CONSUMER CATEGORIZATION OF THE EMERGING CLEAN MEAT MARKET

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ABSTRACT

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Abstract
One of the most significant causes of the growing climate change crisis and a major user of water, land, and energy resources is the conventional mass production of meat. Hence, more sustainable alternatives for meat production are being explored. Clean meat, or meat developed with stem cell technology, has been proposed as a possible solution due to its expected benefits for the environment, food availability and animal welfare. To successfully introduce this product to the market, it is vital that companies producing it are aware of respective consumer acceptance and what they can do to improve it.

Consequently, this study investigates how consumers categorize clean meat and how this can be influenced by clean meat companies. This is achieved by a three-stage triangulation method consisting of an online survey, news articles, and interviews with consumers and firms in the clean meat industry. The data is then analyzed thematically to discover general trends in consumer perceptions, the primary discourses and discursive legitimation strategies used by the media, and the categorization strategies used by consumers and companies. Three markets have been selected for the study: Finland, Germany, and the United States of America (US). The results show that consumers are interested in clean meat, and many will categorize it as sustainable and humane, but improving consumer education about the product could greatly enhance market introduction. To support this, six marketing strategies designed to increase consumer acceptance are presented in addition to a cognitive process model demonstrating how consumers form perceptions is introduced. This study improves knowledge about categorization strategies by using the clean meat phenomenon to understand how categorization strategy differs between external users, i.e. consumers, and internal users, i.e. firms.

Keywords
Clean meat, category, categorization, discursive legitimation, consumer adoption, technological adoption, consumer perception, consumer acceptance, marketing

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1 INTRODUCTION

For decades now, scientists, businesses and concerned citizens have sought solutions for the growing climate change and global warming crisis. Campaigns to conserve energy, reduce waste and recycle material have become widespread, but one significant cause of this environmental crisis has yet to be fully understood: animal agriculture. Despite the evidence that small, local farms are more environmentally and animal friendly, large production facilities remain on the rise (Koneswaran and Nierenberg, 2008).

Not only does this present a concern about the wellbeing of production animals, it represents a serious land resource dilemma. Currently, 56 billion land animals are used for human consumption annually, and experts expect this number to double by 2050 to meet the demands of the growing world population (Koneswaran and Nierenberg, 2008). There are increasing concerns about the large amounts of land, water and energy consumed to produce feed for these 56 billion animals each year. Presently, farm animals and production facilities use more than two-thirds of available agricultural land (Koneswaran and Nierenberg, 2008). Moreover, nearly one third of all water resources used in agriculture is consumed in the production of animal products (Mekonnen and Hoekstra, 2012). Thus, animal agriculture is proving to be insufficient for meeting potential future demands. A more efficient and environmentally-friendly solution is needed to make the most use of earth's limited resources.

This master's thesis introduces the concept of "clean meat" as a more sustainable alternative to conventional meat production. Based on stem cell research, clean meat is produced by culturing and reproducing animal cells in vitro using advanced technologies (Post, 2012). Other terms to describe this technology include "cultured meat," "lab-grown meat" and "in vitro meat." The most frequently used term in literature is "cultured meat," however, "clean meat" has been chosen as the industry term ("Clean Meat"), and thus will be the primary term used for this paper.

Naturally, to introduce a new product to the market, it is advantageous for producers to understand how potential consumers will react prior to releasing the product. This is generally performed through market research to assess interest, identify target groups, and formulate a marketing strategy. As the first clean meat product was only presented in 2013 – five years prior to this thesis – studies thus far only cover the first stage of the market research mentioned above. Hence, many unanswered questions remain, such as how clean meat will be classified, and which markets should be targeted first.

The purpose of this master's thesis is to address these unknowns by researching consumer attitudes and analyzing their categorization methods. Categorization is the separation of products and firms into groups to create cultural understandings and make better interpretations of markets (Zuckerman, 1999). Understanding the degree to which consumer perceptions and the actions of companies can affect and shape categorization is vitally

important, as is the influence of the media in this regard. Because clean meat has not yet been introduced to the market, the media serves as the primary source of information available to consumers about the product. It is possible that the media will use its sphere of influence to establish or reduce the legitimacy of clean meat. This refers to what is known as discursive legitimation, or the use of specific messaging strategies to influence readers.

By investigating how clean meat products are categorized by consumers, companies and the media, this study provides insight about how successful any future market introduction of clean meat might be. This gives way to the following research question:

How do consumers categorize clean meat and how can clean meat startups influence this categorization?

This will be tested by collecting and analyzing quantitative and qualitative data about 1) consumer perceptions of clean meat, 2) the discursive legitimation strategies used by the media about clean meat and 3) consumer and company categorization of clean meat. Upon examination of these topics, this study will demonstrate how consumers feel towards clean meat and why those perceptions exist. This facilitates better marketing strategies for the successful market introduction of clean meat.

As categorization and discursive legitimation represent key aspects of consumer and media perceptions, they are elaborated in detail in the theoretical framework presented in Section 2. Additionally, theories pertaining to the consumer adoption of new products and nascent technologies are introduced, providing a basis for the formulation of marketing recommendations later in this study.

To connect extant research on consumer perceptions of clean meat with the data collected in this study, an empirical background on clean meat is presented in Section 3. This section defines the concept, provides an overview of the development of the nascent industry, and reviews extant studies on the consumer acceptance of clean meat. This information is later applied in the development of the survey.

Next, the research methods employed throughout the study are presented in Section 4. This study follows a triangulation method for collecting and analyzing data, such that primary data will be collected from three sources: an online survey, news articles and semi-structured interviews. The online survey is conducted to provide a general overview of consumer perceptions of clean meat. News articles are reviewed to reveal key discourses and the primary legitimation strategies used to potentially influence consumers. Interviews are conducted with consumers from Finland, Germany and the United States of America (US) to investigate how consumers develop perceptions about clean meat. Interviews with clean meat companies are also conducted to determine how the companies categorize themselves and how they market their products to consumers. Each of these components build upon each other to ultimately demonstrate how consumers categorize clean meat and how clean meat startups can affect consumer categorization.

Having explained the methods used to examine the data, the findings of the study are then presented in Section 5. The main findings from the online survey are first discussed, followed by the representation of clean meat in the media, before the main findings of the consumer interviews are presented. Next, the marketing activities of clean meat companies are described to compare this to the needs of the consumers. Company responses to important consumer concerns expressed by participants of the survey and interviews are also discussed. Altogether, the components within Section 5 reveal the existing ideas about clean meat and the process by which consumers develop new attitudes. If consumer categorization is to be influenced by clean meat companies, these components must be fully understood.

In Section 6, the main findings from the previous section are discussed to derive key implications about consumer categorization. This section ties together the triangulated data, compares the findings of this study to previous studies, presents the primary categorization strategies resulting from this study, and transforms the main implications into marketing recommendations for clean meat companies. The section concludes by addressing the primary limitations to the results of the study.

A summary of the study is presented in Section 7, while Section 8 provides an outlook to emphasize the main contributions of this study and opportunities for further investigation.

2 THEORETICAL FRAMEWORK

The introduction of clean meat to consumer markets requires an understanding of how consumers perceive, justify and adopt new products, firms and industries. This theoretical framework primarily discusses categorization strategies to understand how consumer perceptions are formed and affect markets, supporting the data shown in Sections 5.1 and 5.3. This is supplemented with an understanding of the legitimation strategies used to accept or reject new products, which is necessary for the analysis of news articles described in Section 5.2. Additionally, the consumer adoption process of new products and technologies is relevant in any study regarding marketing strategy and is crucial for understanding the data presented in Section 5.4. Thus, the theoretical background encompasses three main ideas in the following order: category management, discursive legitimation and consumer and technology adoption.

First, literature addressing categorization studies will be examined. A review of the literature surrounding categories found that two streams of category studies existed: those framed from a sociological view and those framed from a psychological one (Vergne and Wry, 2014). This distinction was critical, affecting the kinds of actors and users of categories: in sociology-based studies, the audience is the primary actor whereas in psychology-based studies, the firm is the primary actor. Two logics about how new categories emerge can be seen in this differentiation. In the first, categorization stems from external forces and firms are pressured to conform to these forces. This study focuses on consumers as the primary external force. As explained in Section 2.1, the success of a firm within a category depends on the degree to which it conforms to category standards. In the second view, categories emerge through the self-categorization of firms. In this case, the success of this categorization depends on whether consumers agree about and support the self-categorization of firms. If not, stigmatization may arise. This is further explored in Section 2.2.

Section 2.3 addresses discursive legitimation strategies, which are the strategies used by social actors to support or criticize the actions of key institutional actors. Discursive legitimation is used by consumers to frame the new product and industry in a certain way, which will become important in further understanding how consumers cope with the emerging clean meat industry.

While categorization strategies refer to the perception and acceptance of product markets, the consumer and technological adoption studies discussed in Section 2.4 demonstrate how consumers adopt new products. Since the introduction of clean meat involves a new product as well as a new technology, these adoption strategies are of special interest.

The concluding implications from the theoretical background for the clean meat industry will be addressed in Section 2.5. This section concludes the theoretical background by connecting the discussed categorization, product adoption, and discursive strategy concepts to the clean meat phenomenon.

2.1 Category emergence through competitive actions

In one view regarding the creation of new categories, it is argued that categories are the result of competitive actions. When external audiences, such as competitors and consumers, form opinions about firms, the actions taken by firms in response can create new categories. This process is further explained in the following subsections, beginning with a look at the earliest forms of categories in Section 2.1.1, followed by a discussion of a key idea in categorization studies referred to as the categorical imperative in Section 2.1.2. The categorical imperative argues that firms need to fit in a category in order to be viewed as legitimate in comparison to competitive rivals (Zuckerman, 1999). The role of consumers in deciding who competitors are and how new categories are made is then addressed in Section 2.1.3. This begs the question of how consumers create consistency about categories and their meanings (Hannan, 2010), as discussed in Section 2.1.4. Additionally, the literature addresses what happens when firms ignore consumer categorization. Often, this leads to category stigma, as shown in Section 2.1.5. Consequently, new categories emerge as a result of the process of consumers defining categories, companies reacting to them, and competitive rivals differentiating themselves within them.

2.1.1 Mental models

The study of categories in business research began with Porac et al.'s (1989) study on the mental models employed by decision makers. The authors argue that decision-makers develop cognitive understandings about how their companies identify themselves (in relation to its competitors, suppliers and customers) and use their understanding of the competitive landscape to cope with the identities they have been given (Porac et. al, 1989). In other words, the beliefs a firm has about its own identity and environment affect strategic decision making. Over time, the mental models of competing firms become similar, through competitive interactions and the events taking place in the market, and create "group beliefs," about the market. This is the founding principle behind categories.

Firms can be competitors either on the basis of technology or product substitutability (Porac et. al, 1989). This plays into the market definition adopted by producers. Porac et al. (1989) found that producers were self-defining themselves in relation to their competitors, leading to what they term the primary competitive group, or the group of firms that define each other as rivals. The competitive element of this theory is further discussed below, while the self-defining element, which is the basis for self-categorization, is addressed later in Section 2.2.

2.1.2 Categorical imperative

The need for social comparison (Porac et al., 1989) gives way to the categorical imperative, indicating that firms need to compare themselves to like firms in

order to self-identify themselves. According to Zuckerman (1999), businesses experience a need to conform that stems from a fear of being viewed as illegitimate, which would result in social penalties. Thus, a dependent relationship between the opinions of critics and the successfulness of products develops. When products do not reach the level of legitimacy from critics proportionate to the seller's view of it, then illegitimacy costs ensue and the demand for the product weakens (Zuckerman, 1999).

According to the Candidate-Audience Interface coined by Zuckerman (1999), businesses are competing for the favor of customers to gain the privilege of doing business with those customers. This exists as a two-step process whereby audiences first identify the category that a seller belongs to and then determines how well that seller conforms to the existing identity of that category (Vergne and Wry, 2014). When a business seeking acceptance by the customer does not share the characteristics of businesses that have already been accepted, they risk losing candidacy due to illegitimacy (Zuckerman, 1999). For nascent technologies, customers resort to comparing the new product with existing technologies to determine its worth or value. Thus, differentiation may only be possible after being accepted by the customer. This interface predominantly relies upon the positive approval of customers, derived from the use of cultural codes that are distributed through membership in a particular category (Vergne and Wry, 2014).

The nature of the Candidate-Audience Interface forces sellers to first show they are like others to gain acceptance into a category, and then to differentiate themselves to improve competitiveness. This isomorphism can be difficult when the product is new and there are not many products that can be used to treat the new items as similar. Yet the main conclusion by Zuckerman (1999) is that "audience members employ categories to interpret the offers set before them," thus pressuring others into conformity.

