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Michal Černý

Prague, 11.07.2018

Overcoming Barriers to Insect-Based Food in Europe

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Supervisor:
FH-Prof. Dipl. -Kfm. Bernd Kirschner

Author:
Michal Černý
1710622002

Date:
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Abstract

The aim of this thesis is to understand the barriers of potential consumers to insect-based food in Europe that prevent them from consuming these foods, and to examine how existing companies are overcoming these barriers. The first part of the objective was fulfilled through a comprehensive literature review, whereas the second part of the objective was achieved through primary research. The primary research consisted of 6 semi-structured telephone interviews and 1 structured interview via e-mail due to the interviewees time constraints. In the results, different approaches to product design emerged together with a varied interplay with another factor that was information. Companies showed great awareness in individual factors whereas social factors did not emerge during the research. Differences were discovered in practical factors; differences in availability could be attributed to the period of time the company is in the business while differences in approach to pricing were significant. Several other barriers emerged, most notably, legislation in Europe. Furthermore, some companies showed a discrepancy between strategy and vision. Overall companies approach barriers very well, except the price factor. “177 words”

Table of Contents

Acknowledgment.....	3
Abstract	4
1. Introduction	1
1.1. Problem Statement	2
1.1.1. Legal Perspective	2
1.1.2. Theoretical Perspective	2
1.1.3. Management Perspective.....	2
1.2. Research Objective.....	3
2. Literature Review	4
2.1. What are Insects	4
2.2. History of Eating Insects Around The World	5
2.2.1. Archaeological Findings and Early Historic Times	5
2.2.2. Scientific Era	7
2.2.3. Modern Use	8
2.3. Why Are Insects in Europe Not a Regular Part of the Diet	10
2.4. Overview of Current Research	11
2.4.1. Consumer Acceptance	11
2.4.2. Effects of Communication.....	14
2.4.3. Acceptability of Insects as a Meat Substitute.....	15
2.4.4. Sensory Liking and the Impact of Processing	16
2.4.5. Diffusion of Innovations Framework and Criticism of Current Research and Processing of Insects	17
2.5. Barriers to Overcome in Europe.....	19
2.6. Benefits of Overcoming Barriers in Europe	19
3. Theoretical Conceptualization.....	21
3.1. First Taste of Product	21
3.2. Repeated Consumption.....	23
3.3. Target group	25
4. Methodology	26
4.1. Research Design	26
4.2. Research Data Sources	26
4.3. Methods of Data Collection	27

4.4.	Methods of Data Analysis	30
4.5.	Limitations.....	30
4.6.	Ethical Considerations.....	30
5.	Results	31
5.1.	Exo.....	31
5.2.	Swarm Protein	33
5.3.	Jimini's	34
5.4.	Instinct.....	35
5.5.	Anonymous Company	35
5.6.	SENS	37
5.7.	Näak.....	37
6.	Discussion	39
6.1.	Initial Consumption.....	39
6.1.1.	Appropriate Product Design	39
6.1.2.	Information.....	40
6.1.3.	Interplay of Factors	41
6.2.	Consumer Acceptance.....	41
6.2.1.	Individual Factors.....	41
6.2.2.	Social Factors	42
6.2.3.	Practical Factors	43
6.3.	Target Groups.....	44
6.4.	Unexpected Barriers	45
6.5.	Visions and Normalization.....	45
7.	Conclusion.....	46
8.	Recommendations for Future Research	48
	References	49
	Appendices	54
	Appendix 1. Exo Transcript	54
	Appendix 2. Swarm Protein Transcript.....	59
	Appendix 3. Jimini's Transcript.....	63
	Appendix 4. Instinct Transcript.....	66
	Appendix 5. Anonymous Company Transcript.....	69
	Appendix 6. SENS Transcript.....	73
	Appendix 7. Näak Transcript	76

List of Figures

FIGURE 1: RECORDED EDIBLE INSECT SPECIES, BY COUNTRY	8
FIGURE 2: NUMBER OF RECORDED EDIBLE INSECT SPECIES PER GROUP IN THE WORLD (NUMBER: 2111).....	9
FIGURE 3: BARRIERS TO FIRST TASTE OF PRODUCT	21
FIGURE 4: BARRIERS TO REPEATED CONSUMPTION.....	23
FIGURE 5: INTERVIEW STRUCTURE 1	29
FIGURE 6: INTERVIEW STRUCTURE 2	29

1. Introduction

It is estimated that by the year 2050 the population on earth will increase to 9,7 billion. By the year 2100, it will be 11,2 billion (United Nations, 2015, para. 1). This population growth, in addition to other factors such as climate change, has, in recent years, intensified debate about global water scarcity and food security (Hanjra & Qureshi, 2010, p. 374). Current food production would have to nearly double in order to accommodate this number (Van Huis et al., 2013, p. 59). It is expected that demand for meat will rise by 76% (Alexandratos & Bruinsma, 2012, p. 74) and there are already 1 billion people in the world suffering from chronic hunger (Van Huis et al., 2013, p. ix). Oceans are overfished, water shortages resulting from climate change can impact existing food production, and expanding the already scarce farming land is often not a viable, nor is it a sustainable option (Van Huis et al., 2013, p. ix). Livestock is not a sustainable solution for the future demand of protein, given its impact on the environment in the form of deforestation, soil erosion, water pollution and the fact that they produce the bulk of the agricultural land sector's greenhouse gasses (Gmuer, Nuessli Guth, Hartmann, & Siegrist, 2016, pp. 24–30). This opens the door to other resources (Akhtar & Isman, 2018, p. 265).

Entomophagy is the practice of eating insects (entomophagy should be specified as “human entomophagy” but since in existing literature “human entomophagy” is simply referred to as “entomophagy” I will address it as such as well). According to Van Huis et al., entomophagy can be promoted because of three main reasons, and those are health benefits, environmental benefits, and impact on livelihoods. However, in Europe we do not use this sustainable and healthy source of food (Van Huis et al., 2013, p. 2) even though eating insects is widely practiced around the world (McGrew, 2014, p. 6) and has been an essential part in the history of human nutrition (Defoliart, 1995, p. 306).

The reasons why there is no consumption of insects by humans in Europe is historical and geographical. Entomophagy developed especially in warmer climates (Defoliart, 1995, p. 306) while in Europe that is not the case. Domestication of animals led to the decrease in importance of food sources that were not domesticated. Urbanization led people further away from nature. All these effects are suspected to be the reason why there is no entomophagy in Europe (Van Huis et al., 2013, pp. 35–36). Nowadays, with the advent of global supply chains and a high standard of living there is no technical reason preventing Europeans from insect consumption. However, insect rearing is more expensive in Europe due to the heating expenses in winter, high cost of manual labour, and other factors.

1.1. Problem Statement

1.1.1. Legal Perspective

There are several reasons why entomophagy in Europe is an unused concept. One of the most important ones is legislation. The legislation regarding insects for human consumption on a European level was very unclear up until the 1st of January 2018, leaving it open to interpretation for national governments and thus establishing a business very hard or impossible (Van Huis et al., 2013). However, the European Food Safety Authority conducted research on the risks regarding the human consumption of insects, coming up with no more significant risks than with other conventional food sources. This ultimately led to a more comprehensive legal framework (La Barbera, Verneau, Amato, & Grunert, 2018) and the new regulation of the European Parliament number 2015/2283 applicable from 1.1.2018. Therefore, European legislation should no longer present a problem, however, there might be a time period of uncertainty in governmental processes.

1.1.2. Theoretical Perspective

Other reasons are connected to the people's perception of entomophagy. These barriers can prevent people from trying insects for the first time or become a returning customer after. The barriers that prevent people from trying them for the first time are connected to how individuals perceive insects such as past experiences (Tan et al., 2015, p. 87), appropriate product design (House, 2016, p. 55; Tan, van den Berg, et al., 2016, p. 222), low taste expectations (Gmuer et al., 2016, p. 124) and others. Barriers to repeated consumption are similar but also include more practical factors, such as price, availability, or social factors such as fit into the food culture (House, 2016, p. 47; Tan, van den Berg, et al., 2016, p. 230). For companies, it is essential to know what barriers exist and to understand them.

1.1.3. Management Perspective

Based on this knowledge, appropriate steps need to be taken to overcome the barriers, acquire and retain customers in order to ensure the survival of the business and drive the societal change. Some research has already been done on this topic. However, most of the research was focused on the barriers to the initial trial of the insect-based food and had severe limitations, such as being purely online based or it was conducted without actual insect-based foods (House, 2016, pp. 49–50). But how exactly are the companies overcoming these barriers? To the best of my knowledge, nobody has interviewed established companies that operate and grow in this new market and investigated how they are overcoming the barriers.

1.2. Research Objective

The objective of this research is twofold. First, we need to understand consumers; the barriers that prevent them from trying the insect-based food for the first time and the barriers which prevent them from becoming a returning customer. This objective will be reached with secondary research as I will investigate the current research around this topic. The second objective is from the company perspective. It will be achieved with primary research as I will examine whether companies are aware of and understand the barriers discovered in the secondary research and whether they are taking necessary steps in overcoming them.

2. Literature Review

2.1. What are Insects

The animal kingdom is divided into groups called phyla. The group that holds all the animals with a backbone is called Chordata, while insects belong to the phylum of Arthropoda. According to Britton, characteristic features of arthropods are:

- an exoskeleton (a hard external skeleton)
- a segmented body
- at least three pairs of jointed legs.

The phylum Arthropoda is divided into a number of classes, including:

- Crustacea (crabs, crayfish, prawns)
- Arachnida (spiders, mites, scorpions)
- Myriapoda (millipedes & centipedes)
- Insecta (insects) (David Britton, 2011, paras. 1–3).

The word insect originates from the Latin word “insectum” which means “with a notched or divided body” (Van Huis et al., 2013, p. 1). Insects are proved to be the most successful Arthropods and are the most varied and versatile group of animals on the planet. There are far more species of insects than any other animal amounting to more than 1 million described species, representing more than half of all known living creatures. The total estimated number of insect species is 6-10 million, which means that they potentially represent more than 90 percent of animal life forms on this planet (Van Huis et al., 2013, p. 1).

These animals have adapted to all the environments on this planet with the exception of frozen environments at high altitudes and locations with proximity to active volcanoes (David Britton, 2011, para. 4). Only a fraction of insect species made a habitat in the oceans; however, this environment is dominated by a different arthropod group, the crustaceans (Van Huis et al., 2013, p. 1).

Due to their diversity, it is hard to describe their typical body structure. Despite the difficulty of producing a typical model for what most insects are similar to, according to David Britton there some general features that most insects possess:

- There is a division of the body into three main parts, the head, thorax, and abdomen.
- Insects have an exoskeleton that protects their organs; they do not have an internal skeleton.

- All insects have three pairs of legs with the only exception being some immature forms such as caterpillars.
- The mouth has a pair of lower and upper jaws with the function to bite; however, there are many variations of this structure.
- One the head, insects have one pair of antennae.
- Insects usually possess two pairs of wings, although there some that are wingless.

Compared to insects humans are newcomers on Earth. The primitive man arrived somewhere between one-half to one million years ago. Modern man existed for not more than 50 thousand years. Insects, on the other hand, are recorded in the late Palaeozoic era, which was 200 million years ago, and they were already well developed, indicating that they must have appeared much earlier. Historical evidence leads us to the conclusion that insects appeared in this world around 300 million years ago or more (DeLong, 1960, p. 193). Insects have several attributes that allowed them to survive for such a long time, achieve such a high degree of diversity and conquer almost all the environments found on Earth:

- Insects are protected from the environment by an exoskeleton.
- Insects are the only invertebrates with wings.
- Insects are cold-blooded.
- Insects have rapid multiplication and quickly developing short cycle generations
- Insects undergo metamorphosis to adapt to seasonal variations.
- Insects' respiratory systems show tolerance to high altitudes, radiation, and even vacuum pressure.
- Insects are usually not in need of parental care (DeLong, 1960, pp. 201–202).

2.2. History of Eating Insects Around The World

2.2.1. Archaeological Findings and Early Historic Times

Insects have been used as food ever since human beings first came into existence. Arthropods were of vital importance in the diet of early humans, especially for females and their offspring. Bone tools were found that were used to dig for termites 500 thousand years ago. Evidence of honey collection and insect consumption has been found on wall paintings in caves of early humans in Europe and Africa (Costa-Neto & Dunkel, 2016, pp. 33–34).

As far as historical records are available, insects were part of the human diet since the beginning (DeLong, 1960, p. 194). The probably oldest historical record comes from the Middle East, dated back in the eighth century BC, with mentions of consumption of locusts arranged on

sticks. In ancient China reference to entomophagy can also be found together with the medical benefits of eating them, approximately 3200 BC (Van Huis et al., 2013, p. 41).

Cultures and religious beliefs heavily influence food practices (Van Huis et al., 2013, p. 40). In the limited period of time during which it was written, the bible is an excellent source of history, despite some parts of the Bible which are more philosophical (DeLong, 1960, p. 194).

In the Bible, direct reference is made to the eating of locusts and beetles. Furthermore, insect products such as honey and manna are listed as foods which were being eaten by the children of Israel in the wilderness (DeLong, 1960, p. 194). Probably the most famously in *Leviticus IX: 20-23* is written:

Every winged four-footed thing which goes on the earth is disgusting to you; But of the winged four-footed things, those which have long legs for jumping on the earth you may have for food; Such as all the different sorts of locusts; But all other winged four-footed things which go on the earth are disgusting to you.

Very often these insects are misidentified in historical literature, for example, “locust” was used to refer to grasshoppers, crickets, and cicadas (Costa-Neto & Dunkel, 2016, p. 33). This implies that the Bible and other historical records might be referring to several species of edible insects. The Islamic literature refers to the eating of insects as well, specifically to the eating of locusts, bees, ants, lice, and termites. Jewish literature, as the Islamic and Christian counterpart, implies that some species of locusts were primarily used and largely accepted as food in ancient times (Van Huis et al., 2013, p. 40).

More recently, in the last millennia, records can be found of several cultures practicing entomophagy. For example, nomads of Arabia and Libya dry and eat locusts from swarms that appear. Locusts are eaten mostly by Africans and Arabs with a wide variety of ways how to prepare them – roasted, grilled, salted. They were even used to supply ships (Van Huis et al., 2013, p. 41).

Aristotle (384-322 BC) from Greece was probably the first who referred to entomophagy in the work *Historia Animalium* where he wrote about the consumption of the cicada, specifically that females with eggs were better tasting and juicier than males (Van Huis et al., 2013, p. 41). Entomophagy continued to be referenced to throughout Europe, in Sicily in the second century BC the eating of locusts and grasshoppers was mentioned, in Ancient Rome, there was a popular dish made out of larva of the longhorn beetle. Even German soldiers in Italy repeatedly

consumed fried silkworms as mentioned by Ulysse Aldrovando in 1638 (Aldrovando, 1638; Van Huis et al., 2013, p. 41).

2.2.2. Scientific Era

The idea of eating insects is not a new one, even in Europe. Insect-eating has been referred to in many books. Aldrovande, widely considered as the father of the modern-day study of insects, also commented on how insects are used as food around the world, such as pupae in China and ants in India (Aldrovando, 1638; Costa-Neto & Dunkel, 2016, p. 35). Erasmus Darwin referred to the beetle as being worthy of eating in 1800, Kirby and Spence examined benefits of eating insects in 1863, Packard dedicated a chapter to the consumption of grasshoppers by Arabs and in parts of Africa (Costa-Neto & Dunkel, 2016, p. 35). In 1868 the state entomologist of Missouri Ch. V. Riley suggested controlling the population of locusts, which were returning in swarms and destroying crops, by simply eating them (Van Huis et al., 2013, p. 42). Perhaps most famously, the British entomologist V.M. Holt published a book in 1885 titled *Why Not Eat Insects?* suggested that insects should be collected as food for the poor. Holt was ahead of his time, commenting that insects should be part of British diet and used consumption of lobsters, animals that were considered delicacies and have the same composition as insects, as his argument (Holt, 1885, p. 2).

It is hard to point out when precisely Western countries developed the disgust towards insects. In 1916 Howard discussed and suggested insects as a practical alternative and a new cheap food because prices for food were globally increasing during the first World War (Howard, 1916, p. 389). However, even in this time of need when nations were facing serious shortages of food, it did not happen nor did the eating of insects became mainstream. Costa-Neto and Dunkel stated that the fact it did not happen despite a long history of insect-eating is a fascinating fact in entomological psychology. They are under the impression that sometime during the 1800s, the dominant culture of Europeans and Euro-Americans switched from teaching their children both the beneficial and destructive side of insects to just the dangerous and destructive side. Well documented in journals of first settlers in parts of northern America is the surprise of being served insects by native Americans. It seems that during this time the “disgust factor” was already strong and present (Costa-Neto & Dunkel, 2016, p. 36).

