MEAT SUBSTITUTE FOR FLEXITARIANS:
A design driven approach to inspire food developers
MEAT SUBSTITUTES FOR FLEXITARIANS: A design driven approach to inspire food developers

MASTER THESIS OF:
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DELFT, JUNE 2012

MASTER DESIGN FOR INTERACTION
FACULTY OF INDUSTRIAL DESIGN ENGINEERING

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This report depicts in detail the thesis project “Meat substitutes for flexitarians: A design driven approach to inspire food developers.” This project was developed as my final evaluation in Design for Interaction at the Faculty of Industrial Design at the Delft University of Technology. The project was performed from September 2011 to June 2012, six months working in collaboration with WUR Food and Biobased Research and four months working in the graduation my own.

The thesis project was hosted by the Consumer research Department at Wageningen UR Food & Biobased Research. WUR is currently working in the joint collaboration project “LikeMeat”. The European Commission Project “LikeMeat” delves into the concept of meat substitutes and their role in Western European culture.

Meat has been part of Western European culture since the development of humankind. A detailed introduction of meat types and its role in society is contrasted with positive and negative considerations of meat consumption. The development and origins of meat substitutes are assessed, involving commonly used materials and positive and negative considerations. Sustainability in Western Europe is remarked as the strongest motivator for increasing meat substitute consumption. In order to achieve this, food design must be employed as a tool for understanding the user experience regarding meat substitutes.

Meat substitutes users can emerge from different motivations. One of those users is considered as the target group: flexitarians. For those unfamiliar with the concept, an introduction to flexitarians is given by addressing their characteristics, motivations and expectations regarding meat substitutes. In this way, the research questions drawn previously are concentrated on the target group by performing a qualitative research at WUR Food & Biobased Research.

Research through design was implemented to understand the how the current Flexitarians interactions with meat substitutes are. The research through design process initiated with a creative sessions with food developers, from which 13 concepts were drawn and prototyped. These ideas were evaluated in different stakeholders: involved partners of LikeMeat and intended users. These first ideas helped in finding out what flexitarians value from meat substitutes. As the outcome of the research, current interaction with meat substitutes were identified. This helped to develop a design vision, description of desirable interactions and suggested guidelines for future meat substitutes.
After the generation of the design vision an ideation and prototyping for this meat substitutes for Flexitarians was produced. Meat substitutes should be improved regarding involvement and social correspondence in order to become attractive to Western European society. The two prototypes accomplished different goals regarding these aspects and combined; show that meat substitutes can be introduced in the society by means of several integration processes. These later concepts are inspired in the previously generated ideas for LikeMeat. These concepts allow the interpretation of the design vision to be tangible. In this final phase, the design concepts were user tested to some degree with an experimental prototype in two user group sessions with different participants of Dutch nationality.

**Keywords:** Research trough design, Food Design, Meat Substitute, Food and Culture, Experience design, Interaction design.
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Western Europe: The United Nations Statistics Division published in 2011 considers Western Europe to consist of the following nine countries, except in the case of United Nations Regional Groups, in which the term also includes northern and southern Europe: Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands and Switzerland.

Ecological footprint: The ecological footprint is a measure of human demand on the Earth’s ecosystems. It is a standardized measure of demand for natural capital that may be contrasted with the planet’s ecological capacity to regenerate. It represents the amount of biologically productive land and sea area necessary to supply the resources a human population consumes, and to assimilate associated waste.

Foodie: Foodie is an informal term for a particular class of aficionado of food and drink. Paul Levy and Ann Barr, who used it in the title of their 1984 book The Official Foodie Handbook, coined the word in 1981. Although the two terms are sometimes used interchangeably, foodies differ from gourmets in that gourmets are epicures of refined taste, whereas foodies are amateurs who simply love food for consumption, study, preparation, and news. Gourmets simply want to eat the best food, whereas foodies want to learn everything about food, both the best and the ordinary, and about the science, industry, and personalities surrounding food.

Consumer : A person who purchases goods and services for personal use. The use of the term consumer in this thesis is in due to the description used in the like meat project. Normally referred to a person that eats something.

Intended user: a person to whom a product is designed for. A target group regarding product design.

Analogue: a person or thing seen as comparable to another. An equivalent entity with similar characteristics.

Substitute: a person or thing acting or serving in place of another.

Interaction: reciprocal action or influence between users and products or human beings.
CHAPTER 1:
INTRODUCTION

Food is a product category that plays a major role in a long-term sustainable perspective for the environment.

In Western Europe, one of the promising sustainable strategies regarding food is to increase the consumption of vegetable proteins substituting proteins of animal origin in the population diet. In this chapter, a detailed description of the European LikeMeat project, the involved partners and their activities is given. LikeMeat emerges from the necessity of reducing meat consumption on Western European countries.

This Master in Design for Interaction thesis at TU Delft contributes to the LikeMeat work-frame as a bridge between users and engineers, by suggesting new insights to the development and the design of meat substitutes. This chapter ends describing design approach of project.
1.1 PROBLEM DEFINITION

Food is a product category that plays a major role in a long-term sustainable perspective for the environment. Food production has huge ecological impact in land and water. In Western Europe, one of the promising sustainable strategies regarding food is to increase the consumption of vegetable proteins substituting proteins of animal origin in the population diet. In some cases, vegetable proteins have been presented to the Western Europe consumer market as Meat Substitutes. Nowadays, meat substitute market is considered a rising market sector in the food industry. Despite the reasons that support this diet change, the appreciation and consumption of these products in Western Europe have not fulfilled targets set by companies manufacturing these products. One possible explanation for this behaviour is the low appreciation meat substitutes seem to have. Simply, they do not appear to satisfy consumers’ preferences. (F. Wild, 2011). While current efforts to increase their consumer appreciation are focused on sensory quality, meat substitutes to be developed in the near future will have to be designed with awareness of the users and their social context.

Current practice in food design is a complex multidisciplinary effort. It can be considered as a product-oriented process as shown in Figure 1.1. This figure illustrates the product technology process for food products (Boom, 2009). It consists of four different stages: Production, Product, Consumer and Nutritional Value.

**Figure 1.1** Visualization of the product technology process for food.
In 2011 the European Commission launched the LikeMeat Project, whose aim is to increase European sustainability efforts. Small and medium sized enterprises are encouraged to develop meat substitutes and to participate in this growing market. Unlike the process explained above, the LikeMeat Project process looked forward into the involvement of the user since the early stages in order to be able to understand their needs with meat substitutes. Wageningen UR Food & Biobased Research, one of the parties involved in LikeMeat, is responsible for the consumer research for this project.

Figure 1.2 describes the process cycle considered in the LikeMeat project. It consists of the same stages: Production, Product, Consumer and Nutritional Value, with the addition of an initial Consumer step. By researching the target consumer, the idea generation starts. At this stage, ideas are testing with the users through prototyping and other methods. The results of this testing will support the changes and the final process on the product. Lately, work on improvement of the material and production scale process are considered. Finally, the production process cycle is performed until a new final product has been developed.

In order to broaden the results in this project, WUR Food & Biobased Research integrated my participation in the consumer research phase of the LikeMeat Project. Although product designers have started to recognize the importance of explorations around food, participation of product designers in the development of meat substitutes is very limited. My participation as interaction designer within this project starts at the fuzzy front end of product development suggesting new insights to the development and the design of meat substitutes.
1.2 STARTING POINT OF THE PROJECT

To understand where does my project comes from; it is first necessary to explain the LikeMeat Project and its participants, along with the host research institution and the scope of my participation in the project.

The LikeMeat Project is a 2-year Research and Development [R&D] European project with partners from Germany, the Netherlands, Austria, Czech Republic, Spain, Slovenia and Belgium. The project is funded by the European Commission’s [EC] Seventh Framework Program under the section “Capacities - Research for Small and Medium enterprises [SME’s]” (F. Wild, 2011) The project begins as an European Commission initiative of pursuing a more sustainable vision for the future (F. Wild, 2011). The LikeMeat project vision considers that in order to achieve a considerable reduction in the consumption of meat, meat substitutes must be competitive with meat products in sensory characteristics such as texture, flavour, appearance and aroma; and correspond with the consumer’s preferences. The LikeMeat Project consumer targets are Flexitarians: people who already have an eating diet in which meat is not a daily component. (F. B. Wild, M., 2010)

The LikeMeat project involves three different parties through the development of the assignment. They can be divided and described as follows:

A) Research and Technology [R&D] Development Partners:
They are the main developers of the product, in constant cooperation with the SME’s and B2B’s (see below). These are research institutions from three different countries in charge of the design and development of the meat substitute. The expertise areas of the R&D partners are:

- Food Technology Development: Their main task is to develop the basic (raw) material and assure the product safety. The institutions in charge of these tasks respectively are the Fraunhofer-Institut für Verfahrenstechnik und Verpackung IVV (Germany) and Universität für Bodenkultur Wien (Austria)

- Consumer Research: An extensive assessment of consumer preferences, acceptance and needs (by research) that will allow target-orientated food developments and the promise of well-accepted products for end users. The research partner in charge of these tasks is the Agrotechnology & Food Sciences Group/ Wageningen University and Research Centre
B) Business to Business [B2B] Partners:
Consist of medium to big supply companies from four different countries. They provided their expertise about similar projects and suggestions about their technology and products available to achieve the goal of the project.

C) Small and Medium sized Enterprises [SME] Partners:
The SME’s are the clients of this project. They are the enterprises that the project is enabling to participate in the meat substitutes market by encouraging them to produce this meat analogue.

These last parties’ area of expertise is the primarily in business strategy: knowledge about their products and market strategy. Later on the process SME’s and B2B’s will create a business relationship regarding the final product manufacturing. The next figure (Figure 1.3) outlines the LikeMeat project:

Figure 1.3 Visualization of the LikeMeat project.
1.2.1 About Wageningen University and Research Centre

Wageningen University is a Dutch University & Research Centre that conducts research within the domain of healthy food and the living environment. This specific project took place at the division of Food & Biobased Research. Wageningen UR Food & Biobased Research is an R&D organization for sustainable innovation in the areas of healthy food, sustainable fresh food chains and Biobased products. The organization is focused on the development of highly scientific and market oriented solutions to national and international contracting authorities. Food & Biobased Research works closely with these authorities to develop creative solutions for sustainable and profitable growth. (“Food & Biobased Research “, 2001) WUR Food & Biobased Research main aim is the research and product concept development in relation with the user needs. In order to achieve this, WUR participated in several packages on the project. Each work package corresponded to a different task in the project.

This graduation assignment takes part of the first package of the LikeMeat project: Work Package One (WP1). My work explores the current relationship of flexitarians with meat substitutes by collaborating with the LikeMeat Project. My activities in WP1 during the consumer research phase consisted of context-research analysis, idea generation and idea evaluation.

According WUR the aim of WP1 was:
“To assess consumer preferences, acceptance and needs. To find out which (combination of) functional product properties are required to match the preferences of European consumers for different product categories related to meat products.”

The other activities of WUR Food & Biobased Research relate with Work package 6 (WP6) and Work package 8 (WP8). The first is about the formulation of product concept recipes and the second is related with the final consumer evaluation (In-home & out of home) of the product.
1.3 MY DESIGN APPROACH

1.3.1 Design aim:

“The design aim of this project is to create a friendly meat substitute for flexitarians. This meat substitute should engage flexitarians to prepare nutritional and aesthetically satisfying meals. The final outcome of this project would provide inspiration to food developers on future meat substitutes’ development for Flexitarians.”

1.3.2 Design Process

The complexity of this design challenge goes further than traditional problem solving. In my perspective, there were two aspects that made this project different to others. The more evident aspect is the food product design project. This means the design of food to be mass-produced (Society, 2012). The second is the fact that SMEs, and not WUR, will be responsible of the final design of the meat substitute.

To approach this challenge, I decided it was important to understand how is the current relationship between Flexitarians and meat substitutes. This understanding was reach by “Researching through design” in the LikeMeat project (Jan Stappers, 2007). By designing meat substitutes and evaluate them by Flexitarians knowledge was collected from different directions of the project. My objective was to focus on the users and their interactions with meat-substitutes in order to understand how Flexitarians give value to this kind of product. However, additional insights from of the parties involved in LikeMeat were also analysed.

This allowed me to envision how I believe the future relationship between Flexitarians and meat substitutes could or even should be. I resumed this into a design vision for future meat substitutes. At last, the vision and result of this project are illustrated with two demonstrative design concepts, meant to give food for thought to meat substitutes developers.
An overview of the design process is illustrated in Figure 1.4 on page 10. My process consists of four different project phases: Analysis, Conceptualisation, Designing and Evaluation. The phases and their different activities are explained in sequential order:

1) Analysis
The aim of this phase was to understand what the product is and who the users are. This consisted of a background phase and a context study (Chapters 1 & 2). The background study focused on literature review about what meat substitutes are and the reasons behind the need for meat substitutes. Additional literature reviews included in the background study are about Food substitution and Design & Food. The context study introduce us the flexitarians. The study explores their motivations and preferences.

2) Research through design
The aim of this phase was to research through design, to understand how the current Flexitarians interactions with meat substitutes are. The knowledge of the user in the first phase was used as starting-point to generate the first ideas with the food developers (Chapter 4). These first ideas helped in finding out what flexitarians value from meat substitutes. The prototypes of these ideas are presented in order to obtain functions, properties and interaction values ideals for the intended users (Chapter 5).

3) Conceptualisation
The aim of this phase was to envision how flexitarians interactions with meat substitutes should be. In this step I propose a design vision for future meat substitutes. The design vision describes different interaction qualities and how meat substitutes should approach Flexitarians in future developments (Chapter 6). After the generation of the design vision an ideation and prototyping for this meat substitutes for Flexitarians was produced. These later concepts are inspired in the previously generated ideas for LikeMeat. These concepts allow the interpretation of the design vision to be tangible (Chapter 7). Furthermore two of the final concepts and their user-product interaction scenarios are explained.

4) Evaluation
In this final phase, the design concepts were user tested to some degree with an experimental prototype. The prototype was not yet made out of the original basic material, but the ingredients were nearly identical. The main objective of the prototype was to emulate selected interaction characteristics of the material (Chapter 7). An overview of the results, recommendations for future optimization and conclusions on design process are presented at the end of this section (Chapter 8).
WHAT IS A MEAT SUBSTITUTE?

A meat substitute is a food product that resembles some aesthetic, sensorial and/or performance characteristics of certain types of meat.

WHY IS THERE A PUSH FOR MEAT SUBSTITUTES CONSUMPTION?

From an ecological point of view, livestock used in meat production is responsible for 18% of CO2 emission (Black, 2008). It also requires most resources to nourish the livestock: crops to feed them, water, fertilizer and fuel for transportation.

THE LIKEMEAT PROJECT:

In 2011 the European Commission launched the LikeMeat Project, whose aim is to increase European sustainability efforts. Small and medium sized enterprises are encouraged to develop meat substitutes and to participate in this growing market.

Wageningen UR Food & Biobased Research, one of the parties involved in LikeMeat, is responsible for the consumer research for this project. In order to broaden their results in this project, they integrated my participation in the consumer research phase of the LikeMeat Project.

WHO ARE THE FLEXITARIANS?

A Flexitarian is an omnivore individual with reduced meat consumption. They do not abstain from meat but they choose to reduce their intake as much as possible. The reasons for this dietary flexibility may vary. During the research it as identified that the characteristics of flexitarians users are diverse and they have different motivations to adopt a Flexitarian eating habit. The main motivations are: health, environmental concern, pleasure-seeking or practicality.

HOW IS THE FLEXITARIANS’ INTERACTION WITH MEAT SUBSTITUTES?

There is an evident detachment from meat substitutes. There is very little knowledge and appreciation for them. There is not a connection with the product, therefore no adoption in the daily diets. In an effort of making a product simple and convenient to use our intended users are passive witnesses of the interaction. There is very little room for flexitarians creativity, exploration or self-expression with meat substitutes. They lack of presence in social situations.

The LikeMeat project is still developing the generated ideas. Partners sent samples of the products with their company packages. An in home test is taking place in a near future. In this test, the flexitarians participants will take the product home and prepare it during daily dinners.
HOW THE FLEXITARIANS' INTERACTION WITH FUTURE MEAT SUBSTITUTES SHOULD BE?

For flexitarians, meat substitutes should be friendly food products that stimulate them to share or prepare nutritional (and aesthetically) satisfying meals. Flexitarians should be in a way co-producers of their experience with the product: Either because the product allows them to explore their kitchen creativity or to share with others. The communication should be more transparent: what it is, made from what, etc.

HOW ARE THOSE FUTURE MEAT SUBSTITUTES?

Two meat substitutes concepts are suggested as attractive options for flexitarians. These design concepts that integrate the guidelines of the project, desired interactions and vision into a meat substitute. They will work as first discussion piece of the elements I am proposing to meat substitutes.

HOw FLEXITARIANS REACT TO THEM?

Evaluative test has shown that the interaction characteristics I proposed where successful because the response of the flexitarians was positive about it. However, further research is needed in the long term impact of the interaction qualities I propose.
CHAPTER 2: BACKGROUND STUDY

Meat has been a part of Western European culture since the development of human-kind. A detailed introduction of meat types and their role in society is contrasted with positive and negative considerations of meat consumption. The development and origins of meat substitutes are assessed, involving commonly used materials and positive and negative considerations. Sustainability in Western Europe is remarked as the strongest motivator for increasing meat substitute consumption. In order to achieve this, food design must be employed as a tool for understanding the user experience regarding meat substitutes.
2.1 MEAT

2.1.1 What is meat?

Meat is muscle tissue of slaughtered animals that is eaten as food. Animal muscle tissue is roughly composed of 75% water, 20% protein, and 5% intramuscular fat, carbohydrates and other non-protein substances. (Hipschman, 2010) Sometimes the term meat could also be used to describe other edible animal tissues such as offal. Meat is source of high-quality protein in Western European and American diets. Its consumption supplies the human body with aminoacids, iron and vitamins.