2.1.3 Category emergence

Competitive rivalry and consumer approval are instrumental to the emergence of new market categories. Kennedy (2005) argues that competitors are vital in the process of creating new markets because of the way they interact with each other, and consequently the way they differentiate themselves. This stems from competitive rivals observing and reacting to each other's actions combined with the portrayal of competitive actions in the media. In emerging markets, the first mover advantage leads competitors to rush, sometimes blindly, to claim dominance in the market (Kennedy, 2005). During this process, suppliers effectively create categories by the way they label themselves, inform consumers and co-develop social understandings of the new market.

The process of firms defining the market is aided by consumers in two ways. First, consumers solidify the categories that initial rivalry started. Once a category has been established, there are negative consequences for firms that do not conform to these boundaries (Kennedy, 2005; Vergne and Wry, 2014; Zuckerman, 1999). Second, consumers reward firms that are easy to understand

and fit well with a category. This tendency further validates the categories as consumers choose the suppliers who best fit the category and shy away from firms that do not have the same level of focus or expertise (Kennedy, 2005; Vergne and Wry, 2014; Zuckerman, 1999). It is worth noting that in nascent markets, the influence of the media affects the development of consumer opinions towards categories (Kennedy, 2005).

Category emergence is also affected by the specific organizations that attempt to claim membership. Perretti, Negro and Lomi (2008) find that the formation of new categorical entities is dependent on identity framing and identity matching. Identity framing refers to the way consumers perceive and interpret the identity of candidates of emerging markets, while identity matching is the degree to which the identity of the category and the identity of the candidate are equal (Perretti et al., 2008). These concepts expand upon the categorical imperative by accepting the notion that new categories form when members do not betray the expectations of the audience and extending that to the importance of the initial positive match between the category domain and candidate identity. Thus, the existing identity of a category is a crucial first step, and firms that match this identity then receive the privilege of entering, influencing and shaping the category.

2.1.4 Consumer categorization

The consumer serves as a key player in the process of externally-created categorization. Research suggests that the social structures of an audience or group of users help to create consistency about categories and their meanings (Hannan, 2010). Categorization varies by users depending on their decision-making abilities, i.e. expert or novice (Langner and Krengel, 2013). Hannan (2010) found that engagement in a category increases with user knowledge and expertise, and often involves knowledge building about the category's products, producers and fellow consumers. These actions allow consumers to gain category language (Hannan, 2010) by knowing the terms and their meanings that have been socially adopted by existing users in a given category. Well-established consumers and firms within a category likely influence the way a category is described and defined (Hannan, 2010).

Audience members typically prefer categories that exhibit producers that are easy to interpret and prove themselves as skilled specialists (Kovács and Hannan, 2011). In particular, the typicality of firms, or how well they conform to a category, plays a significant role in consumer interpretation (Hsu, Hannan, and Koçak, 2009). The typicality is usually measured by grade of membership (Hannan, 2010; Hsu et al., 2009; Kovács and Hannan, 2011).

2.1.5 Stigmatization

Firms that fail to adequately conform to the categories defined by consumers may face negative consequences, leading to stigmatization, which is the applying of negative attributes to an organization or industry. This is problematic for firms,

as the negative reputation that ensues from belonging to a stigmatized category leads other non-group members to avoid association with the firms in that category (Vergne, 2012). Because the stigma is applied from external actors, firms can only counteract this negative branding by category straddling (Vergne and Wry, 2014), which is addressed in Section 2.2.3, or stigma dilution, the act of diversifying product offerings to lessen or diminish the effect of a stigma (Vergne, 2012).

Category straddling, or the membership of one firm in two or more categories, is seen as a negative action in categorization studies because it splits the attention of stakeholders (Vergne, 2012) and decreases a producer's allocation of resources to a market (Hannan, 2010). This effectively weakens the loyalty of customers and decreases a producer's audience reach in any one category. However, stigmatization studies show that category straddling can be a desirable and effective way to decrease disapproval (Vergne, 2012). This is because when the stakeholders are less devoted to a firm or aware of its activities, they are less likely to judge its actions.

Disapproval is defined by Vergne (2012) as media-supported or created criticism of a firm's activities. This definition allows for the ability of a firm to become stigmatized despite the otherwise acceptable nature of its industry, or for a firm to be viewed favorably by the public despite the stigmatized nature of its industry. The example given by Vergne (2012) is Boeing, a company well-known for its aircraft and spacecraft technologies, but is also a leading manufacturer of weapons, proving that it is possible to decrease disapproval through category straddling and stigma dilution. It is financially imperative that firms counter public disapproval, as it affects their ability to find investors, keep and gain customers, and maintain their credibility (Vergne, 2012).

2.2 Category emergence through self-categorization

In another view regarding the creation of new categories, it is argued that a new category emerges from firms engaging in self-categorization. Firms determine which categories to enter by comparing themselves to existing members and gauging levels of similarity. As discussed in Section 2.2.1, self-categorization is risky for firms if consumers do not agree with the chosen category. Differences in opinion about category membership may cause consumers to react negatively, as explored in Section 2.2.2. Self-categorization may also be risky for firms because it tempts them to engage in category straddling, where firms self-identify with more than one category (Hannan, 2010), as discussed in Section 2.2.3. If this causes external audiences to experience confusion about the category, it could lead to negative consequences, such as stigmatization. However, if this enhances innovation within the category, this could result in positive outcomes. This is especially true if the categories support each other (Vergne and Wry, 2014). Consequently, self-categorization and category straddling can also lead to the emergence of a new category.

2.2.1 Self-categorization

For a new company, self-identifying with an existing category may be a desirable method for entering the market. This is known as self-categorization. Few studies in category literature have been dedicated to self-categorization. Most recent category studies are sociology-focused, yet Vergne and Wry (2014) argue that psychological dimensions are just as important in understanding the categorization phenomenon. Porac et al. (1989) initiated the discussion of self-identification in their study of mental models. In the self-categorization mindset, firms take it upon themselves to place themselves as cohabitants of the same category with, per their view, similar organizations. New firms seeking to gain membership in specific markets are likely to self-categorize.

According to Zuckerman (1999), there may be a disconnect between realized and desired categories: a firm may not actually belong to the category in which it views itself. This occurs when consumers do not place the firm in the same grouping. Furthermore, self-categorization may tempt organizations to engage in category straddling, which may result in reduced social benefits (Hannan, 2010). When self-categorizing themselves, a firm must consider how well consumers perceive its fit in that category. Entering multiple categories should be done strategically so that consumers do not confuse or disregard the firm's key activities.

2.2.2 Category membership

When firms self-categorize themselves, the question remains whether consumers will accept these selections. Membership to chosen categories is successful when audiences agree that 1) the organization's product offerings are relevant to the category and 2) the organization is sufficiently focused (Vergne and Wry, 2014). The first requirement illustrates that consumers use rules and conditions to assign membership to a firm, whereas the second ensures that a firm is not engaged in category straddling, which refers to spreading its resources to more than one category (see Section 2.2.3).

Categorization is utilized by different users and takes place at various levels. For sellers, the sociological view of category management maintains that sellers have the obligation to seek membership in a category to compete successfully in the market. The category membership dilemma follows this argumentation by suggesting there are consequences for firms that do not acknowledge audience-defined categories. Yet in the cognitive view, firms self-select membership. This can present a problem when the users do not agree on the categorization labels adopted by a firm.

In fact, categorization may be applied differently than how a consumer would define it. Based on this differentiation, Hannan (2010) presents two types of categories: folk categories and analytic categories. Folk categories have unclear boundaries that come from consumers tying an event, relationship, or user to a category with partial membership, whereas analytic categories stem from well-developed criteria regarding category membership (Hannan, 2010). Many

sociological studies are based on folk categories, and these categories are muddied with partiality. Due to the nature of categorization as a dynamic process (Hannan, 2010), this is a natural and inevitable phenomenon.

2.2.3 Category straddling and fuzziness

The discussion of category membership naturally invokes the question of what happens when membership is expanded to more than one category. This can occur when firms engage in category straddling and category fuzziness. Category straddling has been perceived both negatively and positively in literature. On the one hand, category straddling by a firm results in negative interpretations by audiences, devaluing the company as inexperienced or uncapable of excelling in any one category (Hsu, Hannan, and Koçak, 2009). Although the conclusions drawn from such evaluations are likely to be false, consumers require category analysis to make sense of a firm. On the other hand, views from cognitive psychology follow a less restrained possibility for category mixing and suggest that it may be a more innovative way to represent a firm, especially if the categories are symbiotic and mutually supportive (Vergne and Wry, 2014).

Category fuzziness arises when there is an unclear understanding of what constitutes membership into a certain category, and members often claim multiple categories (Vergne and Wry, 2014). The fuzzier the perimeter of a category is, the more difficult it is to select its members. Mixing categories also increases fuzziness, making it more difficult to determine typicality, and when consumers apply categories inconsistently, it can affect the emergence of a new category (Hannan, 2010). For a new market category, fuzzy boundaries will likely have a negative impact on the success of firms in that grouping, an effect that is exacerbated by category straddling. Thus, new firms in an emerging market should not participate in spreading its membership beyond a single category.

Combining categories can occur on three different levels: individual, organizational, and categorical. Individuals and firms that align themselves with more than one category are more likely to lose business opportunities and credibility, while the categories themselves become less appealing as the value of membership is weakened (Kovács and Hannan, 2011). Kovács and Hannan (2011) argue that these consequences are heightened or diminished relative to the distance between categories, as well as the strength of the categories. Categories that are more somewhat similar are more easily understood by consumers than categories that are very different.

2.3 Discursive legitimation strategies

Discursive legitimation strategies are employed to make sense of a new situation or crisis. This strategy involves two components: discourse and legitimation. Discourse refers to communication, and legitimation refers to how key actors are

evaluated by social actors in the context of specific actions and events (Vaara, 2014). Thus, discursive strategies are the tactics that individuals use to approve or disapprove of something, such as a new product, based on reasoning.

Key actors are individuals who have been given authority because of their influential or institutional role and thus are seen as legitimate by social actors (Vaara, 2014). In the case of the clean meat industry, key actors are people from government, industry, or media that play a role in framing clean meat to the public. Social actors refer to the members of the public that receive information about clean meat. Discursive legitimation is important because it shows how issues become framed by social actors and how social actors cope with impressions, such as those leading to categorization (Vaara, 2014). For clean meat, the media plays a pivotal role in influencing the public's opinions about clean meat and, in turn, how consumers perceive clean meat.

According to Van Leeuwen and Wodak (1999), there are four types of discursive legitimation strategies: authorization, moral evaluation, rationalization, and mythopoiesis. Authorization refers to legitimation by using an authority figure, such as a company executive or government representative, or standard, such as a tradition, custom or law, to defend one's beliefs (Vaara, 2014; Van Leeuwen, 2007). Moral evaluation is legitimation by invoking a value system (Vaara, 2014; Van Leeuwen, 2007). Rationalization is the use of knowledge claims or arguments to justify a claim (Vaara, 2014; Van Leeuwen, 2007). Mythopoiesis is legitimation by telling a story to provide evidence for or against an event or situation (Vaara, 2014; Van Leeuwen, 2007). Vaara et al. (2006) adds a fifth type of legitimation strategy called "normalization," or the upholding of what is the norm. It is like authorization, which points to customary practices, but extends this by emphasizing what is functionally or behaviorally standard. This strategy focuses specifically on conformity to social standards or normal behaviors and practices. In the context of a nascent product such as clean meat, this is arguably the most important strategy since social actors are confronted with a product that challenges what is "normal." All of these strategies can occur independently, or in combination, and can be used to legitimize or delegitimize an object, action, or event (Van Leeuwen, 2007).

2.4 Consumer and technological adoption

Consumer adoption refers to the processes developed to make sense of how consumers adopt new products in the general sense. Another term for adoption is diffusion, which has been defined sociologically by Katz, Levin and Hamilton (1963) as "the (1) acceptance, (2) over time, (3) of some specific item – an idea or practice, (4) by individuals, groups or other adopting units, linked (5) to specific channels of communication, (6) to a social structure and (7) to a given system of values, or culture." Adoption requires a common understanding by audiences about the way a product should be treated, discussed and repeatedly used by members of society.

The established model of innovation diffusion consists of several types of consumers: innovators, early adopters, early majority, late majority and laggards (Eng and Quaia, 2009). Customer education, where consumers learn about the product, is an important predecessor to widespread adoption, especially in uncertain environments (Eng and Quaia, 2009). Informing consumers about a new product also serves to reduce uncertainty, build trust and improve comfortability with product (Eng and Quaia, 2009).

Consumer adoption closely relates to theory on new product adoption, which describes how consumers go from first hearing about the product to complete adoption (Eng and Quaia, 2009). This process involves an evaluation stage, where the potential customer assesses how well the product meets his or her needs (Arts et al., 2011). The mental processes that accompany this make a distinction between intended and actual adoption. At this stage, sellers should focus on minimizing the risks that may make consumers hesitate in the adoption process (Arts et al., 2011).