In 1941 Bergier wrote in his book *Peuples Entomophages et Insectes Comestibles* about entomophagy worldwide (Bergier, 1953). In 1951 Bodenheimer published a book called *Insects as Human Food* which refers to more than 500 cases of human entomophagy and gives an

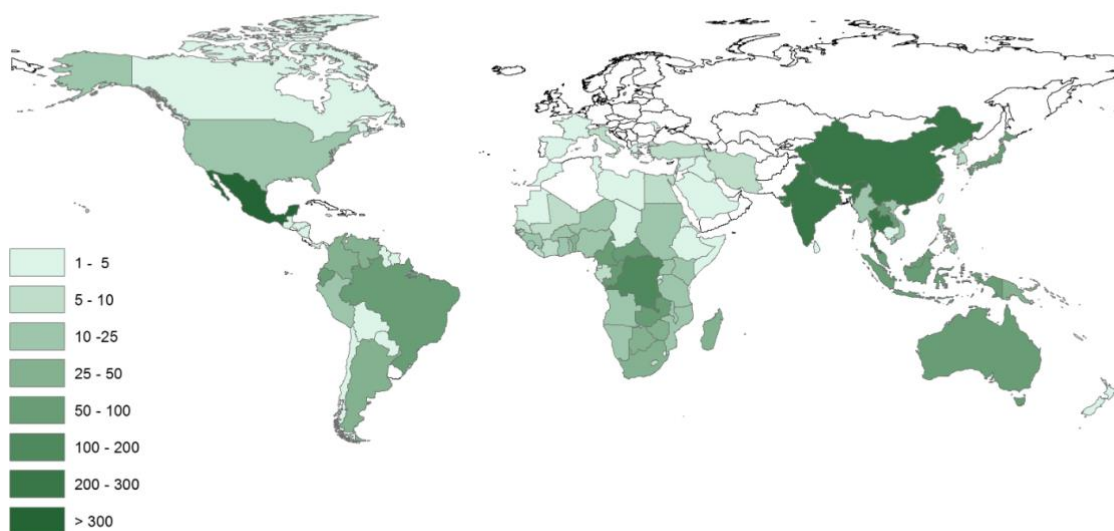
overview of the history of eating insects (Bodenheimer, 1951). Despite all this existing knowledge, the consumption of insects in Europe is not a norm.

2.2.3. Modern Use

“There are over 2 billion people of the world for whom insects are an important source of protein and/or a desired tasty addition to their diet as well as an important cultural component of family gatherings” (Costa-Neto & Dunkel, 2016, p. 37). Insects are widely consumed around the world even today. In some parts of the world consuming insects is a substantial part of the culture, in some, they are consumed because of their abundance, in some, they are consumed because of food scarcity and their nutritional value, and in some countries, they are not consumed at all.

It is hard to quantify the amount of edible insects species around the world. People do not use the correct nomenclature, use synonyms or interchangeable terms for different types of insects or the practice is simply not yet recorded (Van Huis et al., 2013, p. 9). Yde Jongema of WUR estimates the number of edible insect species to 2111 as of 2017. Continents with the most recorded edible insect species are Latin America, Afrika, Asia, and Australia.

Figure 1: Recorded edible insect species, by country

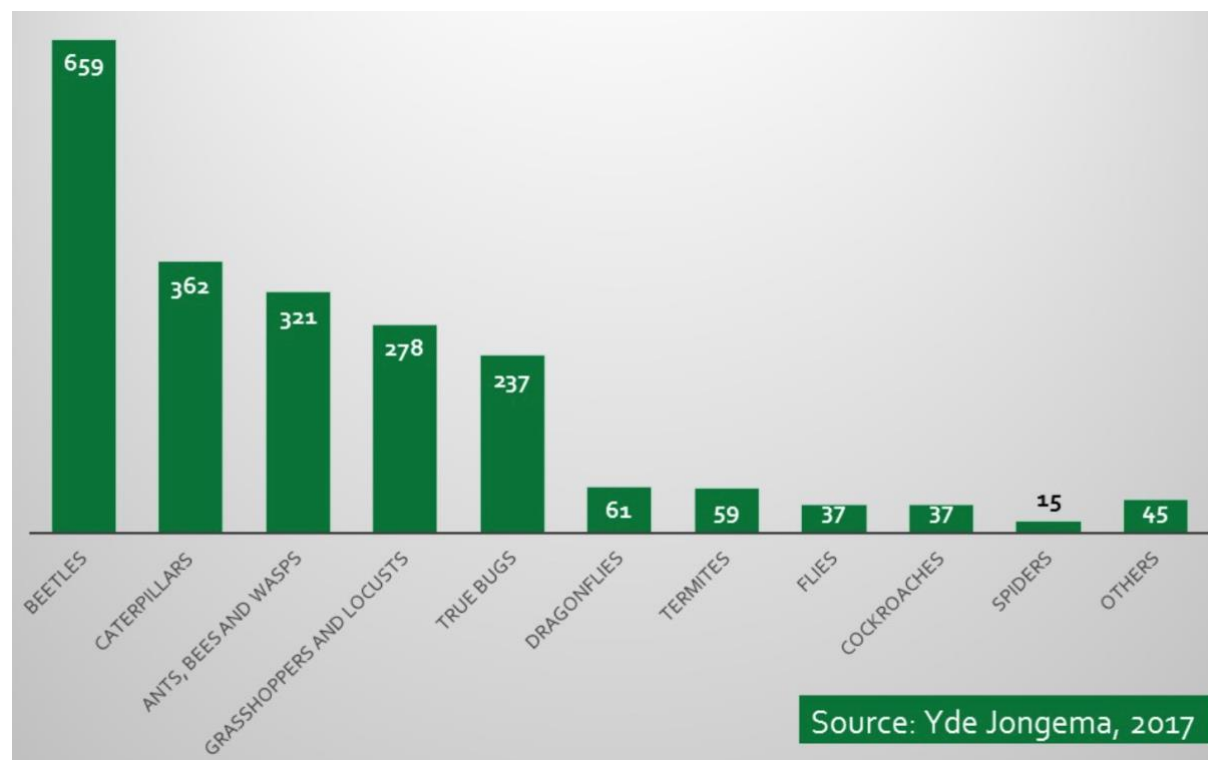


Source: (Jongema, 2017)

Beetles are the most frequently consumed insects in the world. However, considering that this group consists of 40 percent of all known insect species, this is not surprising. Caterpillars (Lepidoptera) occupy second place, most frequently eaten in sub-Saharan Africa. Bees, wasps

and, ants are in the third place (Hymenoptera). Following are “grasshoppers, locusts, and crickets (Orthoptera), cicadas, leafhoppers, planthoppers, scale insects and true bugs (Hemiptera), termites (Isoptera), dragonflies (Odonata), flies (Diptera) and others” (Van Huis et al., 2013, p. 10).

Figure 2: Number of recorded edible insect species per group in the world (number: 2111)



Source: (Jongema, 2017)

Following are some typical examples of insect-eating around the world. In Africa, insects are integral to food security. Caterpillars are important and frequently eaten, especially during the seasons of rain when hunting can be problematic, due to their availability in the Democratic Republic of Congo, Central African Republic, Madagascar and other countries (Van Huis et al., 2013, p. 11). Mopane and termites are popular in Africa as well, smaller ones to feed chicken and bigger ones as human food after frying, especially throughout West and Southern Africa (Costa-Neto & Dunkel, 2016, p. 38).

In Asia, there are approximately 150 to 200 species of insects that are eaten. Some are available seasonally, some are available all year long (Van Huis et al., 2013, pp. 17–18). The silk moth pupae are probably the most well-known edible insects in Asia; Chinese, Japanese, Thai people, and Vietnamese (Costa-Neto & Dunkel, 2016, p. 39) consider them a delicacy. Another widely popular insect in Asia is the Red Palm Weevils. Thailand is in a very specific position – despite the booming tourism and resulting strong western influence combined with the transition from

a lifestyle based on agriculture to an urban lifestyle, insect-eating never resulted in embarrassment and remained a substantial part of the culture. Right now, there are approximately 20 000 cricket farmers in Thailand (Costa-Neto & Dunkel, 2016, p. 39).

Insects are gathered during the rainy season in the Amazonia part of Brazil as well, as it makes hunting and fishing difficult. In the Amazonia part of Columbia various larvae are gathered and eaten, in Ecuador beetles are harvested as they are easy to collect, in Venezuela some species of insects are gathered even outside of the rainy season (Van Huis et al., 2013, pp. 18–20). In Mexico, all people incorporated insects into their diet regardless of the social class they belong to. The most popular ones are chapulines, escamoles (ant eggs) and agave larvae. Dependable on the species insects can be bought, alive, dried, or prepared in different ways (Costa-Neto & Dunkel, 2016, p. 39).

Australia has several insect species that are eaten as well, although mostly by the Aboriginal people. Honey ants are considered a delicacy and are of enormous value especially during times of food and water shortage (Costa-Neto & Dunkel, 2016, p. 38). In the USA there are 54 species of edible insects, mostly by Native American Tribes. Popular are grasshoppers, although not very suitable for farming, crickets, and cicadas (Costa-Neto & Dunkel, 2016, pp. 38–39).

In Europe, the European Food Safety Authority conducted research on the risks regarding the human consumption of insects, coming up with no more significant risks than with other conventional food sources. This ultimately lead to a more comprehensive legal framework (La Barbera et al., 2018, p. 120) and a new regulation on insect-based food. In this regulation, number 2015/2283 applicable from 1.1.2018, a few species were legally acknowledged as food, and the ease of doing business in this industry was greatly reduced, even with other species. Prior to that, there were several sorts of cheese with fly larvae apart from indirect or unintentional consumption from, for example, bread or ketchup (Costa-Neto & Dunkel, 2016, p. 42). Since January 2018 a boom in the still infant industry occurred, and many new companies appeared. There are several companies producing insect-based bars, nutrition supplements, snacks, powder, pasta, burgers, and many others. However, not all insects are edible. Insects may contain toxins, and thus their consumption should be informed and careful (Costa-Neto & Dunkel, 2016, p. 41).

2.3. Why Are Insects in Europe Not a Regular Part of the Diet

Agriculture is believed to have originated “in The Fertile Crescent, a region of fertile lands in western Asia, the Nile Valley and Nile Delta in northeast Africa” (Van Huis et al., 2013, p. 35). In this region, wheat, barley, and many other crops, together with pigs, cattle, sheep, goats and

other such animals were first domesticated (DeFoliart, 1999, p. 43). There are 14 domesticated mammals in the world, each being heavier than 45 kg. 13 out of these animals can be found in Eurasia; these animals yield considerable amount of meat together with milk, milk products, warmth, wool, leather, means of transport, and plough traction, (Van Huis et al., 2013, p. 35). It might be that insects were simply not as useful as other food items in this region, wherefrom agriculture spread to Europe (DeFoliart, 1999, p. 43). Agriculture became much more productive and efficient over time; food could be stored, it was supplied with greater stability, and life became dependent on farming. This changes, combined with the seasonality and uncertainty of insects as a food source, probably led to the dismissal of insects as food, and later perceiving them rather as a threat to efficient food production (Van Huis et al., 2013, p. 35). Thereafter, the spread of European civilization affected eating habits around the whole world (DeFoliart, 1999, p. 43). Furthermore, urbanization, more common in Western countries, weakens the connection between people and nature; urbanization is also increasing, and these locations need a stable and reliable food source which insects are not (Van Huis et al., 2013, p. 35).

2.4. Overview of Current Research

In this chapter, I provide an overview of recent research conducted on the topic of insect-based food in the western world. For a better overview, I have categorized the research into five groups, although, none of them fit exclusively into just one group. These groups are Consumer Acceptance, Effects of Communication, Acceptance of Insects as a Meat Substitute, Sensory Liking and the Impact of Processing, and Diffusion of Innovations Framework and Criticism of Current Research and Processing of Insects.

2.4.1. Consumer Acceptance

Lensvelt & Steenbekkers were examining consumer acceptance in Australia and the Netherlands. They conducted a survey in both countries, after which participants were able to try a biscuit made out of cricket flour or whole insects. Before the survey, participants were either directly informed about the benefits of entomophagy or not at all; the authors were investigating whether this has an impact on the intention to try the biscuits and what factors are important to consumers. They concluded that the briefing about benefits of entomophagy has no effect at all on the intention to try the biscuit, and found that the most important factors for consumers are price and quality. However, a severe limitation of this study was that the participants decided to take part already knowing that entomophagy will be involved, making

the sample of participants early adopters rather than general population (Lensvelt & Steenbekkers, 2014, pp. 555–560).

Hartmann, Shi, Giusto & Siegrist were conducting research on the difference in psychology between Germans and Chinese when it comes to entomophagy, even though the eating of insects cannot be considered common practice in China anymore. Participants of both nationalities were given both processed and unprocessed insects to try. Before that, participants were briefed about the benefits of insects concerning them being a high-quality source of protein, their efficient feed conversion, and sustainability aspects. The authors found out that significant factors in predicting the willingness to eat insects were food neophobia and previous consumption of insects. Education and age had no impact and men were more likely to try them. Germans preferred to consume processed insects rather than unprocessed, whereas the Chinese did not have a clear preference. Germans also had low taste expectations, which was a significant factor; they also preferred savoury taste as sweet was considered unusual. Conclusion was that high score for food neophobia, negative taste expectations and little previous experience with entomophagy result in a significantly lower willingness to try insects, thus, a marketing strategy based purely on nutritional advantages will probably be ineffective (Hartmann, Shi, Giusto, & Siegrist, 2015, pp. 151–155).

Hartmann researched consumer perception in Switzerland as well. First, she used the shopping list method, where participants were describing an imaginary person based on a shopping list provided by the research team. They found out, that the participants perceived people who had insect-based burgers on the shopping list as braver, with more imagination, and more interesting than vegetarian or beef burgers buyers. Secondly, using in a vignette study, they found out that participants perceived a vegetarian lifestyle as being more health conscious, a lifestyle with consuming insects was almost on par with it. The study, however, has several limitations, the most serious being that it was conducted during the time when insects became a legal food source in Switzerland, and this change was accompanied by a heavy media campaign. Furthermore, the study was done without actual insect-based food products; therefore, a lot was left to the imagination of the participants (Hartmann, Ruby, Schmidt, & Siegrist, 2018, pp. 7–20).

Medigo and his colleagues were conducting research on 159 students in Belgium. After a briefing about the research and the consumption of insects, only 51% signed up. Participants were evaluating four types of burgers: beef, beef with mealworms, mealworms with lentil, and lentil. The beef burger was rated as best, the beef burger with mealworms was in second place,

the mealworm lentil burger occupied the third place, and the lentil burger was last in the rating. This showcased that creating meat alternatives with similar sensory qualities is of high importance. After the tasting, 70% of participants stated that insects will be part of the future diet and were willing to incorporate insects into their diets (Caparros Megido et al., 2016, pp. 238–242). A limitation of the study is that the results dismiss the fact that nearly half of the students refused to participate after being briefed about the study. Furthermore, the demography is limited to young students.

Hui Shan Grace Tan compared the cultures of the Netherlands, a typical western country, and Thailand, where insects are a common part of the diet. For that purpose, he established eight focus groups, four in the Netherlands and four in Thailand, in each country were two with people that experienced entomophagy and two that did not. Thai people were more knowledgeable about how to obtain insects, prepare them, and what taste to expect from different species. Dutch people saw insects as food for other motivations, e.g., sustainability. Past experiences were a key factor when participants were deciding to try an insect, whether positive or negative. For example, Dutch people accepted mealworms while Thai people rejected them because of associations with larvae they see in decaying matter. In case of unfamiliar items sensory features are decisive, which is usually negative in the case of insects. The main factor for trying insects or a species of insects for the first time is curiosity; Dutch participants are willing to taste them out of curiosity, however, if the product fails to meet their expectations they will not accept it is a new food. Tan concluded that cognitive arguments (e.g., health, sustainability) are insufficient (Tan et al., 2015, pp. 79–87).

La Barbera and his colleagues were further investigating the disgust of Westerners. In their research, 160 university students were informed about the benefits of eating insects and were given a chocolate bar with processed crickets. After a few days, they were contacted whether they ate it and were surveyed with follow up questions about disgust and future intentions. Prior consumption of insects was not reported by any of the participants. They found out that overcoming food neophobia is a gradual process, until eating it becomes familiar. However, they also found out that familiarity does not necessarily reduce disgust. Meaning, that even people familiar with entomophagy can still reject the food based on the emotion of disgust (La Barbera et al., 2018, pp. 122–124).

Hartmann & Siegrist were also conducting research on enhancing familiarity, willingness to eat and neophobic reactions towards insects. 104 participants from the general population were surveyed about their eating behaviour. Afterwards they were asked to eat a tortilla chip; one

was pure and one with cricket flour as an ingredient. They concluded that exposure to a familiar product with unfamiliar ingredients does increase feelings of familiarity towards the novel ingredient. People who ate processed insects became more willing to eat unprocessed insects. However, a single experience with an insect-based food item is not sufficient in overcoming neophobic reactions towards insects. Thus, just making them available is unlikely to affect the general population's willingness to buy and eat insects (Hartmann & Siegrist, 2016, pp. 119–121).

