Design of a backpack container with cooking and eating tools

Bachelor Degree Project in Product Design Engineering
Level ECTS 22,5 hp
Spring term 2012

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Assurance

This document has been submitted by Carlos Jiménez Sánchez and Irene Gallego Sánchez to University of Skövde as a Bachelor Degree Project in Product Design Engineering at the School of Technology and Society.

I certify that all material in this Bachelor Degree Project, which is not my work has been identified and that no material is included for which, a degree has previously been conferred on me.

___________________  _________________
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Abstract

The aim of this project was to develop a product in cooperation with Primus Company in Stockholm. It consisted of designing a container with the items needed when cooking and eating outdoors, in order to help the users eat and cook in a proper way while practicing activities such as camping or hiking.

Considering the specifications posed by Primus, research was done. One of the main issues to start this research was to carry out a market analysis in order to know all the products similar to the one that was going to be developed. Then, an analysis of the company and the main competitors of it was done in order to develop a product with Primus style and to get ideas for the product. In addition, a questionnaire study directed to potential users was carried out. In this way, it was possible to get to know things such as which items people usually carry in their backpack for cooking and eating outdoors and which ones they considered essential. This helped with making a choice of what the product should contain.

Once all the information collected from the research and from the study of the specifications was prioritized, the concept development phase started. For reaching an outcome, many aspects such as the items that the container should include, the shape of the container and the best material for the product were discussed.

Primus TetraCube is a product that suits all the requirements established at the beginning. In this way, Primus TetraCube is a product that can be carried in an 80 litres backpack and where the user can store all the necessary items for four people who want to eat and cook outdoors. It has also been designed taking into consideration all the details, resulting in a product that follows the aesthetics of Primus with soft shapes and colours such as red, black and grey. Everything combined make Primus TetraCube a comfortable product which helps the user feel at home in terms of convenience and comfort.
Acknowledgements

This project has been developed at the University of Skövde for the Bachelor Degree Project and it has been carried out in collaboration with Primus in Stockholm.

We would especially like to thank Nicklas Andersson, Eric Svartstrom and Urban Kihlström from Primus because of their help in focusing this project and their constructive comments in the development of the final product.

We want to thank Peter Thorvald, the supervisor in this project, for the aid given when necessary and for giving us guidance in how to shape the project.

Thanks also to Dan Högberg for his opinion and interesting comments about the final result of this Bachelor Degree Project.

Finally, we would like to thank our family and friends for their support and help.
# Table of contents

1 Introduction ............................................................................................................................................. 1
2 Background ............................................................................................................................................. 3
   2.1 Theory background .......................................................................................................................... 5
3 Problem definition .................................................................................................................................. 10
   3.1 Aim .................................................................................................................................................. 10
   3.2 Goals and limitations ...................................................................................................................... 10
   3.3 Chosen design strategy .................................................................................................................. 11
4 Research ................................................................................................................................................. 13
   4.1 Philosophy of the company ............................................................................................................ 13
   4.2 Customers ...................................................................................................................................... 13
   4.3 Competitors .................................................................................................................................. 14
   4.4 Market research ............................................................................................................................. 14
   4.5 User survey ................................................................................................................................... 17
   4.6 Materials ...................................................................................................................................... 18
   4.7 Colours .......................................................................................................................................... 18
5 Concept development ............................................................................................................................ 21
   5.1 Organizing ideas ............................................................................................................................. 21
   5.2 Ideas generation .............................................................................................................................. 22
   5.3 Pre-concept .................................................................................................................................... 25
   5.4 Final Concepts ............................................................................................................................... 27
6 Final Design ............................................................................................................................................ 30
   6.1 Body .............................................................................................................................................. 30
   6.2 Modules ........................................................................................................................................ 32
   6.3 Elements ....................................................................................................................................... 34
7 Marketing phase ..................................................................................................................................... 37
   7.1 Name ............................................................................................................................................ 37
   7.2 Logo ............................................................................................................................................... 37
   7.3 Commercialization ......................................................................................................................... 38
1 Introduction

People nowadays increasingly spend their free time in contact with nature. Rural and eco-tourism, which is when people go to the mountain, beach, campings, hiking, etc. is becoming very popular (Instituto Nacional de Estadística, 2012). In these activities it is very common to eat wherever you are. Cooking and eating are also entertaining activities and a part of the fun outdoors, but many times, a problem can be found in the need to carry all the necessary things to do both activities. People usually use backpacks to carry everything, and often it is difficult to carry all the necessary things for cooking and eating outdoors in your backpack.

Taking this problem into account, it would be useful to have some kind of container to store the food and cooking utensils wanted to bring along with everything in the backpack. In this way, when people go cooking or eating outside, they can carry everything in their backpacks and when they want to eat they can take out everything at once.

The company

This project has been developed in collaboration with Primus. Primus is a Swedish company that, with others (Fjällräven, Hanwag, Brunton, Tierra and Naturkompaniet), form the Fenix Outdoor Group, an internationally active company focused on products for outdoor activities and with a very important environmental thinking (Primus, 2010).

Primus has its origins more than a century ago, in 1892, when Frans W. Lindqvist constructed the first soot-free kerosene stove, which was named Primus (see Figure 1). After this, a large number of successes support them as a benchmark company in the market. One example of these successes is when in 1911 Roald Amundsen reached the South Pole with a Primus brand stove on the expedition. Another example is when in 1953 Sir Edmund Hillary and Tenzing Norgay became the first people to scale Mount Everest and their food was cooked on a Primus stove (Primus, 2010).

Figure 1. First Primus stove (Camping Club of Great Britain & Ireland, 1953)
Nowadays, millions of people all around the world use their stoves and lanterns every day. Today, Primus exports to some 70 countries, which accounts for approximately 90 per cent of their total sales (Primus, 2010).

As all the companies in Fenix Outdoor Group, Primus sells products for outdoors activities. Having a look at their catalogue (Primus, 2012), it is possible to see that they are specialized in stoves, lanterns and items to eat and cook outdoors, such as pots, pans and vacuum bottles. The product that has been developed in this project would be in the last group of products.

This product has been designed in a project in collaboration with the design team of Primus in Stockholm.

**The project**

The aim of this project was to design and develop a container with integrated cutlery where the backpacker could carry all the necessary items to eat and cook food outside in a proper way, and at the same time, showing with this product a clever and smart way to package all these items.

Initially, in order to be completed the project should contain:

- **Market analysis**
  In this phase, the following issues would be done: a market analysis consisting of a research of similar products on the market, an analysis of the competitors of the company and an investigation of the users’ needs with a questionnaire.

- **Concept phase**
  This phase should include an idea generation and concept selection phase, seeking to reach a valid solution for this project.

- **Detailed design**
  In this phase the final decisions are made. It should include the final design, material selection, final dimensions and a mock-up in order to show the final dimensions.
2 Background

During the last decades, the human beings have less relationship with nature because people tend to live in cities instead of on the countryside. This is due to the accelerated growth of cities and industrialization. Nowadays, humans are trying to recover that contact with nature because people are becoming more and more environmentally conscious, mainly due to widespread pollution and over-utilization of natural resources (Granero & Baena, 2010). This is why, nowadays, it is becoming more common to practice sports and activities related with nature, such as camping, canoeing, climbing, fishing, hiking and backpacking and this also happens because it is a way to occasionally get away from the routine in cities (Real, 1998). The product that has been developed in this project is likely to be used in activities such as backpacking or camping.

The beginning of backpacking

The exact year of the beginning of backpacking has not been established. According to Goldenberg and Martin (2007), backpacking and hiking are slightly different. Hiking “is a part of mountaineering about walking in the company of nature” (Oak, 2011) and backpacking is the practice of hiking for several days while spending one or several nights outdoors. A backpacker carries all that is necessary for the long journey on his back. This activity thus combines hiking and camping.