Technological adoption refers to the acceptance of a new technology by consumers. In many industries, the development of new technologies represents a significant investment. Thus, actively seeking adoption by consumers is paramount to the financial success of clean meat companies. The adoption of technology by audiences exists in stages. Initial adoption typically comes from innovators and early adopters, and these are the consumers that influence how a product is perceived by later adopters (Eng and Quaia, 2009). The majority of adopters only come after there have been some level of improvement and innovation in the original product (Probert et al., 2013).

Widespread adoption begins with the early adopters but later focuses on mainstream consumers. Probert et al. (2013) recognize the importance of this transition in their study of technological marketing, determining that in order to successfully sell a new technology to a large number of adopters, the seller must conform to the customer perspective. Because of the high levels of investment as well as high levels of uncertainty associated with selling new technologies in uncertain markets, marketing to customers can help increase adoption (Eng and Quaia, 2009). This is because increased consumer awareness is positively correlated to increased adoption rates (Eng and Quaia, 2009).

Most studies integrate the S curve diffusion model to demonstrate the rate at which technologies get adopted. Once again, this model illustrates that new product adoption stems from innovators and early adopters (Eng and Quaia, 2009). The basic premise of the S curve is that the rate of adoption is affected by the number of firms that have already adopted a technology and the potential number of firms that still could adopt it (Yeon et al., 2006). The probability of gaining a new adopter increases as the number of existing adopters who are satisfied and have had positive experiences increases (Yeon et al., 2006).

Some firms have instituted a ”hype” strategy in order to excite customers and garner product support in advance of a product’s release (Yeon et al., 2006). While this seems like a benefit, this has been shown to result in negative results, such as dissatisfied customers (Yeon et al., 2006). This effect can be exacerbated

by the spread of consumer word-of-mouth, consequently hindering long-term adoption. As a result, hype strategies should be used strategically and sparingly.

2.5 Concluding remarks on theoretical background

Categorization refers to the necessity for firms or consumers to use groupings to compete more successfully and better understand the market. This is the main premise behind the categorical imperative: external audiences (consumers, media, etc.) control the categorical organization of firms such that firms who do not comply with this organization lose competitive and social benefits. Categories arise from the competitive actions of suppliers interested in securing the top position of a new market. These actions help shape the market by attracting media attention and educating consumers, who in turn reinforce emerging categories via preferential treatment towards suppliers that exemplify the category. Two streams of thought exist in categorization management studies: one stemming from sociology, and the other from psychology. Studies based on a psychological framework are fewer and suggest that categorization stems from internal users (i.e. the firms categorize themselves). Conversely, studies following a sociological foundation are more abundant and argue that categorization is a product of external factors (i.e. consumers categorize firms). The research gathered from the interviews in this study will shed light on whether external forces or internal forces are more dominant in categorizing the clean meat market.

Firms either compete through technological innovations or product substitutability, and in the case of clean meat, firms are competing on both bases. One issue that arises when studying categorization by consumers is that their use of categories can be errant: membership or partial membership to categories is a subjective judgement, rather than a scientific evaluation. Thus, the conclusions drawn from the consumer interviews in this study will be from a cultural categorization perspective, rather than a scientific one. Category fuzziness arises when it is difficult to assess the members of a particular category. This may play a role in the categorization of clean meat, depending on how consumers define it: meat vs. meat substitute, healthy vs. unhealthy, sustainable vs. unsustainable, etc. This is especially important because clean meat has only recently attempted category emergence.

Stigmatization refers to the socially-recognizable mark left on firms within an industry when they (or the industry) become the recipients of public disapproval. This disapproval threatens the credibility and financial success of firms and leads firms outside of the stigmatized industry to keep their distance. Firms that find themselves in this situation may be able to counter this by diversifying their product offerings, a strategy termed as stigma dilution. If the results of this study find that a negative stigma is associated with the clean meat industry, this would result in a high level of disapproval, causing more public scrutiny and suspicion (Vergne, 2014). For a new industry such as space travel or

in vitro meat, where the amount of resources needed to create a successful business model are extremely high, this negative attention could be detrimental. Firms in stigmatized industries that successfully protect themselves from high disapproval levels typically perform better (Vergne, 2014).

Discursive legitimation strategies may enhance consumer adoption of clean meat if the discourse is framed positively. Thus, identifying the key discourses is the first step in understanding discursive relationships, and the legitimation behaviors that follow (Vaara, 2014). In the context of clean meat, key discourses are the environment, animal welfare, health, food availability, agriculture, and affordability. This is further discussed in section 5.2.1. The second step is identifying key authoritative actors. The media serves as one of the most critical actors as well as governmental representatives and sustainability and animal-related NGOs. All these actors can cultivate certain feelings about clean meat, which may influence the categorization strategies implemented by consumers. Later, Section 5.2.2 examines the key legitimation strategies employed by the media to cope with the introduction of clean meat, leading consumers to think or act in a certain way (Van Leeuwen, 2007).

Consumer adoption of clean meat is currently not guaranteed, since clean meat products are not yet available. Research on the environmental impacts of farming and the concern for animals in the meat production industry indicate that clean meat would be a significant improvement on both accounts. Consumers are increasingly turning towards more green, natural, and cruelty-free products. But while research may indicate that clean meat is favorable, the question of whether consumers will adopt this product remains. The research presented in Section 5.1 and 5.3 address this question, while Section 5.4 reveals the company marketing opportunities that may be beneficial in increasing consumer adoption.

The various theories employed in this paper – categorization, consumer and technological adoption, and discursive legitimation – all relate to how consumers accept and perpetuate perceptions toward markets, firms, and new products.

3 EMPIRICAL CONTEXT

To understand how consumers perceive clean meat, it is necessary to first understand what clean meat is, how it came to be, who is working on producing it, and what the previous studies on the consumer acceptance of clean meat have discovered. This information is later applied in the development of the survey and in preparation for conducting interviews. Thus, this section describes the empirical context of clean meat, otherwise known as cultured meat, which is meat developed by using stem cell technology to reproduce animal proteins (Post, 2012). Additional terms include in vitro meat, lab-grown meat, and tissue engineered meat. However, the term "clean meat" has been accepted by the industry proponents as the most suited for public conversations about the product ("Clean Meat", 2018). Because of this, "clean meat" is the main term used in this paper.

Naturally, to better understand the clean meat phenomenon, background information describing clean meat is an essential component of this study. This knowledge supports the development of the survey discussed in Section 4.2.1 and prepares the researcher for interviewing consumers, as discussed in Section 4.2.3. First, Section 3.1 describes the history of clean meat. Then, Section 3.2 describes how clean meat is developed. Next, Section 3.3 presents an overview of the emerging industry, highlighting the startups that have been established and how they compare to each other. Finally, Section 3.4 describes previous studies that look at how consumers react to clean meat. Altogether, this section provides an overview of what clean meat is, the companies that produce it, the impacts it may have, and what is known about initial consumer perceptions.

Additional research on the proposed advantages and disadvantages of clean meat was conducted to better prepare for conducting interviews. This supports the research question by providing background information on the topics that were found to be of special interest based on the studies discussed in Section 3.4. These were environmental sustainability, animal welfare, health, culture media methods, and farming applications, summaries of which can be found in Appendix 1.

3.1 History of clean meat

This section presents the history of the clean meat industry, highlighting major developments in the field, and thus providing a more well-rounded understanding of the clean meat phenomenon.

Biotechnology related to meat development dates back to 1912, when Nobel Prize winner Alexis Carrel, surgeon and biologist at the University of Chicago, successfully kept a piece of heart muscle from a chicken embryo alive

outside of the animal (Tramper and Zhu, 2011). Cultured meat was first predicted by Winston Churchill in 1931: "We shall escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium" ("Fifty Years Hence," 1931). The first successful experiment to cultivate muscle in vitro was conducted in 1971 by Russel Ross at the University of Washington, where guinea pig muscle cells were grown for eight weeks in cell culture (Ross, 1971). During this experiment, Ross discovered that the amino acid composition of the cultured meat was "similar, if not identical" to natural meat samples (Ross, 1971).

In 2001, a NASA-funded research team, in search of more diversified space meals, successfully grew edible fish muscle. This was conducted by immersing samples of large goldfish muscle, soaking them in fetal bovine serum (FBS), and allowing the sample to grow over the course of a week (Sample, 2002). FBS is a nutrient source derived from the fetuses of pregnant cows that are to be slaughtered (Gstraunthaler, 2003). The result was a 14% increase in size of the sample, demonstrating the successful reproduction of fish muscle in both appearance and smell. Despite this success, the use of FBS is highly controversial, as will be discussed in Appendix 1.

Legally, the prospect for developing cultured meat has been around for three decades. In 1991, a US patent was filed and granted for the development of tissue engineered meat, and, in 2001, a worldwide patent to produce cultured meat was granted (Sandle, 2017). In 2008, People for the Ethical Treatment of Animals (PETA) announced that it would award 1 million USD (806,900 EUR) to whoever could provide lab-grown chicken to consumers by 2012 (Food Safety News, 2012). But the world's first lab-grown product was not developed until 2013 when Dr. Mark Post, a professor of Vascular Physiology at Maastricht University and co-founder of MosaMeat, unveiled a lab-grown burger (BBC News, 2013). The production cost of this burger was 330,000 USD (250,000 EUR) (Ghosh, 2013).

3.2 Development of clean meat

In this section, the methods used to produce clean meat are described. Specific techniques may vary slightly between companies, but the general process and its elements are presented. This information provides a useful basis for conducting the consumer and company interviews discussed in Sections 5.3 and 5.4.

There are many aspects involved in the creation of clean meat: *Muscle cells* are added to a *culture medium*, which then proliferate in a *scaffold* using a *bioreactor* over the course of several weeks into strips of muscle called myotubes (Datar and Betti, 2010; Hultin, 2017; Post, 2012). Each of these components, visualized in Figure 1, are defined and discussed below:

1) *Muscle Cells*: In general, the cells used for in vitro meat production can be myoblasts or myosatellite cells. While myoblasts serve as the basic

building blocks of muscle cells, myosatellite cells are stem cells (Datar and Betti, 2010). The cells can be collected in several ways, such as a painless biopsy (TEDx Talks, 2014) or a feather (JUST Clean Meat, 2018).

2) *Culture Medium*: The culture medium is a nutrient source for feeding and growing cell cultures in vitro (Gstraunthaler, 2003). As mentioned above, fetal bovine serum has traditionally been used for this purpose, but there are many ethical concerns about using this. Because of this, plant-based serums or media would be much better suited for developing clean meat.
3) *Scaffold*: A scaffold is a platform with a wide surface area to which the cells can anchor, and is necessary for the muscle cells to contract and naturally self-proliferate (Datar and Betti, 2010). Scaffolds can be made of edible materials, such as collagen, cellulose, alginate or chitosan, or inedible materials, such as electrically conductive fibers (Datar and Betti, 2010).
4) *Bioreactor*: The bioreactor is a device used to distribute the medium and supply oxygen to the cell sample (Datar and Betti, 2010).

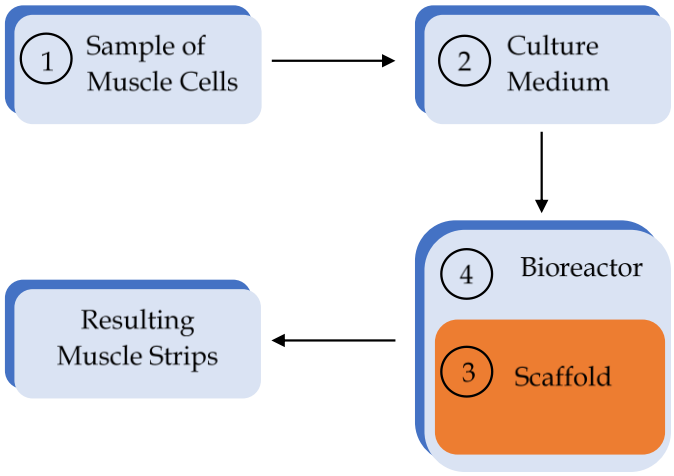

Figure 1 - General representation of the clean meat development process. Clean meat is created by adding 1) muscle cells to a 2) culture medium, which then proliferate in a 3) scaffold using a 4) bioreactor. Figure adapted from Datar and Betti (2011).

One challenge in this process is the obtaining of a stable group of animal cells, called a cell line, that is capable of behaving in consistent and replicable ways (Spect and Lagally, 2017). According to an interview with Post, it took his lab two years to develop fibers that were consistent enough to create hamburger meat (Maastricht University, 2013). Once techniques for consistent fibers were solidified, the biggest remaining challenges to creating a viable consumer product are the color and scaling up production (Maastricht University, 2013). In fact, the most crucial aspect of developing this product will be the physical properties of meat that consumers value: "For a new meat substitute to be widely adopted, it needs to exactly mimic or even better, recreate conventional meat in

all of its physical sensations, such as visual appearance, smell, texture and of course, taste" (Post, 2012). The nutritional value of clean meat is also a significant barrier to consumer acceptance. This is elaborated on in Appendix 1.