2.4.2. Effects of Communication

Verneau and his team conducted research on the effect of communication in Italy and Denmark. They wanted to know if there is a possibility to affect individual intentions to eat insect-based food in a positive way through communication. 282 students participated; they first watched an interview with an expert with different messages. One was about social benefits, one with individual benefits and a control group that watched a video about the benefits of introducing tablets in school. After this videos, they could eat a chocolate bar with processed insects. The results were that providing both individual and social benefits information raised intentions to try insects that carried over to behaviour as well. However, information about individual benefits was less stable than information about social benefits over a longer period. Furthermore, Danish intentions were raised more, because they live in a quickly changing food culture; Italians live in an internationally acclaimed strong food culture which reduces the chance to change. Additionally, familiarity and gender were also significant factors (Verneau et al., 2016, pp. 32–35).

Prior research demonstrated that direct educational campaigns emphasizing the benefits of eating insects are able to increase the intentions to attend events where food based on insects is consumed, Hamerman conducted the first research on whether indirect campaigns can affect people in a similar way. The participants, 179 students, were first given a questionnaire which measured different types of disgust. Following the questionnaire they were presented a brief book review, one group had a passage describing the transformation of inedible ingredients into edible through cooking, the control group had no such passage. After this, they were given a choice of an event to attend – visit an aquarium without any food or join an entomology event with an insect buffet; the majority preferred the aquarium. The study indicated that core disgust (taste, smell, propensity to carry disease) and animal reminder disgust had high levels, but there was no contamination disgust towards insects. Participants with the cooking passage were more likely to attend the insect event if they were low in animal reminder disgust. Hamerman

concluded that companies would do best to combine direct informative campaigns with the promotion of cooking, as taste appeals are more effective than information appeals. Companies should target customers with low animal reminder disgust sensitivity, e.g., outdoor activity commercials featuring cooking insects next to a campfire (Hamerman, 2016, pp. 320–325). This research has several limitations, most notably not taking into account the preference of the aquarium before the research, and the lack of any kind of food in this option.

Menozzi was investigating 231 young Italian adults and their willingness to eat a chocolate chip cookie with cricket flour. Direct information on environmental benefits had significantly positive effects on the willingness to try. Main barriers preventing the participants to eat insect-based food were the sense of disgust, low availability of products in the supermarkets and the incompatibility with local food culture (Menozzi, Sogari, Veneziani, Simoni, & Mora, 2017, pp. 29–33). Significant limitations of this study include the chosen demography of young adults and the focus only on the initial trial, not repeated consumption.

2.4.3. Acceptability of Insects as a Meat Substitute

Hartmann and Siegrist were investigating consumer behaviour regarding sustainable protein production. Despite the large environmental impact of our food choices, consumer awareness about the impact of meat is very low. Furthermore, people are unwilling to reduce meat consumption, men and frequent meat eaters are the most resistant to this change. Achieving acceptance might be harder than people generally think and there are only very few studies with sensory testing of insect substitutes; other meat substitutes, for example, cultured meat, face very low acceptance. It is also not researched whether people will substitute insects for meat or just eat more protein overall, which would not lead to a more sustainable eating pattern. Additionally, if we convince vegetarians and vegans to eat insects, we might even have a more significant impact on the environment (Hartmann & Siegrist, 2017, pp. 12–24).

Verbeke was researching the readiness and willingness to incorporate insects as a meat substitute of 368 residents in Belgium. He found out that 3% are definitely willing to substitute insects for meat, 16.3% are willing. Furthermore, men and young people are more likely to substitute than women or older people. The most significant factor was food neophobia, environmental impact and participants would prefer insects in the form of convenient snacks. However, he concluded that raising awareness and providing information solely about the environmental benefit of meat substitutes is not likely to be effective. Health aspects were not a significant factor, and meat had a much higher sensory appeal to participants. According to Verbeke the best target group are young men who have weak attitudes towards meat, are open

to food innovation, and care about the environmental impact of their food; typical “meat lovers” will not consider incorporating insects into their diet (Verbeke, 2015, pp. 148–154). A severe limitation of this study is that it was conducted as a web-based survey.

2.4.4. Sensory Liking and the Impact of Processing

Hui Shan Grace Tan together with colleagues investigated how individual traits, familiarity, and product preparation affect the acceptance of insects as food. 976 Dutch consumers participated by evaluating 8 mealworm products on 4 acceptability measures (product appropriateness, expected sensory-liking, willingness to buy, and willingness to try). Acceptability depended on whether the consumers perceived mealworms and the product combination as appropriate. However, despite being identical visually, mealworm products were always expected to be inferior compared to familiar products. Therefore, the authors concluded that additional incentivizing factors are required since appropriate product design alone is not sufficient to reach acceptance of entomophagy in western countries by consumers. Contrary to other research, this study suggests that preparing insect-based food in a familiar way does increase the likelihood of trying, however, putting insects in such products might result in dissatisfaction as they are compared against familiar products. However, Dutch likelihood of buying is extremely low with visible insects, and invisible ones too; the participants were willing to try them but expressed no desire to consume them on a regular basis. Furthermore, they deemed sweet flavour as inappropriate. However, even when price and flavour were matched, products were still perceived as of inferior taste. For example, insect-based burgers were removed from supermarket shelves in Belgium after two years, despite the big interest at the beginning. Therefore, the authors conclude that a successful introduction should address appropriate product design, and steps addressing other barriers, such as the currently high price, insufficient availability, and negative perception of insects as food in western countries (Tan, van den Berg, et al., 2016, pp. 223–230). A severe limitation of this study is the lack of actual insect-based food products in the process.

Gmuer, Guth, Hartmann & Siegrist researched how the degree of processing of ingredients affects the intention to eat snacks and the emotions surrounding this. 428 Swiss respondents have evaluated 3 pictures of tortilla chips with insects in different stages of processing and one without any insects. The authors concluded that the negative emotional expectations were more serious than just disgust; people also felt irritated, strange, or uneasy. All insect snacks were rated significantly lower than the reference product, the highest rated were completely processed “invisible” insects, and the lowest was a mixed product where insects were visible in

the tortilla chips. Thus, insect marketing should generate positive emotional expectations, and the product should contain processed insects (Gmuer et al., 2016, pp. 120–126). This study is very limited due to being conducted as an online survey, thus without actual insect-based products.

Tan, Fischer, van Trijp, & Stieger were researching how sensory-liking and food appropriateness affect the intention to eat novel foods. 103 Dutch customers evaluated 4 beef burger patties. The participants were told that one is traditional, and each of the three remaining ones has a novel ingredient included – lamb brain, frog meat, or mealworms. The meals were presented, however without the novel ingredient, just with plant-based ingredients to change taste and consistency. The novel burgers were lower in sensory liking and appropriateness before tasting. After tasting, the sensory liking increased to a similar level, however, food appropriateness and future intentions to consume remained much lower than the beef burger. The authors concluded, that in the future efforts of novel food producers should not focus exclusively on increasing the chance of tasting as it is not sufficient, and should be combined with an understanding of consumer expectations regarding their consumption. Thus, the novel foods should also perform well in relation to food otherwise consumed (Tan, Fischer, van Trijp, & Stieger, 2016, pp. 295–301).

2.4.5. Diffusion of Innovations Framework and Criticism of Current Research and Processing of Insects

Deroy, Reade, & Spence were wondering how is it possible that years after the publishing of the book by Van Huis it failed to get mainstream media attention and insects are still not a part of the western diet. They came to the conclusion, based on reviewing the literature of several decades that emphasizing solely the sustainability and the nutritional value of insects is not very likely to induce a big enough motivation for a change in diet, as rational discourse typically fails to alter people's existing food choices. The authors were trying to figure out whether it is possible to show Westerners that eating insects can be pleasurable. They suggest, that insects “need to find their own place; not as a substitute for chicken, hidden in a cookie, but as insects, celebrated for what they are” (Deroy, Reade, & Spence, 2015, p. 53). They also point out, that changing the western attitude even a little can have bigger impact, as western cultural standards are being adopted in the rest of the world (Deroy et al., 2015, pp. 46–53).

Matan Shelomi used the Diffusion of Innovations (DoI) framework to review entomophagy and its promotion. He was baffled by the fact that insect cookbooks are available since the 70s, there was an insect newsletter running from 1988 to 2000, there are advocates of entomophagy giving

TED talks, and even the UN urges people to eat insects; furthermore, it was proven that significant cultural changes are not impossible, for example, sushi became a popular meal even without a concentrated political effort. The DoI framework describes the decision process that consumers go through when they are presented with innovations, and the success factors an innovation needs to be widely adopted by the population. Shelomi defined entomophagy in the DoI framework as a failed innovation; this means, that it never became widely accepted by its target population. Based on his analysis he suggested three strategies on how to further the practice in the western world. Firstly, according to Shelomi, insects should be developed as feed for livestock rather than food for humans. Secondly, the way entomophagy is marketed should be changed to better fit the needs of western consumers. Finally, companies should focus on supply-side innovations. He suggests, that mass production of insects might be a disruptive innovation if thereafter they are able to convince retailers to carry insect-based products. Also, familiar products might invoke the feeling that edible insects are compatible with traditional recipes (Shelomi, 2015, pp. 312–317)

House criticized existing research for two reasons. Firstly, he noticed that consumer acceptance in research tends to be treated as dependent on the individual. Research treating consumer acceptance as dependent in individual traits, such as sensitivity to disgust or food neophobia, downplays the importance of practical factors of the products themselves, such as price, the form of product, social or culinary practices, availability, and suitability with the current diet. Furthermore, web-based surveys or controlled taste sessions will never tell us how insects foods function in real life. Secondly, consumer acceptance is treated as a general issue, meaning that research about acceptance is targeting samples of the general population. House claims that early adopters should be targeted first, theorizing that if a group of returning early adopters could be identified and established it would open the doors to accessing the general population. This would be achieved through the practical factors mentioned above. The research House conducted confirmed his assumptions. The 33 participants that were interviewed had a low amount of repeat consumers. They consumed insects for the first time out of curiosity or rational (e.g., sustainability, health, etc.), for the second time it was more practical factors working together, such as price, taste, availability, the degree of fit with eating habits. House also suggested, that even though making insects invisible increases the chances of people trying the products, we are not normalizing insect consumption. Perhaps making them visible, and find a returning group of early adopters would contribute more to the normalization of insect-eating (House, 2016, pp. 50–57).

2.5. Barriers to Overcome in Europe

Based on current research we see that there are several barriers to be overcome in Europe. They can be divided into barriers to initial consumption and barriers to repeated consumption. Barriers to initial consumption include factors such as information (Verneau et al., 2016, p. 30), appropriate product design (House, 2016, p. 55; Tan, van den Berg, et al., 2016, p. 222), low taste expectations (Gmuer et al., 2016, p. 124), disgust (Van Huis et al., 2013, p. xiii), food neophobia (La Barbera et al., 2018, p. 121), curiosity (House, 2016, p. 48), past experience and familiarity (Tan et al., 2015, p. 87). Barriers to repeated consumption include, just as for initial consumption, information, product design, and familiarity; however, other barriers influence the decision for repeated consumption as well, such as sensory appeal (Tan, van den Berg, et al., 2016, p. 222), food culture and fit into this culture (Menozzi et al., 2017, p. 27; Verneau et al., 2016, pp. 34–35), price and availability (House, 2016, p. 47; Tan, van den Berg, et al., 2016, p. 230). These factors are elaborated in the next section as they form the theoretical basis of my research.

2.6. Benefits of Overcoming Barriers in Europe

According to Van Huis, insects can be promoted as a food source for the following reasons:

- Health:
 - Insects are healthy, nutritious alternatives to mainstream staples such as chicken, pork, beef and even fish (from ocean catch).
 - Many insects are rich in protein and good fats and high in calcium, iron, and zinc.
 - Insects already form a traditional part of many regional and national diets.
- Environmental:
 - Insects promoted as food emit considerably fewer greenhouse gases (GHGs) than most livestock (methane, for instance, is produced by only a few insect groups, such as termites and cockroaches).
 - Insect rearing is not necessarily a land-based activity and does not require land clearing to expand production. Feed is the major requirement for land.
 - The ammonia emissions associated with insect rearing are also far lower

than those linked to conventional livestock, such as pigs.

- Because they are cold-blooded, insects are very efficient at converting feed into protein (crickets, for example, need 12 times less feed than cattle, four times less feed than sheep, and half as much feed as pigs and broiler chickens to produce the same amount of protein).
- Insects can be fed on organic waste streams.
- Livelihoods (economic and social factors):
 - Insect harvesting/rearing is a low-tech, low-capital investment option that offers entry even to the poorest sections of society, such as women and the landless.
 - Mini-livestock offer livelihood opportunities for both urban and rural people.
 - Insect rearing can be low-tech or very sophisticated, depending on the level of investment (Van Huis et al., 2013, p. 2).

It also needs to be considered that changing the western attitude even modestly has a wider impact, as western cultural standards are being adopted in the rest of the world (Deroy et al., 2015, p. 54).

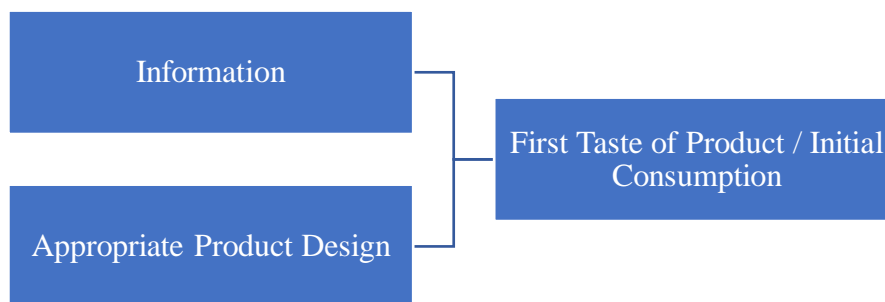
3. Theoretical Conceptualization

Based on the literature review, especially chapter 2.4. Current research, I have created a theoretical framework which provides the basis for my interviews and research. The theoretical framework is a comprehensive summary of the results of current research conducted on this topic, mostly regarding consumer acceptance. In addition to the framework and based on the same research, I have made a short summary of the ideal target group.

The framework is presented in the figures below. It consists of two figures which summarize the factors influencing the consumption of insects. The division into two parts is given by the literature, which establishes that factors influencing the consumption of insects differ between the initial, first tasting of a product or insects, and the repeated consumption of insects, or in other words, becoming a returning customer (House, 2016, p. 47).

3.1. First Taste of Product

Figure 3: Barriers to First Taste of Product



Source: Own work

Factors that companies can influence directly, in order to increase the willingness to try the insect product for the first time, are the information presented to the potential customer and the design of the product. Information can be either direct (Verneau et al., 2016, p. 30) or indirect (Hamerman, 2016, p. 320). Direct information can be either the communication of social benefits, such as environmental benefits or the impact on livelihoods, or of individual benefits, such as the health benefits (Van Huis et al., 2013, p. 2) or the positive perception of insect consumers (Hartmann et al., 2018, p. 2). The effect of information about social benefits appears to be stronger over time than the information about individual benefits (Verneau et al., 2016, p. 34). Indirect information can be used to persuade consumers to try the products as well; Hamerman proved that through the insertion of the passage:

Many famous chefs concur that the art of cooking is the process of transforming raw ingredients into something else. For example, raw cow meat can be transformed into a

delicious steak after grilling it over a fire. A crab, which is basically an aquatic spider, can be transformed into a delectable treat by cooking it in boiling water and adding butter along with various spices. Various bacteria, such as yeast, can be transformed into warm bread, while other bacteria can be incorporated into very expensive and sophisticated cheese. Pollan concludes that cooking is an important skill to have. Reclaiming cooking as an act of enjoyment and self-reliance, learning to perform the magic of these everyday transformations, opens the door to a more nourishing life. Moreover, the lessons of cooking are widely applicable: even the most disgusting raw ingredients can be transformed into something completely different ... and delicious! (Hamerman, 2016, p. 321)

in a book review read by participants of the research, concluding that it could increase the interest in insect-eating. Appropriate product design is important, according to the research conducted to this day (House, 2016, p. 55; Tan, van den Berg, et al., 2016, p. 222). This refers to the processing of insects, or in other words, whether insects are visible in the product or not. Unprocessed insects can evoke emotions that go beyond disgust, such as irritation, uneasiness, and strangeness. The consumers best accept insects that are processed, are least acceptive of products that are mixed, meaning that whole insects are invisible in familiar product (e.g., tortilla chips with crickets in between them), and standalone unprocessed insects rank somewhere in between (Gmuer et al., 2016, p. 124).

With these two factors, the companies can indirectly influence other significant factors as well. With direct information we can peak the curiosity of the potential customer, which is proven to be a significant factor during the first trial of insect-based products (House, 2016, p. 48). With an appropriate product design and incorporation into familiar foods, the producers can lower significant barriers such as disgust, food neophobia, and low taste expectations. However, these barriers cannot be lowered completely, and low taste expectations always persist when a familiar food is compared to the same food but with added insects (Tan, van den Berg, et al., 2016, p. 222).