Backpacking became a fashionable activity in the beginning of the 1900s, when people were looking for a way to disconnect from the stress and strain of urban environments (see Figure 2). Before this date, backpacking was just a way of travelling instead of a recreational activity (Alpeche, 2012). This activity began around 1920 with the invention of the pack board by Lloyd F. Nelson. The pack board was a flat board for the backpack that performed the function of separating the contents of the pack from the back. This gave structure to the backpack and helped to carry the items inside it. The result of this was a better distribution of weight, allowing the user to walk in a comfortable way. Before the invention of the pack board, the backpack was just a bag with shoulder straps attached (Alpeche, 2012).

Nowadays backpacking is more streamlined and everything has become lighter. There have been innovations in shelters, sleeping bags, cooking tools and all those items that are usually kept in a backpack, making them lighter and more comfortable to carry. These are important characteristics for those who wear a backpack for long journeys and with numerous items inside it (Alpeche, 2012).
The beginning of camping

People leave civilization or urban areas to enjoy trips in nature on their holidays. Camping is always an option for this, spending one or several nights outdoors. According to Oxford dictionaries (2012), camping is “the activity of spending a holiday living in a tent”. One of the pioneers of camping was Thomas Hiram Holding, when camping started growing around 100 years ago. Holding travelled a great deal and based on the experience that he had on his trips, he wrote the first Camper’s Handbook. It helped people learn about basics of camping (TalkCamping, 2012).

The first campsite opened in the Isle of Man in 1894 and it was only for males. Camping at the end of the 1800s attracted around 600 men per week (see Figure 3). Due to the large increase of people practicing this activity, camping started growing (CampingInfo, 2012).

During the 1920s and 1930s, camping was consolidated as a recreational activity for those who were looking for a healthy lifestyle and a connection with nature (CampingInfo, 2012). In the 1960s, one of the main options for a holiday with the family was camping, partly because of the economic accommodation and because it was a holiday in tune with nature. Despite the visible progress, camping is still a very practiced outdoor activity and available for everyone. Camping is gaining in
popularity every year and it will continue to do so (TalkCamping, 2012). There is currently a great amount of people who use camping as their main holiday and this is set to grow.

To make all these kinds of activities and trips more comfortable, people usually carry with them lots of different items in their backpacks (items used to cook and eat, clothes, tools, etc.) so space and weight are two important factors to take into account when designing these kinds of objects. Moreover, as all these items are going to be used in the nature, it would be very important to take into account their environmental impact and this is a fact that Primus always keeps in mind.

2.1 Theory background

In this step, some principles that have been used in the development of this product are described; these relate to saving space and being environmentally friendly.

Space saving. Collapsible

As stated above, space and weight are two important factors to take into account for items that are going to be carried inside the container, so it would be important to bear in mind any way to save space and weight in the design process of the product.

Collapsible items are objects that can adjust or change their size to be used or stored. This feature is always useful in an object, but sometimes it is absolutely necessary. Usually, they are used to save space and in addition they normally have at least two functions: one when they are collapsed and another when they are expanded (Connie, 2004). In this product, the collapsible items play an essential role.

An object would be considered as collapsible if it can change its volume, if a space-saving mechanism has been used in it and if it can occupy its practical space when it is stored. The practical space is the free space when the object is imaginatively put in a prismatic shaped box (Connie, 2004).

According to Connie (2004), a collapsible mechanism can be classified into twelve different systems of collapsible structure: stress, folding, creasing, bellows, assembling, hinging, rolling, sliding, nesting, inflation, fanning and concertina.

The most important mechanisms to use in the developed product were: assembling, hinging, sliding and specially nesting. Below are detailed these mechanisms according to Connie (2004). Each mechanism is explained with several examples.

1. Assembling

With this space saving principle, the object has several parts that can be assembled for use or disassembled to be stored. This principle is common in items that are big and have to be transported. It is also used when an item is being designed in order to work with several parts, for
example, a screwdriver with different ends. In this case this principle could be used for items such as cutlery or cooking tools (see figure 4).

![Figure 4. Assembling](image)

2. Hinging

This method uses flexible joints with a good structural quality. It is used both to articulate two pieces and to solve space-saving problems. This principle is usually used in doors, but in the field of items, it is common in covers. This last use could have its origin in the nature since it is the same mechanism as a shell. Several examples could be a mobile phone, a ruler, a compass and a penknife among others. For this project hinging could be used for example in the main container, in cutlery, in cooking tools and for the handles (see figure 5).

![Figure 5. Hinging](image)

3. Sliding

In this kind of objects the parts slide over each other and this allows the object to be opened and closed. This is one of the most used space saving principles. It usually works with cylinders, but it also works with prismatic parts or twist. Maybe the most famous use of this principle is the telescope, but it is also used in tripods, cranes and chairs among others. In this case it could be used for example in glasses and cutlery (see figure 6).
4. Nesting

This principle usually appears when objects are going to be stored. It consists of two or more objects stacked on top of each other taking up less space than when they are separated. This principle is used to store chairs and everything that can be stored inside another item bigger than the first one. In this project this principle could be used for the glasses, the plates and the containers for example (see figure 7).

![Figure 6. Sliding](image)

![Figure 7. Nesting](image)

**Modularisation**

One of the best solutions in order to save space and give the users the possibility of choosing is using a modular structure. A modular structure is a system of parts, or modules, which can be combined in order to build the modular system. These modules can be composed of a repeated unique module or several modules that are combined (Wong, 1993).

These systems are usually used in many different fields, such as furniture design, graphic design and architecture (see figure 8).
The use of this technique in this project would result in a compact product with an effective use of the space. At the same time, a modular system would allow the user choose the items that could equip the product. In this way, the company would have the chance to launch to the market new products later in order to improve the product. Another advantage of using this technique is that if some element breaks down, it can be replaced without affecting the rest of the product (Sako & Murray, 2000).

Environmental impact. Design for environment (DFE)

As stated above, taking into account that this product was going to be used in the nature and that one of the most significant goals for Primus is the environment; design for environment was an important factor in the design process. It is also important to keep in mind the great importance that customers give to the environment nowadays. Because of this, designing a product with an environmental thinking is giving an extra value to the product.

Design for environment

According to Fiksel (2009, page 6), design for environment, or DFE, “is the systematic consideration of design performance with respect to environmental, health, safety, and sustainability objectives over the full product and process life-cycle.”

Different design strategies can be carried out in order to make a better product:

1. Selection of materials with low environmental impact.
2. Reduction in the amount of material used.
3. Selection of environmentally efficient production techniques.
4. Selection of environmentally efficient distribution techniques.
5. Reduction of the environmental impact on the use phase.
6. Life cycle optimization. The life cycle of a product is the way that the product follows from the beginning of its production to the end of its life when it is recycled. According to Fiksel (2009), all of this process embraces activities such as the acquisition of raw materials, components and energy as well as the production itself and the distribution. Also the activities for the maintenance of the product and recycling are include in the life cycle of a product.


8. Function optimization, which consists of developing new ideas for the product.

Nowadays, many technological tools are available for DFE. There are many computer aided engineering (CAE) or computer aided design (CAD) software that allow the study of the future environmental impact that a designed product will have.

In the light of the above, camping and backpacking history will help to better understand how the need of creating a product like the one that has been developed in this project emerges. Space saving is also a significant issue to consider in order to make a smart use of space and volume in the product, and this theory could be helpful to learn more about different ways to save space. Considering that Primus is an environmentally conscious company, several ways to make the product environmentally friendly should be considered.
3 Problem definition

When going outdoors (hiking, mountain or beach trips, camping, etc.) it is necessary to carry a lot of things in order to be able to eat and cook food in a comfortable way, such as, forks, spoons, dishes and glasses. With that many things to handle, the user is likely to end up losing some utensils since the user usually keeps them mixed all together with everything that he or she carries in his or her backpack, so when the camper needs to take out the utensils to cook or eat it is quite difficult to find them.