3.3 Firms in the emerging clean meat industry

This section introduces five well-established players in the clean meat market and how they market themselves online. This information is vitally important for comparison to familiarity of consumers with clean meat companies, discussed in Section 5.3.5, and to better prepare for the company interviews conducted for this study, as described in Section 5.4.

The clean meat industry is emergent; clean meat products have not hit consumer markets yet. But the industry is growing. At least twenty companies have already entered this space, and more are expected to join in search of some of the 567.2 million USD (488.3 million EUR) given in funding so far (Foussat and Canteneur, 2016). This paper focuses on five startup companies that have been identified as the most publicized and/or funded at the time of this thesis. These are Memphis Meats, MosaMeat, SuperMeat, JUST, Inc. (formerly Hampton Creek) and Finless Foods. The clean meat products they plan to sell is what makes them competitors, although some have chosen more specific market niches. Currently, MosaMeat is only producing clean beef, SuperMeat is specifically focused on clean chicken, and Finless Foods is developing clean fish. It is necessary to point out that most of the issues contained in this paper will relate to farming practices, although over-fishing and the welfare of farmed fish are also important matters. Table 1 compares establishment and funding information to illustrate the stage of development of each of these companies.

Company	Year Founded	Location	Funds Raised, in USD	Funding Type	Expected Product Release Date
JUST, Inc.	2011	US	220 million[1]	Late Stage Venture, Series D	2018
MosaMeat	2013	The Netherlands	N/A	Series A[2]	2021
Memphis Meats	2015	US	20.1 million[3]	Early Stage Venture	2021
SuperMeat	2015	Israel	3.2 million[4]	Seed	2021
Finless Foods	2017	US	N/A	Seed	2019

Table 1 - Existing clean meat startups (as of May 2018)

The narratives presented by these startups play an important role in shaping this emerging industry. The information presented by each startup was

[1] Source: Hampton Creek. Retrieved February 19, 2018 from https://www.crunchbase.com/organization/hampton-creek-foods
[2] Source: Company interview
[3] Source: Memphis Meats. Retrieved February 19, 2018, from https://www.crunchbase.com/organization/memphis-meats
[4] Source: SuperMeat. Retrieved February 19, 2018 from https://www.crunchbase.com/organization/supermeat

analyzed and summarized in Table 2. The primary qualifier used to determine whether a company included information about their product on their website was the presence of an explanation of production practices and processes, including but not limited to the use of a culture medium, bioreactor, and origin of starter cells. The two most common platforms for publishing and promoting stories about their companies and/or products are social media and their website.

As shown in Table 2, all five startups have active social media accounts where they communicate news about their products. But not every company provides information about their production and technological processes on their website. Only JUST, Inc., SuperMeat and MosaMeat do so either by means of a video or website text. In fact, JUST, Inc. and MosaMeat include a wealth of information about the process of developing clean meat on their sites. Conversely, Memphis Meats merely relies on various media reports to provide information about the company, and Finless Foods focuses on educating readers about the problem with overfishing.

		JUST, Inc.	Memphis Meats	Super-Meat	Finless Foods	Mosa-Meat
SOCIAL MEDIA	Has an active account	✓	✓	✓	✓	✓
WEBSITE	Includes info about clean meat	✓	✓	✓	✓	✓
	Includes info about its production process	✓	✗	✓	✗	✓

Table 2 - Comparison of company information sharing via social media and website

3.4 Studies on the consumer acceptance of clean meat

This section presents an overview of the studies about consumer acceptance of clean meat conducted thus far and how much is already known about consumer acceptance of clean meat. This review is crucial in comparing the findings of this study to the results of prior studies, as discussed in Section 6.2.

Interest in cultured meat has been increasing in the world of scientific literature in recent years. Objectives range from determining the degree of consumer acceptance, skepticism about consuming clean meat, and doubts and uncertainties about the product itself (Bryant and Barnett, 2018).

Results about whether consumers will accept clean meat are inconclusive. Most studies examining consumer perceptions were conducted in Europe and the US. One of the earliest of these is a survey conducted by Verbeke, Sans et al. (2015), which discovered that a relatively small number of consumers are opposed to technology-produced meat. Similarly, a focus-group based study, conducted by Verbeke, Marcu et al. (2015) in Belgium, Portugal and the United Kingdom, found that two out of three respondents were willing to try clean meat. However, skepticism is a common trend. In a study conducted by Hocquette et al. (2015), only 9.2 to 19.2% of respondents to a France-based survey believed clean meat will be accepted by consumers. In the US, Laestadius and Caldwell

(2015) analyzed over 800 online comments to news articles and found that the perception of clean meat as an "unnatural" and "risky" product is a significant barrier to public acceptance. However, a survey-base study conducted in the US by Wilks and Phillips (2017) found that about two-thirds of respondents would probably or definitely try clean meat.

Concerns about consuming clean meat are evident in each study. Verbeke, Sans et al. (2015) found that feelings of "disgust" and the belief that clean meat is "unnatural" were common opinions among consumers. To overcome the perception that clean meat is unnatural, Siegrist et al. (2018) suggest labeling and marketing clean meat in a way that emphasizes its qualities, not the production process. Price was also found to be a significant barrier (Verbeke, Marcu, et al., 2015; Verbeke, Sans, et al., 2015; Wilks and Phillips, 2017). While O'Keefe et al. (2016) found that consumers were willing to try clean meat, participants still had reservations about safe consumption and labeling, and generally believed clean meat would have to be cheaper than conventional meat in order to get consumers to switch.

Initial reactions to clean meat could improve if social issues are attached to the question. Verbeke, Sans et al. (2015) concluded that consumer acceptance of clean meat rests on being ethically acceptable, in addition to its availability in the market. Verbeke, Marcu et al. (2015) learned that the number of individuals willing to try clean meat increased by 19% when environmental issues were stressed. O'Keefe et al. (2016) held six focus groups in the UK and discovered that the majority of participants were open to clean meat due to the possibility of getting meat without killing animals.

Few studies have worked on developing frameworks to better understand consumer attitudes toward clean meat. A notable exception is Verbeke, Marcu et al. (2015), who developed a model for connecting consumers' feelings and emotional reactions about clean meat to their decisions to accept or reject this product. This process is illustrated in Figure 2. While some participants recognized personal and/or societal benefits, they were limited and coupled with perceived risks regarding health and nutrition. This framework demonstrates that buying decisions about clean meat result from a complicated process.

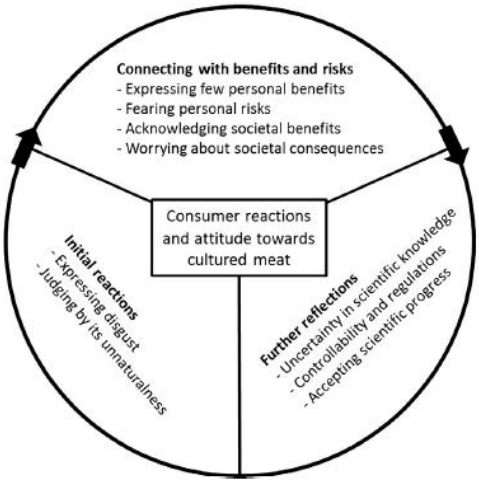

Figure 2 – Model to connect consumer reactions and attitudes to buying decisions about cultured meat (Verbeke et al., 2015)

The study by Verbeke, Marcu et al. (2015) concluded with four important points. First, initial reactions by consumers were solely of "disgust" and "unnaturalness" (Figure 2). Second, consumers would be uncompromising on taste and other factors in their judgement of clean meat. Third, consumers will form perceptions about clean meat based on existing products. This assumption falls in line with category membership, where consumers decide which existing category the product offering belongs to (Vergne and Wry, 2014). Four, the lack of scientific knowledge among consumers solidifies their uncertainty about clean meat. This study aims to further test these conclusions.

To date, clean meat studies have been conducted using surveys, online tools, and focus groups. This research is extended by conducting qualitative interviews. More in-depth interviews will aid in gaining a deeper knowledge about consumer perceptions, including how categorization develops and can be influenced.

4 DATA AND RESEARCH METHOD

Chapter 4 describes the quantitative and qualitative approaches used to answer the research question. First, the triangulation method used to analyze primary data and the thematic analysis method used to categorize the data are described in Section 4.1. Then, Section 4.2 describes how these methods have been applied to the survey, news articles, and interviews used as data samples.

4.1 Triangulation method and thematic analysis

The following introduces triangulation as the primary data analysis method chosen for this study. This method was selected because it provides a robust analysis of consumer perceptions of clean meat from multiple perspectives. Additionally, thematic analysis is described to explain how the data is inductively coded and categorized. Thematic analysis is especially beneficial in inductive analyses and makes the data more comparable to the study by Verbeke, Marcu et al. (2015), which is first discussed in Section 3.4 and becomes important in Section 6.2.

The triangulation method employed in this study will include analysis of the online survey, consumer interviews, and company interviews. The research question is served by each of these methods, but in slightly different ways. Thus, the combination of various questions and interview protocols used for each of these tools offers complimentary views of the data and allows for more detailed interpretations.

Triangulation is the combination of data collection methods to study the same phenomenon; doing so ensures that the results are specific to the phenomenon and not the method (Jick, 1979). In the context of this study, the phenomenon in question is the consumer categorization of clean meat. The basic premise is to determine if each method used in the triangulation produces the same results, thus increasing the validity of such results. The triangulation method adopted in this study comes from Jick (1979), who argues that the use of multiple measures can also uncover a unique variance which may otherwise remain undiscovered. This is especially salient for consumer studies, where data is often context-specific. Using a triangulation method in three different countries (Finland, Germany, and the US) will enable conclusions based on themes and geography. The triangulation method also serves to balance out the strengths and weaknesses of the methods used (Jick, 1979). For instance, if the consumer interviews turn out to be more involved and specific than the company interviews, having the combination of multiple methods accounts for these differences and maintains the overall strength of the study.

The use of a survey in this study provides a greater ability to generalize about the data. Although generalizing is not the goal of this study, the survey

does provide more certainty than using interviews alone, since the data set is larger. This increases the credibility of the study results. On the other hand, qualitative interviews increase the interpretability of the study results. Rather than generalizing, the largest benefit of conducting qualitative interviews is the ability to deeply understand emergent themes.

Thematic analysis was used to formulate and interpret the data, where codes were used to observe and categorize the content of the data (Joffe and Yardley, 2004). This method is suitable for inductive coding, where conclusions are drawn from the raw data rather than hypotheses (Joffe and Yardley, 2004). This method was also employed by Verbeke et al. (2015) in their study of consumer attitudes towards cultured meat in Belgium, Portugal and the United Kingdom. The use of thematic analysis in this paper is suitable for better comparison of findings and a more robust discussion. The codes used in the data analysis were primarily emergent, although a pre-set list of codes was used initially to organize the interviewee responses around the research question.

4.2 Research methods

Next, the three data collection methods used to perform triangulation are described. Together, these methods provide a thorough understanding of how consumers and companies categorize clean meat and illuminate how companies can market clean meat to consumers more effectively.

This study performs a comparative analysis of three countries: Finland, Germany, and the United States of America (US). These markets were chosen based on their access to alternative meat products. Finland and Germany already have significant amounts of vegetarian and vegan products in grocery markets and restaurants, and this will provide a valuable opportunity to present cultured meat as an alternative. The US, on the other hand, does not have a market saturated with meat-alternatives, and it will be important to know how US consumers might respond differently. Additionally, three of the five companies included in this paper were founded in the US. The combination of these three different countries fosters a thorough analysis of consumer preferences and sets the stage for future studies to expand upon this data by comparing the resulting findings to other markets.

The data collection occurred in three stages. First, an online survey was conducted to collect an initial understanding of how consumers perceive this product more generally. The survey questions were designed according to the information from the consumer studies conducted about clean meat (see Section 3.4). Second, an examination of various media reports from Finland, Germany, and the US was conducted. The results of the survey indicated what information was important to identify in news articles. Although measuring exposure to media accounts about clean meat is not a component of the interviewing process in this study, this information was beneficial for conducting the consumer and company interviews and analyzing consumer logic and

development of consumer categorization. Examining the articles was also vital for this study because media coverage of nascent products, such as clean meat, is an important predecessor to consumer acceptance. Third, qualitative, semi-structured interviews were held with consumers and clean meat companies. Interviews with consumers illuminate how they perceive clean meat and why they perceive it in a certain way. The findings of the consumer interviews answers both how consumers categorize clean meat and how companies can influence this categorization, offering an understanding of how to make the product more marketable to consumers. The company interviews are crucial in learning how the companies categorize themselves and what their current marketing strategies are. Conducting interviews with both parties improves assessment of the similarities and differences in how the businesses and consumers proceed with categorization and labeling.