There are, however, two significant factors that the companies cannot influence, which are familiarity and past experience. If an individual is already familiar with the concept of eating insects he is significantly more likely to try them (Hartmann et al., 2015, p. 155). Past experience does not relate just to previous experience with eating insects, but the perception of the insect species as such. For example, Thai people, despite being familiar with entomophagy

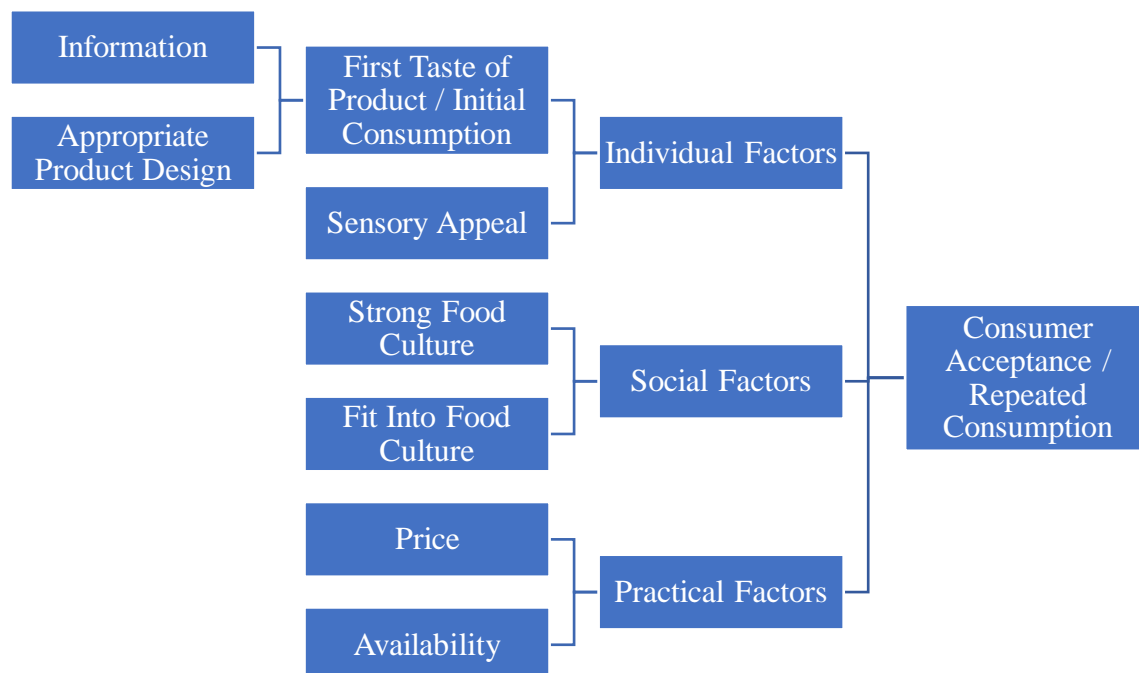
and having insects as part of their diet, refused to eat species they usually see in dead animals and decaying matter (Tan et al., 2015, p. 87).

None of these factors are sufficient to persuade a typical western person to try insects on their own. Most of these factors need to be in interplay, and it is best if all of them are. Appropriate product design is insufficient without other incentives (Tan, van den Berg, et al., 2016, p. 222), marketing based purely on social benefits information (e.g., environmental benefits) is unlikely to succeed (Verbeke, 2015, p. 154), and marketing campaigns based just on health benefits (e.g. nutritional benefits) are also unlikely succeed (Hartmann et al., 2015, p. 154).

3.2. Repeated Consumption

There is a clear disjunction between factors affecting initial consumption and factors affecting repeated consumption (House, 2016, p. 55). Often times research participants willing to try insects for the first time express no intention to eat them regularly (Tan, van den Berg, et al., 2016, p. 229). In the case of repeated consumption, literature recognizes three types of factors: individual, social, and practical factors.

Figure 4: Barriers to Repeated Consumption



Source: Own work

Individual factors are largely connected to factors influencing the initial consumption. However, as we can see from the table above, the initial consumption of insects is just one stepping stone in achieving consumer acceptance; meaning that other factors need to be taken into account when aiming for consumer acceptance. Additionally, in individual factors in

repeated consumption there is an additional factor, sensory appeal. This factor has an interesting contrast to what is established by research that is limited to only the initial consumption of insects. As stated above, such research suggests that the processing of insects and their incorporation into familiar foods is increasing the chances of consumption of insects. While that is proven to be true, research also proved that a familiar food with insects is always expected to taste worse than the same familiar food without insects (Tan, van den Berg, et al., 2016, p. 222). Consumers feel disappointed when trying these familiar products with insects, which reinforces their initial negativity and as a result, they have a very low motivation to become a returning customer. Thus, this familiar food with insects as an ingredient should perform on the same level as the familiar food (Tan, Fischer, et al., 2016, p. 300). Furthermore, if the companies have a mission of normalizing insects, are they really doing it by hiding insects in familiar food? House theorizes that a better way would be to find a loyal niche that consumes insects that are not hidden, and thus contribute to the normalization of insects in western society which would open the door to the general population (House, 2016, p. 57). Deroy also argues that insects should find their own place and be celebrated for what they are, not as a substitute for meat or hidden in a familiar food (Deroy et al., 2015, p. 50).

Food culture is a significant social factor for repeated consumption. For example, countries with a dynamic and fast-changing food culture, such as Denmark, are more likely to incorporate insects into their diet than countries with traditional and internationally acclaimed food cultures, such as Italy (Verneau et al., 2016, pp. 34–35). In Italy, young adults cited the incompatibility with the food culture as one of the most significant reasons for not accepting this novel food (Menozzi et al., 2017, p. 27).

When we talk about repeated consumption, practical factors, such as price and availability, become very significant factors (House, 2016, p. 47; Tan, van den Berg, et al., 2016, p. 230). In western countries insects are more expensive than any other meat, making them unaffordable for most potential consumers. Thus, producers should focus on supply-side innovations to avoid rejection based on price; mass production of insects could become a disruptive innovation (Shelomi, 2015, p. 316). After mass production is established, retailers need to be convinced to carry insect-based products to increase availability. Once these products become available in supermarkets, consumers will notice it, and likely start being familiar with the concept of entomophagy and start adopting these products in the general population. For this purpose, insects need to be marketed as insects, to increase visibility (Shelomi, 2015, p. 316).

Again, these factors do not work isolated but rather as an interplay of all of them. It is not sufficient to decrease the price if the availability does not follow. It is also not sufficient to have a low price and high availability if the carrier products are familiar foods that do not perform on the same level as the same food without insects. The process is gradual, and in strong food cultures might take even longer (La Barbera et al., 2018, p. 124).

3.3. Target group

Little research has been conducted to find a target group of customers that would be willing to adopt insects as food, most of the research is focused on the general population (House, 2016, p. 47). However, research was conducted to find out whether people are willing to adopt insects as a meat substitute. Hartmann and Siegrist found that men and frequent meat eaters are resistant to change (Hartmann & Siegrist, 2017, p. 22). Verbeke confirmed that frequent meat eaters will not consider including insects in their diet, however, he also found out that the most likely demography to include insects are young men, with weak attitudes towards meat, and who care about the environmental impact of their choices; he considers this group as early adopters of insects as food (Verbeke, 2015, p. 154). House also suggested that early adopters should be targeted first; however, he did not define the group of early adopters (House, 2016, p. 47). What remains uncertain is, if we manage to convince frequent meat eaters to include insects in their diet, whether they will reduce meat consumption or just eat more protein overall. On the other hand, if we target groups that do not consume meat, such as vegans and vegetarians, it is not researched whether the impact on the environment would not be worse at the end (Hartmann & Siegrist, 2017, p. 24). Finally, Hamerman suggested that people who frequently participate in outdoor activities have a low sensitivity to animal reminder disgust, something he found is key to adopting insects in the diet (Hamerman, 2016, p. 324).

4. Methodology

4.1. Research Design

I have chosen an inductive reasoning approach to this research, considering that the examined industry is new and little research has been conducted on this topic. Researchers following an inductive approach work from the bottom-up, using participants' opinions to build themes and generate an interconnecting theory to these themes (Creswell & Clark, 1998, p. 23). The distinction between qualitative and quantitative research is the most common one between types of research (Myers, 2013, p. 7). William Firestone divides the differences between qualitative and quantitative research into 4 main groups: assumptions about the world, purpose, approach, and researcher role. Quantitative research is rooted in the positivistic philosophy, which assumes that there is an objective reality independent of individual beliefs. Quantitative methods were developed to study natural phenomena and rely on objective measurement and analysis. Researchers using these methods usually attempt to reduce noise, error, and bias that potentially cloud the perception of facts, and try to remain detached in order to avoid bias. Qualitative research, on the other hand, is rooted in the phenomenological paradigm, which assumes that reality is a construct of individual or group perception. Methods in qualitative research were developed in order to study social and cultural phenomena. Researchers using these methods treat the noise as context and are usually immersed in the studied phenomenon (Firestone, 1987, pp. 16–17). This approach is useful in the development, construction, and refinement of theory and frameworks. It is invaluable in the early research stages as it broadens the vision of the researcher; therefore, it is good for exploratory research (Sofaer, 1999, p. 1104). As it moves from specific observations to broader theories, qualitative research makes use of inductive thinking and reasoning (Soiferman, 2010, p. 7).

4.2. Research Data Sources

Secondary data can be defined as “data collected earlier by other researchers or for other purposes than research” (Hox & Boeije, 2005, p. 596). Secondary research was conducted in the form of a comprehensive literature review which was composed out of an analysis of textbooks, peer-reviewed academic journal articles, available research data, and records of international organizations. The purpose of primary research is to “learn about something new that can be confirmed by others and to eliminate our own biases in the process” (Lowe & Zemliansky, 2010, p. 154). Primary research was conducted with companies that produce insect-based protein bars.

4.3. Methods of Data Collection

Given the nature of the research, I have chosen to conduct interviews as the method of primary data collection. Interviews can be defined as “ a qualitative research technique which involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation.” (Dudovsky, 2018, para. 1). With interviews, we can gain insight into opinions, experiences, beliefs and/or motivations of individual participants on a specific issue. Their usage is most appropriate when the knowledge about a phenomenon is very limited, or detailed insight is required from participants, just like with qualitative research itself (Gill, Stewart, Treasure, & Chadwick, 2008, p. 291). Formats in which interviews can be conducted are: structured, semi-structured and unstructured. Interviews can also be conducted with the use of various techniques, such as e-mail, telephone, and face-to-face interviews. For my research, I have chosen semi-structured interviews as this interview format consists of key questions to explore pre-defined areas and at the same time allows the interviewer to pursue responses and ideas in more detail (Gill et al., 2008, p. 1). The combination of guiding the interviewee and the flexibility to pursue responses is combination most useful for my research.

Interviews became a very popular data collection method due to their numerous advantages. The interviewer obtains more genuine answers as the interviewee cannot think about questions for a very long period of time. They can be recorded and, therefore, reviewed repeatedly. Furthermore, any misunderstanding or confusion resulting from the questions can be immediately resolved resulting in a higher percentage of completed questions and more accurate answers. Finally, the researcher can control the order in which question are being answered (Alshenqeeti, 2014, pp. 42–43). On the other hand, interviews have also disadvantages that the researcher needs to be aware of. Interviews can be time-consuming, and a transcription of a one-hour long interview can take up to 7 hours and can be up to 50 pages long. Responses of participants can change over time, therefore, interviews can suffer from subconscious bias and inconsistencies. Furthermore, the skill and experience of the researcher can heavily impact the quality of the interview (Alshenqeeti, 2014, pp. 41–43).

In order to overcome geographical distances between interviewed companies, I have chosen the telephone interview as the appropriate format. Telephone interviews enable me to reach people around the globe and also make it easier to get a hold of busy people, which company representatives usually are. On the other hand, telephone interviews reduce social clues as body language is completely missing. Researchers are also unaware of the environment the

participant is currently in, such as a busy office or street. Furthermore, international phone calls can be expensive, however, thanks to the internet these costs can be potentially eliminated (Opdenakker, 2006, pp. 4–5).

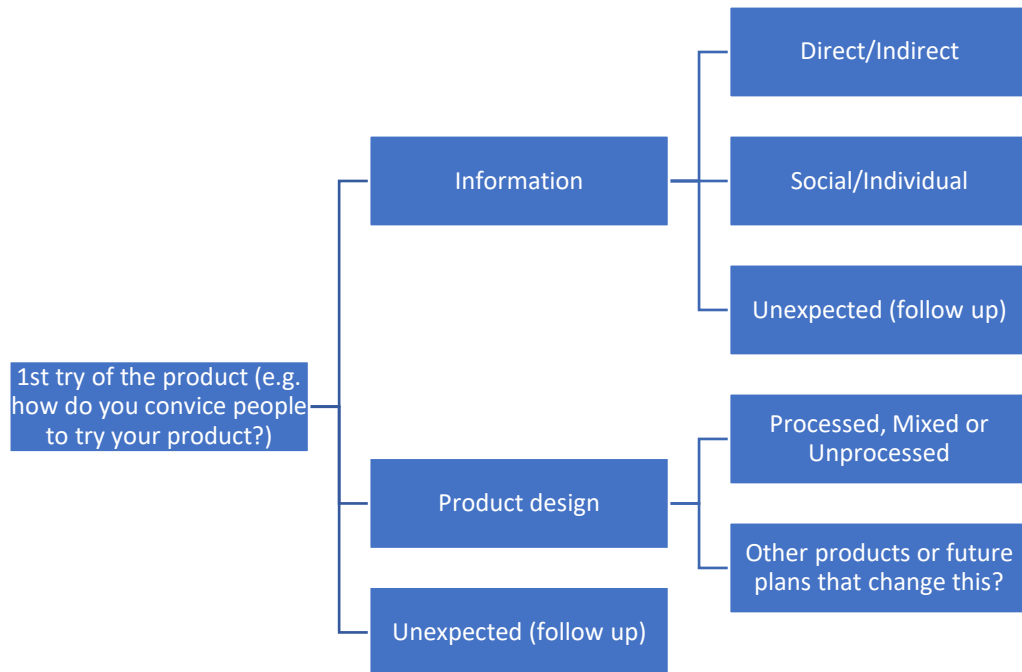
The danger of interviews lies therein that many researchers think they are easy as it is a normal way of communicating. There are several quality criteria for interviews commonly recommended as “best practices” (Roulston, 2010, p. 202). An interview is of good quality if it is self-explanatory, which means that it can be understood without any additional explanations. Furthermore, the longer the participants’ answers and the shorter the interviewer’s questions, the better. The participants’ answers should also be relevant, rich, specific and spontaneous. Finally, the interview should be already interpreted during the interview (Kvale, 1996, p. 145). In order to conduct an interview of higher quality, the interviewers should avoid asking leading questions, take notes during the interview and not just during the reviewing process, and conduct a pilot interview (Alshenqeeti, 2014, p. 6).

The sample size in qualitative research is commonly determined by saturation, which originates from the grounded theory. Saturation “is achieved when further empirical data add nothing more compared with previous data” (Malterud, 2012, p. 801). Although the saturation concept is widely accepted in qualitative research, there are inconsistencies in its use (Saunders et al., 2018, p. 1893) as saturation in research is often claimed without any explanation of how the concept is understood (Malterud, Siersma, & Guassora, 2016, p. 1). This study is an exploratory study, and as such it does not aim for a thorough and complete analysis and description of the studied phenomenon, thus, does not require too big of a sample size. An exploratory study is satisfied when it taps into “unknown territory by presenting cases that contribute to new understanding” (Malterud, 2012, p. 802). However, an exploratory cross-case analysis does require a higher number of participants than an in-depth analysis of one participant (Malterud et al., 2016, p. 4). I have identified 15 companies producing insect-based protein bars in the western world. 7 out of these 15 have been interviewed in this study, representing 47 percent of all the companies. As such, the sample size is deemed as adequate, although the small number of companies operating in this new industry can be considered a limitation.

The interviews as such are based on the framework elaborated in Chapter 3. Theoretical Background. As stated above, the interviews were semi-structured, therefore, they differ from each other. The interviews started off with some general questions about the vision of the company, biggest barriers and challenges they currently face, target markets (geographically speaking) and target groups (demographically speaking). Following these general questions,

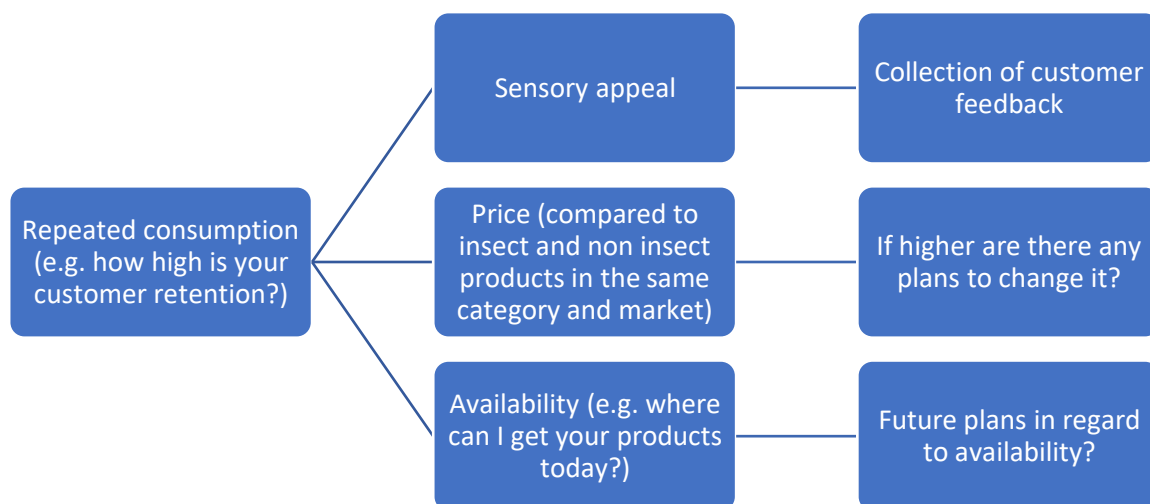
the interviews followed the general structure based on the theoretical framework developed in chapter 3, presented in the figures below.