2.1.2 Types of Meat

Meat can be broadly classified in two types: “red” or “white” meat. This classification is depending of the muscle fibres and their concentration of myoglobin (iron proteins). It does not refer to meat coloration after it has been cooked. Red meat corresponds to those of adult mammals (e.g. cow, goat or sheep) and some fowls (e.g. duck or goose). White meat refers to flesh of poultry (e.g. chicken, quails or turkey), fish and meat of young mammals (e.g. veal, calves or pig). However, in this work processed meats have been included as a third category. Because is different from the others two. Processed meats are defined as meat products with a minimum of 30 per cent meat that has undergone a method of processing other than boning, slicing, dicing, mincing or freezing. These other methods of processing are: smoking, drying, salting, curing, fermenting and pickling. Processed meats include manufactured meats and cured and/ or dried meat flesh such as sausages, ham, prosciutto, bacon and salami. (FSANZ, 2002)

2.1.3 Meat Characteristics

The flavour of meat is classified as Umami, which roughly can be described as savoury. Umami is one of the five basic tastes along with sweet, sour, bitter and salty. This flavour is not palatable by itself, but it makes a great variety of food pleasant because it tends to amplify our other senses of taste. (Potter, 2010)

The characteristic flavour of meat develops when it is cooked. Proteins on the surface of meat recombine with the sugars in a process called Maillard reaction. When meat is cooked, the out-

Figure 2.1   Types of Meat
side reaches a higher temperature than the inside, triggering the Maillard reaction and creating the strongest flavours on the surface (and the change of colour in meat) (Science of Meat, 2011). Besides this process, flavour also depends on the amount of fat present in the meat. The fat present in meat give its marble appearance.

Several factors influence meat’s flavour and texture in before cooking: breed, age, nutrition, sex, and activity level of an animal. For example: younger animals have milder flavour and more tender muscle but less fat than older ones. Additionally the animal’s condition at slaughter and the treatment of the body afterwards are also important. When cooking meat, additional flavour can be added to meat through brining and marinating. Most of the time, the aim while preparing and cooking meat is to maximise its juiciness, flavour and tenderness.

### 2.1.4 Meat & Society

Meat has been considered as food since the very early stage of mankind. And what is understood by the word meat differs significantly from culture to culture. For example, having meat on the dinner plate is often an indication of status and wealth. By the middle of the 19th century meat started to work its way into all ranks of society. During the Second World War the meat consumption diminished because of the food scarcity. However, right after the end of the war meat consumption increased again. Fast production made meat so easily available and cheap that became common to eat it in daily basis.

The consumption of meat and the practices around it differ along cultures, religious views, countries and time. Let’s take as example some religious practices: Greeks used to offer meat to their Gods, Jews have specific laws on eating meat and Muslims call on Allah when they are slaughtering an animal. Because of the close relation between religion and culture, meat is the most emotionally charged food.

Meat and its consumption are always surrounded by taboos. For example: Western European countries do not approve of eating elephant meat while in South and Central Africa is a common practice. Certain is there are not obvious reasons why one animal should be acceptable as food in one culture and not another. More shocking perhaps (and taboo) could be cooking and eating human placenta. For example in Italy it was thought to reduce pain and induce the mother’s milk flow. This former practice in some cultures and countries nowadays the is attracting curious foodies to look for a possible donor and held “placenta parties” (Mitchell, 2010).
2.1.5 Arguments on eating Meat

The good side of eating meat.

“*It tastes good*”. The Taste argument:
We crave it. Well, at least a lot of the people in the planet crave it, with the exception of some vegetarians and vegans. While people are in fact able to live without eating meat, most of them believe life without eating meat would not be as good. The taste argument is probably linked with or caused by the tradition of eating meat.

“*It is healthy*”. The Nutrition argument:
Eating meat is healthy; it gives our body proteins, iron and different types of fat. However (as with most of the food) it should be eaten in moderation according to an individual’s dietary needs. This is determined by age, sex, height, weight and amount of daily physical activity. That means that eating meat is healthy when we know the kinds of meat to eat and the right consumption proportions according to our needs, and live by that knowledge.

“*Meat appeals to tradition*”. The Tradition argument:
Meat takes the central position among food across many cultures. Meat is the main dish to enjoy and is normally accompanied of some other side dishes that will emphasize its flavour. For example: A traditional Dutch dinner that consists of a meat steak with potatoes and vegetables as companion.

The bad side of eating meat.

“*Meat is bad for your health*”. Health argument:
Meat consumption is often related with health problems. Specially “red” and “processed” meat increase the risk of cancer (liver, colon, among others) in meat eaters. Meat-lovers also had been called to be aware of the saturated fat and cholesterol in meat, moderate consumption is recommended in this case.

“*Meat production is evil*”. Ethics of killing for food argument:
They are several ethical issues to consider regarding meat consumption. These issues can include the disagreement with the act of killing animals to eat or practices surrounding the production of meat, for example “factory farming”. Factory farming is the process of raising livestock (domesticated animals) in captivity at high stocking density, basically a farm operating as a factory. (Fraser, 2005)

“*Meat is bad for the planet*”. Environmental impact argument:
Meat livestock industry has been pointed out as one of the significant factors to blame for the climate change because it causes land degradation, water waste and contributes to global warming. (Nations, 2006)
2.1.6 Interactions with Meat

- Transparent packaging
- Look, meat
- Thick!
- 2 portions

This meat was pre-cut.

For flavor,
- cut for recipe
- tenderizing

Needs some preparation

Stop! Dinner time!!!
2.2 MEAT SUBSTITUTES

2.2.1 What is a meat substitute?

A meat substitute is a food product that resembles some aesthetic, sensorial and/or performance characteristics of certain types of meat.

In this project, I remark the difference between the denomination Meat Substitute and Meat Analogue. Being a Meat Analogue a food product that looks forward to mimic meat in most of its characteristics. This term may also refer to a meat-based and/or less-expensive alternative to particular meat products, such as surimi.

Those who are transitioning towards a vegetarian way of eating often use meat substitutes. The origin of imitating meat dishes comes from Buddhist monasteries in Asia. The first precept in Buddhism is usually translated as “I undertake the precept to refrain from taking life” (Wyrick, 2009) Vegetarianism is not compulsory in this religion, however some Buddhists see this as implying that Buddhists should not eat meat, as part of their religious practice. That triggered the creativity of cooks how to use vegetable proteins (wheat gluten) and soy (tofu, tempeh), agar and other plant products to produce a wide array of dishes that resembled meat. Some of their recipes are the oldest references to meat substitutes.

In Western European culture, adoption of meat substitutes has been slower with products as Quorn, available in Europe since the nineties. It is believed that the demand for this kind of products has been increasing because of the consumer interest in vegetarianism and more generally in the choice of occasional meat-free meals as part of a variety in their diets. (A. C. Hoek, Luning, Stafleu, & de Graaf, 2004)

Vegetarian food is often given an aura of moral superiority. The first things ascetics ban from their lives is sex, alcohol and meat. Vegetarianism played a role in the Medieval Christian sects that avowed the ‘pure doctrine’ and split off from Rome. The British vegetarians, who founded the Vegetarian Society in 1847, claimed that eating meat ‘incites animal passions’ and leads to immoral behaviour.
2.2.2 Materials for Meat Substitutes:

These are materials used frequently to mimic different kinds of meat (Meng, 2011), with the right process (shape or texture) and proper spices:

**Tofu:** It is well known in China as “meat without bones”. Tofu is a mild white block with a delicate texture, made from soymilk. There are two basic types of tofu: regular and silken. Regular tofu is grainier and firmer than silken tofu and adds texture and chewiness to recipes. Silken tofu is creamy and custard-like. Tofu has a subtle flavour and can be easily marinated.

**Soy Protein:** It is a food product made from defatted soy flour, cooked under pressure and extruded into flakes, granules or chunks. This dry textured vegetable protein must be rehydrated and cooked to provide a texture similar to meat. This is also known as textured vegetable protein (TVP).

**Tempeh:** Protein-rich food made from split and hulled cooked soybeans and grains that are combined and incubated for eighteen to twenty-four hours. The result is a block of beans that is covered with a white edible layer. It has a distinctive taste similar to mushrooms. Tempeh has a chewy texture that makes it a good substitute for meat.

**Seitan (gluten):** Also known as wheat meat. It is made from cooked gluten, one of the concentrated proteins in wheat or spelt. Its origin dates back thousands of years to China where Buddhist monks originally developed it as a meat substitute. To make Seitan, dough is made by mixing together wheat flour and water. The dough is kneaded to develop the gluten. Then it is rinsed under running water until all the starch and bran are washed off. Seitan becomes surprisingly similar to the look and texture of meat when cooked.
2.2.3 Different types of Meat Substitutes

Vegetarian mock-ups: An Asian TVP product typically a blend of soy and wheat proteins. Often they are pressed in a form reminiscent of the animal (such as chicken). They look forward to imitate meat also in taste and texture. (e.g. pork, chicken, eel)

Food Products: Quorn or Valess. Quorn is food product made from a fermented fungus, which is processed and textured to produce a food, which can be easily mistaken for meat. Quorn products include steaks, burgers, chicken breasts as well as sliced meats and ready meals such as lasagne. Quorn it is not an animal-free product, it also contains egg. Valess is a food product made from milk curd and algae combine them into one new, fibrous structure, which is similar to meat. Before it reaches the consumer, it is enriched with vitamins and iron.

Insects or Algae: Insects or algae can be also substitutes to meat. They are well known to be high in protein, low in fat and contain some vitamins and minerals (iron and zinc). It is considered that insects are easier to raise than livestock and produce less waste. In some countries eating of insects is a common practice, or a delicacy rooted in their cultural heritage, e.g. Thailand and Mexico.

In-vitro meat: It is a meat tissue generated in a lab by culturing edible animal muscle in vitro (in a test tube, in glass) using techniques from tissue engineering. It is proposed as a substitute for people who want to cut the environmental impact of their food consumption, but cannot adopt a vegetarian lifestyle (King, 2011). The scientists predict that if more resources are directed towards their research, the first lab grown burger could be available by autumn of 2012 (Anonymous, 2012). Besides the predicted environmental benefits, lab-grown meat should also provide cheap nutrition and help improve animal welfare.

Vegetarian Chicken from asian market in Netherlands image © by the author
Valess snitzel images by @ http://www.valess.nl/
Insect as food by Tony McNicol image by @ http://tonymcnicol.com
In-vitro Meat University of Maastricht (Nov, 9, 2011) image by @ http://www.reuters.com/
2.2.4 Arguments on Meat Substitutes

The good side of Meat Substitutes

“They are healthy”. The Health argument: Most meat substitutes available in the convenience supermarkets are made from soybeans, iron and B vitamin. Meat substitutes do not have the same nutrients as meat, however most of them are fortified with other nutrients, such as vitamin B12. Diets characterised by high intake of plant food have lower cardiovascular and cancer disease risks. (Sadler, 2004)

“They are environmental-friendly”. The Environment argument: Being made from grains and vegetables, meat substitutes are cruelty-free options to meat. Additionally the consumption of these products could have a less impact on the environment in compared with meat consumption.

“They bring variety to everyday diet”. The Diversity argument: Traditionally, meat substitutes have been categorized as a product for vegetarians. These kinds of products, however, appeal to a wider range of consumers: people that are concerned for their health or those who want to eat a more varied and interesting diet. That has led to a broader range of meat substitutes available through mainstream retailers. (Sadler, 2004)

The bad side of Meat Substitutes

“They are not good as the real thing”. Taste argument: Meat has a very unique flavour and texture. It is claimed that some meat substitutes are hard to recognize in some dishes respecting the real thing. And while texture and flavour are meat-alike they often lack savouriness. There is a strong perception of poor taste on meat substitutes from intended users (Heller, 2010). There are also other factors that influence flavour, for example: salt content. Salt, in different cuisines, has the apparent capacity to increase the intensity of other flavours. Most meat substitutes are low in salt. Some meat however is injected with salt.

“They are not natural”: The artificial argument: The food industry is increasing the number of meat substitutes options at the supermarket shelves to give more options to the consumer. However, most of these products are ready-to-eat some of which can appear to be very processed products and perhaps not necessarily healthy.

“They do not fit my diet”: The neophobia argument: Generally it is believed that meat substitutes are generally not shaping up to consumer needs and expectations. (Heller, 2010) New food products always face certain degree of neophobia from consumers; meat substitutes are not just facing this issue but also a widespread dissatisfaction reputation in Western European cultures.
2.2.5 Interactions with Meat Substitutes

- Clearly for vegetarians
- Same package as meat
- Shaped as a hamburger
- Thickness
- Breadcrumbs coat or similar
- Looks already grilled
- Usecue or aesthetics?
- Fully flavoured
- Package to garbage

+ Note: MS are compostable because they are made of grains and vegetables.

What if...

How do I know when is cooked?

Subtle... really subtle colour change

Ok flavour nice smell

Package to garbage

Bake oven grill pan but...

What if...
2.3 UNDERSTANDING THE NEED FOR MEAT SUBSTITUTES

2.3.1 Why is it important to motivate people to reduce their meat consumption and consume more vegetable proteins?

Modern Food production, distribution and consumption have a big impact on our world nowadays. From an ecological point of view, the impact of the food system in the environment is very alarming. Focusing on meat production, livestock is responsible for 18% of CO2 emission (Black, 2008). Red meat generates greenhouse gases, primarily methane and nitrous oxide. (Group, 2011) They also require most resources to nourish the livestock: crops to feed them, water, fertilizer and fuel for transportation. The production of animal proteins is inefficient; approximately 2 to 15 kg of plant foods are needed to produce 1 kg of meat (Hoek, 2010).

In a socio-economical perspective there are alarming concerns regarding food production for the year 2050. It is believed that by 2050 we will require twice the current food production amount in order to feed all the world population. Additionally we must consider, that by this year, more people will be living in cities than in rural agricultural areas.

After evaluating the impact of meat production on the planet, the first thing we can think about is pushing for governmental action. The development of public policies that help the nations to take a greener path by reducing meat production’s negative impacts on the soil, air and water, and by implementing better policies on food production. (Group, 2011) However this is a change that takes time.

Additionally, there is an ongoing debate as to how we should manage the food industry. There is a technocratic party that proclaims that we will never be able to feed the world with ‘nice’ sustainable food. They claim that the world needs more intensive farming and that economic growth cannot be achieved by self-sufficient production in areas. However, their contra part claims that much is yet to be gained by turning production lines into production circles, by saving water and by clever imitation of natural processes. (Somers, 2011)

Ultimately, the only way to make a significant difference in this issue is through us consumers. The first contribution to this change is something that we can all do: change our eating behaviour. As societies have a decreased economic and social stratification, the pattern of consumption between countries and classes are less distinct and is possible to find similar eating patterns between them. (De Borja, 2010) Societies could make a huge difference by choosing healthier, greener food that can help cutting the greenhouse gas emissions that contributes to climate change. (Group,
One way to contribute to this climate change is opting to purchase high-protein foods with the least emissions or ecological footprint (e.g. meat substitutes, lentils or beans). A second way could be choosing for grass-feed, free-range and/or organic products. Acquiring these products (novel high protein foods and free-range meat) helps to expand the market demand. As the market demand grows, more farmers and companies will opt for sustainable and humane production methods, which would make these products more affordable and available.

2.3.2 Food substitutions and Substituting Meat

Remarkable changes in the food industry are related to social and economical changes such as food accessibility, demographics, economy, and lifestyle patterns (Hoek, 2010). These social and economical changes will led us to substitute a product from our diet with another at some point. For example: dried eggs (also named egg powder) substituting eggs. The first detailed description of this kind of product is from 1883, however it was in 1942 (during the Second World War) Americans made egg powder available to people because eggs were rationed. In London, to increase the consumption of this product the government distributed a poster campaign of dried eggs pointing that they were as real eggs. Nowadays, they are used in fast food restaurants, in survival kits for camping and as a diet supplement (Olver, 2000)

A definition of a food substitute from a technological point of view is: “A food or food component, modified with respect to a reference food or food component from the same category, with the aim to replace it in the same usage situation”. (Hoek, 2009) In a general sense regarding the word substitute, we can think of a product that acts or is used as instead of another product, similar or not.

Even with the social or economic factors as triggers of food substitution, the replacement is difficult. This is mainly for two reasons. First, these products compete to replace an already existing product on the market. So, the consumers already have some expectations in comparison with the product that it is substituting. Sometimes these expectations are not met in a completely satisfying way (Shocker, 2004). The second factor is the adoption time of a product. It takes a considerable period of time for a new product to be adopted and for it to develop its own identity and status, from the consumer acceptance and product development point of view (Hoek, 2009).

For example: margarine in the Netherlands after the scarcity of butter. Margarine was developed in France as a solution to bring a cheap substitute to butter to soldiers and the lower class. In 1847 the Dutch company Jurgens, now part of Unilever, acquired the patent and started producing and distributing margarine in the Netherlands. Margarine was quite popular during these scarcity years because it fitted their needs of the people. But they went back to butter as soon as it was available and affordable in the market again. Still, margarine evolved and became a widespread product. Still in recent decades, margarine passed through many developments in effort to improve the quality of the product and its health benefits. (Unilever, 2012)
There are also food products that emerged as substitutes but became an instant success of their own. As the time pass by the product is no longer see as substitute. This is, for example, the case of Nutella®. Created in 1940’s by Mr. Pietro Ferrero a patisserie owner from the Piedmont region of Italy. He used regional Piedmont’s hazelnuts to extend his chocolate supply and created a solid product called “Pasta Gianduja”. The product was very popular and later in 1951, the creamy version of the product started to emerge in the market. By 1964 the Nutella® as we know it was introduced to the market. (Ltd, 2012)

2.3.2.1 What does this have to do with meat substitutes?

If we analyze from the examples, food products need to fit the users context and needs. This is often underlined with breaking technological advances or changes in the world’s situation. In Netherlands for example, during the period of the Second World War, it was common to eat “Vals Vleesch” (in old Dutch means “fake meat”) a meat substitute made from haricot beans and flour because of the scarcity in food. After the War, the consumption of this meal also ended (Vogelzang, 2009). Nowadays, some studies indicate that meat is consumed 3 times a week or more by 80% of Dutch people, in contrast to meat substitutes that are used even less than once a week (Hoek, et al., 2004).

Meat substitutes also face the problem of substituting a product as described above. The first being the adoption time, these products are relatively new to the consumer market. The second will be direct and crude comparison to meat. Some researchers suggest that it is a positive characteristic for a food product to resemble a more familiar food, because that increases the chance of people liking it (Tuorila, 1994).

