

#### 14.2.4 Manufacturing Considerations

The product is to be manufactured in Polypropylene using injection moulding. Injection moulding requires draft angles on all surfaces to properly eject from the mould. Also of consideration, is where to put the parting line. In discussion with Per-Olof Johansson, Technical Development at Hammarplast Consumer AB, the parting line was set. See figure 14.4 where all white surfaces of the part are to be in contact with the upper part of the tool.

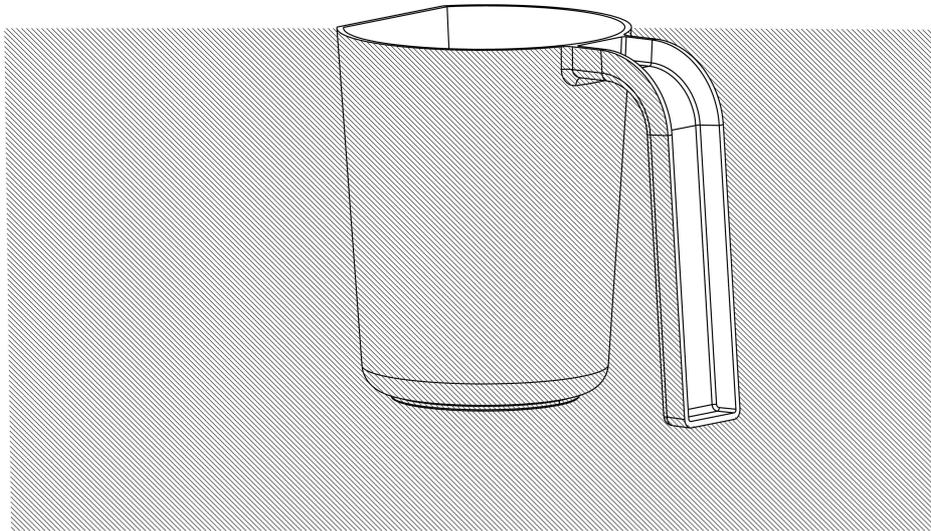


**Figure 14.4** Tablespoon. White surfaces of the part are to be in contact with the upper part of the tool.

To allow the mould to reach all points where handles connect to the vessels, parts were tilted  $6^\circ$  as seen to the right in figure 14.4. According to Per-Olof Johansson, this implementation is a viable solution for production.

*14.2.5 Manufacturing considerations for the 1/2-litre vessel*

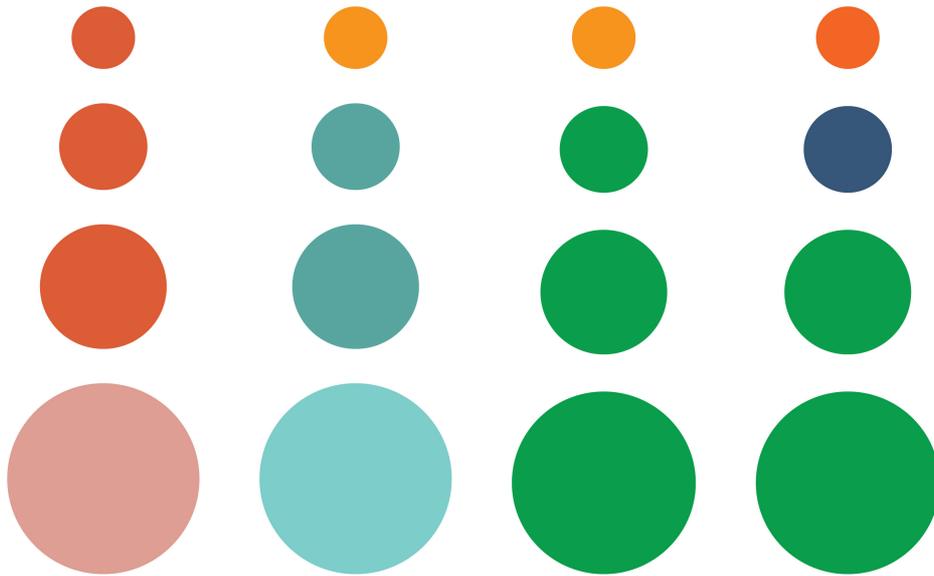
The design of the handle for the 1/2-litre vessel is different from the smaller vessels. This allows for a straight forward moulding procedure. White surfaces are to be in contact with the upper part of the tool as seen in figure 14.5. The handle has been slightly angled to allow for safe release from the mould.



**Figure 14.5** White surfaces of the part are to be in contact with the upper part of the tool.

### 14.2.6 Colour, graphic design & textures

Choice of colour was based on the persona Alfred [see chapter 7.3]. Image boards [see chapter 7.4] describing activities and environments connected to Alfred acted as a starting point for discussion. Several palettes were evaluated against image boards and the original concept design.



**Figure 14.5** Colour palettes experimented with for the final design.

Text and graphic elements are to be protruding from the inside surface of the Teaspoon, Tablespoon and 1-decilitre units. Text on the 1/2-litre unit is protruding from the outside of the vessel.