3.1 Aim

At the beginning the main goal was to present an attractive package to store everything that the potential backpacker needs for cooking and eating outdoors:

“This is what I need to bring with me” and “This is how I am going to bring it”.

The aim was to create some kind of container that could store everything that may be needed to cook and eat outdoors such as a stove, a pan, a pot, glasses, dishes, cutlery and a separate container to store food and that contains some of these items. This product should fit into an 80 liter back-pack.

As Primus suggested, the product will be available as a set for two people with the possibility of adding a modular set for two additional people. Furthermore, the product should also have an attractive and smart way to carry all the necessary items to store, prepare, cook and eat the food.

3.2 Goals and limitations

- A container for two people to carry in an 80 litres back-pack.
- Possibility of adding a modular package for a four people family (2+2).
- The container should fit into a Fjällräven back-pack. (Primus and Fjällräven are brands of the same company).
- Smart gear that can be used to store several items that can be useful on an outdoor trip.
- Smart use of the packing volume. The product should fit easily in a backpack and take up a minimum of space.
- The container should not have all the accessories because the users could already have some of them. To know which items are more important for the customers a survey can be made.
- The stove will not be developed.
- A product with a low environmental load.
- Easy to use and to carry.

To summarize, the main goal was to design and develop a product that showed the philosophy of the company, met all the goals, showed a smart use of space and could be produced and launched on the market.
3.3 Chosen design strategy

Once the problem was defined, a planning for the design project was designed. A summary of this planning is shown in the figure 9.

The first step was making an analysis in order to investigate all the possible issues that may influence in the final product. This is an important step in a design process because it is the base of all the following design phases (Cross, 2008). In this analysis, facts such as the main customers, the state of the art and the main competitors should be covered (see chapter 4).

Then, all of this information was organized and prioritized, in order to clarify which facts are more relevant. For this purpose, a Pugh matrix can be a useful tool (O'Connor, 2007).

Once all the established requirements and all the information from the research were organized, a list of common characteristics for the final product was done. In this way the design team has a common starting point and a defined line work for the concept development. All of these steps have to be beared in mind because with them a design team can know which the purposes are and how they can reach them.

When all the above was done, brainstorming and brainwriting were used. A great number of ideas are generated using these methods (Cross, 2008). Then, all of these ideas have to be analysed and prioritized. In this step, using a Morphological chart can be useful in order to analyse all the possible solutions generated (Cross, 2008). During this phase of the design process, it should be important to take into account the opinion of Primus’ design team (see chapters 5.2 and 5.3).

When the concept generation phase is finished, at least two final concepts should have been developed. Then these concepts are analysed in order to know which one meets the requirements better (Cross, 2008). In this way the best solution is chosen, thus leading to the final design. In this process the Primus’ opinion should be an important factor (see chapter 5.4).

In this step all the details were developed. A 3D CAD model of the final product was built in order to show all the materials, dimensions and how the final product looked like. This method is chosen since it is a good way to show the final appearance of the product and also to calculate technical specifications such us weight and volume (see chapter 6).

After this step, a verification phase was useful. With the analysis of the final result it was possible to check if the requirements established had been achieved. For this step, building a mock-up could be useful in order to see the real dimensions of the product and if it fits in a proper way in the backpack. Now it would be the time to redesign if necessary (Ulrich & Eppinger, 2011).

Finally, when the product was totally designed, the customers’ requirements were reviewed again in order to know how the product should be commercialized. Here a logo and a packaging were designed bearing in mind both the philosophy of the company and the customers’ opinion (see chapter 7).
Figure 9. Planning of the design project
4 Research

In this chapter, a research of all the possible facts that could be essential in order to develop a better final product was done. In this investigation issues such as the philosophy of the company, the competitors and the customers were studied.

4.1 Philosophy of the company

Primus is a company with several products for outdoor activities. It is specialized in stoves, lanterns and items that can be used to cook and eat outdoors, such as pots, pans or vacuum bottles (Primus, 2010). The product that is going to be developed in this project would be categorized in the last group of products. To reach the final goal, all the outdoor products that are produced by Primus were considered in order to see if it is possible to use some of them in the final product (see figure 10).

![Figure 10. Primus products. See appendix 1](image)

Today, Primus continues designing and developing products with the same pioneering spirit of the 1980s, when the first Primus stove was invented (see Appendix 2). This spirit could be summarized as good quality and environmentally friendly products (Primus, 2010). The final product will satisfy this spirit as much as possible.

4.2 Customers

Primus webpage mentions “No matter whether you need to cook at the North Pole or in your own back garden, you can count on Primus to work.” (Primus, 2010). With this in mind, it seems that the customers of the current Primus products and of the product that has been designed are people from those who want to enjoy nature with their families to professionals who climb Mount Everest.
4.3 Competitors

There are numerous companies that work in the same field as Primus does. It implies a continuous innovation and development of products due to the hard competition.

Some examples are:

- Campingaz.
- GSIOutdoors.
- HydroFlask.
- Jetboil.
- Trangia.
- Gelert.
- MSR.
- Light My Fire.
- Guyot Designs.
- Evernew.
- Open Country.
- Stanley.
- Vargo Outdoors.
- REI.
- Snow Peak

4.4 Market research

A market research was made in order to know what already exists on the market of the product. Due to this, an analysis was made to become familiar with the products that met all these requirements. This means, containers including plates, glasses, cutlery and other containers inside.

Many products with these features were found (see figure 11). As common features, they had the cylindrical shape and the nest structure, where little items are placed into bigger ones. Also, most of them used a big pot as the main container. Many products with this feature can be found on the market. While the simplest only include one pot, two glasses and a little container, the biggest can include a big pot, a little pot, a pan, some glasses, cutlery, several little containers, a saltshaker and some cooking tools. Due to its cylindrical shape, users are not able to take advantage of the corners of the backpack.

Figure 11. Similar products. See appendix 3
Then, a market research by objects was done. In this way, five groups were analysed: cooking tools, cutlery, plates, containers and glasses and mugs.

**Cooking tools:** Here, items such as ladles, spatulas, salt-and peppershakers or tongs can be found. Many of these tools have different mechanisms to save space (see figure 12).

![Figure 12. Cooking tools. See appendix 4](image)

**Cutlery:** In this group there are knives, spoons and forks. Here, there are many different mechanisms and shapes in order to save space and give the object some extra functions (see figure 13).

![Figure 13. Cutlery. See appendix 5](image)

**Plates:** The components of this group are basically deep plates and flat plates. They normally have the same size as the container where they are stored (see figure 14).
Containers: There is a huge variety of containers. Some of them are for storing liquids, others for storing food and others for putting little objects in (see figure 15).

Glasses and mugs: In this group it is possible to find a lot of different glasses and mugs. Some are collapsible, others have a cap and others have a handle (see figure 16).
There are numerous products and solutions on the market that are pretty similar to the product that has been designed. Because of this, the market research was an important source of inspiration for the project. One important characteristic for the final product obtained from the market research was that the shape of the container should encompass all the width of the backpack. This was decided in order to solve the problem that the existing products in the market have with its cylindrical shape.