Food technologists are focused on the improvement of the sensory quality and resemblance to meat. They believe that is the way to motivate more people to consume more meat substitutes, instead of focus in the communication of the benefits and ethical arguments behind meat substitutes. (Hoek, 2010)

The complex challenge of resembling meat is in its sensorial characteristics: texture, flavour, behaviour and appearance. Technology is getting closer to replicate with fidelity meat characteristics or reproduce meat in a lab. In the meanwhile a lot of existing meat substitutes resemble to “processed meats” (e.g. sausages). Food developers believe with this meat substitute presentation the strong comparison with the different types of meat is not evoked (Hoek, 2010).
In the food industry, the term “Food Design” refers to the development, shaping and evolution of food products. Food design is an immense research field and a very complex one. Food rules our culture, behaviour, history, impacts in our health, energy, pleasure and mood, plays a social role and some time a religious one, among other functions. Because of this complexity of designing food, a lot of fields participate in it: chefs, researchers, engineers, scientists, anthropologists, psychologists, philosophers, marketing, strategists, and recently designers.

Food design as a design discipline was developed approximately ten years ago and spread quickly through the Salone Internazionale del Mobile (International furniture exhibition in Milan), and some of the most important design schools in Italy (Polytechnics of Turin and Milan).

According to the Food design association this discipline of food design comprises “visual arts, cooking knowledge, graphic design, product design and multi-sensory research. All of this is concentrated with the only aim to reach an aesthetic expression able to create an aesthetic experience.” (Society, 2012).

Is in this last domain “Experience” where food and industrial/product design started to bond as fields. One well-known example of this is what “El Bulli” did to the culinary world in its time. El Bulli was Michelin 3-star restaurant, run by chef Ferran Adrià, located in Catalonia (Spain). Well know for its culinary innovations, El Bulli as we know it, was a reflection of the idea of Adrià: “the ideal customer does not come to El Bulli to eat but to have an experience.” He used to say that, it is not just about the quality and creativity in the kitchen, it is also how you present the dishes and all the external things that surrounded the experience in order to enhance it. This commitment made people of El Bulli approach designers to came up with tools that facilitated experience, new cooking techniques or events for the costumers. After that it was about exploring eating and cooking In a way that, in the perspective of Adrià, brought closer together food, gastronomy and industrial design (Pujol, 2009).
2.4.1 Food & User Experience

2.4.1.1 Designers’ Cases

In this section I wanted to identify how other interaction designers approach the challenge of design a meat substitute. They are really good examples of designers’ perspectives on how future meat substitute would be. The main characteristic between them is perhaps, those designers’ intentions of questioning & eye-opening the user rather than bring an absolute solution.

Faked Meat
Marije Vogelzang 2008

This project emerged as Vogelzang’s reaction to the meat substitutes available in the supermarkets that amidst the “real” meat products. Because of this she worked around the idea of inventing new animals. Then Vogelzang started imagining the possibilities of bringing food design and animal design closer together (Vogelzang, 2009). She generated several meat substitutes referring to animals that do not exist. She enriched the products’ story by including the description of the animals and the characteristics of their environment. She believes that consumer somehow to associate animals with good food.

The food products are made from vegetables and other meat substitutes like tofu. The result was very diverse on “meat substitutes” options. Very interesting was the aesthetics of the food, that hints to resemble already existing meat (fish) in shape but at the same time they are different. Additionally the whole aesthetic and physical appearances of the products are appealing to the eyes. The designer accompanied the meals with a complete story/description. In this description she refers to animals that do not exist and where the meat comes from. She links her animal’s story to the characteristics of the meat analogue. Additionally she gives some examples of how you can eat this meat substitutes. For example, taking the example of his “Herbast”(fig. 2.1). Being “meat” from an animal original from Greece that feeds from aromatic plants and develops an “herb fur-coat”. She recommends using it in BBQ cuts and, for more adventurous eaters, leave the “herb fur-coat” while cooking.

Conclusion: To engage users by storytelling is the main objective of Vogelzang. She developed
around four vegetarian meals with a meat-like appearance, but somehow still in a very subtle way resembling vegetables. There is a latent alien character in her designs, they look appetizing but there is something unsure about them. She complements these meat substitutes by adding a description of their sensorial characteristics. Additionally she created the story of the animal and where it comes from. When you read the story behind the dishes you realize the richness in the description of flavours and textures in the product. The animal story is certainly an effective way to generate emotions through the food, making the eater add meaning to the story of the food. And truth is, we generate stories to food products since we start trading our food.

James King is a designer who is exploring the implications of future biotechnology in everyday life. (King, 2011) In 2006 he developed two projects: In-Vitro meat with potatoes and Dressing the Meat of Tomorrow. His intention with this work was to imagine what sort of meat; in vitro meat would be when eaten.

Results: In his work “In-Vitro meat with potatoes” King describes his interpretation of what an “in-vitro-meat dish” would look like when scooped from the hypothetical lab container and onto the plate. To the contrary, in “Dressing the meat of Tomorrow” his intention was to design a piece of “in vitro-meat” that was made with craft rather than mass-produced with homogeneity and palatable appearance to eat. (King, 2011) The resulted shape “Dressing the meat of Tomorrow” resulted in transversal cuts found in the abdomen and the brain of the cow. In his design story he denominates “the historical animal known as the cow” (King, 2011)

Conclusions: For King, the exploration on his work is how to engage people to meat created in a lab. So using fibreglass he prototyped two “in-vitro meat” dishes. In his work “In-Vitro meat with potatoes” the interpretation of future in-vitro meat does not go so far from the image of meat we know, it is vaguely reminiscent of raw flesh. However “Dressing the meat of Tomorrow” he is referring to a specific user: the kitchen creative. This something people are looking for more and interesting ways of presenting food. This new lab meat gives them the opportunity to achieve this. Curiosity driven, the chef ends up with complex shapes based in cross-sectional images of the cow’s inner organs. He gave it a concrete context and used storytelling to this design solution.

2.4.1.2 Activity: Interview with an Expert

A semi-structured interview was conducted with Wouter Veldman. He graduated from the faculty of Industrial Design Engineering at the TUDelft. Veldman is a product designer and a professionally trained chef who works at Phillips as Product Research manager Food & Recipes. He also works independently on projects related to food, his catering company Kookinspiratie, and designs food concepts for restaurants, food companies and culinary events. The goal of interviewing MSc. Veldman was to find which strategies he uses while designing food. Complete summary of the interview can be found in appendix 2.1.
One strategy, Veldman mentioned: “The advantage that you acquire with industrial design is that you are trained to look for answers. The designer’s mindset is pushing for innovative perspective always and that is something you can translate to food.”

As designer getting immersed in food design it is important to focus on context, user experience and trends. For example: he designed a lunch for a company design team. His objective was to energizes, stimulate concentration and inspire the designers. The outcome was a folding lunch box that carried seven food spheres. The combination of food ingredients was selected according to literature. The chosen food should stimulates the brain and enhance relaxation. The intention was to make the team more productive.
2.5 Conclusions

2.5.1 General Conclusions:

There are several perspectives in the future that push for the adoption of meat substitutes in our daily diets. The main drive is to contribute to a more sustainable future. Improvement is achieved by small contributions multiplied over number of participants and time.

Most of the time it is difficult to establish what exactly we refer to with sustainable in a design project. Cutting a bad habit? Improving a product? Having quality of life? Therefore I considered necessary to define my approach to sustainability in this project. I design to improve the relationship of flexitarians with meat substitutes. Not design for sustainability directly. By understanding why and how people are using meat substitutes, I can picture how this relationship could be for future products. I believe that if we increase the connection of people with meat substitutes we can increase the sustainable effort of reduce meat consumption.

I consider that meat substitutes design is cope in a corrective approach. What I mean with this? Well, the development efforts are into correct the characteristics what made them different to meat. But, how it could be to design with focus in current positive interactions with meat substitutes? When reaching concept and designing phase, focus in something that more than correcting the interaction with a meat-substitute (e.g. texture, flavour, use). Try to focus, instead, in the positive aspects of people’s interactions with food and new food products. Another main conclusion of this analysis would be the importance of storytelling with the product to approach intended users.

This work is an effort to design a meat substitute that motivates flexitarians to consume it. Rather than another meat substitute in the shelves the aim is something that evokes experience in flexitarians. Hoping to inspire and questioning food developers, designers and researchers.

2.5.2 Designer’s Guidelines:

This literature study helped to identify several guidelines for the product that will be developed. Later in the process these characteristics will be combined with the findings of the context study and the design vision.
-- The product solution should motivate the user to try it. Therefore, it needs to catch attention of the intended user.

- The product should engage through storytelling with the flexitarians.

- The product should be designed with a focus on the positive aspects of flexitarians interactions with it.

The next step on this design challenge is to know who are the flexitarians? A research context study needs to be conducted to explore their motivations, characteristics and needs.
Meat substitute consumers can emerge from different motivations. One group of these consumers is considered here as the target group: flexitarians. For those unfamiliar with the concept, an introduction to flexitarians is given by addressing their characteristics, motivations and expectations regarding meat substitutes. In this way, the research questions drawn previously are concentrated on the target group by performing qualitative research at WUR Food & Biobased Research. Afterwards, a quantitative analysis allows for the division of flexitarians into sub-groups according to different motivators in a specific context.
In the previous chapter the current situation of meat substitutes was examined, where I did not found any information that suggested ideal user target for meat substitutes. However, as this thesis collaborated with the LikeMeat project, the use of Flexitarians as the intended user had already been defined.

Flexitarians, also named as semi-vegetarians, are people who already have an eating pattern in which meat is not a daily component. WUR assumed that flexitarians are easier to persuade into consuming meat substitute products as they do not consume meat on a daily basis. WUR also held that they are open to products that do not necessarily resemble meat, meaning they can appreciate a meat-like product for its own sensory characteristics. (Wild, 2011)

Flexitarianism is a relatively new dietary term. Most of the time people following this diet do not recognize themselves as “Flexitarians”. The reasons for choosing this type of diet are diverse. Nutritionists believe that the number of people that are adopting this diet is growing. They say that cutting back on meat, rather than abstaining completely, may be a more practical compromise that benefits our bodies and our environment. (Nook, 2007)

At this moment, research data on western European flexitarians was almost non-existent. LikeMeat focused his research in Netherlands, Germany and Spain. To gain more knowledge about flexitarians context, WUR Food & Biobased Research conducted qualitative research. This research was carried out on flexitarians from Netherlands and Germany. Additional quantitative research was conducted to validate the findings on the qualitative research. Complete publishable executive summary of both studies can be found in appendices 3.1 and 3.2.

At the time I started my participation in LikeMeat, I decided to use both studies (quantitative and qualitative) as a base to explore the Flexitarian context. When I started my collaboration in the LikeMeat the results of both studies were available. Having complete access to the results and reports of the studies, I decided to use those results as part of my context study. My approach was to analyze them and compare the knowledge gained on both research. As result of this I present the definition of a Flexitarian and a detail description on the different flexitarians’ motivations. The results of this chapter will help me make sensitize food developers about Flexitarians for the idea generation of the design trough design step.
3.2 RESEARCH QUESTIONS

The main goal of the context study is to gain insights into the user group: Flexitarians. The research questions of this project are based on the LikeMeat research questions. However, they were restructured on the basis of what I wanted to know about flexitarians. The different research questions are divided by three different topics below:

1. Flexitarians: Who are the Flexitarians?
   - Motivation
   - Social Context

2. Flexitarians & Food Experiences: How is the Flexitarians’ relationship with food?

3. Flexitarians & Food Products: How they experience shopping and cooking?
3.3 THE PREVIOUS FLEXITARIAN STUDIES

3.3.1 Qualitative Research

WUR Food & Biobased Research did the first step on consumer research in May 2011. This qualitative research was done under the supervision of Dr. Rob van Veggel. It consisted of the exploration of flexitarians by conducting qualitative research in the Netherlands and Germany (van Veggel, 2011). WUR decided to study consumer in the Netherlands because some of the subsequent development studies took place in this country. Germany was also selected because many of the LikeMeat partners are located there.

WUR Food & Biobased Research interviewed a total of 18 subjects (9 for each country) enlisted from a recruitment agency. In the selection of respondents, the following criteria were applied:

1) 20+ years old people, gender not significant, which eat meat (or fish) as main meal maximum six times a week.

2) Being responsible, at least to some extent, of grocery shopping and cooking in their household.

3) Equal numbers of people who are member of a small (1 or 2 person household) and who are member of a large (three or more person) household, and about equal numbers of people with a lower and a higher level of education.

The research questions to answer in this study were:
- Who are the flexitarians?
- What is their behaviour in relevant domains of life?
- Which values and motivations do consumers have?
- Can consumers on basis of these insights be segmented?

The research methods used were:

A) Self-documentation through the creation of a photo-diary:
In the photo-diary participants received an assignment to make a photo diary of their main meals during the week before the interview. These photos could show the type of dinner, time, place and the companion in the dinner situation. The objective was sensitizing the participant’s prior the
Flexitarian’s self-documentation:
Food Diaries’ pictures
images by @
WUR Food & Biobased Research
interview, as well as to see how the participant’s dinner experience was.

B) User interviews:
The Flexitarian participants were interviewed by Rob van Veggel at research locations (Arnhem, Den Haag and Munich) in interviews lasting between 75 and 90 minutes. The interviews were individual and consisted of two parts. The first part was a discussion of their actual eating habits and related behaviour using the photo-diary. In the second part of the interview researchers questioned the reasons or motivations to follow this pattern. The interview was recorded and transcriptions were analysed to find the overlaps and differences between the respondents (van Veggel, 2011).

From this qualitative research, as result, the following segments of flexitarians were distinguished:

1. Health flexitarians: Flexitarians that do not think that eating meat is bad. But consider that moderate consumption of it is healthy.
2. Animal friendly flexitarians: Flexitarians that limit their meat consumption in quantity because of its negative impact on environment, animal welfare and economic fairness.
3. Hedonist flexitarians. Flexitarians that skip meat because they plan their meals according to the sensory characteristics of it and the kind of foods they fancy at that moment.
4. Convenience flexitarians. The convenience flexitarians skip their daily meat because it is too much effort to prepare it, or to prepare it well.

Also, for each of the segments, the following clusters of information emerged:

Consumption situation: The description of their dinner situation. For example: if they have dinner alone or with the whole household.

Food Preparation: Information regarding cooking and food preparation. For example, how they decide in their household what to eat.

Shopping for groceries: Explanation of how they experience shopping. For example, where they shop on a regular basis.

Product choice: Information regarding criteria for selection of products.
3.3 THE PREVIOUS FLEXITARIAN STUDIES

3.3.2 Quantitative Research

The quantitative consumer survey was performed to validate and to quantify these segments identified in the qualitative study. WUR Food & Biobased Research, under the supervision of Adrian Kole conducted this survey. The data was collected in three different countries, Netherlands, Germany and Spain, with representative samples of consumers (700 people) that consume meat from one to six times a week (flexitarians or reduced meat consumers). The survey questioned the consumers about their food related lifestyles; their food related attitudes; their meat related beliefs; the importance of different product characteristics; consumption of different varieties of meat and other protein products; about reasons (not) to reduce meat consumption; and about demographic characteristics of the consumers. (Kole, 2011)

Interestingly, it was found that the reasons to not reduce meat consumption were not distinctive between groups. It confirms the central idea of the consumer studies in LikeMeat, that the interest of specific consumer groups in new protein products by no means needs to be driven by a desire to consume less meat (Kole, 2011).

The final segmentation was defined.

1. Cluster 1 (C1)- Price driven consumers: The characteristics of this segment according to the survey were: Older, low incomes, low education, couples with children, least urbanized, in majority women. They have low interest in health or social issues and low intention to reduce meat consumption.

2. Cluster 2 (C2)- Social consumers: The smallest segment comprising 14% of the flexitarians. The characteristics of this segment according to the survey: Young couples with children, relatively low incomes and conservative. Value the social status of meat, but also intend to reduce consumption the most; because of health and critical others.

3. Cluster 3 (C3)- Conscious consumers: Age above average, high education and income and in majority women. Most couples and singles without children. Like new products and like to cook. Involved with their food and some belief in sustainability and health issues. According to the survey, the second highest intention to reduce meat consumption.


According to the quantitative study, demographically the segments differ significantly concerning different factor. These factors are age, income, household composition, education, nationality gender; and between geographical regions. (Kole, 2011). Very interesting was to find that Price driven segment of flexitarians were predominant in Germany. In Netherlands the leading segments are Conscious and Convenience segments. At last, flexitarians from Spain are into Social and Healthy nutrition.
3.4 ANALYSIS

Documents of the qualitative and the quantitative research as well some raw material from interviews and photo diaries were explored according to the topics and research questions. The findings of the qualitative research were the milestone of the beginning of this project. I believe that the use of food diaries in the qualitative research was crucial and helpful to sensitize the consumers for the in-depth interviews. One thing to consider, however, was that in some of the clusters findings the results are not complete for all the Flexitarian segments. For example, I found a very detailed description of shopping and cooking of hedonist Flexitarians. While in other segments like animal friendly Flexitarians and health flexitarians this information was not available.

A suggested approach for future projects in order to avoid these gaps in the information could be using “contextmapping” in combination with the food-diary. Contextmapping is a user-centred design research technique. If we provide the user with design tools (like a workbook or postcards) they can express a particular experience. (Sleeswijk, 2009) By adding a sensitizing tool, for example a workbook, we can gather deeper information about the participants’ experiences. Another recommendation could be to perform a generative group session with a few users that participated in the interviews. In this way participants are able to express their thoughts and feelings, and discuss in a group (Stappers, 2007). I want to underline the fact that contextmapping is not a method to validate. However it helps designers to pay attention to the deeper layers of meaning of the product for the user.