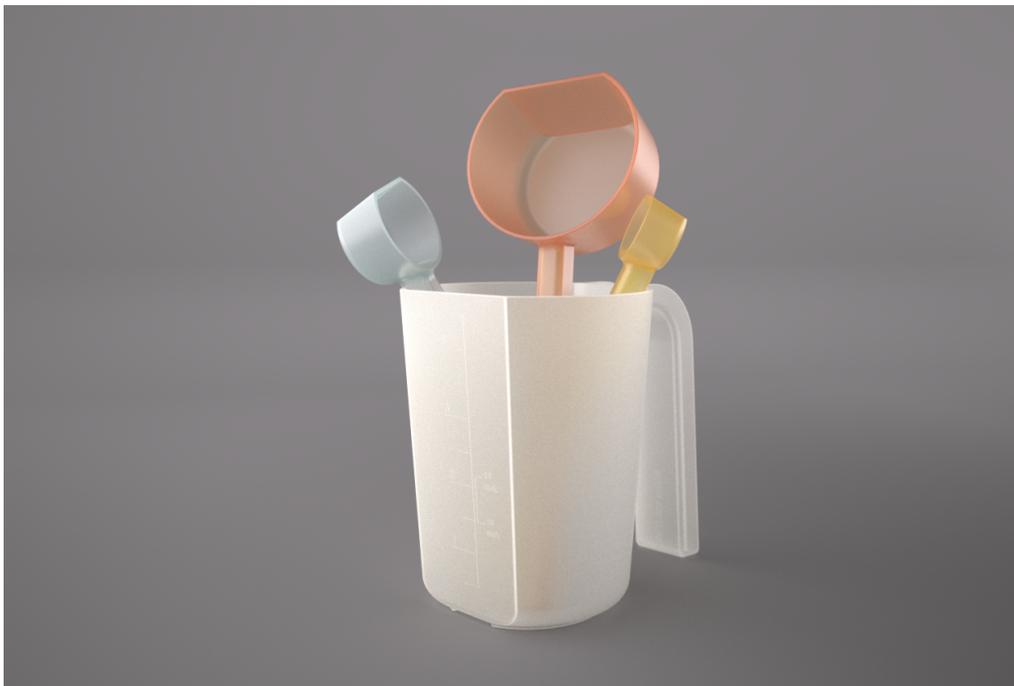
A matte texture is suggested for all outer surfaces of the units. The insides of vessels are suggested to be highly glossy except for text on the Teaspoon, Tablespoon and 1-decilitre units.

## 15 Final Design Suggestion

*This chapter presents the final product, which is the result of this project.*

### 15.1 Product Presentation

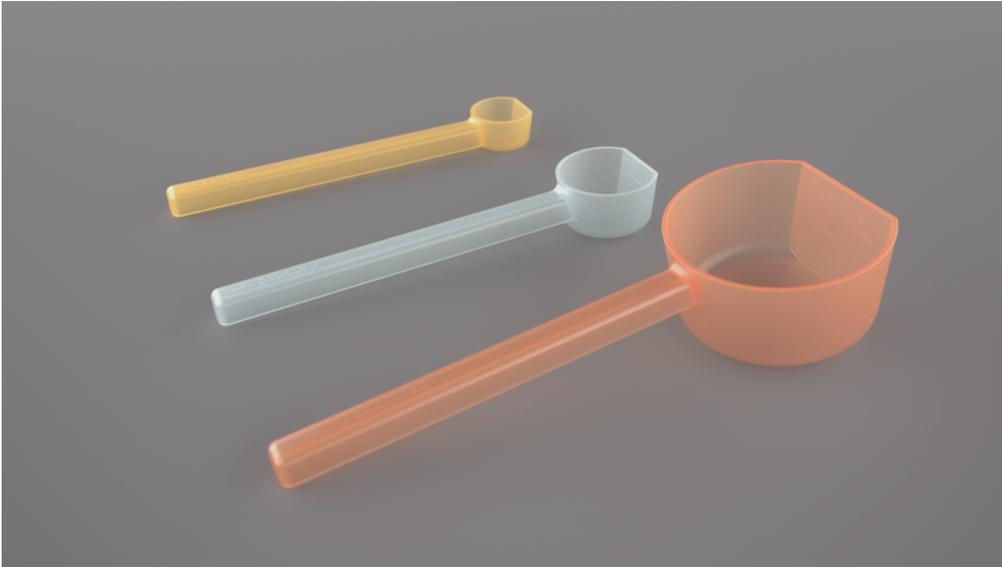
The final product design suggestion consists of four units in total: 1/2-litre unit, 1-deciliter unit, Tablespoon unit and Teaspoon unit, see figure 15.1. Each of the four containers is visually and functionally similar with a flat surface, breaking a cylinder shape. On the flat surfaces, measurement markings are displayed. At the intersection with the cylinder shape, the flat surfaces create spouts for right- and left-handed users. Handles of the 1-deciliter unit, Tablespoon unit and Teaspoon unit are long and slender, see figure 15.2. The handle for the 1/2-litre unit is angled and hollow, which creates a comfortable grip and a thumb rest at the point where the handle connects to the vessel, see figure 15.3.



**Figure 15.1** The final design suggestion, with all four units.

15 Final Design Suggestion

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**Figure 15.2** The final design suggestion, with the three smaller units.



**Figure 15.3** The final design suggestion of the half-litre vessel.

### 15.2 Manufacturing and material choice

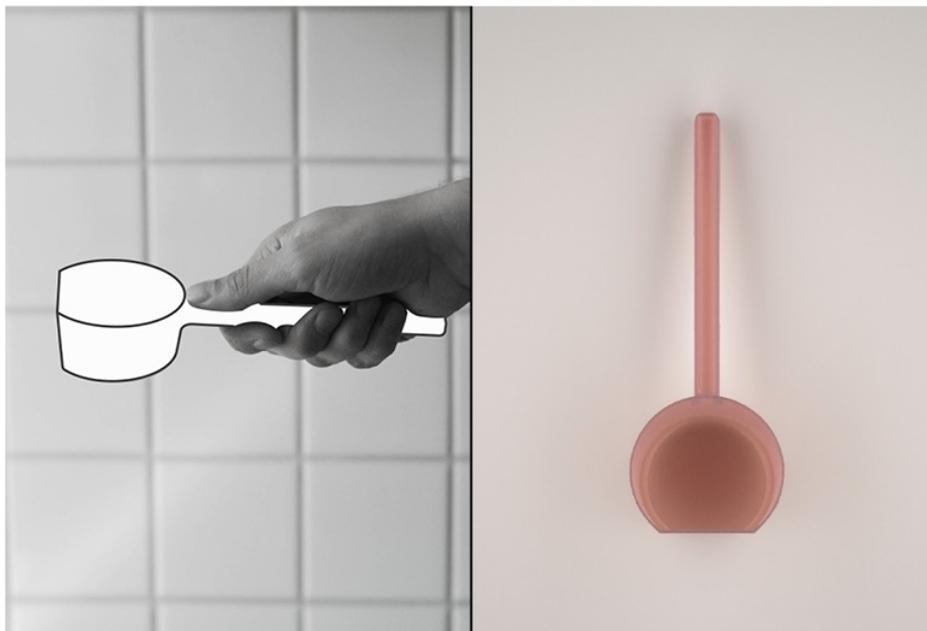
The product is manufactured with injection moulding. The material is translucent, coloured Polypropylene. Text and graphic elements is set as a relief, embossed on the models. The outside surfaces of the units are set in a matte texture, while inside surfaces are glossy. For technical drawings, see Appendix H.