4.5 User survey

Identifying user's needs is an important step of a product development in order to know what users think about the future product. In order to get this information, a questionnaire was created. Questions in a survey should be easy to understand and they should reveal the information that the designer needs. After all, the answers would help to improve the quality of the product that is going to be developed (Czinkota & Hoffman, 2007). Questions are general at the beginning, in order to make the user feel comfortable and more specific at the end. This was done in order to create an easy to understand survey, with short and concise questions, so the user could give better answers that will help to improve the product. They are also neutral questions so as not to influence the decision of the respondent. In order to get a lot of information in an easy way the questionnaire was made online. Around 90 people answered this survey. It had questions such as: do you usually eat outdoors? Do you use a backpack when going on a trip? Which items could be useful for eating and cooking outdoors? Do you think it could be useful? Would you buy it? Etc. The questions that were used in the questionnaire and its respective answers can be seen in Appendix 10.

As can be seen by having a look at the answers (Appendix 10), the age of the respondents is well balanced. There are four age ranges: from 15 to 22, from 23 to 30, from 31 to 40 and 41 or more. There is about 25% of each age range. When a trip is made, about 70% of the people who answered would carry food cooked at home and 16% of them would cook at the place they were at. This may be considered for the product. It should have containers to keep homemade food. It should also be considered that most of the surveyed people would use a backpack and half of them would go on foot to their destination, so it would be significant to create a lightweight product and comfortable to carry.

When asked about the items that the respondents usually carry with them on these kinds of trips, a high proportion of them would carry containers, rubbish bags, napkins and cutlery. Remarkably, the essential items for them would be, in the first place, the rubbish bags (60%), followed by containers, vacuum bottles, cutlery and napkins. This helped to determine which kinds of items could be kept inside the product.

When respondents choose items for cooking, more than a half of them would pick out a pan and a stove. Forty percent of them would prefer tools to cook and 25% would take pots too. These were also items to take into account when creating the product.

Seventy percent of the people who did the questionnaire think that this product would be useful, and about 56% of the respondents would buy it, even if they already have something that is included in the pack. Others think that it would depend on the quality, the price or the aesthetics of the product.
When asked about the price of the final product, people answered that they would pay about 30 or 40 euros. In this estimation, the brand value of Primus products was not included. This is why this last answer does not seem particularly relevant.

### 4.6 Materials

The products of Primus were analysed in order to know which materials they currently use. It was found that they use titanium, stainless steel, aluminium or plastics (polycarbonate; Tritan, a copolyester; polypropylene) in their products (see figure 15).

### 4.7 Colours

In order to become familiar with the main range of colours of Primus products, research was made. After this analysis, it is possible to say that their usual colours are black, grey and red. The most commonly colours used for posters and backgrounds were considered too. Also, they have a series of products where they have incorporated six new colours: pink, purple, blue, green, yellow and orange (Primus, 2010). This analysis was made in order to create a product that follows Primus’ products line (see figure 17).

![Figure 17. Colours and materials. See appendix 9](image)

### Conclusion

The following facts are a summary of the research results that helped to develop a better final product.

After looking for more information about Primus, it was possible to realize that creating environmentally friendly products is a really important characteristic for their company. This is why it was also relevant for the final product.

According to the customers that would buy the product, it should be possible to use it in different situations, depending on the type of trip that they wanted to make.
The results of the questionnaire gave information about what people think about various aspects related to the product. When they go on a trip, it is important for them to carry containers and rubbish bags as items that can be used to store or throw food and objects for cooking outdoors such as a stove and a pan. It is also significant to know that users consider the items that the final product would contain because maybe they would not buy it if it has many items that they already own.

Considering the materials that Primus usually uses, it would be interesting to use the same ones or similar for the final product. Also the colour lines should be taken into account (Primus, 2012).

With the results of the research the following table was done. In this table the main conclusion from the research are shown (see Table 1).

**Table 1. Main conclusions from the research**

<table>
<thead>
<tr>
<th>Product</th>
<th>Environmentally friendly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use in different kind of trips</td>
</tr>
<tr>
<td>Items that it could contain</td>
<td>Containers</td>
</tr>
<tr>
<td></td>
<td>Rubbish bags</td>
</tr>
<tr>
<td></td>
<td>Stove</td>
</tr>
<tr>
<td></td>
<td>Pan</td>
</tr>
<tr>
<td></td>
<td>Pot</td>
</tr>
<tr>
<td>Material</td>
<td>Material that Primus currently uses</td>
</tr>
</tbody>
</table>

Taking into account all the conclusions from the research and remembering all the previous requirements established, a list with all the demands (D) and wishes (W) for the product that was being developing was done (see Table 2). This step is important in a design process since it helps to limit the problem (Cross, 2008).

**Table 2. Main demands (D) and wishes (W) for the product**

<table>
<thead>
<tr>
<th>D or W</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Fit in an 80 Litres Fjällräven backpack.</td>
</tr>
<tr>
<td></td>
<td>-Dimensions &lt; 30x30x30 cm</td>
</tr>
<tr>
<td></td>
<td>-Rounded edges</td>
</tr>
<tr>
<td></td>
<td>-Deformable</td>
</tr>
<tr>
<td>D</td>
<td>For 2-4 users.</td>
</tr>
<tr>
<td>D</td>
<td>Lightweight.</td>
</tr>
<tr>
<td></td>
<td>-Weight &lt; 4 kg.</td>
</tr>
<tr>
<td></td>
<td>Essential items to eat and cook.</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------</td>
</tr>
<tr>
<td></td>
<td>- Pot</td>
</tr>
<tr>
<td></td>
<td>- Pan</td>
</tr>
<tr>
<td></td>
<td>- Cutlery</td>
</tr>
<tr>
<td></td>
<td>- Containers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Others items that the product could contain.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Glasses</td>
</tr>
<tr>
<td></td>
<td>- Plates</td>
</tr>
<tr>
<td></td>
<td>- Stove</td>
</tr>
<tr>
<td></td>
<td>- Rubbish bags</td>
</tr>
<tr>
<td></td>
<td>- Napkins</td>
</tr>
<tr>
<td></td>
<td>- Vacuum bottles</td>
</tr>
</tbody>
</table>

|   | Possibility of adding extra items. Space for users’ items. |

|   | Good quality product. Use quality materials. |

|   | Product with low environmental load. |

|   | Product that can be recycled at the end of its life cycle. |

<table>
<thead>
<tr>
<th></th>
<th>Easy to use and carry.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Handle</td>
</tr>
<tr>
<td></td>
<td>- Quick access</td>
</tr>
</tbody>
</table>

|   | Smart use of the packing space. |

|   | Possibility of using in different kinds of trips. |

|   | Attractive design. |

|   | Appearance that follows the general look of the products of the company. |

|   | Budget price. |
5 Concept development

In this phase, a large amount of requirements has to be taken into account. Some of them have been more significant than others. This generation process is shown and explained below.

5.1 Organizing ideas

At this point, there were many requirements and specifications that had to be taken into account. This is why organizing all these requirements was an important step since the main requirements served as the principal guidelines when developing the product. These requirements were analysed using a Pugh matrix. According to O’Connor (2007), a Pugh matrix or “criteria based matrix”, is a technique to determine which solutions, characteristics or items are better or more important than others. It is a useful tool for concept generation and selection. This method helps to determine the strengths and weaknesses of them and, as a result of it, the ones that would be more suitable.