Figure 5: Interview Structure 1



Source: Own work

Figure 6: Interview Structure 2



Source: Own work

4.4. Methods of Data Analysis

In the process of the interview, I resorted to an audio recording program on my phone, while the interviews as such were conducted on my computer or vice versa, whilst simultaneously taking handwritten notes in order to depict my observations. The interviews were coded and transcripts are provided in the Appendices Section of this thesis; the analysis is based on the notes taken during the interviews and the transcripts. Interviews are often analysed on themes that are recurring among participants. However, my semi-structured interviews were based on the established theoretical framework in Chapter 3, thus, most of the recurring themes are given by the framework. As a result, I have analysed the interviews for different perspectives of participants on these recurring themes, recurring but more specific sub-themes, and recurring themes that were not expected by theory.

4.5. Limitations

There are several limitations to this research. I, as the interviewer, have little experience in conducting telephone interviews; therefore, the quality of the interviews can vary. Furthermore, the interviewees of the companies were from different positions inside the company, and their qualification to answer various questions can be inconsistent. The recording of the interviews was of low quality due to the low quality of recording equipment, and in several cases, there was background noise which can result in missed information. Additionally, as anonymity was optional and chosen by only one participating company, answers might be biased.

4.6. Ethical Considerations

All of the companies were informed about the nature of the research, asked if the interview can be recorded, informed that the results will be shared with participants and gave their consent to these factors. Furthermore, the companies were given the opportunity of anonymity in the research, which only one company took.

5. Results

For the purpose of this research seven companies were interviewed. Representatives of six companies were interviewed over the phone, whereas, one company was reached out to via the e-mail given their limited time availability. Furthermore, one of the seven companies wished to remain anonymous, therefore, it is referred to as an “Anonymous Company” and any information that could indicate the identity of this company was erased from the transcript in the corresponding Appendix except for its North American origin; the other companies are referred to by their name and the transcripts were not altered in any way. Three of the interviewed companies are based in North America, the remaining four companies are from different countries in Europe. In this section, I will summarize my most important findings in regards to each company. Any quotation mentioned in this section can be found in the corresponding transcripts in the Appendix section.

5.1. Exo

Exo is a company based in the United States of America and it is one of the very first movers in the industry, originally being formed in the year 2013. Their products include bars and protein bites with cricket flour. Exo is owned by the Aspire Food Group which develops insect farming technology and automation. Their vision is to “address food insecurity and food sustainability through the development of methods for farming and technology for farming insects in a friendly and scalable manner”. The biggest challenges they are currently facing in fulfilling this vision are twofold. On the one hand, it is the development of a robust understanding of the biology of insects to be able to create the best environment for raising them in a cost-effective and scalable way. They made big progress and the survival rate of their crickets “grew drastically”, however, they admit that there is still plenty of room for improvement. On the other hand, it is the psychological barrier to entry, meaning that consumers do not yet understand or accept insect protein as a viable and beneficial source. They admit that part of the barrier comes from the fact that it is insects, but many people also do not understand the great importance of the beneficial environmental impact, as they are sheltered from the environmental impact of conventional farming practices.

The approach to overcome the psychological barriers is again twofold. First, it is a “social proof” approach where you try to normalize it in the minds of consumers. Part of it is education (e.g., comparing cricket protein to other conventional sources in terms of feed, land, water used and CO2 emissions created), rationalization through explaining the benefits, and trying to point out the difference between farmed insects and insects you “find in the wild”. They believe that

people are emotional and, therefore, you need to provide this social proof, that other people consider insect-eating as normal. They are aiming to find early adopters who serve as social proof to people further down the “early adoption spectrum”. Secondly, they must also provide products that are attractive because of components other than environmental, such as nutritional values and taste. They want to get people excited about their new products. As for the development of the product, they took a trial and error approach, developing a product to see what their customers liked and they built on that; however, they do not just want to cater to existing customers but also create products that are a little bit different to attract new customers.

Originally, Exo started with insects completely processed into a powder and the insects were communicated on the packaging in a very subtle way. However, they realized it is their differentiating factor and their value proposition, so they made the crickets on the packaging more visible in order to “draw attention and to differentiate themselves from everything else on the shelf”. They claim that the picture of the cricket is sufficient to draw attention, possibly, together with the growing popularity of the concept of eating insects. Exo also expressed the desire to move beyond cricket powder to whole insects, no matter the form, because it would show that the insect is not “just another ingredient added to other products similar to whey” but that there are more applications to the product.

From a price perspective, the products of Exo are slightly more expensive compared to non-insect products because of two major factors. Firstly, Exo is a smaller company; therefore, they have higher operating costs due to small volumes. Secondly, cricket flour is a relatively expensive ingredient. Despite the massive improvements in coming down the cost curve, it is still a work in progress and a relatively large component of the cost. While they perceive the slightly higher price as not ideal, they see certain benefits in having a higher price, for example, it makes people realize that it is a quality and premium ingredient. If the price would be too low people might think that the protein is a low-quality ingredient. However, they admit the higher price is not sustainable forever and is really a result of where the market and the industry is right now. From the perspective of availability, their strategy is mostly online based through their own website and online retailers, but they are available also in small brick and mortar shops, gyms, etc. While they are moving towards big retailers, they state that there are a lot of barriers in getting there in the US. They are working mostly on the US market, with limited availability in Europe and will possibly expand to the east in the future.

5.2. Swarm Protein

Swarm Protein is a company based in Germany, originally formed in 2015. Their products are bars containing cricket flour. Their vision is to “provide healthy, ecological and socially sustainable food, and in particular, by focusing on unconventional protein sources, specifically insects”. The biggest barriers and challenges they are currently facing are legal barriers and consumer perspective. Legal barriers, specifically for importing insects, arise from the lack of a unified European framework. Therefore, every member state can decide on its own, which results in confusion as countries, and therefore companies, do not know what certificates are accepted on a regular basis. Regarding the consumer perspective, they are trying to get away from being perceived as a “gimmick” or a fun item that people buy once and become a “staple”, but that is hard and you have to be useful to the consumer while having a good price.

Swarm is targeting mostly the DACH region (Germany, Austria, and Switzerland) and have their eyes set on the Scandinavian market as well. They focus on males as they are more open to new things, and athletes, as they are open to innovation and due to their demand for functional nutrition they listen to nutritional arguments.

They claim that there is no real need to convince customers to try their product for the first time thanks to the branding. The logo of Swarm is an insect, which is big and present on all packaging, marketing materials, even big posters used on fairs; that draws the attention of people and makes them try the products. Only after people are convinced to try the product the company tries to offer a lot of information. They start with hedonistic information, meaning everything revolving around the individual, such as nutritional profile, protein, micronutrients, vitamins, and so on. In the second phase, they go into a broader perspective of sustainability, for example, lower land, water, and feed consumption and the lower emissions of CO₂ compared to livestock.

For the time being, Swarm would like to stay focused on bars, however, in the future, they would like to develop with sport food categories, for example with protein powders. They are very customer oriented during product development, their bars were developed in cooperation with a German Sports University to see what appeals to athletes, and collect a lot of customer feedback during tastings which they later evaluate in the team.

From a price perspective, the products of Swarm have a premium price, due to the fact, that edible insects in a food grade quality are expensive. However, they use the higher price also as a positioning strategy to show that insects are not a cheap substitute but a quality ingredient. Furthermore, Swarm stated that as the market develops and they will go mainstream, a

reduction in prices will follow which will hopefully be achieved by scaling up. As for availability, they are currently in the process of rebuilding their website and in talks with big retailers, as their recent awards attracted the attention of retailers.

5.3. Jimini's

Jimini's is a company based in France, and is one of the very first movers in the industry, originally being formed at the end of 2012. They have a wide range of products including bars, whole insects, granolas and more. The objective of Jimini's is "to change minds about insects in Europe" and to show people that "insects are edible, tasty, delicious, nutritious, and environmentally friendly". In order to fulfil this objective, the company started with a range of five whole-insect products, such as whole grasshoppers, whole crickets, and whole mealworms. They admit it was a difficult choice and it involved a huge amount of work around educating and reassuring people and even using humour to dedramatize the eating of insects and get more people to do it. However, they believe that this is the only way to fulfil their objective; they first needed to show people that whole insects are edible and tasty and only then people would be ready to incorporate insects into their daily diets. Whereas, on the contrary, while acknowledging that it is easier to sell products without visible insects (e.g., protein bars with cricket flour), such approach would not be in line with their objective as consumption of these products does not mean that the consumers will be ready to eat whole insects in the near future. In line with the path they chose to fulfil their objective, they started with a range of five whole insect products and worked on enlarging this range of products into more than fifteen flavours together with whole insects without a flavour that can be added to traditional meals (e.g., into a risotto). Now, they are "slowly but more and more" expanding into cricket flour products: first, it was energy bars, then insect pasta and the latest product launched was granolas. In the near future, they would like to give texture to insect protein to create an alternative to burgers and meat. They hope to achieve acceptance to such a level, that people, in a few years, will be able to eat fresh insects (not alive, but still fresh). The biggest barriers and challenges they are currently facing in achieving this objective is culture and legislation in Europe.

From a price perspective, their energy bars are comparable in price to the same non-insect products in France, and the granolas are a little bit more expensive, however, still comparable to tasty and organic non-insect granola on the market. Their pasta with insect flour is "way more expensive", however, they point out that you do not need to buy any meat with this pasta as all the protein required is already present in the pasta. As for availability, they have more than 800 stockists in Europe, mainly in France, Spain, UK, and Belgium are also present in

Germany and Finland. In most of the cases their products are carried by small shops and organic stores, however, in some countries, even retailers carry their products.

5.4. Instinct

Instinct is a recently formed company based in Germany. Their products include bio insect bars that are rich in protein. Their vision is to “make organic snacks with insects and become the leading company, or one of the leading companies, in the market of insect food in Europe”. The biggest barriers and challenges they are currently facing in fulfilling this vision are the legal construct and the psychology, as many people never tried insects before and it is hard for people to imagine how they would taste. The legal construct is the bigger of the barriers as it is very hard to overcome legal constrictions and nobody really knows yet how insects as food need to be handled. They are not too focused on a single target group yet as they are still in the process of figuring it out. The company has tried to target people who are interested in health issues, care about the environmental impact of their food choices, even sportsmen, however, this niche seems to be too small.

In their branding, as a result of their research on packaging design, they use a graphical depiction of a cricket on the packaging and report that on fairs, conferences, and different tasting events most people (80-90 percent) are willing to try the product, without much need to convince them. However, the company does provide information about the health benefits, such as the protein source, amino acids, micronutrition, vitamins, omega three and six fatty acids and so on, as well as about the environmental aspects, such as fewer resources needed to produce the insects. They stated that people are more interested in the nutritional aspects. For the future, Instinct would like to stick to the protein powder as it is “a much lower barrier to sell than whole insects” and would want to develop its range around the dry category and snacks.

From a price perspective, their bars are in the higher part of the market. However, they do not want to compete with cheap protein bars with, for example, whey, because they are of lower quality and people who buy these bars are not interested in other components Instinct delivers in their bars apart from protein. As for availability, they are currently available on their website and in bio shops in Germany. In the future they would like to be carried by big retailers, however, their volumes are not big enough yet.

5.5. Anonymous Company

The vision of this company is to “make insect-eating normal in North America”. The largest barriers and challenges they are currently facing in fulfilling this vision are the cultural

stereotypes of people. Cultural barriers stem from people viewing insects as pests since they were always viewed as detrimental to crops in North America and there is also no experience of insects as a form of food in North America. Furthermore, people perceive insects as gross and there is an ick-factor associated with them. Another large barrier, from a production standpoint, is that this company had problems finding a production facility that was not kosher certified, and as such would treat the insect bar or any other insect protein as these are not kosher certified, or on the way to be certified. Furthermore, despite the fact that crickets are generally regarded as safe legislatively, other edible insects with plenty of nutritional merit are not.

Their goal is “getting them (the customer) to take that first bite” and everything is directed towards that, because they found out that after that first bit the ick-factor disappears. They use different “emotional, intellectual, and kind of building credibility” arguments to get people to try the first bite. Intellectually it is information about sustainability and environmental friendliness and also nutritional properties, such as high amounts of protein, iron, the amino acid profile, magnesium, vitamin B12 and so on. As for branding, this company believes that a new product needs to look appealing and delicious for people to try. The company is not including insects in any product photography, they only show familiar ingredients; they did everything possible to camouflage or offset the cricket taste and get people to take the first bite. Furthermore, in their branding, the Anonymous Company does not indicate the presence of insects in any graphical way, the logo and the name also do not give away the presence of insects in any way. They are not trying to stand apart by being weird, but instead to present and treat the cricket protein as a viable ingredient.

In the future, they do not plan to change this subtle approach. They admit that since they started the company public awareness increased, however, they claim that the industry is in a bubble believing that by now the majority of the population knows about insects as a protein source while the opposite is true. However, they are definitely not ruling this approach out in the future, when awareness grows. Despite this subtle approach, they do not compare themselves in any kind of customer research to non-insect protein bars.

From a price perspective, the company has a product in the premium, high-end market. Their branding and product reflect that and additionally, they state that cricket protein is much more expensive to produce than, for example, whey. They intend to stay in the high-end market but will be lowering the prices as they scale and their production processes become more efficient.

As for availability, they are available on their website, online retailers in North America and in a number of physical stores.

5.6. SENS

SENS is a company based in the Czech Republic. Their products include energy and protein bars, both including cricket flour. Their vision is to “teach Europeans to eat insects”. The biggest challenges they are currently facing are building distribution and finding the right people to build it. They target specific countries in Europe, but all of Europe is interesting to them. From a people perspective, they wish to target environmentalists, people who appreciate quality products and know what to eat. Their approach is a lot about education and PR, stating that you need to explain everything to them about cricket flour, PR, being famous and seen, and it is a lot about sampling. After this, the product needs to look and taste good, and if all this is good, then the approach works.

In the future, they intend to stick to cricket flour only. As for their branding, the name does not indicate the presence of crickets, neither does the packaging on the first sight, however, they are considering changing this approach and making the cricket on the packaging more visible. They also collect customer feedback to their bars, which they are not afraid to incorporate into the recipe or future communication.

From a price perspective, compared to common bars their price is higher, however, compared to high-end bars it is comparable. They are working on process optimization but believe the price is right as “it is simply a quality bar even without crickets... and the customers respect that (the price)”, therefore, they intend to stay in the high-end market. As for availability, they are working on expanding distribution and are available both on their website but also offline. They plan to be available in big retail stores as well.

5.7. Näak

Näak is company based in Canada, originally formed in 2016. Their products include energy bars and protein powders including cricket flour. As there is still much work to be done in raising awareness and acceptance of entomophagy in the western world, meat consumption drops and healthy lifestyles are becoming the norm, people are entering a new stage where they will be much more careful about their diet. Edible insects are a new, complete source of protein which can be easily integrated into recipes. Näak has stated that tier vision is to “be an actor in this trend a become a leader of the industry”. The biggest challenge and barrier they are currently facing is to find cricket powder that is of good quality and not too expensive. There is a low number of farms in North America and not many certifications. They target Canadians,

who care about the health aspect and environmental impact of their food choices and are sporty or active.

As for the branding, Nääk uses a cricket logo on their packaging together with the catchphrase “cricket protein”. Their approach is based on sampling at endurance sports events and health fairs, giving information, and activity on social media. They want to get away from being perceived as a fun item and rather focus on the benefits of crickets for our health and for the planet. Customers are giving them good feedback as far as sensory performance goes, the company has successfully incorporated the insect flour in a way that it does not affect texture and consistency.

From a price perspective, the price is in the high-end market, with plans to reduce it once cricket powder becomes cheaper. As for availability, they are available in their online store, and in over 500 selling points across Canada, such as healthy grocery stores, sports shops, Amazon which allows for shipment in the US, and big supermarket chains.