### 15.3 Usage

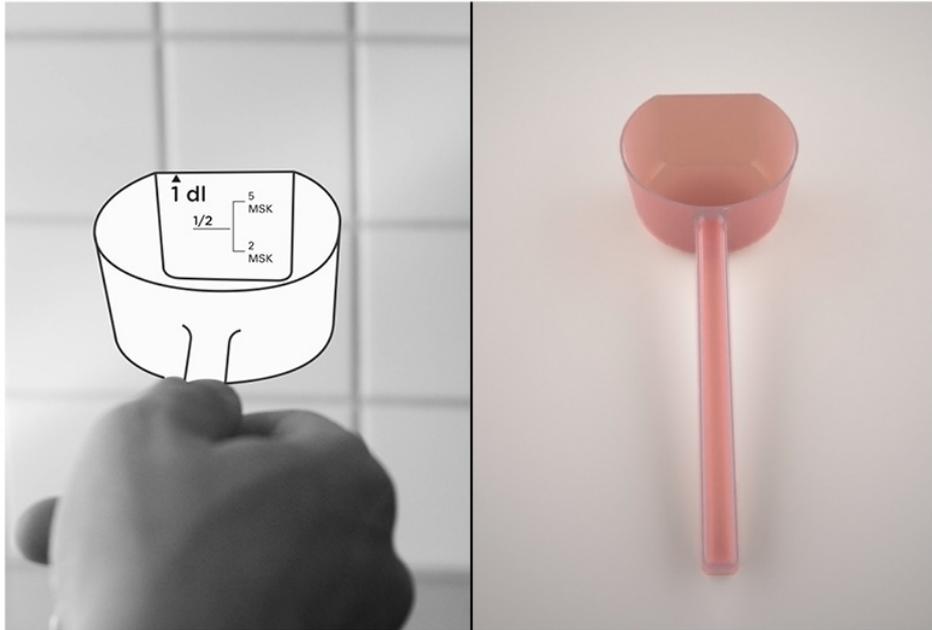
The product offers a set of four measurements units. When cooking or baking, smart measurement markings offer measuring of both tablespoons and decilitres with the 1/2-litre unit and 1-deciliter unit.

The product is stored visibly and easily accessible in the kitchen with the three smaller units standing upright in the 1/2-liter vessel. The 1-deciliter unit, Tablespoon unit and Teaspoon unit can also be stored in a drawer with other kitchen utensils such as spoons, spatulas and turners.

The long handles allow the user to easily and comfortably reach into all kinds of food packaging. The flat surface of the vessels makes reading measurement markings easy and natural while also creating spouts for both right- and left-handed users. See figure 15.4-15.10 for a short demonstration of the usability aspects.



**Figure 15.4** The long handle allows for a good grip for the whole hand.



**Figure 15.5** Measurements are stated on the flat surface of the vessel.



**Figure 15.6** The shape of the vessel creates two natural spouts.



**Figure 15.7** The length of the handles creates an easy access to packages.



**Figure 15.8** The shape of the vessel allows easy scraping.



**Figure 15.9** Pouring with the half litre vessel.



**Figure 15.10** A storage solution.

## 16 Discussion

*The working methodology and the outcome of the thesis is discussed and reflected upon in this chapter. Lastly, recommendations for further development are made.*

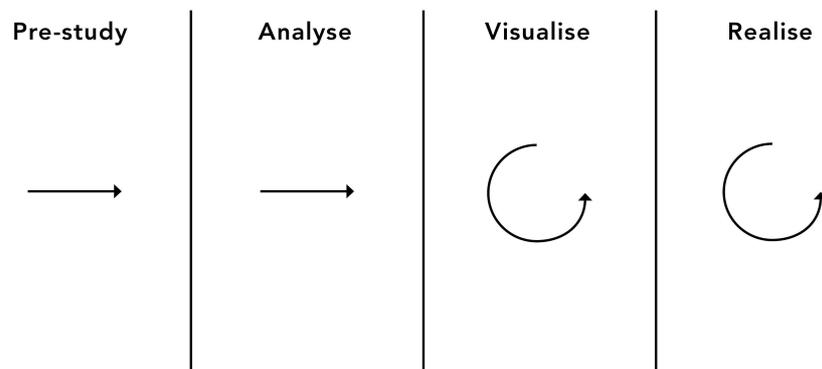
*"Smart, sustainable and well-designed products for the kitchen are in high demand"* [see chapter 2.1]. When formulating the goal of this thesis, the statement above acted as a point of departure. Hence, the challenge presented was to discover innovative, robust, long lasting and functional solutions in a well explored and saturated market.

The outcome of the project was a production ready basis to a series of measuring vessels, as in technical drawings and manufacturing instructions. According to the scope of the project in agreement with the Hammarplast Consumer AB and supervisors at *Division of Industrial Design* [see chapter 2.2], this project did not include development of packaging, distribution channels or brand strategy. If more resources were provided for the project, more in-depth explorations into these areas were highly desired. Packaging development would be very relevant to consider in the scope of product development. Packaging relates to important aspects i.e the logistics and the perceived appearance of the product in retail stores.

According to Hammarplast Consumer Ab, a re-imagining of the brand *Gastromax* is in the works. Future brand strategy would be an interesting and relevant area to cover, if the scope of the project allowed. With a deeper knowledge of the strategy behind the brand *Gastromax*, certain business information could be utilized and from this information valuable insights could be gained to enrich the outcome of the thesis. The insights could lead to design opportunities e.g. improvements of *Gastromax* brand identity and deeper utilisation of design as a tool to compete against competitor brands.