Two Pugh matrices were done, one in order to analyze the characteristics of the product itself (see Table 3) and another one to analyze the items that the product should contain (see Table 4). The scores in the matrix were given following the criteria of the team, and also taking into account all the information obtained from the company. There are three possible scores: “-1”, “0” and “1”. This means that the scores can be worse, equal or better than the base-case. Then, the scores are: “-1” for requirements that are worse than the base-case, “0” for requirements that are equal to the base-case and “1” for requirements that are better than the base-case.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fit in a 80 Litres Fjällräven backpack</td>
<td>1</td>
</tr>
<tr>
<td>For 2-4 users</td>
<td>0</td>
</tr>
<tr>
<td>Lightweight</td>
<td>1</td>
</tr>
<tr>
<td>For different kinds of trips</td>
<td>-1</td>
</tr>
<tr>
<td>Product with low environmental load</td>
<td>0</td>
</tr>
<tr>
<td>Smart use of the packing volume</td>
<td>1</td>
</tr>
<tr>
<td>Easy to use and carry</td>
<td>0</td>
</tr>
<tr>
<td>Possibility of adding extra items. Space for users</td>
<td>0</td>
</tr>
<tr>
<td>Attractive design</td>
<td>-1</td>
</tr>
<tr>
<td>Modular pack</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3. Main requirements of the product

Carlos Jiménez Sánchez & Irene Gallego Sánchez
Table 4. Items that the product could contain

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pot</td>
<td>1</td>
</tr>
<tr>
<td>Pan</td>
<td>1</td>
</tr>
<tr>
<td>Stove</td>
<td>-1</td>
</tr>
<tr>
<td>Glasses</td>
<td>0</td>
</tr>
<tr>
<td>Plates</td>
<td>1</td>
</tr>
<tr>
<td>Containers</td>
<td>1</td>
</tr>
<tr>
<td>Cutlery</td>
<td>1</td>
</tr>
<tr>
<td>Napkins</td>
<td>-1</td>
</tr>
<tr>
<td>Rubbish bags</td>
<td>-1</td>
</tr>
<tr>
<td>Vacuum bottles</td>
<td>-1</td>
</tr>
</tbody>
</table>

5.2 Ideas generation

Keeping in mind these main requirements and all the previous information, a brainstorming was carried up. According to Cross (2008), brainstorming is a method used to generate ideas in order to solve a problem. Ideas emerge in a spontaneous way and they are later analysed and discussed. In this brainstorming several facts of the product were analysed. These facts were the main shape of the product and the items that the product should contain among others.

Taking into account that most Fjällräven backpacks have a frontal opening (see Figure 18), an idea was trying to look for a solution that allowed use this opening, facilitating in this way the use of the product.

Figure 18. Sketch of the frontal opening of the back-pack

After this, the external main shape was analysed. Mainly three shapes were studied; a cylindrical shape, a rectangular shape and a modular structure (see Figure 19). These solutions were evaluated according to the use of the space of the backpack, the ease of packing items and a best usability of the product.
Figure 19. The use of the backpack space

The sketch on the left represents how the product would look like with a cylindrical shape. The advantage of it is that it has the same shape as a pot, a plate or a pan, tools that are commonly used when cooking and eating outdoors. Due to this fact, these items would fit perfectly inside the container. What is annoying is that the corners of the backpack would be wasted. A better use of the space would be made with any of the shapes of the sketches in the middle and on the right in the same picture. The sketch in the middle represents a rectangular shape that takes better advantage of the space of the backpack. The sketch on the right would also be a good option with a clever use of modules and space. According to this description, each shape had advantages and disadvantages.

Once the external shape was studied, an analysis of the items that should be included in the product was done in order to know how much space was necessary. One of the Primus' main goals for this product was trying to use the existing Primus' products. Taking this into account, an analysis of the possible items was done.

There was a need of supplying the product with a pot because it was considered an essential item for cooking outdoors in a proper way. This is why it was important to define the required size of the pot before developing the whole product. After a discussion about the size and, in order to take up the least possible amount of space, a pot of 1 litre capacity was considered sufficient for two people. This idea was consulted with Primus and they agreed with it.

In terms of containers, it was thought that using them as modules would be a good idea. This is because it would be a way to make a smart use of space and volume and to meet the customers' requirement about what the product should contains. In this way, the modules could be used to store food or to keep anything that the user would need. Also, the use of these kinds of modules would allow the company to launch new modules with new products in the future.

Cutlery was also an important item to include in this product. Many ideas about how to solve this requirement were analysed. At first, the best ideas were the ones where cutlery was collapsible or
those that had the utensils, fork, knife and spoon all in one. Then, trying to meet the requirement of the customers, i.e. that of a product that is as comfortable as possible, and asking some of the potential users about these ideas, a typical cutlery set was ultimately the best idea. This decision was confirmed later by Primus. This was due to the importance of making the customers feel at home as much as possible.

More items that could be added to the product were analysed. These were, pans, stoves, vacuum bottles, glasses, mugs, plates, cooking tools and chopping boards among others.

With all these ideas in mind and in order to develop some concepts, a brainwriting was done (see figure 20). This method “is similar to brainstorming, except that ideas are written down instead of spoken aloud” (Owen-Jackson, 2001, page 67). It is a method to obtain several ideas and see them in a clear way in paper, in order to find solutions. This is a technique that can be carried out individually or in group, so an individual brainwriting was done first, so as not to be influenced by the rest of the members of the team.

![Figure 20. Sketches from the Brainwriting. See appendix 11](image)

When this first brainwriting was done, all the generated ideas were shared. The conclusions of this were that the rectangular shape and the modular shape were both good ideas in order to use the available space to a maximum; also, the cylindrical shape could be used to keep pots and pans in a better way. In most of the generated concepts the use of modules was the best way to design a customizable product. In addition, many solutions for different items that could be included were developed, such as collapsible cutlery and cooking tools.

While the brainwriting was being developed, the problem of how to take out the possible modules emerged. This problem was that in order to use the space to a maximum, the modules would be placed very tightly on each corner and this would raise the problem of taking them out with the hand. In order to solve this, two different solutions were developed. The first one was to put a fabric strap at the bottom of the module and in this way the user would be able to take out the module easily (see figure 21). The second solution was the design of an easy mechanism to eject the module. It consisted of a mechanism with a button that when it is pushed two bars move the module out (see figure 22).
In the following table (Table 5) all the different solutions found for the different facts are shown. To make this table a Morphological chart structure was followed. According to Cross (2008), using a Morphological chart is a good way to generate and show all the design solutions for a product.

<table>
<thead>
<tr>
<th>Function</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main External Shape Items</td>
<td>Cylindrical · Rectangular · Modular Structure</td>
</tr>
<tr>
<td></td>
<td>Pot · Containers · Cutlery · Pan · Vacuum bottles</td>
</tr>
<tr>
<td></td>
<td>· Stove · Glasses · Mugs · Plates · Cooking tools</td>
</tr>
<tr>
<td></td>
<td>· Chopping board</td>
</tr>
<tr>
<td>Opening</td>
<td>Hinges · Cover</td>
</tr>
<tr>
<td>Locking</td>
<td>Zip · Plastic Handle · Clicks</td>
</tr>
<tr>
<td>Number of users</td>
<td>2 · 4 · 2+2</td>
</tr>
<tr>
<td>Take out the modules</td>
<td>Fabric straps · Mechanism</td>
</tr>
<tr>
<td>Materials</td>
<td>Fabric · Plastic</td>
</tr>
</tbody>
</table>

All this information was analysed in collaboration with Primus’ design team, and then a first pre-concept was developed trying to find a solution where these individual solutions were combined into a product which meets all the established requirements.

5.3 Pre-concept

Thinking on the possibilities for the main external shape, the idea was to create a mix of the three previously discussed shapes. The rectangular shape of the main container with modules and a cylindrical shape inside it was the main feature of the pre-concept (see figure 23). The rectangular shape would make maximum use of the space available; the modules could store the user’s items and the cylindrical shape would be perfect to keep the pot, the pan and the mugs in a proper way.
Taking into account the users’ opinion about the essential items that the product should contain, this pre-concept would be equipped at least with a combined pot and pan, cutlery and four containers used as modules. These modules would have a large size in order to use all the available space of each corner. In addition, inside it there would be space enough to keep two mugs, two plates, several cooking tools and a chopping board (see figure 24).