4.2.1 Online survey

The first phase of collecting data in this study consisted of a short online survey. The goal of the survey was to assess the general interest of consumers in discussing the topic of clean meat, measure the general attitude(s) towards clean meat, and understand the familiarity of consumers with clean meat companies. These factors build the foundation for more in-depth questions during the second phase – qualitative interviews with consumers and firms. A secondary goal of the survey is to find individuals who may be interested in participating in an interview.

The survey consisted of ten questions. Questions 1-3 related to demographic information, 4 to food-eating habits, 5 to familiarity with clean meat, 6 and 7 to willingness to try clean meat, 8 to beliefs about clean meat, 9 to familiarity with clean meat companies, and 10 to interest in being interviewed. Notably, questions 7 and 8 were based on similar questions used in prior studies about clean meat (see Section 3.4 for more information about these studies). A complete list of survey questions can be found in Appendix 2.

The primary mode of circulating the survey was through Facebook, using the author's social network and encouraging respondents to share the survey with their networks to expand its reach. The online survey was available from October 18, 2017 to November 12, 2017.

4.2.2 News articles

In the second phase of this study, news articles are examined to gain beneficial information prior to conducting interviews and to provide additional contextual background for analyzing consumer discourse. Because exposure to news articles was not a component of selecting interview candidates, article release dates were irrelevant. It was necessary to look at articles from Finland, Germany, and the US to see if any noticeable differences can be identified. However, to limit the number of articles for review to a manageable number, the timeframe for release dates was restricted to two months – November 15, 2017 to January 15, 2018.

Media coverage of clean meat has been occurring for more than five years, yet most of the content in the coverage has not changed drastically. Clean meat startups were not active until 2016, thus earlier news coverage only included the work of Dr. Mark Post, now co-founder of MosaMeat. The benefit of selecting the November 2017 to January 2018 timeframe is that news coverage of clean meat startups was well-established by that time. Additionally, this period includes coverage of the first book published about clean meat and the first investment by a German company.

The search terms used to collect the material were 'clean meat,' 'cultured meat,' 'lab-grown meat,' 'in vitro meat,' as well as translations for these terms in Finnish and German. This parameter resulted in over 90 articles from Finland, Germany and the US combined using Google's News Archive. Many were variations of the same story and to avoid replication, the articles were screened for relevance and uniqueness. Finally, two articles from Finland, ten articles from Germany, and ten articles from the US were selected for analysis. It would have been preferable to review additional articles from Finnish news outlets, but clean meat is not a significant topic in Finland at this time.

To simplify the quotations used as examples in this paper, all articles will be identified only by their country and article number (i.e. FI-1). A complete list of the articles analyzed is found in Appendix 3. Any articles not published in English were translated via Google Translate. This data was then compiled, coded thematically, and analyzed to find key ideas to explore in the interviews and identify the different legitimation strategies used by media.

4.2.3 Consumer and firm interviews

Finally, the third phase for data collection was qualitative, semi-structured interviews. First, interviews with consumers from Finland, Germany, and the US were conducted to gain a more specific understanding of consumer attitudes in each of the chosen markets. Second, interviews with clean meat companies were held to learn how they categorize their own products and to evaluate the marketing strategies adopted by each company. This data will reveal what consumers are looking for in these new products and what will be necessary to achieve widespread consumer adoption. This understanding will aid in the development of a framework to understand consumer attitudes, as discussed in Section 5.3.4. Furthermore, the implications from the findings of the consumer interviews will be used to derive marketing recommendations, further discussed in Section 6.4.1.

Each consumer interview was individual, either in person or via Skype, depending on the location of the interviewee. In-person interviews were advertised to take place in Jyväskylä, Finland; Frankfurt, Wiesbaden, or Kassel, Germany; and the Washington, D.C. Metro Area, US. These locations were chosen based on ability to travel there. The primary goal was to determine how consumers make sense of clean meat and the technology used to produce it.

Ten consumer interviews per country were carried out, resulting in thirty interviews overall. The interview subjects in the different markets were chosen

based on homogeneity to one other to allow for comparative analysis between three different geographic market segments. The three most important criteria were country, gender, and age. To ensure diversity in the data, candidates were also chosen based on their occupational status and meat-eating preferences. Nine interview candidates were sourced from the online survey, while the other 21 interview candidates were acquired through referrals. Interview candidates were also pursued in online social media forums related to clean meat, farming, agriculture, nutrition, vegetarianism, environmental sustainability, and animal advocacy, but none resulted from this.

The first method for sourcing candidates was the online survey, which allowed respondents to indicate their interest and willingness to participate in a separate interview. Of the respondents that answered positively, respondents were selected for an interview based on their similarities to each other and relevance to the research question. Candidates were also sourced via social media advertising and by asking existing interview candidates to refer someone who would also be interested in participating in the study.

The interview questions were designed thematically. Questions 1-4 relate to demographic information, 5 and 6 to meat eating habits, 7-11 to familiarity with clean meat, and 12-18 to feelings and reasoning about clean meat. Question 15, pertaining to health and nutrition, was an important topic discussed in studies about clean meat (for a more detailed discussion of these topics, see Section 3.4). The main topics discussed in news articles analyzed for this study pertained to ethics and the environment (see Section 5.2). These topics were examined in question 18. The full interview protocol, which was used for each interview, can be found in Appendix 4. To protect the privacy of the individuals interviewed for this paper, all interviewees will be identified only by their country and interview number (i.e. FI-1). A list of all interviewees is found in Appendix 5. The aim was to record the audio of these interviews for transcription purposes, but one interview was submitted in writing.

Each company – Memphis Meats, MosaMeat, SuperMeat, JUST, Inc., and Finless Fish – were contacted to request an interview with an employee. All but SuperMeat agreed to participate, resulting in four company interviews. These interviews will reveal the strategies each company has implemented to market its product, as well as address some concerns expressed by consumers. The interviews took place via Skype or Google Hangouts and were recorded for transcription purposes.

Like the consumer interviews, the company interview questions were designed thematically. Questions 1 and 2 relate to the company and the representative's role, 3 and 4 to the type of products made and how they are developed, and 5-11 to marketing strategies. Additionally, topics that were found to be important during the consumer interviews are included: questions 12 and 13 relate to the environment, 14 and 15 to health, and 16 and 17 to farming. Finally, questions 18 and 19 relate to company motivations and challenges. The full company interview protocol, used for each interview, can be found in Appendix 6. Unlike the consumer interviews, these interviews were not conducted anonymously. Each company representative participating in the

interview were given the protocol questions in advance and provided the opportunity to review the transcripts for accuracy afterwards.

The coding and preparation of interview data for analysis was performed following Ose's (2016) method for systematically coding data manually. This method is beneficial when four or more interviews are coded using Microsoft Word and Excel and it supports consistent analyses of large amounts of unstructured data (Ose, 2016). It describes a method for transcribing interviews in Word, transferring the interviews to Excel, coding and labeling the data in Excel, and then transferring categorized text back into Word. This method is acceptable for semi-structured interviews and using this method ensures the scientific quality of the interview method (Ose, 2016).

5 RESEARCH FINDINGS

This section implements the data collection methods described in Section 4 to present how consumers categorize clean meat. Specifically, the findings of the online survey are presented in Section 5.1 to provide a broad overview of how consumers perceive clean meat. Next, the representation of clean meat by the media is analyzed in Section 5.2 to identify key discourses and discursive legitimation strategies. Since the product is not yet available on the market, the media is the largest source of information about clean meat, making it necessary to examine how it is presented to the public. Media discourses and legitimation strategies reveal what kind of information consumers have been exposed to, which becomes relevant in Section 5.3 when the responses from consumer interviews are presented.

The results of the consumer interviews are divided into five key segments. First, the general characteristics of participants are described in Section 5.3.1. Second, the initial beliefs of the participants relating to the consumption of meat in general as well as clean meat are offered in Section 5.3.2. These two sections provide a thorough understanding of the participants involved in this study. Third, the main findings regarding consumer perceptions of clean meat are specified in Section 5.3.3. These findings are the foundation for marketing recommendations later presented in Section 6.4.1. Fourth, the main findings of the interviews are used to develop a cognitive process model that demonstrates how consumers form perceptions of clean meat, shown in Section 5.3.4. These findings are used to support marketing opportunities discussed in Section 6.4.2. Lastly, participant familiarity with clean meat companies and exposure to marketing about clean meat is evaluated in Section 5.3.5. This information is necessary to be able to compare consumer awareness with company marketing activity.

While Section 5.3 looks at the categorization of clean meat from the perspective of consumers, Section 5.4 completes this by addressing how companies categorize clean meat. In this section, the marketing activities of clean meat companies and the narratives employed to address consumer concerns are examined. These reveal how clean meat startups can influence consumer categorization.

Collectively, the five components within Section 5 investigate how consumers and companies categorize clean meat.

5.1 Broad overview from online survey

In the following section, the survey responses are first presented to demonstrate general attitudes about clean meat using the methods described in Section 4.2.1. Possible explanations for the respective outcomes are then presented to be

implemented in the interview questions and, consequently are further discussed in section 5.3.

The online survey received 163 responses in total. The survey targeted consumers from Finland, Germany, and the United States, but respondents from other countries were also able to participate for a more comprehensive view of consumer perceptions. Thus, general findings from the survey are presented first, followed by the results specific to Finland, Germany, and the US.

The numbers indicate several important trends in the data. First, there were a high number of younger respondents. Most respondents were 25-34 years (43%), followed by 18-24 years (20%) and 55-64 years (18%). This is most likely due to the use of social media for the circulation method. Second, there was a high representation of women (116) in comparison to the number of men (40). This could be because women are more likely to eat less meat due to health concerns, and would be more interested in an alternative like clean meat (Iii, 2008). Third, the participants from the US (109) vastly outnumbered participants from Finland (17) and Germany (15). This demonstrates that social connections can heavily influence the distribution of surveys. These limitations are further addressed in Section 6.5.

Most respondents were employed full-time (46%) or students (28%). Occupational status influences budgets and price preferences. Whereas individuals employed full-time have more discretionary income, students have a much more limited ability to make buying decisions. This will play a role in their views about clean meat. Additionally, most respondents consumed meat, either daily (42%) or one to three times per week (37%). These individuals represent the main targeted market, as clean meat is a direct replacement for conventional meat products. Less than 1% of respondents indicated they were vegetarian or vegan.

Most respondents either never heard of the term clean meat or its synonyms cultured meat, in-vitro meat, and lab-grown meat (42%) or had heard of the term but didn't know what it meant (32%). Yet, approximately 41% respondents indicated they would try clean meat, while 36% said they might try it and 23% said they would not try it. The substantial number of individuals who indicated "maybe" is promising for clean meat companies, revealing an opportunity to influence a significant portion of the population. This suggests marketing strategies could be useful in increasing their interest in clean meat by promoting its benefits, such as its social, environmental, and animal-related advantages.

According to respondents, the three most important factors affecting consumer decisions to buy this product are taste, nutrition, and cost. This poses a potential challenge, as respondents disagree about the healthiness of clean meat. There is an equal divide between consumers who believe meat is equally as healthy as conventional meat (41%) and consumers who believe it is less healthy (41%). Interestingly, 18% believe cultured meat is more healthy than conventional meat. But because nutrition was one of the top three factors affecting purchasing decisions, the industry could improve consumer acceptance by up to 80% if the health advantages of clean meat are demonstrated effectively.

Familiarity with clean meat companies was low among respondents. An overwhelming number of respondents had never heard of the four companies included on the survey[5]. This could be due to improper media coverage or low marketing by the companies, both of which are covered in Sections 5.2 and 5.3 respectively.

Overall, the results from this survey were consistent with findings from other researchers that consumers may be hesitant to try clean meat, but believe there are societal benefits overall (Bekker et al, 2017[a]; Bekker et al., 2017[b]; Verbeke et al., 2015). However, these figures are slightly skewed because approximately 13.5% respondents originate from countries other than Finland, Germany, and the US. As a result, responses from the survey have been filtered to analyze the results from Finland, Germany, and the US specifically. This resulted in 17 respondents from Finland, 15 respondents from Germany, and 109 respondents from the US, or 141 in total.

The findings from Finland, Germany, and the US relevant to clean meat are illustrated in Figure 3, separated into five sets. These sets compare familiarity, willingness to try, perceived healthiness, and perceptions regarding environmental sustainability and animal welfare.

Respondents from Finland demonstrated a higher level of familiarity with the term "clean meat" and its synonyms than respondents from Germany and the US (Set A in Figure 3). Overall, 25% of consumers from all three countries described themselves as understanding what the product is, and therefore can be categorized as "experts." This could indicate that consumers are already aware of and knowledgeable about clean meat products even though such products have not yet been introduced to the market. Finding out what these "expert" consumers know about the product, as well as where they gained such knowledge, will be an important component of the interviews. Additionally, it will be interesting to learn why these experts are familiar with clean meat, but not the companies producing it.