The results of the both (qualitative and quantitative) studies were similar. Both identified different segments of flexitarians and it was noted that they share the same characteristics. This validated the user segmentation and raised the food developers confidence in the usefulness of this typology in the product development (Kole, 2011). To resume the findings of both studies (qualitative and quantitative), the final naming of the flexitarians’ segmentation is outlined in Figure 3.1. The final Flexitarian consumer segments were narrowed down to: Health Flexitarian, Hedonist Flexitarian, Conscious Flexitarian and Convenience Flexitarian.
Figure 3.1 Explanation

A) Hedonist Flexitarian compare best to Cluster 2: Social consumers

B) Animal Friendly Flexitarians can be compared with Cluster 3: Conscious consumers. This group wants to reduce meat consumption for ethical reasons (animal welfare or environmental concerns) according to the qualitative study. In the quantitative survey it was found that they are also concerned about sustainability and health issues. It seems more accurate the description “Conscious” than the term “Animal-friendly”. A new name was defined to this segment “Conscious Flexitarian”.

C) For the clusters (Cluster 1: Price driven consumers and Cluster 4: Convenience driven consumers) it was identified that both clusters fit into the Convenience oriented consumer. Even though some statistical data are very different in between segments (age, income, family situation) their concerns and motivations are the same. They both manifest low intention to reduce meat consumption and low interest to the intrinsic characteristics of food. Additionally if we considered the term Convenience Flexitarian with a bigger scope, as anyone that intends to save resources or be pragmatic. In this case both clusters of the quantitative research look to minimize assets: in price (price driven) or energy/preparation (convenience driven).

D) Health flexitarians are Cluster 5: Consumers driven by healthy nutrition.
3.5 CONTEXT STUDY RESULTS

3.5.1 Who are the Flexitarians?

A Flexitarian is an omnivore individual with reduced meat consumption. They do not abstain from meat but they choose to reduce their intake as much as possible.

It is believed that flexitarians are easier to persuade into consuming meat substitute products as they do not consume meat on a daily basis. It is also assumed that they are open to products that do not necessarily resemble meat, meaning they can appreciate a meat substitute products for their own sensory characteristics.

The reasons for this dietary flexibility may vary. During the research it as identified that the characteristics of flexitarians users are diverse and they have different motivations to adopt a Flexitarian eating habit. Four Flexitarian' segments and their characteristics were identified: Health Flexitarian, Hedonist Flexitarian, Conscious Flexitarian and Convenience Flexitarian.

<table>
<thead>
<tr>
<th>Flexitarian Type</th>
<th>Predominant in:</th>
<th>Motivations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedonist Flexitarian</td>
<td>🍴</td>
<td>Motivation: Sensorial reasons Pleasure in food, Social status and Exploration in Food. Regard less is meat or not.</td>
</tr>
<tr>
<td>Health Flexitarian</td>
<td>🏨</td>
<td>Motivation: Health concern They are care about the health risks of including too much meat in a diet. And they are also aware of food safety scandals</td>
</tr>
<tr>
<td>Conscious Flexitarian</td>
<td>🌍</td>
<td>Motivation: Socially Conscious They are cognizant of the environmental drawbacks of consuming meat. But also food trade implications.</td>
</tr>
<tr>
<td>Convenience Flexitarian</td>
<td>🍎</td>
<td>Motivation: Efficiency or Practicality. They want to make their lives simpler: by saving preparation time in the kitchen or money to spend in products.</td>
</tr>
</tbody>
</table>

- Which are their motivations for being Flexitarian?
- How is their social context?

They enjoy food and social gatherings.
They share with others with similar interests.
Social relationships influence them.
They often have social circle that share their ethical perspective about environment, with different levels of involvement.
They normally leave social gatherings for the weekends.
During the week they most likely live by their own.
### 2. Flexitarians & Food Experiences: How is the Flexitarians’ relationship with food?

- Exploration and new experiences. They enjoy cooking and eating (foodies). They like the ritual in preparation of a new dish and share the new experience with others.

### 3. Flexitarians & Food Products: How they experience shopping and cooking?

- They love to shop for groceries, either in markets or specialities’ store. For them it is often a source of inspiration for cooking. They dedicate time to cooking and often look for new recipes in cookbooks and magazines.

<table>
<thead>
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<th>Exploration and new experiences. They enjoy cooking and eating (foodies). They like the ritual in preparation of a new dish and share the new experience with others.</th>
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</tr>
</tbody>
</table>

| They like to cook. Food not only has to be healthy it should also look healthy. Food contribution to wellbeing. |
| These flexitarians might not eat what they consider unhealthy. They have a strong classification in food. They like to cook and but take care of their eating portions. They like to indulge themselves with food but in moderation. |

| They like to cook. Food not only has to be healthy it should also look healthy. Food contribution to wellbeing. |
| These flexitarians might not eat what they consider unhealthy. They have a strong classification in food. They like to cook and but take care of their eating portions. They like to indulge themselves with food but in moderation. |

| Trusting in what you are eating: what is it, where it comes from, etc. Contribution of their act to the world situation. How it make them feel they are doing right. They like to cook. |
| They pay attention to the production of food and meat. They often therefore eat free range and/or organic meat or products. They like to cook but they are not very adventurous. |

| They pay attention to the production of food and meat. They often therefore eat free range and/or organic meat or products. They like to cook but they are not very adventurous. |
| They do not like to put to much effort in food preparation. A lot of flavour in the food is also important. |

| They do not like to put to much effort in food preparation. A lot of flavour in the food is also important. |
| The convenience flexitarians consider cooking at weekdays a routine chore, to which they want to spend as little time and energy possible on it, often cooking double portions, one to be warmed up the next day. |
3.6 CONCLUSIONS

3.6.1 The Flexitarian Personas

The focus of this chapter was to identify and empathize with Flexitarians. The context study helped to underline the motivations, values and preferences of flexitarians. In addition, identify four different types of flexitarians. As a result, I came up with four Flexitarians’ personas and a matrix that later will help us in designing for interaction with the meat substitute.

I assembled four different personas, each one representing one of the flexitarians’ segments. The objective is to give a concise and final overview of each user segment. These profiles should add the findings of the survey but mainly keep the richness of the qualitative research findings. They were based by the context research, inspired from the real participants of the qualitative research.

The personas were complemented with some findings from the quantitative research. The intention with these profiles was to use them to sensitize food developers about flexitarians in the first idea generation.

The different Flexitarian personas are presented in the following pages:
A) Hedonist Flexitarian- Tom
B) Health Flexitarian- Anika
C) Conscious Flexitarian- Helena
D) Convenience Flexitarian- Pieter
Motivations:
It is about flavour:
“I really enjoy a piece of meat, but I also enjoy meals without meat. For instance, cheese fondue doesn’t combine with meat. At times I cook without meat because meat doesn’t fit well with the rest of the meal. It’s a matter of taste. I’m not a meat person. Hence, with respect to flavour, meat isn’t always necessary. You can very well vary with having it in a meal or not.”

Eat what they enjoy:
“I love to explore food, different flavours, textures and different cuisines. I might have at times a traditional meal with meat, potatoes and vegetables, but that would be because I feel like eating that, not because that’s the standard. My spouse encourage me, we love spontaneous cooking decisions.”

Choosing dinner
“When I have a to write at night, I don’t eat meat. Meat stays long with you and makes me tired. During the week I eat less meat since it’s not that easy digestible. Meat is more something for the weekend.”

Social context
“Other people eat food out of custom, without meat they can’t eat. There are many people who eat that dull. Always the same: why would they try something new when the old stuff tastes good? But I want to try new products, there are so many new impressions one can get.”

Shopping
Love to shop for groceries
“I love shopping. I love to do that alone not to be disturbed by others. I love to see if there are new products, or just in general to see what’s available. That’s very inspiring. Of course, when I cook, I shop for the ingredients. I want to pick those that I like best for what I plan to make.”

Product choice preferences
“I have my favourite supermarket because its cosy and they have a lot, but I also go to an Iranian shop nearby. And when I’m in another city, I visit stores I pass just to see what they carry.”

Many sources of inspiration
“For me, cooking is fun and relaxation. It’s very creative for the brain. In the past I have visited for extended periods Belgium, China, Hungary, and America and there you pick up all kinds of ideas. Next year we want to travel to India and I bought already an Indian cookbook.”
ANiKA
Woman, Hamburg, I’m 37 years old, nurse, widow, Caleb (7 years old)

“Eat right, Pray always, and spread the Love”

ABOUT ME:
I’m 40 years old. I live in a beach house with my beautiful son Caleb. The beach is my sanctuary in which I frolic in most of my free time. I take care of people I don’t know, but enjoy it otherwise. I’m a coffee fanatic, not an addict. I somehow plan to remarry, but I just couldn’t find the right man for the moment.
I write a blog & get emotional while doing it. I my blog I love to share how great I have been feeling ever since I started a more healthy lifestyle. Switching diets must come from the idea that you yourself are ready for it, & that

Motivations
Too much meat is unhealthy
“3 months ago, I decided to switch to semi-vegetarian diet, more veggies, less meat. Slowly, I have weaned myself out of it, and I am now eating more veggies than ever. It was hard at first, especially if you really are a pork fanatic: Birnen, Bohnen und Speck and Bratwurst.”

Pursing eating healthy
“I used to be a little bit overweight. But in just three months, I have seen the minor changes. I maintained my ideal weight, which is 64 kg. I am more active, at times hyperactive, my digestion has been easy breazy ;D, & I can now run twice the distance that I normally ran before. Amazing, right?”

Social context
“Keeping our home full of non-processed, nutrition-packed, organic, all-natural foods, and having limited portions of fish/meat has become a lifestyle for me. But Caleb miss the meat’s dinners and sometimes he didn’t understand why he could have a pork sausage for dinner. So we stared cooking together every night and I tried to keep it as fun as I can. Of course, meat tastes good and therefore, when we have special occasions, we have meat.”

Shopping
Product choice
“The change was not too hard, since I had plenty of vegetarian options that I found enjoyable to eat. The only problem that I could see in the future would be having multiple options for dishes. I have never eaten vegetarian before, so my knowledge of dishes is limited. I have been going online to find new dishes for the next two weeks, but I feel like I might be repeating dishes multiple times.”

Shopping
“I shop at the local farmers market when it convenes on Saturday mornings. Normally I buy what’s in season there and bring it home, and then I figure out our meals based on what we have purchased.”
HELENA

Woman, Gouda, I'm 37 years old, Dog Trainer, married, two dogs: Annie and Chip

“I believe everyone is weird in their own way.”

ABOUT ME:
I'm an animal lover who use positive training methods to correct animal behaviour. I like to think of myself as gracious and approachable to everyone. I am quick to forgive and pretty much trust everyone I meet. I follow Zig Zigler's philosophy that it is better to trust everyone and be disappointed every now and again than to live your life in suspicion of everyone you meet. I love to laugh out loud and to make people laugh out loud, also I like spicy food. I go to church any weekend I may be at home and love to cook. All I need to add now is I love long walks on the beach and candle-lit dinners and I would have written the perfect singles ad. No, I am not single. John and I have been together for 12 years.

Motivations
Meat-industry is evil
“The way most animals are raised for meat is cruel. Factory farms produce food that is “icky.” Poorly treated animals get sick more often and require antibiotics. Their manure pollutes the water which is then used to irrigate our spinach (remember last year's salmonella scare?). I believe the recent recalls of pet foods and the tragic deaths were just the logical result of food production from a factory system instead of a farming system.”

Meat consumption
“I can not practice veganism. As much as I admire vegans, I can’t imagine giving up cheese and some meat. So it is important is to make sure that we are acquiring meat that as being breeding well, in a decent way and without suffering.“

Social context
Ethical concerns about the environment
“Trying to make ethical decisions is part of being human. If we don’t struggle with the hard questions in life, we’re not exploiting all the wonders of our humanity. And I believe that considering whether some animals are pets and others are meat is a big decision, worthy of the greatest philosophical minds. Large-scale raising of animals for meat degrades the environment in many ways”

Differences within his family
“I have friends & family who have been trying to eat less meat by my advise. But I haven’t fully succeed. Although I'm certain all of them loves animals, we don’t often talk about what this means for our dietary choices. This is a hard issue. And I hope people are willing to consider their choices with kindness and compassion toward themselves and others”

Shopping
Product Choice
“In the summer, it’s easy for me to eat less meet. I have a little garden in my front yard and a wonderful farmer’s market a short bike ride from my house. Fresh produce is abundant, affordable, attractive, and delicious. In the winter, I find things tougher. I don’t care for sweet vegetables much and most of what stores well over the winter is sweet. And as the days get short and gloomy, I find myself craving meat. Chicken soup makes an occasional appearance although I try to buy meat that is outside the conventional factory farm system. But when I go to a restaurant or someone's home, all bets are off. I try to eat lower on the food chain, but that's about it.”
Motivation
Quickly, efficiently, and cheap
Therefore one has to plan the grocery shopping. When I want to spend on my food only 20 euro I think before I go out to shop on what I want. I hardly buy anything spontaneously. I look at advertisements and compare the sale offers. And I shop mainly at discounters.

Planning and inspiration
Preparation of meat is too time consuming.
“To prepare meat well is a lot of work. And when that also should taste well and be eaten with attention, that’s a lot of work too. You can boil pasta and potatoes by themselves, but meat requires attention. And one has to prepare a sauce to go with meat. When I cook for myself, I want to spend less as possible time with it.”

Cooking
A routine chore
“Through the week cooking is more a routine. One has to eat something! Sometimes I try to prepare something new, but I have to push myself over something in order to divert from the routine.”

Social context
Cooking for themselves
“Now that I live alone I cook less. I pay attention to the nutritional value, but everything else is just quick routine.”
Eat also quick & efficiently.
“I live alone so I cook less. I pay attention to the nutritional value, but everything else is just quick routine.”

With guests: definitely meat
“I once in a while invite people. Then I want only fresh ingredients. The products are then special, something you don’t do when cooking for oneself. Fish or meat is then always there to make the meal complete.”

Shopping
Product choice
Convenience and cheap
“I don’t want to spend much time and money on food: I get those things that keep long and cost little.”
RESEARCH THROUGH DESIGN
CHAPTER 4: RESEARCH THROUGH DESIGN PART 1

This chapter introduces the first idea generation towards a meat substitute for flexitarians. This process started with a creative sessions with food developers, from which fourteen concepts were drawn. These concepts were evaluated by the involved partners of LikeMeat with an emphasis on the characteristics of the meat substitute and finalized with the selection of six concepts for further development.
4.1 CREATIVE SESSIONS WITH FOOD DEVELOPERS

Having two collaborative creative sessions during the project helped, first of all to generate as many ideas as possible for the project and secondly to introduce project collaborators to creative sessions. The ideas generated in that session were evaluated from a strategic point of view (SME’s) with the objective to gain the first product requirements from the project and have the first idea selection.

One collaborative creative session was conducted during my participation in LikeMeat project. However, just before I joined the project, WUR had the first creative session. This creative session was under the supervision of Rob van Veggel. The participants were all the LikeMeat Partners. Four ideas were detailed after I analysed the results of this session.

The second session, facilitated by myself, was held at WUR facilities with the purpose of empathizing with the Flexitarian group and thinking out-of-the-box in order to generate meal concepts for the product “LikeMeat”. The participants in the session were from multidisciplinary fields: consumer researchers, sensory researchers, food developers, a design researcher and a chef. They were divided in equal groups with dissimilar backgrounds to enrich the results with the collaboration of different fields. To understand the users, the “Flexitarian personas” were distributed with the intention to acquaint with the story of the user, as he was telling the story itself. The personas used can be found in the previous chapter.

The researchers had to come up with a dinner situation storyboard based on the information in the profiles. After defining the situation ideas were generated through the participants involvement in some creative facilitation techniques. All product ideas are compared and discussed with all participants (Tassoul, 2009). This second session was outlined according to creative facilitation tools from Marc Tassoul’s book from the TUDelft. Detailed guidelines of the sessions can be found in appendix 4.2. Ten meat substitutes concepts were the result of this creative session.

The end results of these two sessions were fourteen meat substitute concepts and a vast amount of possible product characteristics. To start narrowing it down, I clustered the information in three main areas:

- Basic Concepts generated in the session.
- Perceived product characteristic preferences for each type of Flexitarian.
Participants at Wageningen of the second creative session:
WUR Food and Biobased Research Consumer Scientists,
Food Developers, Chef of the Restaurant of the Future and TUDelft Professor.
Images by @ the author
- What product information should be presented for each type of Flexitarian?

This “Flexitarian concept-maps” were generated, with the main purpose to communicate and store the findings of the analysis (Appendix 4.3). The secondary purpose of them was to elicit discussion about the different concepts and the characteristics of the different consumer segments for further steps. After some evaluation the information was narrowed to fourteen detailed product ideas. I used elements of the concept-maps to enrich the description and the features on the product ideas.
4.2 THE FIRST IDEAS
The ideas are described along with the consumer segment they belong to (according to the Flexitarian Persona):

**“LikeMeat” like-tapas.**

*Description:*
A product for the sophisticated cosmopolitan. This product is festively served. Ready-to-eat, individual packaged, and in variations of different exotic cuisines.

**Healthy Bites “LikeMeat”**

*Description:*
Organic savoury ready-to-eat snack. Something healthy and easy to eat: ideal for the busy person on the go. Can be bought at kiosk in places like train stations. Varieties with different flavours, different packaging like potato chips packaging.

**Steak BBQ with herbs.**

*Description:*
A juicy “LikeMeat” steak mildly flavoured with barbecue herbs and condiments. Easy to combine with vegetables, baked potatoes and grilled corn.
Asian “LikeMeat” cuisine.

Description:
A soft flavoured basic product with infinite possibilities. Our interpretation of the classic Indonesian tempeh.

Baked “LikeMeat” Stripes:

Description:
The baked “LikeMeat” stripes are a product for quick preparation. Tasty meat-like strips of mild flavour as ideal complement for vegetable salads. Designed to be complemented with vegetables.

“LikeMeat” ham:

Description:
Vegetarian ham made from a blend of seasoned cereal and vegetable protein.
“LikeMeat”
cubes in olive oil with herbs:

Description:
A product easy to use in daily meals. Basic soft-flavoured product shaped as cubes immersed in extra virgin olive oil with herbs. Mediterranean flavour, could contain chopped olives also.

BBQ “LikeMeat”
marshmallows:

Description:
A delicious and healthy basic product for children: it should fun to barbecue their own meal like they do with marshmallows. Marshmallows are sweet: this product should appeal to the taste for children but is not necessarily of sweet flavour. The package includes a special skewer for roasting.