This pre-concept was designed for two people, but it should also have the possibility of adding a modular pack for an additional two people as another cover (see figure 25).
For this pre-concept the full frontal opening of a Fjällräven 80 litres backpack was taken into account. In this way, the user should be able to open the container and take out whatever is necessary in a simple way. The frontal opening makes it unnecessary to take out all the things placed on top of the backpack when the user needs to use the product. This would partly meet the “easy to use and carry” and the “comfortable as possible” requirements.

The pre-concept developed met all the established requirements. This pre-concept was shown to Primus’ design team and they agree with it, because this concept was close to what they were looking for. This is why this pre-concept became the base of the final concepts. This pre-concept was designed in plastic, and Primus suggested the option of making it in fabric, so this was the main fact that was taken into account when the final concepts were developed. In addition, Primus’ design team suggested some more changes which were used for the final concepts.

5.4 Final Concepts

Based on the pre-concept, and taking into account the suggestions of Primus, two final concepts were developed. These concepts had many common features with the first pre-concept, but they also introduced several significant changes. The rectangular main shape became a square shape in order to achieve a symmetrical shape that could allow the use of the same module for any of the corners. Another change was the elimination of cooking tools, using this space to add all the necessary things for two additional people. This decision was made because cooking tools were not considered absolutely essential for cooking outdoors. In this way, the idea of another extra product or a modular extra pack for an additional two people was abandoned, because the “+2 set” was included in the main product. This is due to the great dimensions that the final product would have if more extra space was added.
The two final concepts were practically identical, and they only differ in the material, one is in plastic and the other one is in fabric (see figure 26).

![Figure 26. The one in plastic to the left and the one in fabric to the right](image)

Both final concepts had the same dimensions (260 x 260 x 200 mm) and they were equipped with the same elements and modules. Each concept was equipped with: four sets of cutlery, four plates, two mugs, two collapsible glasses, a one-liter pot with a pan and a chopping board that could be used as a colander too.

Another important fact that was taken into account was the different kinds of modules and their sizes. The modules were designed in two different sizes, and an idea of creating a cleaning set module, a dressing set module and a first aid set module came up, in order to make the user feel as comfortable as possible in every way.

Tables 6 and 7 were very useful, when it was decided which concept to choose.

**Table 6. Common features of both final concepts**

<table>
<thead>
<tr>
<th>COMMON FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same size: 260x260x200 mm</td>
</tr>
<tr>
<td>For 4 people</td>
</tr>
<tr>
<td>Same compartments inside</td>
</tr>
<tr>
<td>Same modules</td>
</tr>
<tr>
<td>Same place of access</td>
</tr>
</tbody>
</table>
Table 7. Main differences between the two concepts

<table>
<thead>
<tr>
<th>DIFFERENCES</th>
<th>PLASTIC</th>
<th>FABRIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretty rigid. The cover can be used as a support</td>
<td>Adaptable and deformable</td>
<td></td>
</tr>
<tr>
<td>Difficult to add extra compartments</td>
<td>Easier to add extra pockets</td>
<td></td>
</tr>
<tr>
<td>Enduring</td>
<td></td>
<td>Weaker</td>
</tr>
<tr>
<td>Locking. The lock is out of the main shape</td>
<td>Zip. It is integrated in the main shape and it is easier to assemble</td>
<td></td>
</tr>
<tr>
<td>Straps to take out the modules are more complicated to build</td>
<td>Easier to build the straps system. The straps can be sewn</td>
<td></td>
</tr>
<tr>
<td>Easy to clean</td>
<td></td>
<td>Difficult cleaning process</td>
</tr>
<tr>
<td>Easily scratched</td>
<td></td>
<td>Scratch resistant</td>
</tr>
</tbody>
</table>

Both concepts were shown to Primus. Taking into account the advantages and disadvantages of both concepts and the point of view of the company, the concept in fabric was chosen. The reason was mainly that the concept in plastic felt a little bulky and the one in fabric seemed to be more adaptable and comfortable to be packed into a backpack. Another advantage of the fabric concept was that this material is a more environmentally friendly alternative. Moreover, the fact that this concept had a zip instead of a lock was taken into account when the choice was made. However, the concept in plastic could be perfect to be carried in the trunk of a car.
6 Final Design

In this chapter, the final concept is developed and designed with details based on the concept that was previously chosen. The product and all its items have been built and rendered with SolidWorks, 3D CAD software.

To give a clear description of the final concept, this chapter has been divided into three parts with reference to the main features of the product. These are body, modules and elements. Section 6.1 is about the external main shape of the product, section 6.2 deals with the idea of having modules inside the main container, and section 6.3 details all the items that the product will include. Information about the measures, the materials and the main characteristics of each of these parts of the product can be found in each section.

6.1 Body

The main shape of the final product is a square shape. Its dimensions are 260 x 260 x 205 mm. This shape allows exchanging the modules that are placed inside, so that they can be used in any of the corners. Finally, in order to solve the modules’ extraction, the idea of the straps was chosen (see figure 27). There is a cylindrical shape in the middle of the main box used to store the pot with the pan and other elements detailed in section 6.3. The corners of the body are rounded in order to make it more adaptable and to give a better appearance.

![Figure 27. Main shape and straps](image)

In the upper part, there is a cover with a piece of foam inside in order to store some elements of the product described in the section 6.3 (see figure 28). This cover is joined up with the main box through a zip. This opening is in the upper part of the main box so the user can open it from the front. The opening system consists of a plastic zip with two large zippers for a comfortable use. These are long enough to make the opening and closing movements very easy. Both zippers have two rounded shapes with the Primus logo at the tip of them (see figure 29).
In the external shape there is also a handle (see figure 30). It is a short strap with a padded part in the middle of the handle. It allows the product to be carried comfortably in the hand. Nevertheless, the product has been designed to be carried in a backpack but is always good to have a handle to grasp the product easily.

The product also has an external compartment with a chopping board / colander inside (see figure 30). The shape of this compartment has a wide part on the centre facilitating the removal of the board.
The material of the external part of the box is rib stop nylon with polyester padding. This material is strong enough and can keep heat and cold. It is also deformable and adaptable and is used in other Primus products i.e. Primus Insulation bag (see figure 31). The structure inside the product is also made of this material.

6.2 Modules

The product is equipped with modules. There are two sizes of modules, one is 1.3 litres and the other one has half the size of the large one. This feature gives the users freedom to choose how they would like to organize their items, food etc. Each module is equipped with a corresponding cover. The modules are distributed symmetrically, so there are only two modules designs that are repeated. This is why the modules can be exchanged easily (see figure 32).

Once the modules were designed, the idea of creating some customized modules came up. This idea would allow the design of more modules in order to supply the product in the future. This was discussed with Primus and after analysing the possibilities, the conclusion was that the product should be equipped with three modules: a dressing set module, which is always needed and it is where the user could carry liquids; a first aid module and a cleaning set module. The latter was suggested by Primus. Other possible modules that could be designed in the future in order to be sold separately could be, for example, a module equipped with a stove.
The dressing set module consists of four different recipients: one for liquids, one for sugar, one for salt and pepper and an extra bottle for anything else that the user wants to keep inside, for example any kind of spices. The salt and pepper shaker is in one piece but with two separate compartments. Obviously, the user will choose the function of each recipient (see figure 33).

![Figure 33. Dressing set module](image)

The first aid module contains latex gloves, some gauze bandages, tweezers, a scalpel and some tape. The module has these items by default but the user can add more first aid tools if necessary (see figure 34).

![Figure 34. First aid module set](image)

The cleaning set module has two small bottles for liquids, such as washing-up liquid or some kind of detergent. It also has two cloths to dry dishes, the pot and pan or any surface of the product. The last item inside this set is the sponge scourer to clean dishes, cutlery or modules with soap or any liquids stored in the bottles of this module (see figure 35).