In comparing willingness to try clean meat between the three countries (Set B), Finland demonstrated the highest level of interest. When asked if they would try the product, about two-thirds of Finnish consumers said yes, compared to slightly under two-thirds for Germany and one-third for the US. However, it should be noted that with only 17 total responses from Finland and 15 from Germany, these values might not be representative. Nevertheless, an overall 37% of respondents from all three countries who were willing to try clean meat suggests that there is a market for clean meat in these countries.

Interestingly, while the majority (87.5%) of Finnish and German consumers felt clean meat was at least equally as healthy as conventional meat, approximately 52% of Americans described clean meat as less healthy than conventional meat (Set C). This cultural gap may result from differing understandings of the healthiness of consuming meat. Alternatively, this could result from a lack of trust in science. This is later explored in the interview phase.

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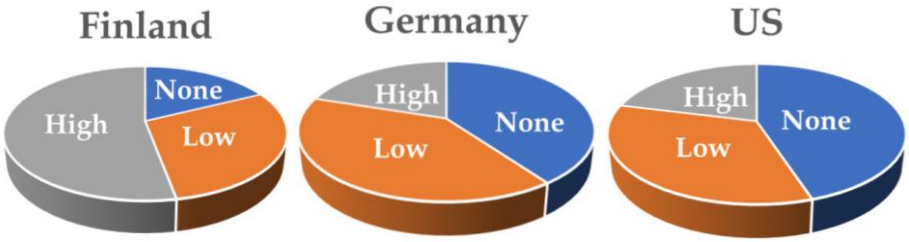
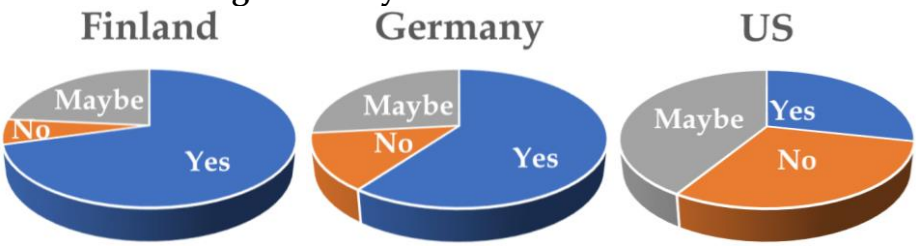
[5] Note: Finless Foods was excluded from the online survey as it was not known to the author of this paper at the time the survey was published.

Set A: Consumer familiarity with clean meat



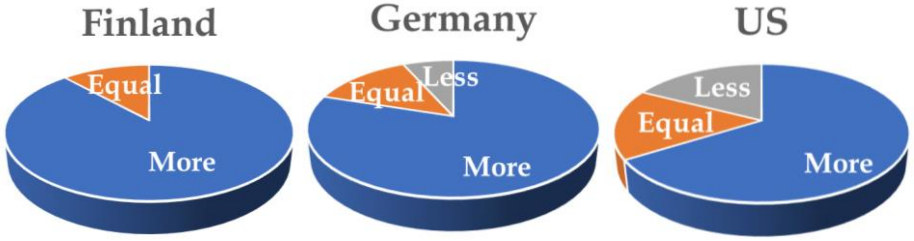
Key: None = Never heard of it; Low = Heard of it, but unsure what it means; High = Heard of it, and understand what it means

Set B: Consumer willingness to try clean meat



Set C: Perceived healthiness of clean meat over conventional meat

Set D: Perceived sustainability of clean meat vs. conventional meat



Note: The chart for Finland contains zero answers for "Less"

Set E: Perceived animal welfare benefits of clean meat vs. conventional meat

Note: The charts for Finland and Germany contain zero answers for "Equal"

Figure 3 - Comparison of survey responses from Finland, Germany, and the US regarding clean meat

Most individuals from all three countries (70%) felt that clean meat was more sustainable than conventional meat (Set D). While 19 respondents from the US and one respondent from Germany indicated that it was less sustainable, none of the respondents from Finland thought it was less sustainable than conventional meat. In any case, this data bodes well for the clean meat industry if environmental benefits can be demonstrated.

Regarding animal welfare, most consumers believe that clean meat is a viable solution for better animal welfare (Set E). A hefty 81% of consumers find clean meat to be more humane than conventional farming practices. Only one individual from Finland, one from Germany, and 13 people from the US felt that clean meat was worse for animal welfare. This could be a question of how humanely the animal stem cells are harvested, as asked by one respondent.

When asked about the factors affecting their decision to buy clean meat products in the future, respondents could select more than one answer and were given the opportunity to supply additional answers. This is because buying decisions are influenced by a combination of factors, and the goal of the survey question was to find out which ones were the most pivotal. To make the factors more comparable to each other, the numbers were converted to percentages, as displayed in Figure 4. Overall, consumers care most about taste, followed closely by nutrition and cost. In Finland, cost and taste were tied as the most important factor. In Germany, taste and accessibility were the two most important factors. In the US, taste and nutrition were essentially tied as the most important factor. In other words, all countries cared about taste, but Finland was also concerned with cost, Germany with accessibility, and the US with nutrition.

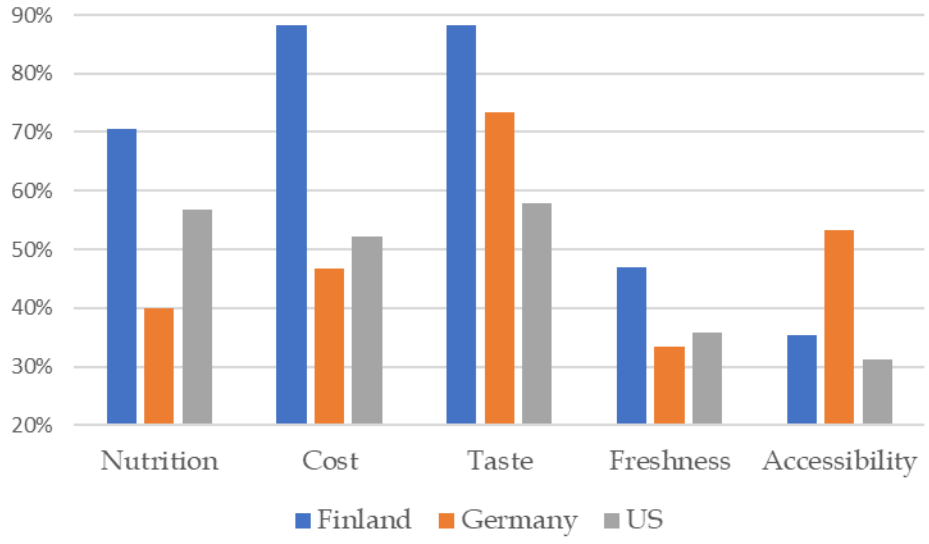


Figure 4 - Comparison of factors affecting decision to purchase clean meat between Finland, Germany, and the US as a percentage of survey respondents

The results of the survey indicate very little familiarity with clean meat companies. Each respondent was asked about their knowledge of the four clean meat companies included in the survey, but 112 of the 141 respondents (79.4%) had never heard of any of the companies. However, 29 people had heard of at

least one company: 6 from Finland (of 17 total), 1 from Germany (of 15 total), and 22 from the US (of 109 total). Of these respondents, only 2 individuals were aware of and familiar with all four companies. The level of company awareness among the 29 respondents is represented in Table 3. Overall, Memphis Meats and Hampton Creek (now JUST, Inc.) had the most familiarity. The responses in this table are divided between the people who had merely heard the name of the company ("Limited Familiarity") versus the people who understood what the firm does ("Strong Familiarity"), separating the uninformed consumers from the informed ones. During the consumer interviews, it will be important to understand why there is low familiarity, as well as why some companies are more well-known that others, as indicated in Table 3. Although the survey only gained 17 respondents from Finland, 35% of respondents claimed familiarity with clean meat. This would be an interesting finding if the number of survey respondents would have been larger, thus more representative. To confirm the percentage of 35%, more survey respondents would need to be tested but that is not within the scope of this thesis. This issue is discussed further in the limitations discussion in Section 6.5.

	Memphis Meats	MosaMeat	SuperMeat	Hampton Creek[6]
Limited Familiarity	31%	7%	3%	41%
Strong Familiarity	17%	7%	10%	17%

Table 3 - Familiarity of survey respondents with selected clean meat companies

The survey also consisted of an open-ended question that can be analyzed qualitatively: *What other benefits or drawbacks do you see for clean meat?* Because of the high number of respondents from the US, most of these responses originate from the US, however, a few comments can be seen from Finland and Germany. The perceived benefits of clean meat seen by survey respondents were environmental advantages, safer meat consumption, food security, and improved animal welfare. The perceived drawbacks of clean meat were much more numerous: healthiness, taste, price, apprehension, accessibility, view that clean meat is unnatural, changes to the food economy, impact on farmers and a lack of long-term research. Examples of these benefits and drawbacks are illustrated in Table 4.

The two most prominent concerns were health and apprehension. Respondents were primarily concerned about the health effects of consuming clean meat, the chemicals and additives used, the nutrient makeup of clean meat, and the long-term effects of consuming it. There was also hesitation due to a distrust of food trends. Certain foods that were marketed as healthy were later found not to be: "Wary, because Olean was promoted as a healthy alternative originally. Same with Aspartame and other non-native/lab/man-made products" (US). Additionally, some respondents reacted apprehensively

[6] Although Hampton Creek has been rebranded under the name JUST, Inc., the change was not known when the survey was released. Thus, respondents responded to questions that used the name "Hampton Creek". Table 3 retains "Hampton Creek" because of this.

towards clean meat, either due to a lack of familiarity or dislike of unnaturally-produced food.

In addition to the open-ended question, survey respondents could add other factors – besides nutrition, cost, taste, freshness and accessibility – that would affect their decision to buy clean meat products in the future. These additional factors were found to be the environment, animal welfare, morals, disgust and opposition, long-term effects, safety and meat-eating preferences.

On the one hand, some respondents felt that issues such as the environment and animal welfare should be considered important factors in purchasing decisions. This could demonstrate that consumers are more willing to purchase products when they perceive them to be better for social reasons, such as sustainability and the treatment of animals. This could also demonstrate that, due to the nature of survey circulation, the respondents who were willing to answer the survey are more concerned about social issues. This possible downside is further discussed in Section 6.5.

Topic		Excerpt from Survey Response
Benefits of Clean Meat	Environmental Benefits	"Methane savings, farmland savings, massive amount of nitrate fertilizer and environmental savings, petroleum savings (due to nitrate savings), etc." (US)
	Safer Meat Consumption	"Clean meat is probably less likely to be susceptible to disease or other factors that could harm animals." (US)
	Food Security	"The benefit would be for regions suffering from malnutrition. Especially malnutrition from lack protein." (US)
	Animal Welfare	"Less opportunity for mistreatment of animals." (US)
Drawbacks of Clean Meat	Healthiness	"I'm interested in any possible issues regarding the health effects; compare to e.g. GMO." (Finland) "My main concern would be how the lab meat would be able to create different macro and micro nutrients." (US) "What chemicals are used in this process?" (US)
	Taste	"Is it as tasty as normal beef?" (Finland)
	Price	"It's going to be expensive." (US)
	Apprehension	"People will be afraid to try it." (US) "This could be how the zombie apocalypse starts." (US)
	Accessibility	"Accessibility in all regions of the world." (Germany)
	Unnatural	"I am hesitant because it sounds very unnatural. I still don't understand the concept." (US)
	Changes to Food Economy	"It weakens the connection between source of food and consumer." (US)
	Impact on Farmers	"Unfortunately, if this technology takes off then we would see a cultural shift away from animal husbandry, resulting in the loss of livelihood for millions, primarily in the Midwest." (US)
	Lack of Long-Term Research	"Inability to accurately predict long term effects." (US)

Table 4 - Perceived benefits and drawbacks of clean meat according to survey respondents

On the other hand, some respondents found that the nature of clean meat and how it is produced are factors that prevent them from purchasing it.

Comments such as “not natural,” “not typical,” and “it’s just gross” were used to describe opposition. Remarkably, one segment of respondents was opposed to clean meat purely because of disapproval of meat in general. One basis for this is health: “It would still be meat, so I consider it generally unhealthy” (Finland).

Another is morality: “I don't believe we are meant to eat anything from an animal - even if it is grown in a lab. It still came from an animal” (US). This is interesting because it shows that while some use morality to promote clean meat as a better alternative to conventional meat, others use morality to reject the new product.

The comments from the US respondents indicate concerns about potential side effects, long-term effects, quality control, government oversight, religion and unnaturalness. These could stem from cultural or religious beliefs about what is “natural.” Additionally, the link between clean meat and genetically-modified foods was mentioned more than once, pointing to the overall cultural skepticism of modified foods. The frequency of the term “unnatural” requires further investigation. It may be that the decision by the coalition to label the product as “meat” is not to the product’s advantage. As one survey respondent states, the “marketing of clean meat as ‘beef’ will result in people saying that it is ‘not as good’. It should be marketed as an entirely different product. The tastes don't need to be compared” (US). This is an important point for clean meat companies. If consumers do not liken the product with meat, then marketing it as such would negatively affect sales. This possibility will be further examined in the consumer interviews, presented in Section 5.3.