### 16.1 Working Process

The implemented method was found suitable throughout the project. Since the given task was product development with a design focus, using elements from Landqvist [x] was suitable. The method allowed the project to be free from constraints while it also provided a clear guideline. The project plan [See appendix A] corresponded well to the work pace at the initial phases, *pre-study* and *analyse*. However, the process turned out to be more iterative than imagined at the last phases of the project, *visualise* and *realise*, see figure 17.1. The project was presented one week ahead of the original project plan. [Figure A.2]



**Figure 17.1** How the project plan was executed.

The research phase was initiated on a wide level; the reason being to be certain not to miss out on relevant insights in order to discover opportunities for a well-established product category. A persona for the project was formed with insights gained from the *Measuring* chapter [See chapter 4] and the *Target Group Research* [See chapter 7]. Observations on chefs and home cooks in their kitchen proved to be very insightful, the subject's attitude towards measuring could be identified. Expert interviews complemented well to the observations, it was interesting to gain knowledge on the topic from an experienced person's point of view. Sonyia Sjöberg's [See 7.2] commented for example on the difficulties for apprentices in her cooking classes to convert tablespoons into decilitres. Her statement highlighted the importance of relations between different quantities.

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The aim of the chapter *Trend Forecasting* was to widen the scope beyond kitchen products, taking inspiration from fields outside of the context. However, no direct connections between the conclusions of the trend analysis and the final result is evident. A more in-depth and extensive research is needed in order to gain useful information. Despite that the project did not take any direct use of the forecast, it was nonetheless a worthwhile exploration into consumer products and a useful exercise.

An understanding of the brand Gastromax's positioning on the market was gained through market research [see chapter 5]. A comparison with price and consistency in design was made with brands encountered in the market. Figure 5.1 shows the identified classifications: *Do-it-all*, *Strong Identity* and *Premium*. Gastromax was identified as in between the *Do-it-all* and *Strong identity* categories. The identified position of Gastromax confirmed the earlier statement [see chapter 2.2] that Gastromax could be defined as a *mass-market premium* brand.

According to figure 5.1, if Gastromax wishes to gain a stronger brand identity, a consistency in design has to be implemented. Based on initial discussions with supervisors at Hammarplast Consumer AB, an assumption was made at that point, for the company to wish for a stronger identity. In the first concept suggestions [chapter 12.3] and the refined design suggestions [chapter 13.2], a strong and bold visual language was put ahead of manufacturing efficiency. This was later questioned, during discussions of future production possibilities for the design. Initially, the suggestions were not in coherence with intentions from the company and the adaption of the requirements for a *mass-market premium* product was implemented at a late stage of the design process. Although manufacturing issues did arise during the last stages of the project, the final design was transformed into a viable product in the *mass-market premium* category. Descriptions on how the final design adapted to requirements are discussed in chapter 16.2. In figure 5.6, the final design is seen to fit in the first quadrant, leaning towards playful and inventive.

The function analysis aided as a checklist in all evaluation processes; the final design corresponded well to the function analysis. It regarded however only usability and was kept relatively vague and simplified. As a result, the functional analysis [table 8.1] was useful at the early stages of the evaluation process. Later on in the project, it proved to be insufficient to refer to the function analysis only, since other aspects such as manufacturing requirements was to be considered.

The separation of *ideation* into three phases came natural. Phase one contained generation of ideas and concepts with simple sketches through brainstorming sessions. Phase two concerned reflections and explorations of the ideas gained in phase one. Important insights, of which some were realised in the final design, were gained in the second phase of ideation [see chapter 11.4]. The last phase consisted of

implementations and elaborations of concepts, through mock-ups, concept design suggestions and subsequent evaluations.

### 16.2 The Final Design

According to the scope [chapter 2.2], to be able to be in coherence with *Mass-market premium*, attributes to be kept in mind during the design process were *long-lasting quality, high functionality, robust and innovative*. How this was executed was dependant on the interpretation of the attributes, considering the ambiguousness of the words.

The final design derived from the second out of the four early concepts, [see chapter 12.3.2], and displays long handles in combination with a cylindrical vessel and a flat surface. Organic shapes were kept in mind when the design was formed, with its long, slender handles with big radii at the point where the handles meet the vessels and also at the bottom edge of the vessel. These organic attributes became the characteristics of the concept, and most of the original elements have been carried through to the final design. The organic elements are considered to be in coherence with the context of food, which is highly organic in itself and in its shape. The interpretation of the organic elements are however highly controlled and accurate in the final design. All radii are consistent and symmetrical. The shape of the vessel is also perceived as strict and strong. The flat and straight shape of a shovel inspired the flat surface of the cylinder. The strict and controlled shape meeting organic elements, were considered appropriate with the context of the product. Being near highly organic substances that are unpredictable and at the same time be consistent and accurate when acting as a measuring vessel.

The long handles and the flat surface were considered to meet the attribute *high functionality*. The flat surface is supposed to act as a functional surface, [see figure 12.9]. The measuring information will be stated on this surface and it is slightly tilted to enable easy reading. The long handles are intended to endorse convenient digging into packages. These functionalities were also justified through user testing.

The attribute *robust* was perceived as something physically rigid and strong. A rigid construction of the vessels was needed while at the same time enable manufacturing within feasible costs. The challenge was to keep the long handles rigid using Polypropylene [see chapter 9.4.3] and a hollowed-out design. [Chapter 14.2.2] To strengthen the u-shaped handle additional, the wall thickness was slightly increased for the handles. As a result, wall thickness is not even throughout the whole part, which is normally not recommended. But the rigidity of the product was higher prioritized and manufacturing competence at Hammarpast Consumer Ab assured that the increase in wall thickness of the handles were of no concern.

*Long lasting quality* is an attribute closely connected with a *robust* construction. A robust construction combined with a tough material, makes a product stand physical wear for a long period of time. It is however not always the physical properties that fail when the appreciation of a product wears off. Aesthetical qualities have a great influence on this matter. It is difficult to predict if a product design is destined to be aesthetically long lasting, it is however possible. An exploration on the concept of *quality* could be executed if the time frame of the project had allowed it. It is possible to make use of a thorough trend analysis, in order to look back in time to make predictions on what aesthetics will last into the future.