6. Discussion

6.1. Initial Consumption

6.1.1. Appropriate Product Design

Primary research on the different approaches companies have taken towards making consumers try their products for the first time was very insightful. With regards to appropriate product design, all of the companies use completely processed insects as an ingredient in their bars and while the other ingredients, flavours, and amount of cricket powder used differ, from the theoretical perspective all of the companies have the same product design. However, where the differences in the strategies of the companies become visible is in the branding and future plans, something that the reviewed literature failed to address. Consider the company Exo, the oldest out of all the interviewed companies that started with cricket flour-based products. At first, they started with a very subtle way of communicating insects on their packaging, however, later they realized that crickets are their differentiating factor and included them on the packaging. SENS also started without visible crickets on their packaging and still did not change their approach, however, they are considering it. The only interviewed company that started without a clear communication of insects on their packaging and is not considering to change this approach is the Anonymous Company. The remaining four companies used clear and visible graphical depictions of insects on their initial packaging. Swarm's logo is an insect, and they display it not only on the packaging but also on big posters on events and all marketing materials. Näak has a cricket logo on the packaging, together with a catchphrase "cricket protein". Instinct, in turn, conducted research prior to designing their packaging, reaching the conclusion that people want to see them, therefore, they put a big graphical depiction of a cricket staring at the consumer on the packaging. Jimini's also started with crickets on their packaging, although, this is a special case since the company itself started with whole insects before expanding into insect powder products, therefore, their customers were already ready for this idea and the company always wanted to visibly push insects.

Interestingly, most of the companies that use crickets on their packaging reported that this communication is sufficient on its own to get people to try the product for the first time. Exo stated that that approach alone is sufficient to draw attention, Swarm reported that they do not need to convince people to try their product as their logo in the shape of an insect does it for them, and Instinct stated that, to their surprise, 80 to 90 percent of people are willing to try the product without much need to be convinced. Contrary to this, the Anonymous Company, one of the two companies that are not using insects in their branding, named the cultural barrier, or

more specifically, disgust or ick-factor as the first and biggest barrier. Some of the companies using crickets in their branding stated a psychological barrier as well, however, to a much lesser degree. These companies were Instinct and Jimini's, although Jimini's has primarily whole insect products so the reasoning for this barrier can be found there. Perhaps including the insects on the packaging encourages potential consumers to try the product in a much more effective way. There is, however, a downside to this approach - two companies that use insects throughout their branding strategies, Nääk and Swarm stated that they are trying to get away from being perceived as a "gimmick" or a "fun item". Therefore, putting insects on the packaging seems to be a trade-off between the ease of getting consumers to try your product and fighting against the perception of being a fun item.

6.1.2. Information

As for information about insects, all interviewed companies showed deep knowledge about the benefits of insects and also stated that they are providing this direct information to their consumers. Exo stated that one of the biggest barriers and challenges is that consumers do not understand the great importance of the beneficial environmental impact as they are sheltered from the environmental impact of conventional farming practices, therefore, educating needs to be carried out around that. Swarm reported that after their logo attracts the customer, they supply them with a lot of information, first about individual benefits, such as the nutritional profile, protein, micronutrients, vitamins and so on. After they provide the individual information they go into the broader perspective of sustainability, such as lower land, water, and feed consumption and lower CO₂ emissions as compared to livestock. Instinct as well provides both types of information, about individual health benefits and environmental aspects, however, they stated that more people are interested in nutritional aspects. The Anonymous Company and Nääk also provide both vital types of information to the consumers, and SENS states that education is one of the most important aspects of acquiring customers.

Information-wise, the companies are providing vital direct information in order to persuade potential customers to try the products. The only notable difference, compared to the literature review, is the fact that Instinct reported that people are more interested in nutritional aspects, and Swarm stated that they provide the information about individual benefits before the information about sustainability aspects. On the contrary, Verneau found in his research that information about social benefits is more stable over time in the minds of consumers as compared to information about individual benefits (Verneau et al., 2016, p. 34). Perhaps, despite the initial interest about individual benefits, as reported by companies, the effect of

information about environmental benefits, as reported by literature, does linger longer in the minds of the consumers, therefore, companies should continue to put the same emphasis on both types of information. None of the companies reported a use of indirect informational campaigns as described by Hamerman, for example, commercials where people are cooking insect next to a campfire (Hamerman, 2016, p. 324).

6.1.3. Interplay of Factors

As stated in Chapter 3. Theoretical Conceptualization these factors need to work in unison (Hartmann et al., 2015, p. 154; Tan, van den Berg, et al., 2016, p. 222; Verbeke, 2015, p. 154). All of the interviewed companies use both vital types of direct information and all of them have, in terms of bars, what literature considers a product design which lowers negative emotion the most (Gmuer et al., 2016, p. 124). However, two patterns seem to have developed on how these two factors can work together. It appears, that companies that do not use visible graphical depictions of insects on their products, may have a harder time convincing potential consumers to try their products, therefore, they need to rely more on information provided to these potential consumers beforehand. On the other hand, companies that use graphical depictions of insects in their branding, seem to have an easy time convincing potential customers to try their products, but then use the information to get away from being perceived as a fun item. They seem to provide this information after the consumer has tasted the product. Without actual sales and customer retention numbers of companies it is hard to tell which one of these approaches is more effective, but, companies should be aware of the different functions of information, given their branding choices. Probably the most difficult battle was fought by Jimini's, who started out with whole insects, which, in terms of appropriate product design, ranks below cricket flour-based products.

6.2. Consumer Acceptance

6.2.1. Individual Factors

Individual factors consist of the initial consumption or willingness to try, examined in the previous section, and the sensory appeal. Sensory appeal is a very important factor, especially for companies that use insect powder in familiar foods, as customers always expect them to taste worse (Tan, van den Berg, et al., 2016, p. 222), therefore, the familiar food with insects as an ingredient should perform on at least the same level (Tan, Fischer, et al., 2016, p. 300). Exo initially developed bars in cooperation with a famous British chef to see what people want and built on that. While they adjust to their customers, they also do not want to cater to just existing customers but want to develop products that get more people excited and attract new customers.

Swarm, on the other hand, developed their products with a very customer-oriented approach. They cooperated with a big German sports university to see what their target group wants, collect all customer feedback, generate internal feedback and evaluate all of that in the team. Jimini's stated that people like their insect powder-based products and that it is easier to sell them compared to whole insects. However, they show great awareness of this factor, as they are currently working with experts on texturizing insect protein to be used as a substitute to burgers. The Anonymous Company and Näak are getting positive feedback, stating that they incorporated the cricket flour in such a way that it does not change neither the taste nor the consistency of the other ingredients. SENS is collecting feedback and reported that they have implemented a change in the recipe based on this. Furthermore, Instinct also collected positive feedback, however, they currently lack an extensive feedback from the market.

The most important finding is that all of the interviewed companies show great awareness of the sensory appeal factor. As this is a new industry offering a new category of products, it is probably impossible to get the products right on the first try. Therefore, the fact that the companies are willing to change their recipes according to customer feedback, work with experts on improving their product, or even better, in the case of Swarm and Jimini's, already develop their products with their future customers is a very positive sign for the industry as a whole.

6.2.2. Social Factors

Social factors, strong food culture and fit into the food culture, are almost not researched at all. Verneau compared Italy and Denmark and came to the conclusion that in the former, the process of acceptance will be harder as there is a strong food culture and insects do not fit into it (Verneau et al., 2016, p. 35). However, the question of which countries have a strong culture into which insects fit is a factor that is, to the best of my knowledge, not researched at all. The only interviewed companies that reported culture as one of their main barriers are Jimini's from France, the Anonymous Company from North America and Instinct from Germany, however, to a much lesser degree than the other barrier, legislation. Jimini's, however, started with whole insects, therefore, the cultural barrier might be experienced more strongly. The Anonymous Company, as examined in the previous sections, is not using insects in their branding which might be part of the reason why they experience this barrier in a stronger way than the other companies. Additionally, the Anonymous Company also reported that many food production companies in North America are kosher certified, which insects are not, and therefore, refuse to handle insect-based products.

Overall, we cannot dismiss the role of food culture and the fit of insects into this culture since it was proven by Verneau. However, in this research no clear pattern emerged that could support these findings despite the international nature of the research. Therefore, companies should take this factor into account when choosing their target markets, but, it does not seem to be strongly experienced by them. Perhaps future research should be examining not just food culture, but cultural aspects prohibiting the handling and consumption of insects, such as the kosher issue brought up by the Anonymous Company.

6.2.3. Practical Factors

From the perspective of availability, there are big differences in scale between the companies. All of the companies are available in their online stores, and they are aiming for small stores and shops, such as healthy shops, gyms, sports shops and other physical selling points. Most of them are also available in big online stores, such as Amazon, are aiming to be carried by retailers, or already are carried by retailers in a few countries. The differences can be, in my opinion, attributed to the period of time the company is in the industry since the oldest companies reported the highest number of selling points, and on the contrary the youngest companies reported the fewest. Exo reported that there are big barriers in achieving availability with big retailers in the US, and SENS was the only company that stated distribution as their biggest barrier and challenge they are currently facing. Overall, availability seems to be on a good track in the industry, with companies expanding, which is logical given the desire for growth of business.

From a price perspective, all of the interviewed companies with the exception of Jimini's reported that their products have higher prices than non-insect products in the same category. Swarm admits that they have a higher price since edible insects in a food grade quality are expensive and plan on reducing the price as they become more mainstream and scale up, although, for now, they use the higher price for positioning and showing that insect powder is a quality ingredient. The Anonymous Company is also in the higher end of the market, which is reflected in the product properties and branding, and they plan to reduce the price as they scale up and develop more efficient processes. SENS and Näak both reported higher prices as well, with the former believing that the price is adequate and that there is no reason to change it despite improvement in process efficiency, and the latter stating that they will reduce the price once cricket powder becomes less expensive. Furthermore, Instinct is in the higher end of the market and claims that they are not interested in competing with cheaper bars as the people who buy them are not interested in the other properties the Instinct bar delivers.

When a company wants to achieve a high number of returning customers and consumer acceptance, practical factors, such as price, become more important to consumers (House, 2016, p. 47; Tan, van den Berg, et al., 2016, p. 230). From the information obtained during the interviews, the companies mentioned above seem to be quite comfortable being more expensive and in the high-end market, with the only plans to reduce the price in the future being gaining economies of scale or waiting until the expensive insect powder becomes cheaper. On the contrary, Exo took quite a proactive approach to price reduction. This is reflected in the reported biggest challenge, which is to gain a robust understanding of the biology of insects in order to create the best environment for raising them in a cost-effective and scalable way, and reported massive progress in reducing costs. Although they want to keep a slightly higher price for positioning purposes, they are well prepared for decreasing the price in the future. Meanwhile, Jimini's already reported a comparable price with their bars to non-insect products in the same category and market.

The interviewed companies are producers of bars and not producers of insect powder, therefore, their high cost comes partly from the expensive cricket powder. However, Exo and Jimini's stood out in terms of the price factor due to their proactive approach and results. Perhaps it is a sign of higher maturity of the companies, as they are among the oldest interviewed, but the other companies might look into their future plans regarding price reductions again, as it is an important factor not only in achieving consumer acceptance of insects, but also in the survival of their products as competition will intensify in the future.

6.3. Target Groups

Exo took a social proof approach in overcoming psychological barriers. As a result, they are trying to find and target early adopters who will show other people, who are further down the early adoption spectrum, that eating insects is normal. This approach is very much in line with what House suggested (House, 2016, p. 47). Swarm is targeting males as they are open to new things. Furthermore, together with Instinct, they target sportsmen, as they are interested in the function of nutrition and are open to innovation, however, Instinct found this target group too small. Additionally, Instinct targets people who care about the health and environmental impact of their food choices, much like SENS. None of the companies expressed the desire to be a substitute to meat, or to target meat eaters specifically, as literature often suggested the role of insects will be. The only exception was Jimini's, who shared that they are working on texturizing insect protein which could serve in the future as a substitute for meat.

6.4. Unexpected Barriers

Some of the interviewed companies stated barriers which were not anticipated in the literature review. Exo reported the barrier of developing a robust understanding of the biology of insects in order to farm them in a more efficient manner. Considering that Exo is also working on the supply side of cricket powder, this could be seen as a sub-factor to the Price Factor. Instinct, Swarm, and Jimini's, three out of four interviewed European companies, stated that one of their biggest barriers is legislative. This indicates, that despite the new European legislation there is still much uncertainty and confusion in Europe, especially regarding the handling of insect powder imports. The Anonymous Company based in North America brought up a new sub-factor to the social factors with their kosher issue, and that is cultural specifics that prohibit the handling or consumption of insects. Näak, a Canadian company, stated that there is a low amount of farms and certifications in North America, bringing up supply-side barriers, which could be seen as a sub-factor to price as well.

6.5. Visions and Normalization

The last point I would like to discuss in relation to this research, are the companies who stated in their vision that they want to normalize insect-eating in the western world. In the industry of bars with insect powders, the companies are making the insects invisible in the product, and in some cases, even in branding. But, as House stated, are we really normalizing insects if we are hiding them in other foods (House, 2016, p. 57)? Perhaps, insects should be celebrated for what they are and not be hidden away in a familiar food (Deroy et al., 2015, p. 50). Only one identified research concluded that people who are eating processed insects are more willing to eat unprocessed insects (Hartmann & Siegrist, 2016, p. 120). The company that clearly stands out in this regard is Jimini's. In pursuit of their objective "to change minds about insects in Europe" they took the bold step to start with whole insects, despite being aware that it is an uphill battle. According to their opinion, they first needed to show people that insects are edible and tasty, and only then they could start incorporating them into the diet of people in the form of flour. Most researchers come to an agreement in the view of this approach. Perhaps, another working approach might be to subtly incorporate the insects into the diet, and then create products with whole insects and include them in branding. However, not all of the companies that stated their vision as the normalization of insect-eating have such plans. Maybe, they should consider this aspect when deciding about the future.

7. Conclusion

Entomophagy, or the eating of insects, is a concept unused in the western world. However, it can be promoted for three main reasons: impact on the environment, impact on health and impact on livelihoods. The objective of this thesis is twofold. First, we need to understand the consumers and the barriers that prevent them from trying insects for the first time and becoming a returning customer. Second, to examine whether companies are aware of these barriers and how they are overcoming them. The first objective was reached through secondary research in the form of an extensive literature review, whereas the second objective was achieved through primary research, the major instrument being a semi-structured telephone interview. In the course of this research 7 companies were interviewed, 4 in Europe and 3 in North America. During the semi-structured interview topics, which were given by the theoretical conceptualization based on the literature review, were explored. Interviews were recorded, coded, and I have taken notes during them. The interviews were analysed based on the different views of companies on the recurring themes, recurring but more specific sub-themes, and unexpected themes. The results were presented in the form of a summary of the most important points for each company.

After the literature review, it was determined that in order to reach consumer acceptance a company needs to address individual, social, and practical factors. The practical factors being availability and price, social factors being a strong food culture and the fit into this food culture, and individual factors consisting of sensory appeal and the initial consumption. Subfactors of initial consumption are information provided to the consumer and appropriate product design. The companies have shown different strategies on how to get consumers to try the product for the first time. Some of the companies with insects included in their branding had little trouble in attracting attention and the first-time customer, however, they were fighting the perception of being a fun item. Other companies did not include insects in their branding and reported trouble in convincing customers to try them for the first time. However, both strategies apparently work. All of the companies communicate the most important information to people. In sensory appeal, all companies showed awareness of this issue, and willingness to change in order to suit the customer feedback. Social factors did not emerge during the interviews in any significant way. In the practical factors, all companies are working on increasing availability, however, the same cannot be said for the price reduction. A few of the companies were much more proactive in this regard, giving them an edge based on previous research. Furthermore, some unexpected barriers emerged during the interviews; in Europe, it was most notably

legislation. Additionally, some companies showed a discrepancy between their strategy and their vision of normalizing insect-eating in the western world.

8. Recommendations for Future Research

This thesis, given its exploratory nature, leads to several recommendations for future research exploring barriers pertinent to entomophagy in the western world and how to overcome them:

1. It is important to research, whether solely including insects in the form of powder in carrier foods can increase the consumer acceptance and how branding influences this effect
2. Research about best practices in farming insects is required, to increase efficiency and reduce costs.
3. Research on which western countries have a food culture into which insects might fit.
4. Research about the cultural aspects of western countries that can prevent the handling and consumption of insects, such as the kosher issue.
5. Research that would define the most suitable early adopters group to target for companies producing insects.

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Appendices

Appendix 1. Exo Transcript

Interviewer: What is the vision of your company?

Interviewee: So, broadly speaking, it is to basically, address food insecurity and food sustainability through the development of methods for farming and technology for farming insects, at a host, friendly, and kind of scalable manner.

Interviewer: What are the biggest barriers and challenges you currently face in fulfilling your vision?

Interviewee: I'd say on the one hand it's the development of kind of a robust understanding of the biology of the insects, to be able to kind of create the best environment for raising them in a cost-effective and a scalable way, we've made very positive steps to gathering that information, the difference from the company a couple of years ago we expect the cost of raising them as well as survival rate, it grew drastically, but it's only have been a few years, so there's plenty of room still to be covered. So that's one aspect, the second would be in regards to the, I guess, psychological barrier to entry, for a lot of consumers understanding or accepting that, you know, insect protein as a viable and beneficial source. On the one hand some people just have a bit of a psychological barrier because it is insects, and on the other hand for some people who don't, they don't necessarily haven't fully internalized the value proposition of the fact that finding an alternative source of protein is a lot more environmentally friendly is important, just because the environmental impact of some recurring farming practices that are used. Some people may have a general idea about the impact, it's not as obvious, some people are kind of sheltered from that impact, it becomes a little bit less of a critical issue.