5.2 Representation in news articles

As previously stated, news articles have been gathered to gain valuable background information necessary for interviews and to reveal discursive legitimation strategies used by the media. This research is important because educating consumers, accomplished by media in this case, is an important predecessor to widespread consumer adoption (Eng and Quaia, 2009). Therefore, this section presents an analysis of salient articles from Finland, Germany, and the US, as described in Section 4.2.2.

The purpose of this analysis is two-fold. First, the analysis seeks to locate key discourses presented by the media that can be discussed in the consumer and company interviews (see Section 4.2.3). Second, the analysis serves to demonstrate how the media attempts to influence consumers, either for or against clean meat, revealing key legitimation strategies. Four legitimation strategies in support of clean meat and three delegitimation strategies to undermine clean meat were identified, the latter of which includes a discussion of media discourse on consumer acceptance of clean meat.

Ample news regarding clean meat can be found from Germany and the US, but it is not a substantial topic in Finnish news coverage. Between Germany and the US, the content of the articles was comparable. Texts from both countries

discuss what clean meat is, which companies are working on it, who has received investors, how the meat industry is reacting, and/or the challenge of consumer acceptance. Because there are no discernable country-specific differences, the findings are discussed collectively.

5.2.1 Discourse on clean meat

As previously discussed in Section 2.3, identifying key discourses is the first step in understanding discursive relationships, as well as the legitimation strategies that follow (Vaara, 2014). In reviewing the text from the news articles, six key discourses in the context of clean meat were identified: the environment, animal welfare, health, food availability, agriculture, and affordability. These discourses are important in further evaluation of the legitimation strategies employed by the media, discussed later in Section 5.2.2, as well as finding out which topics may be relevant for consumers, as discussed in Section 5.3.

Environment
The texts frequently referred to the benefits clean meat proposes for the environment. More than two-thirds of the articles discussed the environment in some way or another, especially in the context of the drawbacks of industrialized meat. These include the high demand for natural resources and energy as well as the high levels of greenhouse gas production.

Animal welfare
Another common topic in the articles was animal welfare. Clean meat is regarded as a pathway for ending factory farming and the slaughter of animals for human consumption. A common argument is that even if animals are reared for meat, animals should not be raised in inhumane conditions, as is currently common. This closely relates to the discourse on redefining animal agriculture.

Health
The idea that industrialized meat is unhealthy is also introduced in the texts. The use of antibiotics to prevent disease among food livestock and fatten up animals is used to argue that clean meat is healthier, since it is created without the use of antibiotics or other chemicals. The question of whether consumers will perceive it as healthy is also addressed.

Food availability
The articles often cited the UN report stating that the world's population will double by 2050. Because of this, the demand for meat will grow beyond the capabilities of current production methods. This is used to show that clean meat is better equipped to feed a growing world. This idea is closely linked with environmental concerns, since more meat production means more greenhouse gas emissions and increased use of natural resources. Despite this danger, meat consumption is expected to grow. Clean meat is proposed as necessary if meat consumption does not decrease.

Agriculture
Redefining animal agriculture was a strong theme in the texts. Proponents of clean meat hope that it can replace conventional meat production. This is because conventional meat production is associated with negative environmental impacts and inhumane conditions for livestock animals. Additionally, conventional agriculture was linked to health concerns due to antibiotic resistance, contamination, and more. However, the agricultural industry is a major source of employment. Critics are concerned about the loss of farming jobs. In many ways, the media demonstrated that industry pushback is also a big threat to the success of clean meat.

Affordability
Price is cited as a significant challenge for clean meat among the articles. Many texts referred to the initial cost for clean meat, citing the 330,000 USD (250,000 EUR) lab-grown burger. However, there were also numerous discussions about the evolving costs for clean meat. Companies are confident they can bring costs below that of conventional meat. This could be an important predecessor to consumer acceptance.

As shown in Figure 5, these discourses are interconnected at times. Conventional agriculture has been discussed in conjunction with all five other discourses. This is due to its benefits for the environment, treatment of animals, human health and food availability. Yet, clean meat must meet the affordability standard set by conventional meat. Additionally, supporting a growing world population sustainably is a rising topic.

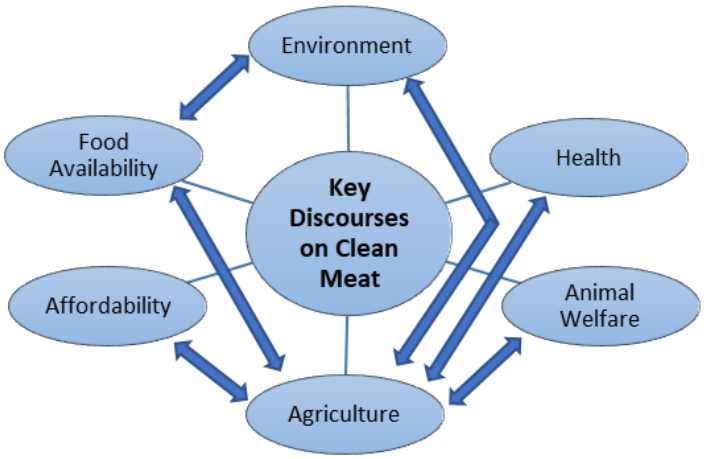


Figure 5 - Key discourses on clean meat and their interconnectivity

5.2.2 Legitimation strategies

As discussed in Section 2.3, discursive legitimation strategies can be used to justify beliefs about new products. Using the expanded framework of authorization, moral evaluation, rationalization, mythopoiesis, and normalization set by Vaara et al. (2006) as the foundation, seven unique strategies relevant to clean meat were synthesized. These strategies were frequently used in the media texts to influence the discussion about clean meat.

Four types pertain to legitimation strategies intended to increase support for clean meat: moral evaluation, authority-based rationalization, economy-based rationalization, and mythopoietic predictions. These strategies have a more positive tone towards clean meat, whereas the remaining three are negative strategies invoked to devalue clean meat. These delegitimation strategies are: authority-based deauthorization, industry-based normalization, and tradition-based normalization. Table 5 shows the difference between these strategies.

Legitimation strategies	Delegitimation strategies
Moral evaluation: Justification based on morals	**Regulation-based deauthorization:** Invoking uncertainty about government regulation
Authority-based rationalization: Validation through experts and statistics	**Industry-based normalization:** Use of criticism from the meat industry to reduce legitimacy
Economy-based rationalization: Justifications regarding changes in the meat industry	**Tradition-based normalization:** Arguing that clean meat contradicts the traditional definition of meat
Mythopoietic predictions: Story-telling to hypothesize about the success of clean meat	

Table 5 - Key discursive legitimation strategies found in news articles

Moral evaluation

The articles frequently referred to moral-based discourse to make arguments in support of clean meat. Ethics-based justifications were often used to describe why clean meat is required. As shown in the following example, farming is viewed as unethical due to the consequences for the environment and livestock animals:

> *There's no shortage of buzz among food-tech companies about how, once perfected, cell-cultured meats will reduce the amount of greenhouse gases we pump into the atmosphere, use less land and water, and save billions of animals each year from slaughter.* (US-1)

In this example, moral evaluation is employed to justify that clean meat is better for the environment and for animal welfare. This excerpt invokes use of the word "slaughter" to appeal to the compassionate side of readers and argues that saving animals from slaughter is a worthy and necessary cause. It leads the reader to question the necessity of animal death in human survival.

The texts also question the ethics of raising such a high number of animals in unnatural environments:

> *Most importantly to many is ethics. Humans kill an unsustainable number of animals every year, most of which are imprisoned for their entire lives while eating anything but a natural diet.* (US-5)

In this example, the author uses a specific tone to raise the importance of the statement. Words like "kill" and "imprisoned" send strong messages,

reflecting the author's beliefs about right and wrong. It is evident that these statements were used to invoke feelings about morality and ethics to support clean meat over conventional meat.

Authority-based rationalization

Authority-based rationalization is the use of quotations from experts and reputable sources of statistics to support the argument that clean meat is preferable to conventional meat. This includes statements by CEOs of clean meat startups and published clean meat studies. For example, experts were used to demonstrate the environmental benefits:

> *[Question:] What is the main benefit to the environment? [Post:] The reduction of greenhouse gases as the cause of climate change and less consumption of valuable resources.* (DE-9)

As the researcher responsible for the world's first lab-grown hamburger, the statement by Dr. Mark Post, co- founder of MosaMeat, holds a lot of clout.

Another method for adding legitimacy is using statistics to share information. Statistics about the effects of industrialized farming on the environment, as well as the resources that clean meat would save, were common. Using statistics produced by governmental agencies was especially important in the texts. A typical example is shown in the following:

> *The consequences for climate protection are devastating: According to figures from the UN FAO, 14.5 percent of all global greenhouse gas emissions are accounted for by the keeping and processing of animals. Livestock farming thus contributes more to climate change than traffic.* (DE-6)

The author invokes a reputable source – a United Nations agency – to justify comments about how conventional meat is harmful for the environment. Additionally, the texts frequently referred to an environmental analysis performed in 2011 by Tuomisto and Teixeira De Mattos:

> *A study by researchers from the University of Oxford in 2010 came to the conclusion that meat from the laboratory compared to conventional meat consumes 35 to 60 percent less energy. In addition, 80 to 95 percent less greenhouse gases would be generated and 98 percent less land needed.* (DE-5)

As discussed in Appendix 1, there is a high level of uncertainty associated with the findings of this study. This is not an important factor in the articles. Instead, this research finding was compounded by additional statistics to make an argument:

> *[SuperMeat] also cites research conducted by Oxford and Amsterdam Universities... Meanwhile, the demand for meat is projected to double by 2050.* (US-2)

As demonstrated above, research from reputable universities was used to rationalize the benefits of clean meat. Even though these figures are projections, this is overlooked to emphasize the predominant issue of the growing world population.

Economy-based rationalization

Economy-based rationalizations are justifications used to defend changes to the conventional meat industry caused by clean meat. Two major types of rationalizations were identified. First, the texts justify any potential reduction of farming jobs by using examples of how new innovations changed industries in the past. Second, investments in clean meat are used as proof of industry interest.

The texts confront the fear of losing farm-related jobs when clean meat takes off by comparing this to what has happened in the past. Numerous historical examples were cited to show that many jobs have been made outdated by innovations over the years, all in the name of progress. These innovations were welcomed by mainstream consumers, and, as a result, the subsequent loss of jobs was not a serious issue. The first example frequently cited to illustrate this point was the horse-drawn carriage industry:

> *Henry Ford accomplished more for horses than Henry Bergh (the founder of the ASPCA) did, despite the fact that Bergh's passion was to help horses while Ford was hardly contemplating their plight at all. As GFI correctly points out, what if the Memphis Meats and Beyond Meats of the world can do to factory farming what Ford did to the horse-drawn carriage industry?* (US-4)

This excerpt demonstrates that the introduction of one product completely transformed an entire industry. The rationalization is that if clean meat renders the conventional meat industry irrelevant in the same way, this would not be unprecedented. While numerous people undoubtedly lost jobs because of these innovations, these examples are used to illustrate that such changes are not detrimental. In each case, new jobs were created, and the texts argue that clean meat will create new jobs as well:

> *Scientific jobs needed in the field of clean meat will become more prominent in the world of food production.* (US-7)

The second form of economy-based rationalization strategies found in the news articles pertained to the investments of large meat producers in clean meat companies. These investments are used to illustrate that the industry is interested in clean meat. This kind of discourse was a surprising finding, given that the clean meat technology has the potential to dramatically change the meat industry:

> *In one of the stranger ironies, what has given real credence to the alt-meat realm is Big Food's arrival on the scene. It's an odd turn of events. When legacy packaged food companies began gobbling up natural food startups, the latter lost much of their street cred. But the opposite has happened with meat nouveau: Big Food's backing has helped validate the burgeoning industry.* (US-8)

Surprise is a key element in this passage, not only about the investment of meat companies, but also that clean meat companies would welcome them as investors. This excerpt also places a large emphasis on the conventional meat producers by calling them "Big Food." The argument is that in supporting the clean meat industry, these producers have added a level of legitimacy to it. In

this case, the rationalization is based on the established reputation of the meat producers.

This strategy is also used to make sense of the situation. The investments are proof that meat producers and clean meat companies are ready to work side by side, indicating more of a partnership than a rivalry. However, investments in clean meat were not always viewed favorably, as will be discussed later with industry-based normalizations.