There are many interpretations of the word innovative. But in order to keep the exploration of the attribute within the scope of the project, a simple approach to interpret the word was decided. According to Oxford Dictionary [1], innovative is an adjective describing advanced, original, or featuring new methods. It is believed that something original have been discovered in the final design. Both the long handles and the flat surface on the cylinder of the small vessels is considered to be original and featuring new methods. None of those features have been discovered through the market research [see chapter 5] and proved to be efficient during the user testing See chapter 14.1] The final design is nevertheless relatively similar to the existing archetypes of measuring vessels, the features are however considered to be appropriate to Gastromax's market [Chapter 2.2].

During the design process, several evaluations resulted in trade-offs from the original design. Without further knowledge of business strategies concerning the product i.e. end-customer pricing, distribution and packaging options, Advice from Hammarplast Consumer Ab were to determine this matter. Hence the design of the handles was altered from concept 2.1 with solid handles, to keep manufacturing costs at a minimum. The solid handles were also difficult to achieve manufacturing wise, with the company's existing equipment.

Compromises of concern when the handles became u-shaped [see chapter 14.2.2] are hygienic aspects and rigidity of the handles. It was stated during the development process, that one of the essential features of the design is the length of the handles and it should not be given lower priority. Hence to allow long and slender handles with a confident and secure usage, rigidity is of top priority. However in discussion with the company, the material choice was confined to Polypropylene, which is not a material as rigid as initially desired. It is highly preferred in future opportunities to make an evaluation on rigidity; surface structure, colour reproduction and a thorough cost-analysis, in order to evaluate if the proper material was chosen. The small and confined space on the bottom of the hollow handles is of concern from a hygienic point of view. Dirt can easily get caught in the confined space during usage and when put on a rack in the dishwasher, with the vessel facing downward, water will get stuck inside handles. However, the length of the handles could signify that the product is

intended to be placed vertically inside the dishwasher, which would eliminate the problem. It is however impossible to predict the end-users behavior in this matter and it cannot be assumed that users with dishwashers have the possibility to place utensils vertically in their dishwashers.

### **16.3 Prospects**

The goal and scope of this project is to present a design for a concept for measuring dry and liquid ingredients and to reach a production-ready state, as defined by Hammarplast Consumer Ab.

For future development it is of interest to further explore manufacturing alternatives in order to avoid compromises of the design. However, trade-offs during the design process are not to be viewed upon as failures, but as necessary elements of any product development process. The project highlighted the importance of having a good conversation with the manufacturing competences at an early stage, in order to develop a product that is in coherence in both design and manufacturing requirements.

Solid handles were initially an important feature of the products design. In the market for kitchen utensils, companies are constantly competing on various levels. A strong, bold and original design could be an argument for exploring other manufacturing methods. There are several alternative methods that would allow hollow articles, such as filling the core with plastic foam, gas assisted injection moulding or water injection moulding. However according to supervisor Katarina Elnér-Haglund, none of these methods would be defensible if implemented on this project, due to high costs with no guarantee of a desirable end-result, aesthetically or construction wise. With no deep insights into the company's business strategy in regards to this product, it is however hard to argue for additional costs at this point. More in-depth meetings with Hammarplast's technical and executive representatives could result in an exploration of all alternatives in regard to manufacturing, marketing and cost-analysis for the product.

Graphic design and the application of text is an important feature of the product. This area is suggested to be further explored and tested thoroughly on potential users. Ideally, graphic elements are printed or integrated into the product. The current graphical elements are displayed as a relief on the vessels, which can result in reading difficulties. To seek out and evaluate alternatives to the current application of graphic elements is highly recommended.

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# Appendix A: Project Plan

Table A.1 The original project plan.

Planned Schedule	Jan		Feb		Mar		Apr		May		Jun													
	21/1 – 3/2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
<b>PRE-STUDY</b>																								
Background																								
Aim/Objectives																								
History & Cultural context																								
Market research: benchmark, price, sector charts																								
Material research																								
Interviews																								
Identify customer need																								
<b>ANALYSE</b>																								
Function analysis																								
Trend analysis																								
Image boards																								
Target Group																								
User scenario																								
<b>VISUALISE</b>																								
Ideation																								
Concept generation, idea sketching																								
Evaluation of Concepts & Further development																								
Test & Experiment: Mock-ups																								
<b>REALISE</b>																								
CAD models																								
Prototyping																								
Final presentation																								
Report Writing																								

Appendix A: Project Plan

**Table A.1** The actual project plan.

Actual Schedule	Jan 21/1 – 3/2		Feb 4/2-3/3		Mar 4/3 – 31/3		Apr 1/4 – 28/4		May 29/4 – 26/5		Jun 27/5 – 13/6												
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
<b>PRE-STUDY</b>																							
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<b>REALISE</b>																							
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Prototyping																							
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## Appendix C: Recipes in User Testing

### C.1 Recipes in User Observation

#### Le cake au chocolat

(Av: Sébastien Boudet)

250g ägg

200g råsocker

150g mjölkchoklad eller 120 g mörkchoklad 70%

100g osaltad smör

120g vetemjöl

7g bakpulver

90g mandelmjöl

25g kakao pulver

120g vispgrädde

#### Instruktioner:

1. Sätt ugnen på 175 grader.
2. Vispa ihop ägg tillsammans med råsocker.
3. Smält chokladen i ett vatten bad eller i mikro.
4. Smält smöret.
5. Sikta vetemjöl, bakpulver, mandelmjöl kakaopulver över äggblandningen.
6. Vispa ordentligt för att ta bort klumparna.
7. Häll i vispgrädde och smöret i smeten.
8. Vispa ordentligt till ett slät smet.
9. Häll i den smälta mjölkchokladen, byt vispen mot en slickepott och rör tills allt mjölkchoklad har blandas ordentligt med smeten.
10. Klä en kakform med lite smörpapper.
11. Fyll cirka 1/2 av formen med smet.
12. Grädda i ugn i cirka en timme, kontrollera med en kniv ifall kakan är klar. Är kniven ren, så är den klar!