Interviewer: What are your target markets? I would presume it's North America, but do you plan to go to Europe at some point or what are your plans?

Interviewee: Yeah, absolutely. I guess, for us specifically, at the core we are a farming company, so generally we generate the cricket protein powder, which we sell to other companies to put into their products, but at the moment we're also seeking to be involved in building up the Exo protein brand, so that we have customer facing product as well, so on the Exo protein front we're mostly focused on the United States at the moment just because of the scale on the operational facilities that we have but we are very open to expand internationally to the East, Oceania as well, Europe as well, but that's a bit of a slower process, We're still trying to pay back, to dig our heels into the US, and then with regards to the powder side it is

again still a bit more focused on the US but that is something that we expect to grow substantially in international markets.

Interviewer: Ok, thank you. You mentioned also psychological barriers, so how do you do it, how do you convince people who never ate insects before to try your product?

Interviewee: So there is a number of, I guess, approaches you can take, but part of it is, I guess in very broad strokes, it is a bit of a social proof approach, where you try to normalize it in people's minds, so part of it is educating, to make them understand that, you know, it not actually as weird as you think, that there are a lot of benefits there, and you know, the fact that you are getting insects from a farmed source and not finding something in the wild is substantially different. So, aligned with this psychological predisposition that you have towards wild insects is not necessarily fair to apply to farmed insects. So, a component is that kind of rationalisation or arguments that you have to provide to people. Another component is really just kind of convincing them of the environmental impact and not only why crickets are better but why the current farming practises are negative and try to convince them that it is something that will become necessary or is already necessary. I mean, part of it is kind of an emotional side, no matter how much arguments you provide to people, people are emotional, so you have to kind of provide that social proof, show them that there is plenty of people that do think it is normal, that kind of slowly breaks down the barriers that they have, so part of that involves targeting individuals who are a bit more adventurous, a bit more open minded, try to think early adopters if you will, so if you can kind of target those people first, they serve as a social proof to the people further down the early adoption spectrum.

Interviewer: Ok, thank you. And to these early adopters, who probably also never ate insects, what kind of information do you convey to them to persuade them to become like customers of yours and to contribute to the normalization?

Interviewee: So like I said, a portion of that would be just the education, so for example, comparing cricket protein, or insect protein in general, to something like beef protein, what is the difference with respect to the environmental impact from a feed perspective, from a land perspective, from a water perspective, from a CO2 emission perspective, so providing them the statistics around that serves to motivating them. The other component is to also provide products that are generally very attractive from other components, so from a nutritional standpoint, from a taste perspective, making those products appealing even beyond just the environmental impact it is also a component in that, to a certain extent you just kind of get people emotionally excited about trying new things and making them feel like they are

adventurous because to some people that is about edges, they like the idea being on the cutting edge of new ideas.

Interviewer: Ok, thank you. And now that you mentioned the sensory liking of the people, so that they like the taste and consistency. How is the feedback to your bars, do people like it, and do you develop your products according to the customers wishes or how does it work in your case?

Interviewee: So, to a certain extent it was, originally, developed kind of through the boss that we had that was using a relationship that was existent with a very talented chef from the UK. So, that was kind of how the original bar were developed, the original approach was kind of just building that product, at least to my knowledge, because I was not there at the beginning part of it. So, the beginning part of it would have been, to my knowledge, they build the product and saw what people were attracted to, there is a very significant number of people who really love our formulation because of the fact that it does take a unique approach to protein bars and incorporates our foods along I guess fruitier flavours than a lot of other protein bars on the market. So for people who really do find that approach to their taste, there is a significant number of people who really do enjoy that approach because it is not commonly found. But at the same time knowing that we do not necessarily appeal to everybody and there is a significant market of people who prefer, you know, the chocolate tier flavours and stuff like that. So not only trying to cater to the current customers and ensure that they are happy with the new products today, but also create products that are a little bit different that will attract a new customer base that would reflect the taste preferences.

Interviewer: Ok, thank you. I know that you are using completely processed insects in your products, so in your bars there is like this flour or powder or however we should call it, and I also know that Exo originally started without insect on their packaging, but then you moved to putting the insects on your packaging. Is this some kind of way you want to move forward, to make the insects more visible on the packaging and perhaps at some point even use whole insects instead of powder or this is not an approach?

Interviewee: That is a good question. So basically, they kind of came to the realization as well as a couple of other companies I am familiar with who for example started off with a much more subtle packaging that at the end of the day if that is your differentiating factor then that is something you need to call up, because otherwise it becomes less obvious why you are special and just look like a slightly more expensive protein bar with no real value proposition. So on the one hand, when you see the insect on the front it kind of at least draws attention to the

product to understand that there is something unique or different in this particular product, but at the same time as the consumption concept of insect protein is becoming a little bit more, I guess popular, people are becoming a little more aware, to a certain extent there is a sensational major that draws people's attention so we have been able to stand out and differentiate ourselves from everything else on the shelf by having this indication that this is unique, this is insect protein – even that alone would get people's attention. So, I noticed that for a lot of other products as well, or companies, they kind of tried to take that approach, of putting the insect a bit more front and centre on the packaging, not something to hide, and I mean that approach works well. But also to your other point, there is also this desire to kind of expand to other products that are not only simply using the powder but potentially involve insect whether, no matter if smoked, seasoned, or whatever the case might be, it is an approach that allows people to kind of see the insect front and centre so it is not only simply an ingredient that is added to other products similar to whey, but rather that they have more applications that can be, that there is more applications for the product.

Interviewer: Thank you, two more questions. The price of your product, how does it compare in your target market, so in the US, to non-insect products in your category?

Interviewee: Compared to non-insect products, I would say it is slightly higher, the function has two major components. On the one hand compared to a lot of the other competitor products we are a lot smaller as a company, so the volumes that we can generate kind of push us towards having to have higher costs because we are operating in smaller volumes. And the second aspect of this is that cricket protein itself is a relatively expensive ingredient. Like I said, there have been massive improvements in coming down that cost curve but it is still a working progress, so that is still a relatively large component of that cost, so as a results, I mean, we have the price slightly higher I would say, which is not ideal, obviously, but at the same time people, for the most part do understand that on the one hand this a bit of a premium ingredient to a certain extent in terms of its ability to be a lot more environmentally friendly, but also for people who for other reasons want to avoid meats or dairy, insects are providing an alternative. Then there is probably some component in it being slightly more expensive that to some people it does make it seem like a premium thing, I can bet that if you were selling insect at like an incredibly cheap cost people would just think it is, you know, just disgusting like protein you just found on the floor, rather than contributing a bit of a premium to it and people realizing it might be a bit of a high quality ingredient so something in the lines of, you know, if you go to a French restaurant and you have snails at McDonalds for 30 cents people just kind of, would

find it, it is snails and something disgusting but because it has a high price and it seems premium and you found it at a fancy restaurant it has all of a sudden people thinking it is some kind of delicacy. So, I mean that is maybe not the best example because we are not necessarily taking the delicacy approach per se. But there is some value in being slightly higher price that people kind of think it as a high quality ingredient, rather than a low quality ingredient, but, even then it is still not something that would be a sustained strategy to keep it at a higher price forever it really is just a little bit of function of where the market and the industry is at now.

Interviewer: Thank you, and very last question, so about the availability of your product. I presume I can get them on your webpage but what your other selling points, do you have physical selling points, or are you carried by big retailers and what are your future plans?

Interviewee: So, we are in a few physical locations. As far as the very large retailers in the US, the grocery stores, that is something we are working on currently but it is something we are not super, I guess, aggressive on getting into, just because of the fact that, at least in the US, the way the retail industry works here is quite difficult to work with and there is a lot of barriers to entry. It is a very expensive round to play in, so to speak, so instead we are trying to be very cautious taking that route, we are moving towards it, we are trying to get into it, but at same time not overly aggressively, because we do not want to put ourselves into that position, so online is definitely the main approach, there is obviously our website which is one place from which purchases can be made, but then there is a bunch of other online retailers that do sell our product, for example Amazon, but there are also brick and mortar locations, gyms small stores here and there, convenience stores as well carry our products. The same applies to certain international locations where we do that, for example in Germany, there is an online store that does sell our product as well.

Interviewer: Great, thank you, that is all from my side.

Appendix 2. Swarm Protein Transcript

Interviewer: What is your vision, the vision of your company?

Interviewee: So, like in a very broad scope we want to provide healthy, ecological and socially sustainable food, and in particular by focusing on unconventional protein sources, specifically insects.

Interviewer: What are the biggest barriers and challenges you currently face?

Interviewee: Biggest challenges are actually legal barriers, so of course there is also consumer perspective, but that is kind of, you know, a 50/50 split, a lot of people are very interested and open to the new, and I think consumption, like end consumer perspective is more of a long term issue so I will divide this answer into two parts. So the first issue is legal, because there is no unified European framework specifically for importing insects. Every country, member state decides on their own, a lot of countries do not really have a clue what kind of certificates they accept or what they need so there is like a total mess and a lot of insect producing companies are in a state where nobody knows what country accepts them on a regular basis. And, in the long term perspective I think a lot of consumers are really willing to try it out but we want to get away from being a gimmick, like a fun item, that you buy to scare your friends, and become a staple and I think this is really really hard because most people try it because it is so new and because you know, you can talk about it, and to become a staple you have to have a product that is actually useful for the consumers, that has a good price and yeah, the use.

Interviewer: OK, thank you for the answer. So, if I may ask, what are your target markets? Right now, geographically speaking.

Interviewee: So, geographically, the German speaking ones, so Germany, Austria, and Switzerland, Switzerland has a different regulation of course. But then also the Scandinavian markets are really interesting. That is more for the future because the labelling so far is the same for the German speaking countries more or less so we will focus there.

Interviewer: Of course. And target groups, when we now speak about demography?

Interviewee: Target groups, we mostly of course aim at males, because men are more open towards trying something that is considered, sometimes considered to new such as insects. But, more broadly we focus on athletes, so on the sports market, because they are very open to product innovation and have a high demand for functional nutrition, so we can argue via the nutrients and they also have kind of a role model in society, so everybody want to be sporty,

right? So, if sports people accept this as a good food source, then we think we can diffuse into general mainstream.

Interviewer: Thank you. So now, a little more specific. So, how do you do it? How do you convince people to try your product for the first time?

Interviewee: We do not have to convince them. We show them that there are insects inside, sometimes, you know, people actually stare, last week trade fair we had was the FIBO global fitness trade fest, it is the biggest fitness fair in the world, and we made – you know, we like to provoke – we have like very big posters with insects with our logo on it, which is an insect, and that draws a lot of attention, and then sometimes you just have to nudge the people a little bit, you know, “come closer”, “try it”, “have you tried insects” and most people are really like open and interested.

Interviewer: Ok. This logo is on all of your packaging’s, on your products, right?

Interviewee: Yeah. On all of the packaging, all of the information materials. And then, after you have the people convinced to try it we offer a lot of information. You know, because then people have a lot of questions. “What kind of insects is it?”, “Why should I eat insects?” and stuff, but the very first touch point is just out of curiosity.

Interviewer: And what kind of information do you provide about the benefits of the insects? Or why they should try it if I may ask?

Interviewee: In the first place we provide so called hedonistic information, so everything that is about themselves, so nutritional profile, about protein, about micro nutrients such as vitamins and stuff. And then, in the second phase we go into a broader perspective of sustainability – that it consumes less land, feed and water, and produces almost no greenhouse gasses compared to most conventional livestock protein sources.

Interviewer: Ok. Thank you, and do you have any plans for a new product category or are you sticking the bars for the time being?

Interviewee: For the time being we are sticking to bars, to push this category. But, we will develop along the sports food categories, so powders are really interesting for example.

Interviewer: Ok. And are you keeping track of your percentage of returning customers?

Interviewee: Right now not. Because we have a re-launch of the website in two months so than we will have a better tracking system.

Interviewer: Ok. And do you keep track of your customer feedback, as in the performance of your product in regards to taste, consistency and so forth? So the sensory performance of the product?

Interviewee: Yeah, mostly because people just tell us. We do a lot of tastings and you know, we get a lot of consumer feedback and then we regularly taste the bars themselves to see if they change in quality in some ways, so there is an internal and external feedback. And then, we discuss it in the team.

Interviewer: So you are open to developing the product according to feedback, right?

Interviewee: Yeah sure, I mean we developed it along with the customer. We worked together with a German sport university, which is the biggest sport university in Europe, to see what kind of nutritional profile we need for athletes, what tastes are right for the product, too sweet and stuff.

Interviewer: Ok. I am almost finishing, so one of the last questions is: How does the price of your product compare to non-insect products in your category, in your markets?

Interviewee: It is a premium price, of course. Edible insects are quite expensive right now, especially if you want to have them in a food grade quality, which requires a lot of laboratory tests and verifying. So it is still very expensive. And, we also use the price as a positioning to show that insects are not like a cheap substitute, like whey protein or so, but actually a very high quality and, therefore, high worthy nutritional source.

Interviewer: So do you have any plans on decreasing the price at some point, or do you want to stay in this high-end market?

Interviewee: I think as a product and the market develops, the more mainstream you go, you have to reduce the price. I think it will not be very cheap, in the midterm not be a cheap product or a cheap source and ingredient. So at the beginning we also want to stay up and as we scale up we also want to reduce price, then we go more broader. You know, if you go to retail and stuff you have to reduce the price.

Interviewer: Ok. And that is also my last question, so right now I could probably get your products on your website, and is there any other selling place, or what are your future plans in this regard?

Interviewee: Right now we re-build our whole website and then we also are in discussions with retailers because we won a lot of awards recently, and got the attention of retailers. Which is a

very different distribution channel actually, it is of course quite interesting, and we like to talk to people and try to see how this channel proceeds.

Interviewer: Ok. That is all from my side, so if you have any questions or feedback to me, please do, and if not, then that is everything from my side.

Interviewee: Everything from my side too. Was very nice, very consistent, short interview, I like that.

Appendix 3. Jimini's Transcript

Interviewer: What is the vision of your company?

Interviewee: Well, the objective of Jimins is to change minds about insects in Europe. We started with whole insects, ready to eat, not powder, whole seasoned insects like the whole grasshopper, the whole cricket, the whole mealworm. It was a difficult choice, because, as you know, people are not, or were not ready to eat insects so we had to do huge work about educating, reassuring, yeah, using humour to dedramatize the thing and tell people you should eat insects, because there is already 2 billion people on earth eating insects so this was the choice. And then, slowly and more and more we are trying to introduce insect flour based products. With energy bars, insect pastas, insect granolas and so on. So the strategy and the vision is to show people insects are edible, show people insects are tasty, delicious, nutritious, environmentally friendly. And then, start to incorporate it into our daily diets.

Interviewer: So, your company started with whole insects and now you are moving to cricket flour based products, do I get it right?

Interviewee: We are not really moving to, we are enlarging the range. I mean, we still have the whole insects.

Interviewer: But you started out just with whole insects?

Interviewee: Yes, exactly. With a range of five products, which was 2 grasshoppers and 2 mealworms, seasoned, we had garlic and herb, we had curry, tomatoes, and then we enlarged the range, we have more than 15 flavours, we also have a range with whole insects, they are not seasoned, they are de-flavoured so they can be cooked added to your pasta, your risotto, your cookies, because as you probably know, insects have no sugary or salty taste and then it can be in a risotto, in a starter or in a main course. So yes, this is the de-flavoured range. Then we started developing the one with flour or powder, determining what you want to call your insects grounded into something. And we started with energy bars, then we launched insect pastas and then we launched the granolas. And we are now working with an expert with a PHD to discover how to texturize, give texture to the insect protein, so we can recreate the meat texture and the meat taste and the meat, just like, it is already a possible thing to choose a burger without meat. We would like to do something similar with insects. But before that, we have to discover how to texturize the insect part.

Interviewer: And this products with the insect flour, this like conventional products with insects added in the form of a flour, do you keep customer feedback on how they perform in terms of taste and consistency and so forth? This sensory liking of people.

Interviewee: People like it, I mean regarding the taste, regarding the functional part about being source of a protein people like it. Yeah, they like it and you can sell it to more people because there are no insects in the view. Our main objective was to show people that whole insects are edible and tasty and then, that would mean that people would be ready to eat insect in flour. Whereas on the contrary, when somebody is eating an energy bar without seeing insects, it does not mean that he will be ready to eat insects in 3 months. Yeah, we wanted to do the most complicated part. We have a longer vision about insects. We want people in Europe to be able to eat insects in all their forms, to be in 5, or 2 years, or I don't know when, to eat fresh insects. Meaning dead insects, but fresh.

Interviewer: Thank you. Where can I get your products, what is the availability? I presume that in the online shop, but what about selling points, big retailers and so forth?

Interviewee: We have 800 stockists in Europe, mainly in France and Spain, also in the UK, Belgium, Netherlands. We are in Germany and in Finland. So it is mainly shops and organic stores. And in Spain we are with retailers.

Interviewer: When we were talking about the conventional products, with the insect inside, how does the price compare to non-insect products, so to the same product categories but without insects?