![Figure 35. Cleaning set module](image)
These modules are made of Eastman Tritan copolyester (Eastman Chemical Company, 2012). This is a plastic currently used by Primus in some of their newest products. This material has been tested in order to be safe enough to store food. It can be used both clear and hard so it can be used for the module itself, the bottles and also for the cover.

6.3 Elements

The product is equipped with many more items and tools. One of the main objectives was trying to use existing Primus products in this product. On top of it there is a piece of foam that holds four cutlery sets and four plates. The cutlery set is a Primus product called Leisure Cutlery Kit that is made of titanium and has spoon, fork and knife held together with a silicone holder (see figure 36). The plates are not Primus products because they don’t have a product like this, but it is currently in the market. Each plate is made of aluminium because it is a lightweight material and it is a good heat conductor (International Aluminium Institute, 2012) so it could be used as a big pan together with a Primus Pot Gripper.

![Primus Leisure Cutlery Kit Titanium](image)

**Figure 36. Primus Leisure Cutlery Kit Titanium**

In the middle of the main box, there is a rounded compartment. Inside there is a combined pot and pan; this is a Primus product called EtaPower Pot 1L and according to its technical characteristics, it is made of hard anodized aluminium with a multi-layer titanium nonstick surface on the inside. Considering that there is enough space inside the pot, the product has two aluminium mugs and two collapsible glasses inside it and these are covered with the pan (see figure 37).

![The pot, two collapsible glasses, two mugs and the pan](image)

**Figure 37. The pot, two collapsible glasses, two mugs and the pan**
The product also has a chopping board made of Eastman Tritan copolyester. On one side it has some holes so it can be used as a colander too. Its dimensions are 190 x 150 x 5 mm (see figure 38).

![Figure 38. Chopping board / colander](image)

The product has been designed for four people. This is because a product with an extra pack for an additional two people would be too large and bulky. However, if the user needs the product only for two people, he or she can leave at home all those items that are not going to be used and take advantage of that space to store other objects, such as rubbish bags or napkins.

The colours used in this product are red, grey and black, because, according to the previous research (Appendix 9) these are the most used colours in the basic products line. To see more detailed pictures of the product go to Appendix 12.

### 6.4 Technical specifications

Detailed information about the technical specifications of the weight of the product can be found below. This information have been found in primus webpage and using SolidWorks program.

**PRODUCT ELEMENTS WEIGHT**

- Primus EtaPower Pot 1litre weight: 290g
- Mug weight: 55g (x2) = 110g
- Collapsible glass weight: 45g (x2) = 90g
- Primus Leisure Cutlery Set-titanium weight: 51g (x4)= 204g
- Chopping board weight: 130g
- Plates weight: 85g x4= 340g
PRODUCT MODULES WEIGHT

Cleaning set module: 180g
First aid set module: 200g
Dressing set module: 155g
Small module: 60g+25g (cover) = 85g
Large module: 105g+25g (cover) =130g

PRODUCT BODY WEIGHT: 750g+200g (foam)= 950g

Taking into account than all this information is an approach of the real weight of each element, the information below is the total weight rounding the result.

TOTAL WEIGHT OF THE PRODUCT: 2044g+ 950g = 3000g = 3kg
7 Marketing phase

Once the product has been fully developed, is the time to finalize the details before the access of the product to the market. These details are the name of the product, the logo of the product, how it is going to be commercialized and the packaging.

7.1 Name

First of all, the product should be named. This step has not been easy because there were many alternatives and many ways to come up with a solution. In order to choose a good name for the product, some requirements should be met: it has to be easy to remember and easy to pronounce, it has to be related with the product and it should be identified uniquely (Figueroa, 1999). In order to reach a name, brainstorming has been done. Words concerning the product have been written down trying to achieve a solution and to relate the name with the product. Some of these words were: outdoors, family, modules, square, box, backpack, set, pantry, and taking into account that the product is for four people, some of these words were different synonyms of the word “four”, i.e. “quattro”, “tetra” or “delta”. After this, mixtures of some of these words were made. This resulted in names such as: “outdoors family set” and “delta pack”. One of the final names was “backpantry” because it was a mix of the words: “backpack”, “pantry” and “country”. After a discussion and asking some of the potential customers, this name was ruled out. Finally, the chosen name has been “TetraCube” because it is easy to remember and to pronounce and it represents the main characteristics of the product (similar to a cube and for four people) very well.

7.2 Logo

The logo can help the user to remember and recognize the product easily and quickly. A logo that can be used at any size and is easily remembered has to be original and simple. The logo of this product is a graphic representation of the most relevant characteristic of product: the square shape. The logo has been design with a few lines in order to make it clearer, simpler and easy to understand. It is also representing the name of the product: TetraCube. The colours chosen for the logo are the most frequently used by Primus: red and black (see figure 39).

Figure 39. Primus TetraCube Logo colour and black&white
7.3 Commercialization

In order to sell the product, all the items previously named in chapter 6 are going to go inside. In terms of modules, the product finally has 3 customized modules (dressing set module, first aid module and cleaning set module), one small module and two 1.3 litres modules. Apart from these modules, the product comes with three extra modules: two small and one large module. In this way the user can keep what he or she needs inside the product freely, exchanging modules as required.

7.4 Packaging

When a decision about the items that the product will have inside has been made, a package in order to sell the product in a proper way has been designed (see figure 40).

The need of creating a package is basically “to protect the product, to enhance its appearance and to facilitate its distribution” (Calver, 2004). In this package there is also a lot of information related to the product. It is possible to find a list of all the items that the product has inside, the whole size, the total weight and a brief description of its function.

There is a hole on top of the package so the handle can be held to carry the product easily. There are also two more holes on each side of the product. One of them is to let the user perceive the feel of the material of the product and the other one have been done in order to show the extra modules and also to let the user touch and feel the modules. The packaging is made in corrugated cardboard (see figure 41).
8 Design for environment (DFE)

Given that Primus is environmentally conscious and considering the importance of this for the contemporary society, DFE has been an important issue to bear in mind in the development of this project.

The final objective of this project was to create a product that could be produced and commercialized by Primus. With this in mind, one of the requirements for the final product was to try to use materials that Primus is currently using. Due to this, there has not been a deep research about the possible materials or the production process.

In order to choose a material for the plastic items, a research about the plastic commonly used by Primus was done. In this analysis three possible plastics were found. These were polycarbonate, Eastman Tritan Copolyester and polypropylene. After being looking for the characteristics of each material and talking with Primus design team, Eastman Tritan copolyester was chosen. Some of the main reasons of this choice were that Tritan gives a longest product life. It also has low energy consumption and low greenhouse gas (GHG) emissions in the production process and it has a favourable life-cycle assessment (LCA) versus polycarbonate among others (Eastman Chemical Company, 2012).

Another material choice was done for the main box. Two possible options were considered; on the one hand using a plastic material and on the other hand using a fabric material. The last one was chosen because a fabric material meets the product requirements better and it is also more environmentally friendly. In addition the use of this kind of material would probably increase the service life of the product. Once this material was chosen, a research of the fabric materials that Primus is currently using was done. Several fabric materials were found, but the one that they use to produce the Primus Insulation Bag was chosen because it is a material that keeps heat and cold and this could be good for this product (Primus, 2010).

In terms of DFE, it was supposed that if Primus is that concerned about protecting the environment they use materials and techniques according with its purpose.
9 Discussion and conclusions

This chapter is a reflection of the project. The final results have been compared with the specifications that were established at the beginning of the project. Also a discussion about the final result has been done. At the end a view of the work done is posed.

One of the requirements of this product was to create a container for two people to carry in an 80 litre backpack with the possibility of adding a modular pack for a four people family (2+2). Another important requirement was that the product had to make a smart use of the space. The final product should be a container that does not include all the accessories giving free space for users items. Finally, it had to be an easy to use and carry product and with a low environmental impact.