**Biff à la Lindström med dijonyoghurt**

2 Personer

250g nötfärs

1,5 msk ströbröd

0,5 dl mjölk

0,5 gul lök

0,5 msk finhackade inlagda rödbetor

1 msk kapris

1 ägg

0,5 tsk salt

0,5 krm peppar

0,5 msk smör att steka i

1 knippe färsk persilja

**Dijonyoghurt**

1 dl matyoghurt

0,5 msk dijonsenap

1/4 msk honung

ev. salt

ev. peppar

**Så här gör du:**

1. Lägg ströbrödet i en bunke och häll på mjölken. Låt svälla några minuter.
2. Skala och finhacka löken. Rör ner färs, lök, rödbetor och kapris i bunken med ströbröd och mjölk.
3. Tillsätt senap, ägg, salt och peppar och rör färsen smidig.
4. Forma små biffar och stek i smör, 3-4 minuter på varje sida på medelhög värme tills biffarna är genomstekta.
5. **Dijonyoghurt:** Blanda matyoghurt, dijonsenap och honung. Smaka av med salt och ev peppar.
6. Strö grovhackad färsk persilja över biffarna och servera med rotfrukter och dijonyoghurt.

## C.2 Recipes in User Test 2

### Jordgubbsmuffins

Färdigt på: 30 min

#### Ingredienser

2 dl yoghurt

6 matskedar råsocker

3 tsk vaniljsocker

1 1/2 tsk bakpulver

1 krm salt

4 dl mjöl

1 dl fullkornsmjöl

1,25 dl mjölk

2 matsked jordgubbssylt

1. Sätt ugnen på 200 grader.
2. Smörj en muffinsplåt för 12 st muffins.
3. Vispa socker, vaniljsocker, bakpulver och salt.
4. Blanda sedan ner mjöl, fullkornsmjöl, mjölk och yoghurt till en jämn smet.
5. Rör därefter ned sylten.
6. Fördela smeten i muffinsformarna, fyll dem till ungefär 3/4 med smet.
7. Grädda i mitten av ugnen i cirka 15 minuter.



## Appendix D: Observation and Interviews

**Table D.1**

OBSERVATION	TOLKAT BEHOV
Subjekt 1	
Kön: Kvinna	
Yrke: Konditor	
Ålder: 23	
I köket finns många verktyg men det är väldigt välorganiserat.	Behov av att bakning och matlagning köket ska fungera som en strömlinjeformad process.
Tar fram flera bunkar som hon tror sig behöva innan hon sätter igång.	Behov av att ha ökad effektivitet.
Använder en skål ovanpå vågens existerande skål.	Behov att köksredskapen ska tåla slitage.
”Jag kan gissa hur mycket sju gram bakpulver är”	Behov av att använda ögonmått/erfarenhet
Slickepott är mitt favoritredskap eftersom inget går till spillo och den är mångsidig.	Behov av att inte slänga mat
I bakning använder jag decilitermått, matskedar och sånt. I matlagning är det inte lika exakt.	Bakning är mer exakt än matlagning
Jag tycker decilitermått är jobbiga för de är små och skramlar runt och är svåra att diska.	Behov av lättdiskade och prydliga verktyg.
Förvarar måttskedarna hängande på väggen ovanför diskhon	Behov av att verktygen är nära till hands

**Table D.2**

<b>Subjekt 2</b> <b>Kön: Man</b> <b>Yrke: Kock</b> <b>Ålder: 49</b>	
OBSERVATION	TOLKAT BEHOV
Frågar om han får ta en halv lök till	Behov att improvisera i köket och använda sina erfarenheter.
"Äh jag tar två ägg"	Behov att improvisera i köket och använda sina erfarenheter.
Tog en vanlig tesked för att måtta upp dijonsenapen	Behov att det ska vara enkelt att laga mat, att det kan baseras på fingertoppskänsla.
Kaprisen tog han med en vanlig matsked	Behov att det ska vara enkelt att laga mat, att det kan baseras på fingertopp känsla.
Han vet inte vilket märke köksredskapen i köket han jobbar i har	Kunskaper i köket beror inte på vilka redskap som används.
Mats smakar av den råa köttfärsen med en liten sked (smakar av ofta)	Behov att ständigt smaka av det som lagas.
Mattias tar med handen och tar nypor av salt och peppar i såsen.	Behov av fysisk beröring på maten som lagas.

**Table D.3**

<b>Subjekt 3</b> <b>Kön: Man</b> <b>Yrke: Kock</b> <b>Ålder: 20</b>	
OBSERVATION	TOLKAT BEHOV
Måttar upp andel yoghurt med decilitermättet, tar sedan en liten sked och skrapar ut det som har fastnat.	Behov av att inte låta någon råvara gå till spillo.
Mattias måttar upp senapen först med en tesked som han sedan skrapar av på en matsked.	Behov av mindre måttskedar som kan stoppas in i mindre burkar.
Honungen mäter Mattias upp med en tesked. Han tar en matsked till hjälp för att skrapa ner det som har fastnat på teskeden. Det upprepar han flera gånger, honungen klibbar fast i båda skedarna.	Behov av skedar som honung inte fastnar så lätt vid.
Mattias tar med handen och tar nypor av salt och peppar i såsen.	Behov av fysisk beröring på maten som lagas.
Mattias är noga med att plocka undan. Flyttar på alla ingredienser till deras ursprungliga plats.	Behov av att köket ska vara rent och prydligt.

**Table D.4**

<b>Subjekt 4</b> <b>Kön: Man</b> <b>Yrke: Student</b> <b>Ålder: 26</b>	
OBSERVATION	TOLKAT BEHOV
Har många varor/utrustning framme på ytor i köket	Behov av att ha verktyg och produkter han använder ofta nära till hands.
Han befinner sig på nästan samma plats under hela processen.	Behov av kontroll och överblick i köket.
Han har inga hängande verktyg i köket.	Behov av att köket ska vara en ren arbetsyta.
Den digitala köksvågen är central i processen.	Behov av kontroll över mängden ingrediens.
Ställer en slev och skål i vasken och låter spola vatten på dem under tiden han gör annat.	Behov av att matlagning ska vara en naturlig syssla som han behärskar.
Väger inte chokladen utan räknar rutor.	Behov att det ska vara smidigt och enkelt under bakning.
Han placerar de ingående ingredienserna på arbetsytan.	Behov av att effektivisera processen.
Han litar på den digitala vågen.	Behov över bekräftelse av rätt mängd.
Plockar undan efter sig så snart kakan placerats i ugnen.	Behov av att köket ska vara en ren arbetsyta.