Interviewee: Compared to, it depends. For the energy bars, it is the same price because we have 2 euro energy bar and they are organic, so it is the market price in France at least, I don't know where you are and whether it is the same. For the pasta it is way more expensive, because the 5 euros for 200 or 300 grams which is high, however, the insect pastas you do not need to buy any meat because all the protein you need is inside the pasta, so it is quite expensive for now. And for the granola, it is kind of the same price for tasty and organic granola, it is a bit more expensive. But, we are trying to reduce the prices, of course, it depends from the quantities and the markets. We are going to lower the price when there will be higher demand, it is kind of logical.

Interviewer: Thank you, very last, general question. What are the biggest barriers you face right now?

Interviewee: It is culture, definitely, and legislation in Europe. It is changing, since the first of January 2018, but still.

Interviewer: Thank you for the interview, that is all from my side.

Appendix 4. Instinct Transcript

Interviewer: What is the vision of your company?

Interviewee: The vision of our company is, we want to make organic snacks with insects and want to be one of the, or the leader, of the developed market of insect foods in Europe.

Interviewer: What are the biggest barriers and challenges you face right now?

Interviewee: It is the legal construct. Especially in Germany, it is very hard to get around the legal constrictions, because nobody knows how exactly insects as food has to be handled. Second, many people never have eaten insects before, so it is hard for some people to imagine how it would taste. But, this barrier is much smaller than the legal aspect.

Interviewer: Ok. What are your target markets?

Interviewee: That is a tough question, because we tried different target markets. First, we tried sportsman but it seems it is not the right target market because the niche is too small. And also the needs of sportsman is not what we intended about, we target people who have interest in health issues, so they want to eat things that are good for their health, and also good for the environment. And we try to address children. But, the thing is, we are not extremely focused at the moment because we have to try it on the market first.

Interviewer: So how do you do it? How do you convince people to try your products for the first time?

Interviewee: In the past we tried with our prototypes, mainly on fairs, conferences and tastings, and we tell them that these are products with insects and if they want to try, and surprisingly, most people try. So, it is much less hard, to need to convince them, because they want to try it. Eighty to ninety percent of people try it, so it is not as hard as we imagined it the first time.

Interviewer: And when they need convincing, how are you convincing them? What information do you convey to them?

Interviewee: We tell them about the health benefits, about the protein source, amino acids, the micronutrition, vitamin B12, iron, and so on. Then, about omega three and six fatty acids. And then about the less resources needed to produce the insect, and environmental aspects. But, more people are interested in nutritional aspects.

Interviewer: To what degree are the insects in your product processed and how do you communicate their presence on the packaging of the product?

Interviewee: The insects are completely processed, they are dried and milled to a powder. We have, on the packaging, there is a cartoon insect who looks at the people but maybe you can take a look at our website, there you can see the packaging.

Interviewer: Yes, I saw them.

Interviewee: We tested, before we started to make packaging, what people want on the packaging and the majority said that it is important for them, that they see the insect on the packaging.

Interviewer: Thank you. Do you have plans for a new product category or will you stick to bars for the time being?

Interviewee: We have more products on our mind, we are just testing at the moment, but most of them will be in the dry sortiment or snacks and so on.

Interviewer: And, in these products, do you plan to stick to processed insects, in the form of powder, or do you want to differ from it in the new products?

Interviewee: At the moment we stay to processed insects because it is a much lower barrier to sell processed insects, than whole insects.

Interviewer: Thank you. Do you keep track of the percentage of returning customers?

Interviewee: We will do this in the future, but as we are not on the actual market it is hard to say.

Interviewer: Do you keep track of your customer feedback to the sensory liking of your product, so for example taste, consistency and so on?

Interviewee: Maybe same answer. We want to do this, we want to keep track about this, and we also want to iterate, make some slight changes to have a better taste in our next product, but as we do not sell at the moment, it is hard to. In the past, we tested our prototypes with attendant people and the feedback brought us to the product we have now.

Interviewer: And the price of your product, how does it compare to non-insect products in your category?

Interviewee: It is the higher part of the market, some non-insect products have the same price range, because most of them are of higher quality. It is also what we want to address. It changes when you compare to other protein bars, especially with whey protein you have a much lower price range, but it is not what we want to address. We do not want to compare us to cheap

protein bars, whey protein bars, they have much different quality aspects and even the people who buy whey protein bars are not interested into the assets we deliver besides of the protein.

Interviewer: Ok and one last question. Today I can get your products on the e-shop I believe and is there any other way?

Interviewee: At the moment you can't get our product, we do not have a delivery or in the store. We get it in one or two weeks than you can buy it. Organic resellers, in Germany, namely in Berlin, bio company, namely Basic Bio, and you also can buy us in (name of store chain).

Interviewer: Do you have any plan to be carried also by big retailers or no?

Interviewee: We are open to it and we have some contacts with them and we interested in it, but at the moment we can't deliver the big amounts they want. But it is definitely the way to go.

Appendix 5. Anonymous Company Transcript

Interviewer: What is the vision of your company?

Interviewee: Our vision is to make eating insects normal in North America.

Interviewer: What are the biggest barriers and challenges you currently face?

Interviewee: The largest barriers are cultural stereotypes of people viewing insects as pests, those kind of societal norms have been around for hundreds of years in North America, with America specifically being such an agriculturally based economy and insects were just always viewed as detrimental to crops and agriculture and America and Canada really have no long held tradition of conceiving insects so there is really no kind of like experience in North America of having insects as a form of food. I would say, that kind of cultural stereotype is the main barrier. I would say that kind of touches on the consumer standpoint, another point is that common believe of insects as being gross, so having an associated ick-factor which takes several different approaches to try to overcome. From a production standpoint, a lot of the production facilities that we have tried to use or have used in the past have been kosher certified, and that was a big large barrier for us to try and get our production up and running, trying to find a facility that was not kosher as, I don't know if you done any research into crickets and mealworms and grasshoppers and the kosher issue around, have you looked into that at all?

Interviewer: Yes, I have, the only thing I am not sure is about the legislation in North America but other than that, on the general issues I am quite aware of them, yes.

Interviewee: Right, yes, so, as far as kosher certification, that seems like, even though they are mentioned in Leviticus I believe, 1122, there is no, I think there is no history of or no tradition of eating them amongst the Jewish people. So they are not really on the roadmap as far as I know for being kosher certified any time soon so, at least in North America, I know that it's a large challenge to find a correction facility that will treat the cricket bar or any insect protein as a result. Legislatively, for our government crickets are generally regarded as safe, in Canada and the United States, I know that there are other types of insects such as black soldier larvae that have plenty of nutritional merit, that are not legislated for human consumption, so the government is fine with some types of edible insects but not others. So those are some of the challenges.

Interviewer: And how do you do it, how do you convince people to try the product for the first time, as you mentioned there are several factors like the ick-factor, so how do you do it?

Interviewee: So, for us, we take a variety of different approaches to basically try and make that first bite as easy as possible for a new consumer, because we find out that after they've taken that first bite and tried it once, then the ick-factor disappears, their previously held beliefs can be changed and they are ready to consume our product and even more different types of edible insects. Our goal is just about getting them to take that first bite, that's what everything is directed towards. We use a variety of different emotional, intellectual and kind of building credibility arguments to kind of try to get somebody to take that first bite. I would say intellectually we focus on sustainability elements of insect protein, and how efficient and environmentally friendly it is for the environment, we also focus on the nutritional component, and are able to convince many people that way by informing them of incredible nutritional properties of cricket protein such as the high amounts of protein, iron, the amino acid profile is very compelling, magnesium, Vitamin B12, that definitely interests a certain group of people. For branding we're dealing with foods so in order for something to, for somebody to try a new food, it needs to appeal to their taste buds and look delicious, so we spend a lot of time and energy on, we are making sure we make appealing photography of our food, show them ingredients that they recognise, like berries and seeds, so that it's, there is some familiarity, furthermore, by using cricket flour instead of whole crickets consumers are unable to see anything that they would consider gross, the only things that they can see are seeds and nuts, and things they are pretty familiar with. And then in recipe formulation, we worked very hard to use flavour profiles that camouflage and offset the cricket taste, so that people would be unable to distinguish what crickets actually tastes like, because again we want it to be as easy as possible for people to take that first bite. And then a final point is that in our branding, in our photography we have avoided the use of any imagery that is insect or cricket related. If you look up our website or any of our packaging, our primary logo is a (a logo without any connection to insects), our name is (company name that does not indicate any connection to insects as food), not like crickely foods, we don't treat the cricket as a novelty, we don't try to stand apart by being weird, we treat the insect protein as a viable, credible nutritional ingredient that, and we're not trying to shock people into trying our bar, we deliberately try and focus on "it is just another ingredient" in our protein bars.

Interviewer: So you mentioned marketing and branding and I saw the packages and the images and the logo and I am aware that you are using processed crickets and are there any plans to change this communication in the future to for example include a cricket on

the packaging or communicate it more clearly or for the time being you are staying with the subtle approach?

Interviewee: So for the time being we are staying with the subtle approach. We have no plans of doing a rebrand, as for instance, ever since we began our company (number of years stated, however, as it could give away the company identity I excluded it) years ago, public acceptance of insect protein has become much more widespread, both internationally as well as locally, so we may certainly reach a time, where people are much more comfortable with the idea and the visual. So we definitely won't rule it out for the future, and it's something that we may even change soon, but, it is also important to remember that we are somehow in a bubble in our industry of thinking that everybody knows about it at this point, because we have so much exposure and conversation about it. But, the reality is that 95 percent of the world, well, 95% of North Americans specifically or western culture, still are unaware of insects as a protein source.

Interviewer: Thank you. You mentioned the sensory performance of your product, so taste and so forth, do you collect customer feedback on how your bars or protein powders compare to non-insect variants in terms of taste and consistency or this sensory liking?

Interviewee: We have not compared our products with non-insect protein bars in any form of customer research.

Interviewer: Thank you. I two more questions for you. What about price, how do your powders and protein bars compare to non-insect bars or products in the same category. Is it the high-end market, is it the same price, is it cheaper, more expensive?

Interviewee: No, it is a premium, high-end product. We have designed our product and branding to reflect that, and it is very, traditional proteins like whey powder are much cheaper to produce or much cheaper to buy than cricket protein.

Interviewer: And do you have any plans to change this or do you intend to stay in the high-end market?

Interviewee: We intend to stay positioned as a premium product. We will be lowering our prices in the future as we scale and as our production improves and increases and becomes more efficient, but we will never be competing purely on price.

Interviewer: Ok. One last question. Today I can get your products on your website, and what is the other availability of your product and what are the future plans in this regard? So do you plan some cooperation with big retailers or other?

Interviewee: Yeah, so we are available on our website in North America, we are available on (online shopping platform) in North America, and then we are available in about (Number of stores and location stated) right now, with that number growing in the future.

Interviewer: Ok, thank you very much, that is all from my side.

Appendix 6. SENS Transcript

Interviewer: What is your vision?

Interviewee: To teach Europeans to eat insects.

Interviewer: Thank you. What are the biggest barriers and challenges you currently face?

Interviewee: Building distribution. For that you need right people and to find these people.

Interviewer: I assume distribution in Europe?

Interviewee: Of course. Well, to expand, let it grow.

Interviewer: So your geographic target market is Europe or do you have specific target countries?

Interviewee: Well, we do have some countries. But we would be glad, all of Europe is interesting to us.

Interviewer: And what target groups do you have from a marketing perspective? I mean demographically, not geographically.

Interviewee: What do you want to hear? Age, or?

Interviewer: Well, for example, sports people, vegetarians, people what eat meat or something like that.

Interviewee: Well, people who can appreciate quality products, simply people who know what to eat. And environmentalists.

Interviewer: So how do you convince people to try your product, so they would become your customers? (Silence) Meaning, for example, what kind of information do you provide them with when you meet them or in your marketing. Is it environmental, health benefits or something similar?

Interviewee: Well you have to explain everything to them. You have to explain not just what cricket flour is, but the product needs to make sense. And when all of this makes sense, than it needs to look good and taste good. Of course, we can promote it somehow but it is a lot about sampling.

Interviewer: So you are giving them information about benefits of crickets, than you make a nice product with processed crickets and that is the approach to acquiring customers?

Interviewee: I do not know how to answer this.

Interviewer: Can you try to give me feedback, am I doing something wrong or should I be doing something differently?

Interviewee: Well of course this is an example of how we acquire customers. It is about education, PR, being seen, being famous, for people to try it for the first time. You have to shoot information at them from all sides, you have to be heard, seen and available. Then they need to get the information that it is good, and then it works.

Interviewer: Do you have plans for other products than bars, for example I saw cricket bread?

Interviewee: Yes.

Interviewer: Can I ask, will you change the degree of processing of insects in this products or are you sticking with cricket flour?

Interviewee: Cricket flour. Only.

Interviewer: Ok. Are you considering changing the way crickets are communicated on the packaging? Or not, meaning if they will be more visible than they are currently.

Interviewee: We consider it.

Interviewer: I am almost at the end. Do you track the percentage of returning customers?

Interviewee: Yes.

Interviewer: Would you share this percentage?

Interviewee: No.

Interviewer: And do you track feedback of customers towards you products, well towards bars, meaning if they taste good and the consistency is good as well?

Interviewee: Yes.

Interviewer: And how is the customer feedback if I may ask?

Interviewee: Various, I don't know how to summarize this. We collect all feedback, we have a guy for that, who is writing with them, it is part of the customer relationship. We collect any kind of initiative, which we then, for example, incorporate into our recipe. Or into further communication.

Interviewer: So you are willing to change your recipe so it suits your customers and their preferences?

Interviewee: Well, it is part of the feedback. We already did one change on the basis of customer feedback. So yes, we listen to our customers.

Interviewer: I will ask further. How does the price of your product compare to other products in your category, which do not have insects. Is it higher, approximately the same, or lower?

Interviewee: It is higher.

Interviewer: Do you have any plans to lower the price? For example on the supply side or do you want to stay in the high category?

Interviewee: Oh, you mean like that. Compared to common bars it is higher, compared to high-end bars it is comparable. Of course we are working on process optimisation internally, but If think the bar should cost less, I don't think that. It is simply a quality bar even without crickets. So the price is right and customers respect that.

Interviewer: So you plan on staying in the high-end price range?

Interviewee: I think it is the only sensible way, yes.

Interviewer: Ok. I can buy the bar today only on the internet or somewhere else as well? What are your future plans in this regard?

Interviewee: You can buy them in a lot of retail places, of course it is not perfect, but we are available also offline. We work on expanding distribution. As much as possible and as fast as possible.

Interviewer: As you mentioned, so you want to be in big retail chains I presume?

Interviewee: Yes, as well.

Interviewer: Thank you, that

Appendix 7. Näak Transcript

Interviewer: What is your vision?

Interviewee: In 2050, over 50% of our protein needs will come from edible insects. About 80% of the world population already includes insects in their diet. However there is still much to be done to raise awareness and trigger acceptance of the benefits of entomophagy in Western countries. As meat consumption drops and healthy lifestyles become the norm, we are entering a new stage in which people are much more careful about their diet, and edible insects are new complete source of protein which is easy to integrate into recipes. Näak wants to be an actor in this trend and become a leader of the industry.

Interviewer: What are the biggest barriers and challenges you face?

Interviewee: Finding cricket powder that is good quality and not too expensive. There aren't many farms in North America yet, and not many certifications. As a result our products are, for the moment, more expensive than most other energy bars.

Interviewer: What is your target market(s)?

Interviewee: We target people who are interested in healthy diets, sustainability, and have an active lifestyle.

Interviewer: What is your target group(s)?

Interviewee: At the moment we are looking at Canadians, age 18-45, who look for alternative products for a healthier and more sustainable diet, and are sporty or active.

Interviewer: How do you convince people to try your product for the first time? (for example, with what information are you trying to convince them and through what channels, or any other approach).

Interviewee: We try to rent booths at as many endurance sport events and health fairs as possible, giving out samples and information. We are also very active on social media and hold many contests to get people to try Näak bars. We focus on the benefits of cricket for our health and for the planet, rather than making eating cricket a challenge.

Interviewer: To what degree are the insects in your product processed and how do you communicate their presence on the packaging?

Interviewee: We use cricket powder, which is made from 100% crickets. They are simply roasted and ground into powder. We use a cricket logo on our packaging as well as the catch phrase "cricket protein".

Interviewer: What is the sensory performance of your product (e.g. taste, consistency, etc) compared to non-insect products in your product category, if you collect customer feedback?

Interviewee: Cricket powder is relatively tasteless, so our energy bars don't have a particular "insect" taste. Furthermore, it is easily incorporated into the recipe so it doesn't affect the texture and consistency. Customers are satisfied with the sensory performance, and often say that they could never have guessed cricket protein is the second ingredient.

Interviewer: How does the price of your product compare to non-insect products in your product category in your target market?

Interviewee: We are more expensive.

Interviewer: If the price is higher are there any plans to decrease it?

Interviewee: Yes once cricket powder becomes cheaper.

Interviewer: Where can I get your products today, and what is your plan for the future availability of your product?

Interviewee: As of today our products are sold on our online store, and in over 500 selling points across Canada (mostly in Quebec). Our retailers include healthy grocery stores, sport shops, and also big supermarket chains. Naak bars are also available on Amazon which allows us to ship them to the United States.