Schnitzel “LikeMeat”:

Description:
A LikeMeat product piece coated in flavoury breadcrumbs.
Deep-frozen “LikeMeat” pizza snack:

Description:

Delicious pizza snacks: tomato sauce, like-meat flavoured slices and so much melt-in-the-mouth mozzarella cheese.

“LikeMeat” Microwave Stew

Description:

A delicious and healthy basic product for children: it should fun to barbecue their own meal like they do with marshmallows. Marshmallows are sweet: this product should appeal to the taste for children but is not necessarily of sweet flavour. The package includes a special skewer for roasting.

Bento-box “LikeMeat”:

Description:

A bento meal that consists of LikeMeat (fish or meat flavoured), cooked rice and one or more cooked vegetables in a box-shaped container.
**Minced “LikeMeat”:**

*Description:*

LikeMeat mince made with soya protein. The meal should be marinated with strong flavour, which is included in an additional bag inside the package.
4.3 FIRST IDEA EVALUATION

4.3.1 Aim of the evaluation

The aim of the first evaluation was to make a selection of ideas to prototype and evaluate with flexitarians. The product ideas generated were envisioned to appeal to flexitarians. However, it is also interesting to know how their producers perceive meat substitutes. What they consider important in function and values. Successful products also need to fit into the business model of a company, such as in its productive capabilities and marketing strategy. At this point, the concepts produced during the idea generation were shown to companies alone. The goals of this evaluation were:

- Explain the Product Ideas generated for LikeMeat in the Creative Sessions.
- Get the first idea selection of product concepts for the LikeMeat partners.
- Elicit the evaluation on the ideas according to their business perspective by getting them to suggest how to develop the concepts further. Something which also would give more insight into their product development perspective.

4.3.2 Method

The first evaluation was the presentation of the outcome from creative sessions to the LikeMeat partners. An interactive presentation booklet, in PDF format, with all the concepts was generated and distributed to the partners. The ideas were presented by introducing an evocative sketch of what the product could look like and the product information. (Wansink, van Ittersum, & Painter, 2005) The product information included: descriptions, variations, nutritional benefits, preparation steps, prospective packaging and storage.

The ideas were divided into four different categories. In this case the categories were according to the degree of preparation of the meal to make the ideas easier to understand for the companies. Not according to the results of the user research. The categorization was the following:

A) Ready to eat: Products designed for easy consumption that does not require any extra preparation.
   1. Baked, “LikeMeat” stripes:
2. “LikeMeat” cubes in olive oil with herbs:
3. “LikeMeat” ham:

B) Minimum Preparation: Products that require some preparation such as heating or marinating.
5. Microwave Stew.
6. Bento-box “LikeMeat”
8. Mexican minced “LikeMeat”

C) Hobby Cooking: Products that require a higher degree of sophistication in preparation such as combining with other ingredients.
10. Asian “LikeMeat” cuisine.
11. BBQ “LikeMeat” marshmallows.

D) Snacks & Others: Products designed to be eaten between meals, or in informal social gatherings.
12. Healthy Bites “LikeMeat”
14. Drinking snacks “LikeMeat”

After reading the full description of the meal idea, the LikeMeat partners had to fill out a survey where, from the perspective of the company, they share their opinion on it. The survey focus was in three areas:
The Consumer Research department of Wageningen UR Food & Biobased Research distributed a PDF survey to all research and commercial partners on September 15th, 2011. On October 13th, 2011 the last response was received. A total of nine responses were received and analyzed. The complete form used can be found in Appendix 4.4.

### 4.3.3 Results of the evaluation

After the analysis, three main features considered to be a challenge for the partners in the development of the product were identified in order to understand the character of the designed product (van Boeijen, 2010):

#### 4.3.3.1 Related to Form & Properties of the Product:

1. **Meat substitution or meat imitation**
   This is perhaps the most evident question while designing a meat substitute. The main discussion generated by the ideas was about the product being a “meat imitation” or being a “meat substitute”. In the latter case, the meaning of “meat imitation” is a product that faithfully mimics all characteristics of Meat (e.g. Steak BBQ with herbs). These characteristics are aesthetics (texture, appearance, shape etc.) and/or sensorial (flavour, smell). The other classification of products was denominated as “Substitutes” because the intention with this type of product concept is not to faithfully imitate meat but to be a replacement for it (e.g. the LikeMeat cubes in olive oil, sausages). If a product concept was a direct meat imitation it was sometimes heavily weighed by the partners to decide if a concept had potential. It was something that not all the partners could agree on.

   “The target is “LikeMeat” not, “LikeCheese”. Basic flavouring might not cover the protein of flavour notes...” (e.g. Etol; about the “LikeMeat” cubes in olive oil with herbs)

2. **Texture:**
   This refers to what sort of texture that each idea should have. Some textures are more challenging than others. For example: Crunchy and fibrous layered textures represent a challenge to develop.

3. **Behaviour of the material:**
   Some technical questions about the behaviour of the material emerged, such as:
   - How the product would look like/feel/smell before and after cooking.
   - How oxidation will affect the product.
   - Which tolerances are possible for the manipulation of the product. (e.g. cutting, seasoning, marinate in a liquid).

4. **Flavouring is something important:**
   The flavouring challenge is hiding protein notes to have meat or a soft flavour (e.g. fresh herbs) in
4.3.3.2 Related to Function of the Product:

1. Comparison with meat and/or other products:
The majority of the partners expressed their concern about the comparison of with similar products and the negative aspects of it. Not just with meat. For example: the idea “Healthy Bites LikeMeat” resembles, crisps according to some of the partners. While some were enthusiastic about it, others were concerned that it could be associated with the “unhealthy” attributes of crisps (or chips).

2. Nutrition:
The type of nutritional value that the product should have: Similar to meat or fortified with nutrients.

4.3.3.3 Related to Values of the Product:

1. Feasibility & Novelty:
Another finding of the report was to find out which options they considered to be feasible according to their point of view. This is illustrated in Figure 4.2.

Additionally, the figure indicates by coloured areas if the concept was considered a “Niche Product” (with limited market) or a “Broad Product” (with multiple market applications). The most popular ideas were the ones that could have a broader application and market. However these ideas are not so different from what we can find in the market nowadays. The ones considered as “Niche products” had a more original approach, according to the partners, but the characteristics of these products were unfeasible because they required bigger technological development or higher production-cost.

2. Cultural Correspondence:
One aspect that stands out in the analysis and needs to be considered is that the companies represent different countries. This means that perhaps some aspects in their food culture represent a difference in the perception of the concepts. For example: the “Asian LikeMeat” concept was widely popular with the Dutch partners, where for the German companies the opposite was found. This is an important aspect to take care of in product development with the consumers.

4.3.4 First Ideas Selection

On the survey sent to the project partners, one of the questions in the idea survey was very important: whether (or not) the partners recommended continuing with the concept. While the results gave an overview of the partner’s preferences WUR decided it was not enough to select the ideas
for development. This was mainly because of two reasons:

- Technical and Commercial Feasibility were considered in equal value, as the objective for WUR Food and Biobased Research was to collect as much information in these two aspects. The presentation was sent to the SME’s and Research Partners at the same time. It was evident that each partner considered its value differently.

-Nine of the sixteen partners sent WUR their questionnaires. A total of nine questionnaires were received. Only eight responses were analyzed. One of the responses was left aside because one of the R&D partners (BOKU) did not want to influence the final selection of the product. According to their field of work and food safety, all the options were viable.

On November 23-24 (2011) in Barcelona a meeting of the project partners was held. The general goal for this meeting was to report results and discuss the efforts of the different work packages. Additionally concrete planning of the work to be done in the next 6 months of the rest of project was made: requirements, activities and commitments. As part of the user research team of WUR Food & Biobased Research the main participation in the meeting was the presentation of project process advances and results of the creative sessions and survey [WP1] by Karla Rosales and Rob van Veggel.

The results of the feedback analysis were presented in a PowerPoint presentation. Our main objective was to present the analysis of the partners’ insights into the concepts and have a final selection of which ones to develop further. In addition we wanted to elicit a conversation to get a better direction in the discussion topics.

The findings in the evaluation were addressed and that contributed to the project’s decision making and the final idea selection. At the meeting in Barcelona it was decided to have the same amount of ideas that mimic meat aesthetically and sensorial and those who do not.

Six options were chosen; having the same number of meat substitutes ideas that aim directly to imitate meat and those who do not. After the presentation of all the advances the final selection of the idea was refined to:

1. Steak BBQ with herbs
2. Baked “LikeMeat” stripes
3. Schnitzel “LikeMeat”
4. “LikeMeat” ham
5. Asian “LikeMeat” cuisine
6. Healthy bites “LikeMeat”
4.4 CONCLUSIONS

4.4.1 First Evaluation Conclusions

1. Novelty & Feasibility:
After the new concepts’ selection and discussion, the need for a classification of the product ideas in relation with the product development stage was identified. As the first concept ideas were very diverse, some of them were identified for some partners as “Advanced products”. This is because the stage of development of the food basic material is not ready to be shaped or to behave as some of the concept ideas described. Other concepts were considered to be products for “early stage of the project”. This was also a factor, when choosing the first idea selection. For example, one partner commented:

“(this is an)...Advanced product, not product for launch” (e.g. Angermühle; about the BBQ Steak)

2. Cultural Correspondence:
Agreeing that food culture will have an impact on the final production product development, it was decided that each company would deal with this aspects when they are commercializing their products. One idea would be to consider cultural correspondence in the use and selection of flavours.

1. Comparison with others products:
According from a strategic point of view, the final product developed should aim to be a high quality product. Comparison with meat or other product could exist (if applicable), however the quality of the product should be reflected in the production, materials and image of the product. It stood out as evident the need of generating a proper name for the product, to replace in the future the product’s actual name, “LikeMeat”. This name would stand out the product as a Substitute to meat, facilitating the association with meat products, but not a direct comparison.

2. Nutrition:
There is a general concern, of the companies, to provide the right nutritional value to the product users. That is a really positive finding during this evaluation. It is difficult to achieve exactly the
same nutrients of meat, the nutritional value that of meat substitutes is adequate. It is gradually more recognized that certain foods and their components could supply health benefits beyond their nutritional value (Sadler, 2004). The consequences of its consumption (meat substitutes) will depend on the physiological and nutritional state of the individual. (Pensel, 1998)

1. Meat Substitutions or Meat imitation:
The research specified that flexitarians were the target group. Flexitarians have different motivations in their meal choices. Free out-of-the-box thinking was encouraged in the creative sessions to explore what this meat substitute could be. The objective was to have as many ideas as possible, to maximize the opportunities to develop a product that can be different in the market or to inspire the creation of new products in the future. So, a meat substitute does not necessarily have to mimic meat in all sensorial aspects.
CHAPTER 5: RESEARCH THROUGH DESIGN PART 2

The first prototype of a meat substitute is presented in order to obtain the sensory attributes and interaction possibilities with the users. The main characteristics desired by the users are identified and presented to users in a session at WUR. A context map was obtained from the input of the users, which provided a guideline for the development of a meat substitute. Also, an evaluation of different flexitarians is included. The outcome of chapter is the last requirements needed and they are analyzed in chapter 6, where a general design vision for the final product concepts is explained.
5.1 RAW MATERIAL

Fraunhofer-Gesellschaft Research, in Germany, is currently working on the protein recipe and production of the raw material for the Project LikeMeat (WP 2).

The raw material (also denominated basic product) is the basic vegetable protein recipe that later will be developed into a product. Proper selections of the adequate protein-rich recipe components are important because, the protein materials have high impact on the nutritional and sensorial quality of the meat analogue. High protein materials have characteristic flavours, and most likely will determine the taste of the non-flavoured basic product (Wild, 2011).

Therefore they tested several protein-rich raw materials that might be suitable to be used as a main ingredient for the basic meat analogue. The result was the formulation of three different raw materials a combination between several ingredients like soya, lupine, gluten, pea or animal protein (milk and egg). The material available for prototyping was the Raw Material 1: Soya/Pea/Lupin bean. It will be specified if other materials were used any prototype.
5.2 PROTOTYPING #1:

5.2.1 Aim

The aim on this iteration was to get acquainted of the possible interaction with the meat substitutes concepts generated. In order to do this we started to prototype with the raw material available. Another function of these prototypes was to make the selected ideas tangible and make a second selection of concepts.(Jan Stappers, 2007) These concepts intend to be tested and evaluated by flexitarians. By prototyping ideas we enforce realistic-thinking about how someone could interact with the concept (IDEO, 2011).

5.2.2 Method

The method consisted on two cooking sessions using the raw material. On November 2011 (18 & 21) I assisted Chef Johan Verbon in this prototyping sessions. Johan Verbon is the Executive Chef at Restaurant of the future [RoF] Sodexo WUR. Working at RoF, Chef Verbon supports food companies with the development and design of innovative food products that meet consumer expectations. Both days, the session lasted nearly three hours in the kitchen.

The raw material available comes as rectangular blocks in a vacuum-sealed bag. We started cooking with the raw material, using the material (ingredients and spices) available in kitchen. Originally, the idea was to just prototype the selected ideas; at the end 14 were elaborated. At the end of both days the ideas were informally presented to a group of consumer researchers involved in the project to get their insights about the results.
The material colour is not appetizing or flattering, it does not have a strong smell. The material appearance and touch was rubbery.

Interactions with the basic raw material

After removing from the bag the exterior dries out quickly when in contact with oxygen (air), especially at the corners of the product. It has a 20% protein content and does not contain a lot of fat.

It has a very dense (solid) structure. If you cut it you can find that in the inside has long fibred structure.
When the material is being heated, it will increase in size approximately three times the original size.

Trying to add colour to the material (with liquid food pigments)

The product fell apart during simmering (in a stew like meal). We discovered that the product could be a bit more stable when using binders in the recipe.

When the prototype had finished cooking the smell was really nice, however we realized that it did not catch any flavour. Adding flavour was especially difficult because of the material density. Two different ways of flavour marinating were tried: flavour dissolute in powder or in oil. In both cases, it was difficult to add flavour to the raw material.

It is not possible to prototype anything like a steak or something that needs bigger chunks. The material tends to cut into a cubical shape.

When the material is being heated, it will increase in size approximately three times the original size.
After doing the prototypes we realized that the product present difficulties in chewing when cold, while when warm, it became softer to masticate. In short, it requires too much chewing before swallowing. In a combination with some vegetables, it was more likely to swallow the vegetables before the meat substitute.

Eating Interactions

The material does not take up fluids and flavours very well. This results in meals (like schnitzel or a stir fry), which consist of a coating with a lot of flavour (like a sauce or bread crumbs) and a raw material with little flavour (except for a soy like after taste which is difficult to mask at the moment). This becomes very clear in tasting the product: first a lot of flavour which disappears fairly fast, followed by the taste and texture of the raw material only.

After eating the product makes you feel very satisfied, it is a very positive characteristic of the material, because of its high protein recipe.
Selected Prototypes

From these prototypes, three ideas were selected from all the prototypes to be evaluated by flexitarians in a user session and a focus group. The ideas selected were: Asian Cuisine LikeMeat; Breadcrumbed LikeMeat and Baked-Stripes LikeMeat.
Asian Cuisine LikeMeat
Healthy Bites LikeMeat (snack)
LikeMeat Stew
LikeMeat Hamburguer
5.2.3 Results of Prototyping

Related to Needs and Values:

1. In this first iteration, the findings about the concept ideas were very limited in comparison with those related to the raw material behaviour and appearance. In this case the value is directly related with the possibilities that the product enables. That is the value on the technological side at this point in the process.

Related to Function:

1. There was no way to see when the product was well cooked. Most of the time it was realized when it started to burn.

2. At this point in development the product should not be served alone. There is the need to add something to enrich the interaction with the product. (e.g. breadcrumbs, a sauce).

Related to Form & Properties of the Product:

1. Texture: The raw material as it now is more suitable for some ideas but not others, because of its long fibrous constitution. For example it is not suitable for a sausage or a ham. In the chef’s opinion could be a chicken-like substitute. Long fibres facilitate this. However the behaviour in the material doesn’t allow cooking it in similar ways as chicken. Vegetarian researchers who tasted the prototypes though that texture was acceptable, but the rest of the group opinionated the opposite. Improving the texture depends in majority of the concept to prototype.

2. Behaviour: The material needs a more porous structure because it does not procure a lot of opportunities in flavouring or manipulation. Having a more open structure can make it softer to the bite and more permeable (10-15% water absorption). The Raw Material does not have a lot of fat in it, which is why the products dry out after opening.
3. Flavour: At the moment, the best way to add flavour to the product was to marinate in some mixture of flavour and in very natural oil with almost no flavour, though that proved to be not enough. In future work, the intention is to inject an oil based flavour directly to the material. Adding oil can also add juiciness (and in the meantime help avoid the dehydration of the material). If fat is added to it, it can be argued that it will not be as healthy. However if we use healthy oil with a lot of Omegas, the effect can be different. Meat also has fat, but normally the excess of this fat is associated with cholesterol and health problems. Fat is not bad itself, we need it in moderation as part of our diet. This product can contain some beneficial fat in it, not the ones that are a health risk. Additionally if we improve permeability less fat can be used in the flavouring.
5.3 IDEA REFINEMENT: DEVELOPER’S SESSION

5.3.1 Aim

WUR was uncertain on how to detail the meat substitute concepts before the second evaluation. In my opinion, the focus of food developers at that stage was drifting too much towards the material limitations. For example: “We can not shape the raw material in certain way” or “We can not add colour”. Instead of keeping the focus on the users.

After prototyping, I proposed to conduct a session with food designers. This session’s main objective was to refine the meat substitutes concepts for the evaluation with the flexitarians. To select the proper product characteristics I decided it was useful to implement the use of design goals in product development. The design goal is needed to help us to keep the overall picture of our users. This session was at WUR on December 13, 2011 in the Restaurant of the Future. Eight researchers from different specialization in food development such as Developers, Sensorial or Consumer researchers participated in a one-hour session.

This session had two main goals:
- To define the characteristics of the product ideas to be presented to the Flexitarians.
- To motivate the researchers at WUR to: “don’t think in product characteristics, think experiences”.

By developing and detailing the ideas we could indicate new directions to the partners working in the basic raw material developments.