Table D.5

Subjekt 5	
Kön: Man	
Yrke: Kommunikatör	
Ålder: 41	
OBSERVATION	TOLKAT BEHOV
Arbetsytan var väldigt tom. Ett fåtal röda melaminverktyg stod i en hög burk i samma färg och material, även några spatlar och slevar i svart nylon fanns i burken.	Behov av att ha ett rent och dekorativt kök.
Hackar löken väldigt noggrant.	Behov av att följa instruktioner noga.
Läser receptet högt för sig själv	Behov att föreställa sig processen innan han utför den.
Måttar flera ingredienser med ögonmått efter placering på skärbräda.	Önskar att mat ska vara enkelt och opretentiöst.
Noga med att plocka undan samtidigt som han lagar. Diskar även under matlagningen.	Önskar rena verktyg och ytor när han lagar mat.
Använder godtycklig matsked för att mäta dijonsenap men säger att han skäms för att den inte är en exakt matsked.	Önskar ha en avslappnad inställning till mat.
Mängden köttfärs mättades med ögonmått.	Önskar att matlagning ska vara enkelt och smidigt.
Tog fram en stekspade ur en låda trots att det fanns i den röda <b>melanin</b> burken jämte spisen.	Önskar att visa upp ett vackert kök.
Använde en tesked salt från en burk med salt med ett teskedsmått i.	Behov av att ha verktygen nära till hands.
Måttskedar ligger ibland å skräpar inuti förpackningar.	Önskar en centrerad plats för verktygen i köket.

**Table D.6**

<b>Lisa Förare Winbladh</b>	
1	UTLÅTANDE
2	Jag har extremt bra ögonmått, det har ju inte alla och då måste man använda väldigt mycket mått.
3	Jämfört med andra matskribenter så skriver jag mycket mer noggrant, exakt liksom.
4	Om du inte skriver varför i ett recept så gör folk inte så.
5	Att säkert förklara hur viktigt det är att väga ingredienserna i kakor och bröd är viktigt.
6	Folk har så olika tekniker när de väger upp.
7	Förmalda kryddfrön är jättedåligt
8	Sen har jag microplanerivjärn, sådana här supervassa rivjärn.
9	Jag är väldigt förtjust i melaminskålarna i Margarethaserien som är klassisk. Det är helt enkelt att formen är så vansinnigt trevlig på den, den står stadig.
10	Ha riktigt bra stekpannor, gärna teflon, det här nya inte helt teflon utan nya super teflonet, som håller jättebra.
11	När man väl har börjat använda en våg så fattar man inte att man håller på med decilitermått och sådant där.
12	Men till andra saker, som vätskor och sådant så är decilitermått jättebra. När man liksom har en gryta på spisen så ska man tillsätta lite mer vatten och sådant där, då är det jättepraktiskt.

Table D.6

<b>Sonyia Sjöberg</b>	
1	Ja, mjöl och socker o... ja de har ju olika, alltså olika tyngd.
2	Jag kanske skriver så "vispa en liten stund" det är inte bra å skriva så.
3	En annan grej är om man smakar hela tiden så vet man åtminstone var man är på väg. Det är det allra viktigaste.
4	Man skriver ta tre matskedar. Men att förstå vad en matsked är?
5	Sen visade det sig att 10 matskedar är en och en halv deciliter, å det är inte alltid så lätt att förstå!
6	De som går på sina kockutbildningar de ska ju också kunna omvandla vikt.
7	Sen är det så att om du skakar ett decilitermått som många gör, när det inte är riktigt fullt, skakar du till den... Då är det redan för mycket.
8	Ett tag gjorde man ju långa sådana här, folk litade inte på långa mått.
9	Å då ser det större ut om du instinktivt tycker det kan inte vara en deciliter, litar inte på det.



## Appendix E: Evaluations Charts

**Table E.1** Evaluation chart with weighted scoring.

FUNCTION	WEIGHT	Concept one	Concept two	Concept three	Concept four
Communication	20%	5	4	2	1
Communicate relations	10%	3	3	2	3
Simplicity	15%	4	4	2	3
Joy of cooking	5%	3	3	4	4
Promote spontaneity	7%	3	4	4	2
Visual consistency	15%	3	4	5	4
Compact storage	10%	3	3	3	1
Decorative	8%	2	4	4	3
Manufacturing efficiency	10%	4	3	5	3
<b>TOTAL SCORE</b>		<b>3,57</b>	<b>3,65</b>	3,25	2,53

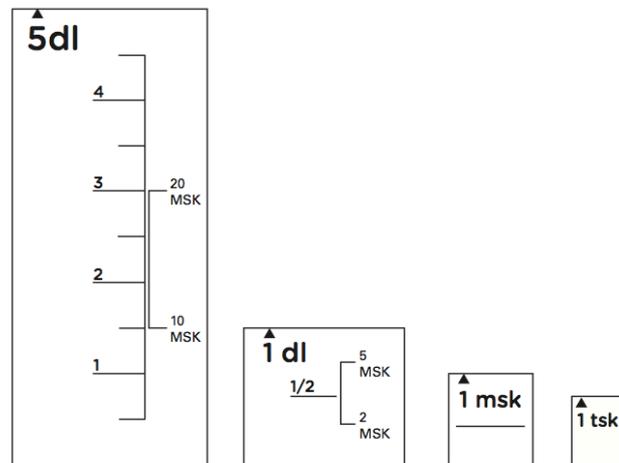
**Table E.2** Evaluation chart with mood indicators

Evaluation chart with mood indicators

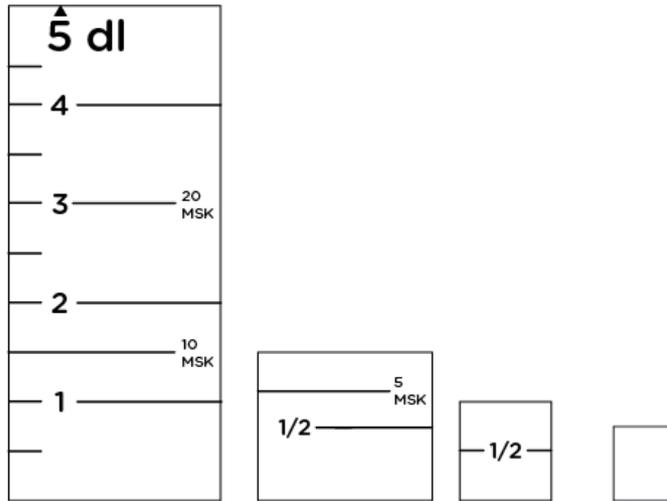
FUNCTION	Concept one	Concept two	Concept three	Concept four
Communication				
Communicate relations				
Simplicity				
Joy of cooking				
Promote spontaneity				
Visual consistency				
Compact storage				
Decorative				
Manufacturing efficiency				

Method developed by Per Liljeqvist.