According to these previous requirements, it is possible to say that the final product meets almost all of them. Individually, the product can be carried in an 80 litres backpack and it makes a smart use of the space. The accessories included in the product are the necessary tools for eating and cooking in a proper way outdoors. With the handle at the upper part of the box the requirement of the easy to carry is met. The requirement of an easy use of the product is met with the opening on the upper part allowing the user to have an easy access to the product directly from the backpack. In terms of environmental impact, the final product has been developed with materials that Primus is currently using and, consequently, with a low environmental impact. These materials also ensure a long service life of the product. Finally, the requirement about creating a container for two people with the possibility of adding a modular pack for a four people family became a product for four people in order to save space. With this, the user can leave the items at home if he or she does not need them. In this way the product is for four people instead of two.

The result has been the expected outcome; a product that meets the requirements previously established and that visually follows the aesthetic of the Primus products. About the product itself, it is possible to think that it is pretty bulky at first sight but its dimensions are 260 x 260 x 205 mm. Maybe a little bit large to carry in a backpack, but thinking that it is for four people and having a look at the similar products in the market, it is not that big. If the user is going to have a trip with three more people, he or she will carry the utensils for eating and cooking for four, so the rest of them will be able to carry some of the user items if needed. Another difference with the other similar products in the market is that Primus TetraCube has space enough to carry the tools for eating and cooking and also empty space to store food. There are many products that have many containers fitted inside one another and in this way if the user wants to store food he or she cannot use all the containers.

As for the process, all the facts and requirements that could be taken into account were studied and the concept development started. A big brainstorming and then a brainwriting were done, where some ideas and mainly a pre-concept were developed. At this time the team had a meeting with Primus’ design team. A discussion about all the established requirements and the main characteristics that the product should have was carried out. After that the pre-concept was showed to them and they thought that it was very close to what they were looking for and they gave some comments and suggestions in order to improve this concept. One of these main comments was studying the possible materials for the main container. With these suggestions the final concepts were finished, one concept using fabric and another one using plastic. Then these final concepts
were shown to the Primus' design team, and with their collaboration the final choice was done. After that, the final design was developed with all the details. It is true that maybe this is not the best way to proceed in a design project, but each project has its circumstances, and in this project these circumstances were the previously explained. More ideas could have been developed, but in this case, Primus' opinion and comments were taken into account.

During the process, different facts that could be related to the final result were studied. One of these facts was the collapsible principles. When the project started, we thought that this field could be very important for the final product, thinking on the developing of items such as cooking tools and cutlery. This is why this field was studied. Then, we talked with Primus' design team, and we concluded that the best solution would be trying to use currently Primus products. For this reason, the items were not finally designed, and just the main container, the modules and the way to pack everything were designed. For these things the collapsible principles were not used in the design process, but they were taken into account.
10 Further work

In this chapter a brief description of the possible ways to go on with the development of this project has been done. Five different options have been analysed as possible ways: making a more extensive analysis about the future environmental impact of the product through a life-cycle assessment (LCA), designing the product using alternative materials, developing an economic analysis of the product production, designing and developing a line of products with the same or similar features or building a real prototype in order to verify that the product meets all the requirements when used in a real situation.

Once the product has been designed in detail and knowing the materials that are going to be used, LCA would be a good tool in order to know the future environmental impact of the product during all its life-cycle (from the raw materials to when the product is recycled). The aim of this is to analyse in an objective, methodical, systematical and scientifical way the environmental impact caused by a product. According to standard ISO 14040 “Environmental management, life-cycle assessment, principles and framework”, the LCA is a tool to evaluate possible environmental impacts associated with a product or process through the collection of inputs and outputs inventory of the product system, the evaluation of the environmental impacts associated with each input or output ant the interpretation of the results obtained in the previous phases. The result of this analysis would be obtaining knowledge of the strengths and weaknesses of the product’s life-cycle. Due to the extension of this analysis, it is necessary to study all the life-cycle of the product i.e. the process to obtain raw materials, the production process, the amount of material used, etc. It has not been carried up in this project, but it would be an interesting and useful analysis.

In this project, the final product has been designed using materials that Primus is currently using. Another interesting way to go on with this project could be with an analysis of different materials that could be used in this product. If so, the main goal would be to find new more environmentally friendly materials, which would allow a better recycled process or a low environmental impact. In the development of this project some materials with these features were analysed. One of them was Recycled Cyclepet Fabric, which according to HOYU (2012), “uses the recycled material from post-consuming recycled PET bottles”.

Due to the extension of this project an economic analysis has not been carried out, but it would be another possible way to go on with the project. To that end, a good analysis about the amount of material needed or the production process, among others, would be necessary.

At the beginning, the product designed in this project was meant to be for two people with the possibility of adding an extra module for two more people. Finally, this idea was abandoned and a product for four people was designed. Creating a series of products that could meet the same established requirements and could allow the users to choose the product that best suit their needs would be a good idea. In this way, a container to keep all the items that one person needs for cooking and eating outdoors would be launched at the market. The same solution would be applied for a product for two people.
Finally, another way to continue with this project would be building a real prototype. In this way, a real test about how the product meets its function and its requirements in a real situation could be carried out. This was not made due to the time limitations in the project.
11 References


Appendix 1. Moodboard of Primus products.
Appendix 2. Moodboard of Primus philosophy.
Appendix 3. Moodboard of similar products.
Appendix 4. Moodboard of cooking tools.
Appendix 5. Moodboard of cutlery.
Appendix 7. Moodboard of containers.
Appendix 8. Moodboard of glasses and mugs.
Appendix 10. Questionnaire results.

How old are you?

- 15 - 22: 20%
- 23 - 30: 19%
- 31 - 40: 15%
- 41 or more: 2%

How often do you go on a trip to "the nature" (mountain, country, camping...)?

- Really often: 14%
- Once a month: 30%
- Once every two months: 19%
- 3 - 4 times a year: 14%
- Hardly never: 2%
- Other: 20%
When you do this kind of trip, do you usually eat there?

- Yes: 71%
- Sometimes: 23%
- No: 6%

Do you cook there or do you carry the food done with you?

- I cook there: 16%
- I carry it done with me: 70%
- I do not eat there: 6%
- Other: 8%
When you go on a trip, do you usually take a backpack with you?

- Always: 52%
- Sometimes: 24%
- No, I usually go by car or similar: 16%
- I go there by car (or similar) but I use a backpack: 5%
- No: 3%

What do you usually take with you when you eat outdoors or what do you think that would be useful?

- Rubbish bags
- Napkins
- Liquids (oil, vinegar, sauces...)
- Spices or salt
- Porringer
- Glasses
- Other

Bar chart showing the number of people for each item.
Which of the previous things do you think that would be ESSENTIAL?

- Rubbish bags
- Napkins
- Liquids (oil, vinegar, sauces...)
- Spices or salt
- Porringers
- Glasses
- Other

What do you use to cook outdoors?

- Coffee/tea pot
- Stove
- Ladle, spatula...
- Pot
- Pan
- Other
Which of the previous things do you think that would be ESSENTIAL?

![Bar chart showing the preferences for essential items]

Do you think that it would be useful to have a container or similar to carry in your backpack all the necessary things to eat and cook outdoors?

![Pie chart showing the responses to the question]

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Would you buy it if you already had some of the things that this pack/set contains?

- Yes: 56%
- No: 30%
- Other: 14%

Which price would you pay for it?

- 30 - 40 €: 68%
- 40 - 50 €: 21%
- 50 - 60 €: 10%
- More than 60 €: 1%
Appendix 11. Previous sketches.
Appendix 12. Pictures and details.
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Skövde, 2012