5.3.2 Method

The participants were introduced to objectives of the session and the methods to use in a round table. The first warm-up activity was mindmapping possible new names for LikeMeat. How they would rename the product if they had the opportunity. After generating some possible in names or name sources, I gave a little presentation on how a design goal can be used to define the product, service or system from a design perspective. To achieve this goal we need to define the intended interaction qualities between the people and the designed product. These qualities will be intangible, but they will be translated to Product Attributes. The product attributes are tangible
5.2.3 Results

The participants worked on one of the concepts “Breadcrumbed LikeMeat” that was defined into an almost complete product. The first activity was an introduction, to empathize with the users, about Flexitarian empathizing with the “Healthy Flexitarian”. The following activity was to select a design goal for the product to the user, the one they wanted to achieve while designing the product. Lately, brainstorming about how we can achieve that goal to the users through interaction qualities and how the product will affect them was performed.

At the last part of the session we linked the effect with a physical characteristic of the product. In this part we used the “Flexitarian maps”, described in Appendix X, generated in the creative session. In this way the product characteristics that were generated in the session for the health Flexitarian were used.

Only one product was finished into a complete concept due to time considerations. Surprisingly, the results were promising and each participant was aware of what to expect for the next user-session at WUR. As well as on how the characteristics of the project concepts can be narrowed down. The same method to select the product characteristics was used for the other two selected concepts. The refined ideas were developed into a storyboard to use with the flexitarians. In the next section the ideas and storyboards will be explained in detail.
5.4 FLEXITARIANS EVALUATION

5.4.1 Aim

The previous activity was focused on more concrete definitions of the selected ideas, the visualization of the context of use and the intended interaction with the product. This helped to develop the material and methods used in this session.

In this iteration four meat-substitute product ideas were presented to a group of flexitarians in order to get relevant feedback from the users. This activity had two goals:

- The first was to research on how appealing the concepts were and their opinion about the presented meat substitutes concepts?
- The second objective was finding the ideal flexitarians interactions with meat substitutes by confronting them with storyboards and prototypes, complementing the overall findings from their perspective.

5.4.2 Method: Meeting with Flexitarians

Following the refinement of the first ideas, a user session was conducted. This was the second evaluation for the first concepts. First a pilot session was held to test the procedure to follow and then the session material was reviewed with Bea Steenbekkers from WUR, culminating with the addition and modification of a questionnaire.

My goal was to research what the current relationship between flexitarians and meat substitutes is like. To get insights into their perception of meat substitutes by evaluating the concept ideas we presented.

On January 17 2012 consumer user research activities were planned at WUR. They took place in the facilities of the “Restaurant of the Future” where two groups of eight flexitarians attended a evaluation session followed by a focus group. In the focus group participants tasted the product and gave their opinion about it. A total 16 flexitarians contributed with the study, 12 women and 4 men. The participants were mostly women with an age ranging from 24 to 72 years old. A
screener, selected four participants of each type of Flexitarian type: Health, Conscious, Hedonist and Convenience. The sessions combined two types of Flexitarian per session. The first session was the Health and Conscious Flexitarians. Convenience and Hedonist flexitarians participated in the second session.

Both sessions took exactly one hour to complete, keeping to the schedule was important because of the focus group after the session. The group sessions were conducted in a semi-structured manner, additional questions were asked during the session in order to encourage the participants to share their opinions. Each session consisted of one warming up exercise and four small activities. The warm up activity consisted of questioning the consumers about how they feel about meat substitutes and why they feel that way. Having foreseen a language barrier a survey that they could answer in Dutch was provided. To make it easier to identify how they feel/think about the meat substitutes a visual exercise (LEMtools) was used (Huisman, 2009).

After this activity, four concepts were presented to them. From these four meat substitutes concepts, three were from the previous selection: Asian Cuisine LikeMeat; Breadcrumbed LikeMeat and Baked-Stripes LikeMeat. An additional new idea was added to the session. The idea was selected because it was very dissimilar to the previous product ideas. The objective in adding this idea was to get more insights into their perception of meat substitutes by facing them with an extreme idea. All the ideas were corresponding to the Flexitarian segmentation. Detailed guidelines of the sessions can be found in Appendix 5.3.

All the concepts were presented with a storyboard. The storyboards are a tool used to envisage the complete user experience through a sequence of images/sketches. (IDEO, 2011) In the storyboards we tell the story about the user and the product. It was used as a way to communicate the concept ideas to the user in order that they experience and reflect on the product. (van Boeijen, 2010) The participants were provided with a storyboard print. Additionally the storyboard was showed with a beamer and I guided them through the narrative of the storyboard. In a way, it was like a television ad for food, you do not taste the actual product but you can formulate an opinion or a purchase decision about it.

The order of the product concepts I presented was different in each session, in order to avoid any possible inferences in the results. Following each presentation, a survey was answered by the participants. This poll rated several aspects of the ideas that could help us to get a user’s evaluation on the product concept and our opportunities areas in the product. The complete storyboards and surveys can be found in Appendix 5.4.
5.4.3 Results

Are the generated concepts appealing to flexitarians?

The opinions of the flexitarians were very diverse. The predominant feeling on the meat substitutes in the introductory survey was satisfaction or fascination. However, while the users seemed to were very curious about the possibilities that this kind on products can bring.

“Satisfaction: Omdat het makkelijk is om zo geen vlees, maar toch goed te eten. Fascination: omdat het technisch mogelijk is om een, bijna niet van echt te onderscheiden, vleesvervanger te maken.”

[Satisfaction: It makes it easy to not eat meat, but still eat something good, i.e. healthy. Fascination: that it is technically possible to make something that resembles meat this much]. Flexitarian Participant 8

But also bias to be disappointed in the future about the product:

“Ik wil het proberen maar het lijkt me niet lekker, wel gezonder dan vlees.”

[I would like to try it but it doesn’t seem tasty or delicious. It does look more healthy than meat]. Flexitarian Participant 9
What is their opinion about the presented meat substitutes concepts?

1) Asian Cuisine LikeMeat:

Originally targeted to Hedonist Flexitarians. It is a box full of fibrous stripes of LikeMeat with chicken flavour. Special for Asian like meal, inside the box some recipe cards were included and an exotic Asian cooking sauce that can be used for seasoning.

It was the most popular concept with the Hedonist Flexitarians, who was the original targeted cluster with this option. Overall the opinion on the product was positive. The important feature of this product was the possibility to combine it with several products and the addition of an Asian flavoured sauce. Flexitarians considered it positive to include a flavoured sauce in the product. In their perspective it will be easier to “hide the real flavour”

2) Breadcrumbed LikeMeat: Conscious Flexitarian / Convenience

Originally targeted to Conscious Flexitarians (it also can be targeted to convenience flexitarians since is a ready-to-eat meal). It is a LikeMeat product coated in full-flavour breadcrumbs in a traditional recipe. Inside its environmental-friendly package is a bag of fresh herbs to add while serving.

“Dat het snel is klaar te maken en je kunt er nog een heleboel bij gerechtjes by serveren. [...] (I like it) Because it can be prepared very quickly, and can be combined with many side dishes].” Flexitarian Participant 3

“Not really new, just the herbs are new” Flexitarian Participant 11
Originally focused on the Conscious Flexitarians. The overall opinion on the product was very positive because it was something familiar for the users. However this could also be the reason why it had fewer mentions: it is not something new.

3) Stripes LikeMeat: Health Flexitarian / Convenience

Originally targeted to Health Flexitarians. Tasty high protein meat-like strips of mild flavour. An ideal complement for vegetable salads and pasta when poured onto the plate.

The most accepted concept with the Health and Convenience Flexitarians, the original targeted cluster of this option. This substitute had a positive response, however it was not perceived as a full meal but as a complement for salads. Remarkable for being novel and convenient, the value that this product could give to the users was uncertain.

4) Me-eaty

Targeted to all Flexitarians. A delicious and new LikeMeat whole piece flavoured with your favourite meat recipe. The packaging and shape of the meal piece goes accordingly to the selected meat flavour (e.g. red- beef, pink- pork). Your daily help to reduce meat consumption just cut it in its centre, and add the vegetables you want. You will see how you consume more vegetables each day.

“ Ik weet niet of dit iets toevoegt aan de smaak of voedingswaarde. Het lijkt me overbodig. [I don’t know if it adds to the taste or nutritional value. It seems unnecessary to me.]” Flexitarian Participant 12

“I don’t see the point of food being moulded into a particular shape. It just makes it seems very unnatural. You may actually feel like you are eating something that used to be alive while you are munching away.” Flexitarian Participant 7
It was the most unpopular concept with all the users. The shared opinion on the product was “Dissatisfaction & Disgust”. Interestingly enough it caused several remarkable reactions in the users. The shape was considered as childish, however the users manifested how much it reminded them to the animal they were eating. Interesting for a meat substitute.

**How the concepts can be improved from a user perspective?**

- They necessary do not have to be frozen ready-made products.

  “Always willing to try new products, but fewer ready-made dishes.” Flexitarian Participant 2

- Facilitate openness while cooking.

  “Let the cook more free in the addition to make the meal more special. ...” Flexitarian Participant 4

- Specify clear the ingredients of the product. Make them recognizable.

  *Je weet niet wat er in zit*  
  [You don't know what it is made of, what the ingredients are] Flexitarian Participant 14

**5.4.4 Note on the LikeMeat Project.**

After the evaluation of the ideas with the flexitarians, the LikeMeat continue the project development of those ideas. In a meeting with the partners at WUR facilities all the information about the prototyping and testing was presented. They are still developing those ideas. Partners sent samples of the products with their company packages. An in home test is taking place in a near future. In this test, the flexitarians participants will take the product home and prepare it during their dinner situation in a determinate time period. The LikeMeat project partners will meet again during June or July in Vienna to check the advance of the project.
5.5 CONCLUSIONS

5.5.1 Use of storyboards as user evaluation method:

When working in a multidisciplinary project; designers have to adapt their research methods to the resources either available or already assigned to the project. For this iteration it was crucial to get “hands-on-research” with the users after all the previous activities. The selection of storyboards aimed to reach a better understanding of the user, not just of the product itself in terms of form-properties: flavour, shape or texture. The objective was to find more about their values of interaction from all of the interactions that are related with the product such as function, values and needs. The storyboards conducted the richness on product idea and their characteristics. It was clear that at the beginning it was somewhat confusing for the participants:

“Het ziet er niet aangenaam. Ik denk dat het niet lekker ruikt en smaakt.”
("It does not look nice on the drawing. I don’t think it smells and tastes good.")
Flexitarian Participant 9 on Concept 1.

As we advance with the evaluations, they become more comfortable with the process:

“Het ziet er lekker en gezond uit. En is dat waarschijnlijk ook. Makkelijk klaar te maken. En je kunt er mee voor de dag komen”
[It looks delicious and healthy, which it probably is. Easy to prepare and also very presentable (something you would serve to someone).]” Flexitarian Participant 9 on Concept 3.

The objective with the storubords was to have them with an “sketchy/ unfinished” appeareance (Stappers, 2007). The users seemed to be very influenced by the aspect of the sketches in the storyboards.
5.5.2 Desired Product Properties

The findings in this section, rather than referring to a specific concept, are general conclusions on the understanding of the characteristics of the designed product: As in the previous chapter, three main features were identified in order to understand the character of designed product and interactions (van Boeijen, 2010):

**Prototyping**

1. In this first iteration, the findings about the concept ideas were very limited in comparison with those related to the raw material behaviour and appearance. In this case the value is directly related to the possibilities that the product enables. That is, the value on the technological side at this point in the process.

1. Having use-cues from the product in cooking will be a great characteristic in the product, i.e. colour change while cooking.

1. Meat substitution vs. meat imitation
Some people, especially city folk, love eating meat but are incredibly squeamish about where it comes from. They want their bacon and chops and steaks, but they don’t want to be reminded of nasty things like abattoirs and what goes on behind the butcher’s counter. Meat comes from the supermarket in neat plastic-wrapped packages and let’s leave it at that. It still remains open, if the product concept, should mimic or not meat. Texture, Behaviour and Flavouring are challenges to follow.
On Flexitarian evaluation

The most significant findings from the users were in values and needs:

1) Transparency: This value refers to how the novel protein communicates where it comes from and its purpose.

   “Waar is het van gemaakt? [What is it made off?]"
   “Dat is aangegeven dat het een vleesvervanger is [That it is indicated (‘labelled as’) that it is a meat substitute.]”

2) Credibility: It is related with the coherence of the whole product.

   “Voorverpakt, dus niet vers [Pre-packaged, it is not fresh]”

3) Novelty vs. Value: This aspect refers on how strong the added value that the new meat substitute is bringing to the market should be. How does it differ from other products? It is directly linked with Transparency and Credibility.

   “Diversification is food for economy…yet another article in the supermarket.” (User on his opinion about a new concept)

4) Role of the Meat-substitute in a Meal: According to the character of the Novel protein product, which will be the role it will have in a meal. The common shared thinking is secondary role; this is perhaps because of the previous experiences with this type of products.

   “The substitutes are not the main element within the dish but are likely to complement other ingredients.”

5) Possibilities / Action: Products should invite action and be thought provoking. Let the user
adopt it in his eating pattern and stimulate the imagination to the ways this product could enter in his life.

“dat het de fantasie niet prikkelt [it does not stimulate the imagination]”
“De smaak, deze vall duidelijk tegen”.

6) Exploration: The product should give a degree of freedom in use to the consumer. Products “are too finished” to the consumer eyes and do not leave room for innovation.

“Het uiteindelijke resultaat ziet er een beetje op ‘Voltooien’[The final result looks a bit ‘final’].”
“Is het gerecht wel “creatief” te noemen. [I’m not sure you can call/name this dish ‘creative’]
“Let the cook more free in the addition to make the meal more special…”

7) Comparison: Familiar is a good attribute when it refers to preparation.

“Omdat dat bekend is. Het is veilig om voor zo’n gerecht te kiezen.” [Because it is familiar, it is a safe choice.]

8) Shape: Meat Substitution or Meat Imitation. This is always a questionable issue; in this activity there was not a conclusive agreement on what the users prefer. Preferences in shape are very relative, and while some prefer a meat imitation appearance:

“Vleesvervangers moeten eruit zien als een stuk vlees, dus rond, langwerpig, of kleine stukjes. [Meat substitutes should look like a piece of flesh, round, oblong, or small pieces.]”

Others do not care about the shape. However the recommendations found in Chapter 3 seem to predominate: “Not to similar, not to dissimilar” (Hoek, 2010.

“Better shape is a normal shape, like they have now in the supermarket. I would like the meat substitute to look less similar to meat.”

An interesting questioning emerges from the fact that meat does not look always the same. Something that is very interesting is how the perception of little variations in shape, cut or colour
Participants at Wageningen of the second creative session:
WUR Food and Biobased Research Consumer Scientists,
Food Developers, Chef of the Restaurant of the Future and TUDelft Professor.
Images by @ author
gives the users the impression of something natural. Something that is “real” is perhaps the most interesting result according to the shape to explore.

“It looks like meat, which should we always make this comparable with it, for me the design is terrible (for option 4 me-eaty). The shape of the animal is disgusting. I also don’t like it when every piece of meat is the same, then it is not real.

9) Texture: & Behaviour: Product should somehow be transparent through form and properties.

“Je weet niet wat er in zit [You don’t know what it is made of, what the ingredients are.]”

10) Flavour & Taste: Predispositions in taste will be difficult to defeat. The users did not manifest any preferences in flavour. Their concern was focused on the experiences they already had.

[The taste, it is disappointing.] (User on the negative aspects of a concept showed in a storyboard- without tasting)

5.5.4 Designer’s Guidelines:

The focus of this chapter was exploring the interactions with the products through prototyping and storyboards, in collaboration with WUR Food and Biobased Research. Secondly, the users complemented the overall findings from the Flexitarian perspective by evaluating the defined ideas. In this way, I aimed to find the ideas in flexitarians interactions with meat substitutes by confronting them with storyboards and prototypes.

Design guidelines from Prototyping:

- The prototype of the final product concept should emulate the interaction with the user in the best way possible. In this way, the material behaviour can be illustrated and showed to the food technologists. In this way the material development is not limited to what is possible at the moment with the basic material. The physical characteristics and behaviour, from a technological perspective, should remain open to generate more innovative ideas.

- Having use-cues from the product when cooking will be a great characteristic in the product. (e.g. colour change while cooking).
Design guidelines from the Flexitarian Evaluation:

- The meat substitute concept should convey transparency to the user. There are several ways to achieve this as for example in form and properties. However the most important one is where it comes from and its purpose. This can give to the product the characteristic of being and make it feel “natural”.

- The product should give a degree of freedom in use to the consumer and leave room for creativity and innovation.

- Familiar is a good attribute when it refers to preparation.

- The product should be coherent and different from other products.

- The product should have a specific role for the user in the dinner (meal) situation.

- The product should invite action and be thought provoking. Let the user adopt it in his eating pattern and stimulate the imagination to the ways this product could enter in his life.
CONCEPTUALISATION
CHAPTER 6: DESIGN VISION

This chapter presents the final outcome of the envisioning process, resuming the proposed design vision for future meat substitutes. It delves into similarities between flexitarians in order to identify the most appropriate characteristics that can connect with a product.

Afterwards, a set of guidelines is suggested. These guidelines are intended to orient or inspire designs according to cultural correspondence and user–product bonding. Regarding flexitarians, this chapter explores the current interaction between flexitarians and meat substitutes and provides with my personal interpretation of future interactions.
This chapter presents the final outcome of the envisioning process, resuming the proposed design vision for future meat substitutes. The objective of this Design Vision is to identify how meat substitutes should be designed for flexitarians in their future development. This vision obeys to different drivers through this design project.

The first is based on the participation in the LikeMeat project. The R&T developers are generating this new meat substitute and giving ideas of what this product could be to the companies involved. The final decision on the product commercial development corresponds to the involved SMEs. They will acquire the technology and knowledge generated and holds their own product development process for their brand. While the concepts result of the design research were very successful because they satisfied the partners. I believe they do not represent a future perspective on the product. The ideas selected in the design research phase do not add a new value or meaning layer to meat substitutes. They are, in fact, not so different to already existing meat substitutes. What matters, for this design project, is to think ahead towards the future and give hints on how this type of product should interact with flexitarians.