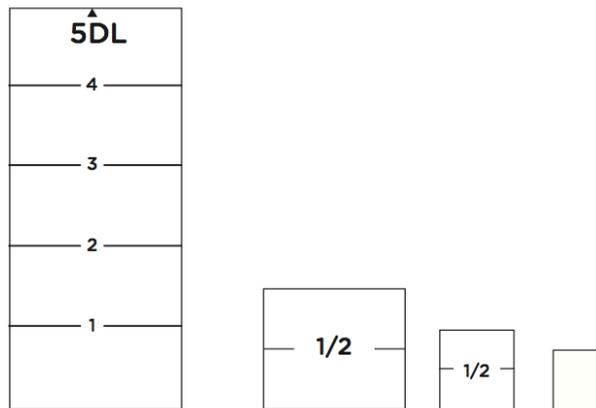
## Appendix F: Text and Symbols



**Figure F.1** Graphic design suggestion number one.



**Figure F.2** Graphic design suggestion number two.



**Figure F.3** Graphic design suggestion number three.

## Appendix G: User Test 2

### G.1 Subject 1

Subject 1 is a 24-year-old female. She enjoys baking in her spare time and as a result is experienced in baking.

#### G.1.1 Usability

The handles of the measuring spoons received positive feedback from subject one. She liked the length of the handles because it enabled her to dig into tall packages. The rigidness of the handles was appreciated, since she was concerned about the length of the handles might lead to flaccidness.

The flat surface of the container was thought of as a distinct detail; it made the subject think that the vessel might be easier to pour compared to a completely round shape. However, she could not determine if it actually made it easier to pour in practice.

#### G.1.2 Communication

The measurement spoons given to subject one were said to be easy to understand, in terms of functionality. Subject one pointed out the usefulness of having 2 and 5 tablespoons written out in the decilitre-measuring spoon. According to subject one, measurement markings for tablespoons on a decilitre container can aid as guidance for inexperienced chefs. Subject one preferred suggestion one of all three graphic design suggestions. Subject one appreciated the clearly expressed *msk* and *tsk* on the tablespoon and teaspoon, in suggestion one. [Appendix F, figure F.1] However, she was concerned for the markings of *20 msk* and *10 msk* on the 5-decilitre measuring cup since she rarely uses large quantities of these measurements when baking. Subject one thought the exaggerated lines on suggestion two were distracting.

## **G.2 Subject 2**

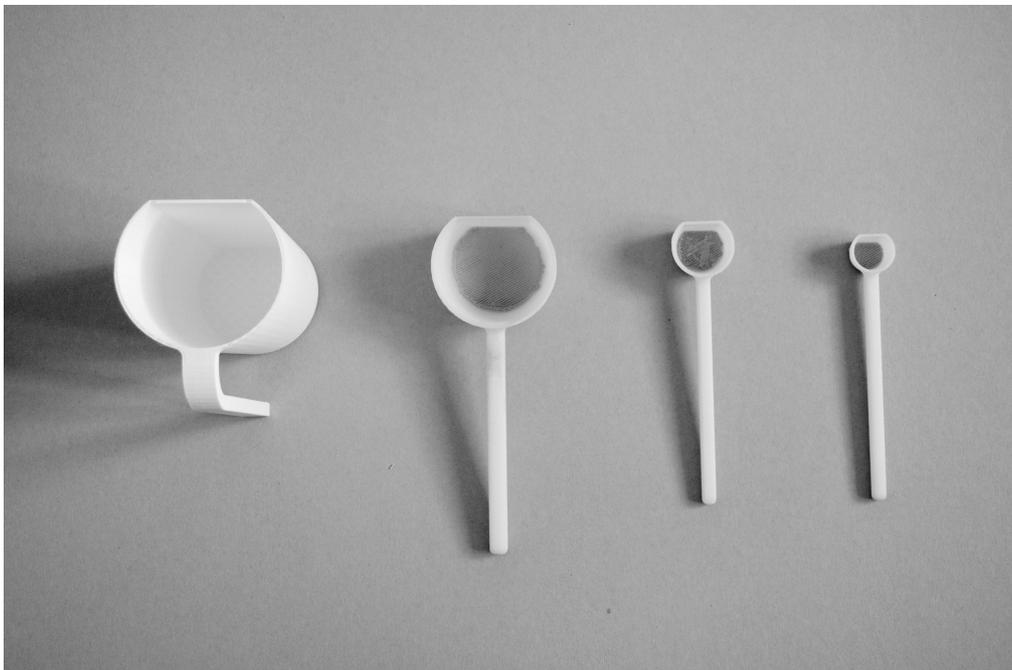
Subject two is a 26-year old man. To accomplish the task at hand, subject two was handed a 1-deciliter unit, a tablespoon and a teaspoon.

### *G.2.1 Usability*

Long handles were considered very helpful when reaching for ingredients in the bottom of packages, especially helpful for packages with small openings. Subject two was observed to use a pencil grip. When filling the 1-deciliter container with liquid ingredients (milk and yoghurt), the subject was observed to put his thumb on the top surface, close to the container. When interviewed, subject two responded positively to the length of the handles. Reaching into small containers was easily performed, according to subject two.

### *G.2.2 Communication*

Subject two had no problems distinguishing containers from each other. The flat wall of the containers was interpreted as useful when digging into packages of dry ingredients. Three suggestions for graphic design of measurement markings were shown to subject two. Suggestion one was deemed most attractive, although the markings on the tablespoon was said to be confusing and not consistent.



**Figure G.1** 3D printed models of concept 2.1