Secondly, besides the analysis of all the activities and information generated in the project, this vision also represents my belief of how users and meat substitutes should relate with each other. Meat substitutes are not new but they are unknown to the Western European population. I believe they should be agents of change, by helping the consumers to acquire new skills and knowledge. In a near future, people will have to choose between a large variety of products instead of meat: In-vitro meat, insects, 3d-printed meat or meat substitutes (just to mention some). Meat substitutes are products that make a huge impact on the adoption or direction of these products. As meat substitute consumption started around the 60s it is time to start building design actions to increase our attachment with these kind of products. First, the integration of the findings is shown and at the end of this chapter the design-vision is described.
6.2 DESIGN RESEARCH FINDINGS

6.2.1 Similarities between Flexitarians.

The main characteristic that identifies the flexitarians is their eating pattern that characterizes for a reduction of meat consumption. In the context research, segmentation within the flexitarians was identified according to their motivations and needs. During the evaluation with flexitarians we discover that the segmentation is not absolute. Flexitarians with different motivations can share characteristics between them. For example, Environment Conscious Flexitarians mentioned the importance of being creative and enjoy preparing your meal. Something they share with Hedonist Flexitarians. With this in mind, I keep thinking about which possible similarities they could have between them. I decided to focus more on the core value or meaning in between the flexitarians, rather to keep focus just in its differences. I narrowed down the concerns and motivations of the different segments and found some similarities in the four groups. By finding the main behaviour similarities in the four groups, but still identifying their peculiarities to access how to deal with them.

After some analysis on the context study, I concluded that basic similarities between flexitarians are related with:

1) Character: Refers to the tendency to act in a specified way or the level of involvement with their surroundings. It can be either Active or Passive. For example Conscious Flexitarians and Hedonist Flexitarians are Active in Character. I believe they could be more enthusiastic about being creative while cooking for example.

2) Level of Motivation: Refers to the incentive to achieve or do things. These can have a Social drive or Task drive. Hedonist and Convenience flexitarians share the task drive. While for hedonists the focus is in enjoying the ritual of the cooking and experiment in the kitchen. The value for convenience flexitarians is doing the right thing, for example cooking a meal according to the package.

After some research, I discovered that Giles Colborne, author of Simple and usable web mobile and interaction design published by New Riders in 2010, proposes a similar model. (Colborne, 2010)This model can be used when designing interactions, by helping us understand the driving force in people’s personalities. I think that in the future, a refined version of the chart I show above can be explored to help designing concept interactions with the intended users.
6.2.3 Project Guidelines on Meat Substitutes Development

As result of the Research by Design Phase chapters the current the function, the properties, the form and the use of meat substitutes were analyzed. And these properties of the product were collected in three different levels of Design Research: Intended user, prototyping and opinion of the LikeMeat partners.

By fulfilling functions products may satisfy needs and realise values. Satisfying needs and values make products something desirable. Values and needs are different among the persons. While for somebody would be important the need to express oneself another could value, for example, the economical value.

It is because of its properties that a product can perform functions. Generally function is the purpose that a product is for. However, different persons might see different things as the function of a product because they satisfy different preferences or intentions.

These characteristics belong to a single category because they both say something about the behaviour of the product. (van Boeijen, 2010). By form I refer to the geometrical form (e.g. geometry, shape or size) and material. And by properties I am considering the attributes of the product derived by the form (e.g. elasticity, weight, or flavour).
The analysis of these elements helps me to define for my project a set of meat substitutes guidelines according to the research.

**The guidelines are the following:**

1. A meat substitute does not necessarily have to mimic meat in all sensorial aspects. Flexitarians did not recognize as essential to pursue a meat look or flavour. What they recognize as important was the need for something that seems real. They were not talking about “real meat looking”. For real they refer to something that allows little variations in shape, cut or colour gives the users the impression of something natural or real.

2. The meat substitute concept should communicate transparency (clearness) to the intended user. There are several ways to achieve the communication of this characteristic. It can be through form and properties of the meat substitute. Perhaps the image or packaging. However the most important one is to make clear to our intended users what it is our meat substitute. This can add to the product in the characteristic of being perceived as something natural or fresh.

3. The user has to enjoy degree of freedom while using the product. The meat substitute should enhance the possibilities of action. Let the user adopt him in its eating pattern and stimulate his creativity in preparation and cooking.

4. For Flexitarians something that is familiar is a good attribute when it refers to food preparation. Users tend to increase a preference for certain products just because they are familiar with them. They favour products emotionally rather than rationally. However Familiarity is frequently dubbed as simplicity. Because I know it is familiar it will be simple. That is why; sometimes we end again with another bread-crumbed meat substitute option in the market. I believe that meat substitutes should have certain degree of familiarity in preparation with meat or other products. However we cannot neglect the opportunity to the intended users to learn something new by proposing them something different.

5. The meat substitute should be convincing by being coherent. It should have a name by its own. This name should make him stand out. And it should be accord to its image. Image and name should differentiate from other products but yet still be recognizable as a meat substitutes.

6. Getting feedback from meat substitutes while preparing and cooking. Having use-cues from the product in cooking will be a great characteristic in the product. (e.g. colour change while cooking). Additionally add information about ingredients in the product can lead to better results on the kitchen. (e.g. Flavour pairing)

7. It is very important to address of cultural correspondence in the final design of meat substitutes. Start from general (Western Europe) to end in local (In my case Dutch culture). Food
traditions and rituals connect us with our everyday practices. If a product fits in our everyday practices is the first step to improve attachment with a new product. And after that, a tradition slowly evolves through time helping the adoption of new habits and products.

8. The physical characteristics and behaviour from a meat substitute concept development need remain open to generate more innovative ideas. Concept development should not be limited to the possibilities of behaviour the basic material. The prototype of the final product concept should try to emulate the interaction with the user in the best way possible. In this way, the material behaviour can be illustrated and showed to food technologists and is not limited to what is possible at the moment with the basic material. As Roher (Rohrer, 2001) indicates “a designed solution defines the engineering problems they will solve, rather than the design being constrained by what engineering can do at any given point in time constraining the design.”
6.2.2 Current Interactions

How is the flexitarians’ interaction with meat substitutes?

Detachment:
There is an evident detachment from meat substitutes. Meat substitutes and flexitarians lack of an emotional bond. They are products that are in Western Europe since the 60s, and yet there is very little knowledge and appreciation for them. Its like a acquaintance who which we can not talk because we do not share the language. Yet we can mumble some words but we cannot engage in a full conversation with him. There is not a connection with the product, I therefore no adoption in the daily diets.

Lack of a social side: There is face on meat substitutes that I believe has been explored. Meat substitutes already have a social side, a strong social affiliation with vegetarians. Not with flexitarians. While I do not believe this makes a difference between flexitarians, because most of the flexitarians I contact in this research does not recognize themselves as such. I believe the social side needed is the one related with social situations and relationship between peoples: the act of sharing and transmitting experiences.

Lack of Action Involvement with them: Most of these products what I call a Kitchen-Potato Approach. What do I mean by this? Because of the effort of making a product way-to-simple and convenient to use (most of the products are ready-to-eat products) our intended users are passive witnesses of the interaction. There is very little room for flexitarians creativity, exploration or self-expression with meat substitutes. Therefore there is not a story between them and the product. The interaction is even a pretended one. e.g. The grill marks already made for a vegetarian hamburger I use in the second chapter. This could be, I believe, a reflection on focusing most of the efforts of the development on the sensorial characteristics (taste and bite). That while I recognize they are important, they minimize the importance of the activities that surround the product.
6.3 DESIGN VISION FOR FUTURE MEAT SUBSTITUTES

6.3.1 Desired Interactions

How the flexitarians interaction with future meat substitutes should be?

Attachment:
Aim to enhance the bond between Flexitarians and meat substitutes. Reintroduce these products to flexitarians. There should be reinforcement in the storytelling of the product to bring them closer. Make the communication between product and user more transparent: what it is, made from what, etc. Try to discover ways to increase the Flexitarian commitment with meat substitutes. Because I think that are very related with daily habits, and those are very important to influence people. Initially I propose two ways: A sharing character or action involvement.

Sharing Character:
Aim to explore the opportunities of meat substitutes related with social situations. Social gatherings increase the opportunities of sharing with others. Is a very subtle but significant way to create memories and associate them with a product or transmit the experience and influence others.

Action Involvement:
Aim to explore flexitarians creativity, exploration or self-expression with meat substitutes. Flexitarians should be in way co-producers of their experience with the product, because the product allows them shape and modify. This will generate daily experiences of use and through the time they will build on experience stories.
6.3.2 Desired Vision

In the interaction design vision proposed in this thesis:

“\textit{I want to increase flexitarians attachment with meat substitutes by motivating to sharing and action. In my vision future meat substitutes are food products that stimulate flexitarians to share or prepare nutritional and aesthetically satisfying meals}”

Therefore the complemented design aim is:

“\textit{The design aim of this project is to create a friendly meat substitute for flexitarians. This meat substitute should stimulate flexitarians to share or to prepare nutritional and aesthetically satisfying meals. The final outcome of this project would provide inspiration to food developers on future meat substitutes’ development for Flexitarians}.”
6.4 EXPLORATION ON OTHERS
MEAT SUBSTITUTES

6.4.1 Aim & Method

Four meat substitutes were selected. These products were different in physical and aesthetical properties. The products were cutting, prepare and cook. The results were captured in pictures. The aim on this iteration was to interact and experiment with the meat substitutes materials. By playing the interaction with some commercials meat substitutes collect different characteristics of meat substitutes that can trigger the next concept generation.

6.4.1 Results

- **SOYA BEEF PROTEIN**: Modular structure (e.g. tempeh beans) allow to be more playful and create more forms with the food.
- **VEGETARIAN ROASTED PORK**: Very different in texture: fibrous, sponge-like, stretched out.
- **VEGETARIAN CHICKEN**: Rigid shape, good texture inside. Mold for the chicken, has potential as idea (A lot of possibilities). In the actual use, having a mold is not very good.
- **TEMPEH**:
6.5 IDEA GENERATION
ACCORDING TO VISION

6.5.1 Aim & Method

After the creation of my vision and guidelines the idea generation process started. However, this process did not started from scratch. I based my idea generation process in some of the concepts of the research with LikeMeat. I sketched some ideas of how to achieve the vision I wanted to achieve. Additionally I tried to work the concepts or generate more by “think with the hands”. This means that I also ideate concepts with prototypes, to play out the interactions. At the end I selected the two concepts that I believed reflected the nest the design vision and guidelines.

6.5.2 Ideas
IDEAS

SOCIAL

ACTIVITY

SNACK BOX

CREATIVITY

FLEEX

SHARE!

TOOLBOX

TAXONOMY?

+ TOOLS?

THIN SLICEABLE

IRRREGULAR FIBROUS

TENDER SOFT SPONGY JUICY
FLEEXI

To aim for a seductive shape that triggers curiosity while cooking.

WATERMELON MEAT

Playing with the appearances. Based in the recipe from the book "Modernist Cuisine".

Ideation by prototyping

SNACKS

Using seasonal vegetables. A way to local in production. And additionally it adress cultural correspondence with the Netherlands.
I became particularly intrigued with the reproduction of characteristics of meat that we normally do not consider. (Since it has a level de comparison). So I became obsessed with the idea of bleeding meat substitute.

Prototyping something that was easy to shape, to change. Allowing the intended user to manipulate it.
THE BLEEDING BEET-MEAT RAVIOLI

The bleeding ravioli has a beetroot outer shell and a moist meat-substitute filling. When cut you can see the big ravioli bleeds. When you ate him, the red juice gets in the corners of your mouth.

THE HAPPY VEGGE-HAM

The happy ham is a blushy pink veggie ham that has a big beetroot smile. Happy ham likes to be eaten, but not squeezed. His tapioca dress gets ripped off.

COMBINATIONS

STUFFED LIKEMEAT BALLS

Meatballs again??

RED-LIKEMEAT

Red-LiKeMeat, as it was impossible to add an edible colour to all the material, I remember the annoyingly persistent the beetroot is, so I submerged the material for some hours.
In the next chapter, I will illustrate with two experimental prototypes the results I present in this chapter. The prototype was not yet made out of the original basic material, but the ingredients were very closed to the ones in the used while researching in LikeMeat. The main objective of the prototype was to emulate selected interaction characteristics of the meat substitute and have a holistic view of vision, interaction and guidelines.

In addition to the guidelines I propose in this chapter. I included the guidelines I selected from literature review and context research in the Demonstrative Concepts:

Design boundaries from literature research:
- The product should engage trough storytelling.
- The product solution should motivate the user to consume it.
- The product should be designed with a focus on the positive aspects of peoples’ interactions with it.

Design boundaries from context research:
- The product concept should appeal to the preferences Flexitarians
- The product concept should be designed focusing on the aspects that flexitarians enjoy of food
- The product concept should be designed focusing on the aspects that Flexitarians’ values. time constraining the design.”
CHAPTER 7: MEAT SUBSTITUTE FOR FLEXITARIANS

In this chapter, two meat substitutes concepts are suggested as attractive options for flexitarians. These prototypes have independent characteristics that when combined, support the findings of the LikeMeat project and my design vision.
7.1 FROM CONCEPTS TO DESIGN PROPOSAL

7.1.1 Selected Ideas

The following meat substitutes models function is to act as demonstrative design concepts that integrate the guidelines, desired interactions and vision into a meat substitute. They will work as first discussion piece of the elements I am proposing to meat substitutes. The two ideas were selected from the previous chapter and are based on ideas from the research by design phase.

- The core of the first idea was developed thinking in the introduction social elements on meat substitutes. It is a snack box was inspired in the combination two ideas from the ideation with LikeMeat: LikeMeat snacks and LikeMeat bento box.

- The second idea focuses in how meat should encourage activity involvement for flexitarians by inviting them be explore and be creative in the kitchen while to cooking. The name of this idea is Fleex

The design ideas where refined until they reached a similar detailing to products that are currently in the market. In an additional note, I am not designing the whole meat substitute from scratch. I am departing from the same knowledge on basic material from the LikeMeat Product. I based the ingredients of my prototypes in the same of the raw material of the LikeMeat project with the addition of some ingredients.
7.2 FLEEX SNACK

7.2.1 Description

The Snack Box Fleex is a product aimed to be attractive to flexitarians, which are planning to participate in a social gathering. It consist of a box with two different fleex products:

- 2 rolls of Fleex stripes.
- 8 Fleex-bites.
- A potion of mustard or mayonnaise to dip it.

The Fleex-bites are made from lupin and gluten, giving each piece the adequate consistency and strong flavour capacity. Spices and fresh parsley are added for flavour. The Fleex-bites can be baked, fried, or heated on a pan without much preparation tasks in order to facilitate their consumption. They can be accompanied with mustard or mayonnaise as in ordinary borrels. Borrels were social gathering event that inspire the creation of this product. It can be an alternative (o companion) of the traditional cheese cuts and bitterballen. This product is also attractive to consumers that are willing to try something different or on a diet regime. The Snack Box Fleex is a healthy, grown-up option to snack and have fun with friends.
Package

To make an integral image of the product both meat substitutes I am presenting are under the same name “Fleex”. But offered in different variations. In this case the name of the product is The Snack Box Fleex. Inside the snacks are “Fleex stripes” and “Fleex-bites.”

The package is designed to use minimum of material and to facilitate it’s recycling. The box can be used in the microwave and oven. It can be reused. It is 100% compostable. The box is made out sugar cane and the lid is from a bio-compostable plastic made of corn.
Cultural Correspondence

In this concept I address cultural correspondence by targeting the product to the most common informal social gathering of Dutch people. In this gathering drinks and snacks are consumed. Normally the snack consists in Borrel hapjes (borrel snacks) that consist of nuts, cheese and deep fried snacks (bitterballen or mini-frikandel). These snacks accompany the drinks and are served in the plate where you have to dip it in mustard and then eat. Dutch people love a good borrel. But the snack box can be used in other occasions as well. The flavour of the Fleex-bites was selected according to flavours used in traditional “Borrel hapjes”. The food pairing website (http://www.foodpairing.be/) was used to find the combination of flavours. (e.g. the lupin beans with fresh parsley and soya sauce)
7.2.1 Scenario
7.3 FLEEX

7.3.1 Description

The fleex stripe is a product aimed for flexitarians that like or enjoy cooking and trying new recipes and flavours. The substrate is made from soy and gluten with a top composed of beetroot slices, giving the characteristic colour and texture. The characteristic flavour and colour of beetroot provide a subtle resemblance with meat. This characteristic can be attractive to flexitarians. It has a mild flavour. The flavour of beetroot equilibrates the soy and gluten notes. Additionally seaweed was added to pursue a more Umami flavour. Additional flavour and combination for recipes were inspired by the food pairing website (http://www.foodpairing.be/).

The stripe is presented in a piece of 60 cm long, folded in a sealed package that provides enough material for a meal composed of up to three individuals. The stripe can be cut in squares, thin stripes or rolled; allowing the consumer to exercise and enjoy the cooking experience. The package includes a sample recipe when the product is consumed for the first time, along with methods of preparation such as pan or oven heating are allowed.

Characteristics

Subtle resemblance on look with meat achieved with the combination with thin fresh beetroot slices. It makes evident the ingredients that contain. You can see clearly the beetroot and soy combination.
The shape was designed to be playful and trigger curiosity. In this way, I wanted to stimulate creativity in preparation and cooking. Besides being familiar, shape resembles to a really long prosciutto or lasagne plate. Yet introduces something completely new. When cooking, some of the beet juice is release. This gives certain juiciness to the product and a lot of colour.

**Cultural Correspondence**

It was very important to address of cultural correspondence in the final design of the meat substitutes. In this case I am using traditional vegetables that can be found with relative easiness in the Dutch countryside. I believe that the best way to find a bond between users and food products is to identify the relationship between the product and their culture. In this case, binding local Dutch vegetables with Dutch flexitarians.
Recipe to try:

Wrapped Fleex with zucchini and fresh cheese.

1. Slice zucchini into 1/4 inch thick slices lengthwise.
2. Mix it with crumbled fresh cheese and herbs. Add salt and pepper. Let it apart.
3. Get the Fleex into a portion.
4. Add a spoon of the previous mix in the middle of the cutted Fleex. Wrap the Fleex around it, tucked in the ends.
5. Cook in medium heat (in a pan or steamer) for 8 min.
6. Serve. We recommend you to serve it with green beans and mashed potatoes.

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6. Serve. We recommend you to serve it with green beans and mashed potatoes.

Package

To make an integral image of the product both meat substitutes I am presenting are under the same name “Fleex”. But offered in different variations. In this case the name of the product is “Fleex stripe”.

The package is designed to use minimum of material and to facilitate its recycling. Open from rubber bands. The intention is to avoid adding glue to the cardboard. Additionally the rubber bands can be reused.
7.3.1 Scenario
EVALUATION
CHAPTER 8: EVALUATION

Two group sessions were held in order to evaluate the prototypes presented in the previous chapter. Each session was composed of Dutch nationals with and without ‘Flexitarian’ diets. The participants evaluated the prototypes on aspects such as interaction, packaging, appearance and cultural correspondence. Remarks and opinions are considered when drawing conclusions.
8.1 PILOT TEST

8.1.1 Aim & Method

Two prototypes were developed with packaging in order to let flexitarians experience the meat substitutes proposal as close as a real product in the market. By this mean, testing the intended interactions to achieve. The aim of this small pilot test was to check if the prototypes elaborated for testing were adequate. Additionally get some insights on how to improve their characteristics. The test consisted in an informal cooking session with designer Wouter Veldman. The test was conducted at his home and the two Fleex products were provided for the session. He was asked to use the product as how he normally approaches a new ingredient to use in the kitchen. The test was recorded and a discussion about the prototypes was encouraged.

8.1.2 Results

General recommendations

- Being more specific in shape by type of recipe for people that is not so adventurous or use to cook. For example a donut if is to eat in a bagel.
- More clear the instructions in the package.
- Add recipe with ingredients in the back part of the package. Before shopping not after.
- Improve flavour by making it a little bit more Umami as it is with meat. He recommended adding seaweed, dried mushrooms or glutamat monosodic.
- He first cut some pieces to find how it will work. He was curious how it will behave in the pan and with other tools. However as I explained him the prototype function if was just to emulate some aspect of the interactions. He then proceeds to explain how he will approach it. Perhaps cut it, add some breadcrumbs and fry it in the pan.

“I want to classify it somehow would be resembling veal or beef (but he could not), and as a consumer I probably would do the same”

He recognized that the shape of Fleex stripe was playful to use:

“If I am making a pasta dish, with sauce I will chop it in pieces… because is almost square. Is quite nice for that. I can play with it. That’s nice that you can play with it”
8.3 USER TEST

8.3.1 Aim

In this evaluation activity, seven flexitarians were selected for the testing of the meat substitute. The user test consisted in two sessions were the same test set up was implemented. All participants were from Dutch nationality and in age range between 23 and 25 years old.

The composition of the first Flexitarian group was as follows: One Flexitarian female and three Flexitarian males (One who rarely include meat substitutes in his diet, other who consumes meat substitutes very often and one former vegetarian.)

The second group of participants included a group of two female and one male participant. One of them consumed meat frequently at diner, while the other two are more flexible.

The main objectives of this activity included:

- To expose the participants to each concept and obtain their conclusions. It was important to know if they perceived a difference between the characteristics of the two Fleex concepts and their other experiences with meat substitutes. To see if the proposed interaction characteristics are somehow perceivable.
- To capture if the designs were cultural and social correspondence with Dutch culture.
- Additionally, I also asked aboout their motivations that drive the participants to consume or to avoid meat.

8.3.2 Method

During the course of the activity, the participants were introduced to two different concepts and their experience was monitored. I developed a research procedure that included a brief introduction of the project, followed by the presentation of the participants and ice-breaking activity. For simplicity sake, each participant described their preference regarding meat consumption and the main motivation that made them take that decision. After this, they were encouraged to discuss their previous experiences with currently available meat substitutes. After the discussion, an activity was provided in which they were part of a fictitious situation where they were acquiring both designed products: first the Fleex Snack box followed by Fleex. I invited the participants to use freely the products and cook. I performed the role of the moderator and facilitator of the activity.
The audio of the whole evaluation was recorded in order to perform the analytical extraction of relevant information afterwards. Pictures were taken during the meeting as well.

**Differences between the two sessions:**

The first session was at the participant’s house. The second session was at my place, because the participants preferred that way because of their schedule. I was expecting that participants that were at home to be more explorative while facing the prototypes. However, the first session was slower and participants were shyer to cook. During these sessions, I opted to present the second prototype more extensively in the second session. The reason was that this group was more involved in cooking than the first one. It resulted in a more dynamic and interactive experience for the participants to prepare a dish with the prototype.

**8.3.3 Results**

**Previous experiences of the participants with meat substitutes**

Most of the flexitarians that participated in this test used to consume meat substitutes. Some of them include them in their diet occasionally and others frequently. Many of the participants mentioned meat substitutes such as tofu or soy, while talking about meat substitutes. However, most of them recognize that they do not use those substitutes because they do not know how to use it. The flavour was also strong drawback of the available meat substitutes.

“I normally eat tofu when my roommate cooks vegetarian. I do not like it very much, does not have any flavour. But perhaps is also because I do not know how to use it”

The meat substitutes that are sold at the supermarket were mentioned as the most consumed. The most popular mention where the breadcrumbed pieces with soy or cheese (e.g. Valess) and a new product in the Dutch market “Vegetarian Fillet Americain”.

Second Evaluation moments
Presentation of the prototypes
Cooking the prototypes
images by @ author
First Evaluation moments
Presentation of the Snack Box

The Fleex Snack Box

First session

The participants were interested in the product since the preparation was minimal.

The users said that when dealing with meat substitutes, the preparation time should be as less as possible. The meat bite product fitted into that mindset and they were in favour of that.

The participants were not aware of the existence of lupin beans, but the taste was attractive to them.

One remark was made on the volume of the meat substitute. The users would prefer a larger amount of meatballs than a package presentation. It was more interesting for them to provide the product to a larger amount of people, i.e. guests.

On the social interaction level, this product was successful in inviting the users to consume the product during social interaction.

After the visual exploration of the product, I heated the meat balls in a pan in order to provide a tasting experience. In this aspect, the users were satisfied with the products characteristics: texture and flavour.

The overall conclusion of this product is:
- It is easy to prepare
- It is attractive to larger group of consumers
- It is easy to identify it as meat substitute
- The texture and flavour are appetizing
Second session

A social meeting where vegetarian snacks were necessary was explored and the meat bites prototype was presented. The characteristics of a meat substitute that are required by the users are: Taste, Amount of meat substitutes Easy to prepare

“I think this is a good prototype for girls, because they would eat this more easily that bitterballen because it its more healthy”

On the other hand, they were not very convinced of having a product with 20% of gluten or lupine. One positive aspect of the labeling, is that is very clear the components of the meat substitute which allows them to decide if they would consume the product. The packaging of the product was interesting to them, in the sense that they feel this is a new product and were willing to try.

On the flavour aspect, they considered that the taste was nice although a bit spicy. It was interesting for them that they could consume them while knowing that there is no bread or meat in them, reducing the calorie intake. This was a positive aspect for the female participants.
First session

The second prototype was presented to the participants in a packaged version. First they were subjected to a fictitious situation in which they would be purchasing this product. The first impressions of the users were:

1. It does not look like meat.
2. Some resemblance
3. Looks like beat root.
Looks appetizing

The interaction that the users suggested to had with the product were to cut it in small pieces and pour it over a salad or make thin pasta stripes. The aspect of the prototype was difficult to understand for them, since it does not resembled meat. On preparation, two participants were in favour of having the less preparation possible, whereas the other two did not mind to prepare the meat substitute before consumption. I suggested an idea of preparing a “Slavink” type of meal. All four participants were interested in the idea and mentioned that it could be appetizing.

After the visual experience with the prototype the participants were invited to interact with the product and explore their creativity. They mentioned that they do not have many ideas for this activity and that they do not explore much at the kitchen. They decided to cut pieces of the prototype and cook them on a pan. After cooking the prototype they took a look at the appearance, which in their opinion, remained very similar to the uncooked part. The taste, however, was mentioned to be better than the appearance.

At the end, the participants were convinced that both prototypes are an appropriate protein intake. They did not liked that the second prototype tried to resemble meat by the colour, but the taste was a good characteristic. They also mentioned that they would like to have a meat substitute with twice the volume than meat for the same price.
Regarding the second prototype, a packaged version of the product was presented initially. On a visual level, they recognized very fast that beetroot was the main component. The meat substitute did not resembled meat as they considered it.

After opening the package, they unfolded the prototype and said that it did not looked as anything they saw before. It was hard for them to identify how large a single portion should be. The texture was nice to them since they considered the product to be and look fresh.

For the second part of the session, the participants had several ingredients for preparing a meal with the product. They made wraps with spinach, goat cheese and zucchini. During cooking, they started to become more interested in trying new flavours and more ingredients were provided. An interesting remark was made on the differences in taste when the beetroot was placed on the pan as compared to when the soy substrate was. They preferred the first option. The overall cooking experience was interesting for them due to the interaction with the prototype allowed flexibility for preparation.
8.4 CONCLUSIONS

In both group sessions the participants were introduced to two different meat substitute prototypes. The evaluation test has shown that the interaction characteristics I proposed were successful because the response of flexitarians was positive. Participants were enthusiastic about the product. They generated a lot of curiosity. The Snack box Fleex because it was something that they perceive they could rather easy start to consume. On the other hand, Fleex stripe was the most though provoking of the two concepts. They recognize that they need to get familiar with the product first. They could buy it to make a special dinner and throughs the practices of the recipes that include integrate it to their diet. For this reason I believe that the interaction elements and the guidelines I propose in this thesis can be useful to food developers. Several suggestions of the users were collected from the user tests. These recommendations will be used to assemble a demonstrative prototype in the presentation of this project. (July 9, 2012)

8.4.1 The Fleex Snack Box & Share

The sharing layer in these concepts was very evident.

“Look the vegetarian bitterballen… the package has mustard. Do not add mustard, people have it in their home”

The Snack Box had more success when exposed to male participants and those that prefer to have less preparation in the meals. This was not the only reason of why it was popular. It was also mentioned for girls, the fact that you can actually enjoy a healthy snack. They probably not feel as guilty as when eating bitterballen, because not necessary have to fried them. They also mentioned that the volume of the product should be increased significantly. They did not experiment or try to add something to the snacks. However they mentioned they would try present the snacks in a stylish way, if they will offer them in a formal gathering.

Cultural Correspondence: It definitely fit in their routine.

“Its nice… I will not have to worry. Is for a party, right?… I will use the oven, not pan. I do not want to fry. Is bad for my diet”

Package Suggestions:
"Add more, my friends are always hungry"

8.4.2 The Fleex Stripe

On the second prototype, the participants recognized the beetroot immediately. The colour did resembled meat, but the texture or the appearance did not. They considered that trying to resemble meat in meat substitutes was unnecessary. The prototype shape and appearance was very intriguing and a discussion point for the participants, ranging from those who did not liked it to those who were interested to try it. It reflected the call for action and creativity I was pursuing.

“Originally the recipe did not mention the cheese. But I was searching in the fridge and that’s what I found. This was so much fun. When you invite us I though we were filling a boring questionnaire. Much better, I would tell my flatmates at dinner. Do you have a spare (one)? Perhaps I can cook with them”

The cooking experience was triggered but dependent on the participants with some of them were experimenting with the product, whereas others only cooked it. The flavour was mentioned to be better than they expected.

Cultural Correspondence: It was not clear. The cultural correspondence is not easy to see. It until you explain when they realise it. They suggested to add a mention about the vegetables in the package.
CHAPTER 9: THOUGHTS ON THE PROJECT

The journey started by learning about meat substitutes, flexitarians, identifying their needs, designing meat substitutes that are attractive to them and testing those products. In this chapter the recommendations for the proposed design concepts and future meat substitutes are drawn. Finally, my personal reflection on the project is given in this chapter. My final reflections take into account my personal and professional experiences combining them with my designing vision.
9.1 RECOMMENDATIONS FOR FUTURE DEVELOPMENT

“no hay comida rara, sino gente rara” Ferran Adrià
“ There is no such thing as strange food, but rather strange people”.

9.1.1 Recommendations for Future Development

- Evaluative test has shown that the interaction characteristics I proposed where successful because the response of the flexitarians was positive about it. However, to make sure that further research is needed to know more precisely how this concepts could contribute to enhance attachment of flexitarians and meat substitutes in longer time of use.

- Dutch flexitarians perceived the product as convenient for their daily routines, specially the snack box that was more popular than the other concept. I correlate the success also with the fact of being a social product. I could see it took a less effort to interact with the product and others. The cooking test with the concept Fleex, stressed out some participants because they were not too much into cooking. A difference that perhaps is because age difference between test participants. Participants from the evaluation in design trough design step were older than the ones in the evaluation test.

- Fleex proposes to address cultural correspondence by linking the product to the available traditional and seasonal vegetables. A recommendation to expand “Fleex” meat substitutes products in Netherlands is to expand the product portfolio by releasing other flavours according to different root vegetables, also called forgotten vegetables that are characteristic from the country. (e.g celeriac, kohlrabi, parsnips or turnips).

- The final use cases can be adapted to Spain and Germany. This can be either in flavour and ingre-
dients or cultural characteristics. To Spain I will recommend a stronger social focus. For Germany a very detail and specific cooking instructions

9.1.2 Recommendations on the proposed guidelines

- An extensive research it is recommended in the impact of the interaction qualities I propose to increase flexitarians meat substitutes consumption.

- I believe that the design guidelines and desired interaction qualities I propose can be used immediately for future Meat substitutes concepts. Developers can use to keep an overview while designing a meat substitute. Through use and time the notion of the interaction of these products might change, so I believe that is necessary to go back and review this guidelines in order to keep them relevant.
People say magic happens when you get out of your comfort zone. Having as a goal to design an ambiguous and enigmatic food product was definitely challenging. As enthusiastic I was while starting, I soon realized that it was not going to be an easy task. More than once I was not convinced completely and changed my perspective. I wanted to explore all possibilities.

My process was very explorative and applied. Most of the time, I got interested in finding the reasons to certain questions that involved the interaction between users and meat substitutes. Drawing answers to those questions became clear when I formulated a vision of what I knew and believed was necessary for meat substitutes: Why is important to focus in the value of experience in them?

Through the results of my testing with people and intended users, I noticed that they recognized the need of improving the elements of activity and social focus. While hesitating to accept this, they will need these characteristics in daily basis: food we feel attached to have most of the time in a very subtle way. The final products presented in this thesis are intended to show a way in which this elements and guidelines can be integrated to meat substitutes products.

9.2 PERSONAL REFLECTION ON THE PROJECT

“...no hay comida rara, sino gente rara...La comida te puede conducir a la reflexion. A mí me decían que hacía cosas marcianas, pero, si no es así, no se puede comenzar nada que sea revolucionario” Ferran Adrià

“... there is no such thing as strange food but rather strange people... Food can lead to reflection. They told me I did alien things (food), but, if the contrary, nothing that is revolutionary will be achieved “

People say magic happens when you get out of your comfort zone. Having as a goal to design an ambiguous and enigmatic food product was definitely challenging. As enthusiastic I was while starting, I soon realized that it was not going to be an easy task. More than once I was not convinced completely and changed my perspective. I wanted to explore all possibilities.

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On why I explicitly did not took the design for sustainability perspective directly was because I believe that if we increase the connection between people and meat substitutes, we can increase the sustainable effort of reduce meat consumption. We aimed for flexitarians because they are more open to this kind of products. However, if we succeed to attach people with products, change can be reached also onto people more reluctant to change. Especially with a social element as change driver in products.

Food will be always intrinsically connected to cultural behaviour. As human behaviour changes over time, food of the future might not resemble to what is customary now. The work delivered from this thesis aims to address this relationship, so food designers can benefit in order to provide products that are appropriate to specific cultures. There is, however, not a doubt in my mind that this is a path to follow in this area. This changed my perspective on food substitutes and their role in sustainability. Therefore, I tried to show others what as designer think is necessary to change regarding meat substitutes design. It is exciting for me, think in the possibility, that in the future my work can lead or inspire on the development of a future “alien” food.
ACKNOWLEDGMENTS

"Experience is food for the brain."

Bill Watterson
(American Author of the comic strip
Calvin & Hobbes, b.1958)

I would not make it so far in this project just by myself. I would like to thank all the people that have helped and supported me throughout this journey.

To my supervisor team:

Walter Aprile: For the never-ending coffee talks about Food, “Peculiar Things” and México. Also for guiding and cheering me from the beginning of the project.
Annemiek van Boeijen: First to join my project team. And second for keep me focused allowing me to refine my work.
Bea Steenbekkers: For your feedback during the project and specially taking the time to be involved in it.
Rob van Vegel: To push for user perspective in scientific environments.

To LikeMeat Project Team for participated with their knowledge and insights:
- To WUR Food and Biobased Research Specially to Valesca Kooijman, Nancy Holthuysen and Jeroen Knoll.
- To the other R&D Partners: BOKU and Fraunhofer-Institut. Specially to Florian Wild.
- To the SME’s and B2B’s for participating in all the activities and discussions we proposed in Barcelona. Thank you for being enthusiastic on having a designer in the project. Special thanks to: Lukas Pohl from Wiber for sending us spices used in
the prototypes. People in Vegetalia for being good hosts in Barcelona and interested in talk about different ideas.

Others professionals that contributed with advice that contributed to the project:
- To chef Johan Verbon. Thank you for enthusiasm and experience while prototyping in the kitchen of RoF.
- To Wouter Veldman for your recommendations on my project.
- To Deger Ozkaramanl for our talks at the beginning of the project.
- To Jón to help me getting my ideas clear.

To all the Flexitarian that participated in the project in sessions and user tests that I performed throughout this project. Perhaps they will not read this but I am very grateful for their participation.

To my friends: thank you for all the cheering. To my Delft family for all the moments I treasure.

To my family: Por su apoyo y amor incondicional. Nada es imposible, solo requerimos tiempo y esfuerzo.

To my husband José: Thank you for joining me without hesitation in any wild adventure that comes into my mind. For your patient and love. Gracias por el adorable puente.


IDEO. (2011). IDEO Human-Centered Design: IDEO.