Mythopoietic predictions

The texts frequently discussed plant-based alternatives in conjunction with clean meat. In some cases, plant-based products were used to hypothesize how successfully clean meat will disrupt the market. These have been termed mythopoietic predictions. A common example used to do this is the explosion of non-dairy milk products on the market, as exemplified in the following:

> *As a sign of the market's potential, alternative meat producers point to the explosive growth plant-based milk has made in the dairy aisle, now capturing almost 10% of U.S. retail sales by volume.* (US-8)

In this example, plant-based milk products and clean meat are viewed as similar to suggest the future of clean meat will be equally as successful. Another type of mythopoietic predictions found in the text relates to plant-based meats, as demonstrated below:

> *Consumers are increasingly interested in protein in all forms, and it's showing up on labels in foods around the grocery store, even the cereal aisle.* (US-6)

These products have also earned a place on the meat aisle due to an increased demand for alternative forms of protein. Moreover, plant-based meats have become more sophisticated because of improved food science technologies. One article uses the word "futuristic" to describe the improvement.

Regulation-based deauthorization

One compelling argument against clean meat articles was government approval, or the lack thereof, employed to delegitimize clean meat. This was accomplished through authority-based deauthorization, which is using the lack of government regulations to show that clean meat is a risky product. One reason clean meat is not on the market yet is that no company has gone through the regulatory process to get the product approved for human consumption. The principal difficulty is that no established avenue for regulating this product exists:

> *For one thing, there are significant regulatory challenges to getting them to grocery store shelves, and it's unclear how a manufacturer seeking approval would even proceed in this uncharted area of science. The FDA oversees products made through fermentation – a key process used in the biotech sector – but the USDA is responsible for regulating meat quality and safety. Vincent Sewalt, who works in regulatory compliance at DuPont, has said if a company started the approval process today it would take two years to get through in the very best-case scenario.* (US-8)

In this excerpt, a sense of doubt and uncertainty is brought in by calling clean meat an "uncharted area of science." This reference associates clean meat with a fear of the unknown. Furthermore, regulating clean meat is meant to sound difficult, demonstrated by the reference to the approval process. This text presents the process as long and arduous, which could further dissuade readers.

Industry-based normalization

Industry-based normalization strategies were a key component of articles referencing opposition to clean meat. This is a form of normalization used to discuss criticism from the meat industry. Much of this criticism was initiated by the investments of large meat producers in clean meat companies:

> *Cattle producers are wondering why companies such as Tyson and Cargill are investing in what producers see as meat competitors.* (US-6)

This excerpt indicates confusion as to why meat companies would invest in clean meat companies. But it also addresses the element of competition. Clean meat companies are viewed as competitors, and it is perplexing why conventional agriculture would support that.

Discussing pushback from the industry was often coupled with statements about the confidence among meat producers that clean meat will not deter their customers. Increased efficiency is used to demonstrate how successful they have become overtime:

> *Steers and heifers headed to the slaughterhouse are a lot meatier than they used to be. In 2016 the U.S. produced 26 billion pounds of beef, nearly the same amount it did 40 years ago. It did so while raising and slaughtering 28 percent fewer cattle.* (US-6)

This statement upholds the norm by reminding readers how well-established conventional meat production is. Furthermore, boasting about raising and slaughtering fewer animals is a form of an environmental argument since the number of livestock animals needed has significantly decreased.

Tradition-based normalization

Normalization tactics based on the traditional understanding of meat played a large role in the texts. The media presented consumer acceptance as a significant challenge for clean meat. The hesitation stems from skepticism about the development process, taste and price.

Some texts point to skepticism about the development process as an obstacle to consumer adoption. The conventional meat market is so well-established that it seems unlikely consumers would adopt the idea of meat grown in a laboratory:

> *The marketing of the meat industry has been so successful in recent decades that even advocates of laboratory meat are unsure whether consumers would even accept the bio-engineered meat. Or whether from a kind of misunderstood tradition orientation they would rather stick to highly industrialized mass animal husbandry.* (DE-7)

The fact that it is produced in a laboratory is the first point of doubt, even if the benefits of clean meat are acknowledged. As shown in the below example, eliminating animal slaughter is overshadowed by the production method:

> *"From an ecological and ethical point of view, factory farming is unacceptable," says the renowned Düsseldorf philosopher and Bioethicist Dieter Birnbacher. But in the end it is the price and thus the market that decides whether the artificial meat will prevail in the long run. And though for one artificial Schnitzel no animal must be killed, exactly this is why consumers are skeptical, believes Birnbacher. "Because the food comes from the laboratory and is technically produced."* (DE-5)

This excerpt about a supposedly respected German expert highlights criticism about the production method. Although Birnbacher says that industrialized meat production is environmentally and ethically harmful, he states that consumers will be hesitant. Claims that consumers are skeptical of clean meat because of how it is produced perpetuate consumer fears.

5.3 Results from consumers interviews

In this section, the findings of the consumer interviews described in Section 4.2.3 are presented. These findings support the research question by demonstrating how consumers categorize clean meat. First, a general overview of the consumer interviewees is provided in Section 5.3.1. Then, initial beliefs are examined in Section 5.3.2 to reveal the established opinions consumers have regarding conventional and clean meat. Next, the way consumers perceive clean meat is presented in Section 5.3.3. Having presented the preconceived notions and perceptions, a cognitive process model is then applied in Section 5.3.4 to form a connection between these two themes and demonstrate the process by which consumers categorize clean meat. Finally, consumer knowledge of clean meat companies is presented in Section 5.3.5 to assess awareness of clean meat companies, thus revealing the effectiveness of existing marketing tactics. Together, the sections within this chapter reveal the existing ideas about clean meat and the process by which consumers develop new attitudes.

5.3.1 Characteristics of participants

This section presents the overall landscape of the participants, including demographic information and general interest in trying clean meat.

The age range among consumer interviewees was 22 to 66 years of age, providing a wide range of variability. Hereafter, consumer interviewees are referred to as "participants." All participants were either employed (including both full-time or part-time), studying, or retired. Of these three occupational statuses, "student" was the most common, representing 53% of the overall interview landscape. Furthermore, the overall population was relatively young, having an average age of 33.8 years old.

To make the results more comparable across the different countries, there was a high level of homogeneity among participants in both gender and age. For each country, at least two non-meat consumers were included. This greatly enhanced the diversity of participants and allowed for greater comparison of categorization strategies used by consumers. Table 6 shows interview candidate information at the country-level to provide an overview of the spectrum of interviewees. This shows a good variety of candidate properties to ensure heterogeneity of backgrounds and comparability among the countries. For a more detailed view of the demographic information and level of familiarity of each individual participant with clean meat, refer to Table 7 in Appendix 5. This table also includes the identifying codes for participants (i.e. FI-1).

	Total	Men	Women	Age Range	Average Age	Students	Employed	Retired	Meat Consumers	Non-Meat Consumers
Finland	10	4	6	26-60	32.2	6	3	1	7	3
Germany	10	5	5	22-66	31.6	7	2	1	8	2
US	10	5	5	26-60	37.7	3	7	0	8	2

Table 6 - Overview of consumer interview candidates at the country level showing a variety of candidate properties

Interestingly, 90% of all interviewees were willing to try clean meat at least once (Figure 6). This represents a much higher level of willingness than was indicated on the consumer survey, where only 37% of respondents from Finland, Germany, and the US combined said they would try it (Section 5.1). However, the number of participants in the interviews was lower and the participant selection process was more biased due to the circulation methods described in Section 4.2.3. Moreover, this does not necessarily mean they will adopt the product. Thus, the goal of the consumer interviews was not to measure the number of consumers willing to buy clean meat, but rather the reasons why they would or would not buy it. This is an especially important distinction since some of the interviewees who were willing to try clean meat for the sake of trying it later said they would not buy it regularly for various reasons.

Figure 6 - Willingness of consumer interview participants to try clean meat

5.3.2 Initial beliefs about clean meat

Before consumer perceptions about clean meat could be understood, it was necessary to look at how consumers feel towards meat in general. In this section, background questions evaluating which factors influence meat consumption

habits are summarized, followed by a discussion of participants' initial reactions towards clean meat. This section indicates what consumers think of clean meat when little to no reflection has taken place. Later, it will be investigated why consumers have these feelings, as discussed in Section 5.3.3.

Influences on meat consumption habits

Two key groups of factors affecting meat consumption were discovered, which henceforth will be referred to as personal factors and awareness factors. Personal factors are comprised of upbringing (examples in Figure 7, A-C), health (Figure 7, D-E), culture (Figure 7, F-G), price (Figure 7, H-J), and personal preference, such as taste (Figure 7, K-N). Awareness factors pertain to social issues, namely the environment (Figure 8, A-C), animal welfare (Figure 8, D-E), or both (Figure 8, F). In many cases, participants cited more than one of these influences from both groups.

Upbringing

A "I think how I grew up. At home, everyone eats meat, and I come from a farm, so we had our own meat there, basically, but I never liked when they killed the animals because they were cute sometimes." (DE-3_14)

B "It is part of my culture and how I was raised that I never thought about going all meatless. I never thought about food a lot because it was my mum who was in charge for cooking." (DE-2_16)

C "What my parents fed me was probably a big factor in determining." (US-5_20)

Health

D "I strongly believe that meat is harming our bodies if we consume too many meat products." (FI-1_22)

E "I watched this documentary, it's called "Forks Over Knives." It talks about meat and puts into perspective the negative side effects of eating meat. I knew all these things about it, but I love meat so much, I don't know. […] Eating a lot of meat is not good for health reasons, or cancers, or other things that are strongly correlated to the intake of animal protein." (US-3_18)

Culture

F "Meat is everywhere. You can go into the town and buy a döner for 3 bucks, so it's very cheap." (DE-1_16)

G "Culture, you know, mom and dad when they made me sandwiches as a kid, and what we had for dinner. Mostly culture." (US-6_24)

Price

H "I dumpster dive, that makes it the easiest. It's easily accessible and it's free. I eat meat. I try to avoid buying meat, meat products, but I'm not a vegan." (FI-5_16)

I "Now that I don't live at my parents anymore I have to look for the cheapest food I can get with the little money I have." (DE-2_18)

J "As a student, of course, it's also not easy. That's why I don't eat meat that much, I guess, because it's too expensive." (DE-3_48)

Personal preference

K "I would say, personal preference and maybe price would influence a bit, and just the environmental impact. And then, forms of meat production nowadays." (FI-6_20)

L "But now as an adult I'm very particular about what kind of meat I eat. I only eat locally-produced meat." (FI-9_14)

M "For instance: Döner or pizza, there's always meat on it. If I ordered it without meat, it wouldn't taste as good." (DE-10_12)

N "Eating meat tastes good, that is a factor. It's tasty to me. And it's a source of protein." (US-5_18)

Figure 7 - Factors influencing meat consumption[7]

Upbringing and culture were the two primary influences on current meat consumption habits. In many cases, participants were raised eating meat and encountered little reason to change their eating habits. This is especially true for

[7] Examples from interviews used in illustrations have been edited for brevity and clarity.

participants from Germany, where meat was perceived to be an integral component of their eating culture. These factors lead to strong partiality of meat that makes reducing consumption difficult, despite acknowledgment of negative impacts of conventional meat on the environment and animal welfare.

Awareness about a social issue may affect meat consumption, but not eliminate it altogether. Even dumpster diving was adopted to avoid buying meat while continuing to consume it (Figure 7, H). One common argument resulting in reduced meat consumption was health, citing the negative effects of consuming meat on one's health. Additionally, cost played a large role in the type of meat consumed, especially for participants in their 20s and 30s. While they would prefer to buy organic or ecological meat because of the benefits to health, environment, and animals, many opted to buy conventional meat due to budget constraints. Such budget constraints are common among students, rendering price an important feature for future products from the perspective of students.

However, concerns about the environment and treatment of animals were also evident factors, being cited as significant reasons for reduction in meat consumption and adoption of vegetarian or vegan diets. This demonstrates that increased knowledge about social concerns is an influential factor in meat consumption.

It is necessary to discuss these factors because they serve as early indicators of how consumers will feel towards clean meat. It is evident that upbringing and culture are strongly correlated with meat consumption. Because of this, consumers that are highly accustomed to eating meat could find value in clean meat, especially when combined with benefits for health, price, and awareness issues.

Environmental concerns	
A	"I also think about the environment, that's probably the second, because there have been a lot of facts lately about how meat consumption is destroying the environment and the globe." (FI-1_20)
B	"I'm worried about the climate change, so that's the biggest reason I don't eat meat." (FI-8_14)
C	"I realized the environmental impact of eating meat. And decided I could do without for most of the time." (US-4_18)
Animal welfare concerns	
D	"The ethical aspect would be the most important factor because that was the main reason for me to become a vegetarian. If there would be a way to eat meat without harming animals, that would be better." (FI-1_111)
E	"I try to just decide to eat less meat to have not that big of an impact, because the German meat industry is not good if you look at how the animals are. But I like the taste." (DE-6_16)
F	"I became vegetarian when I met my girlfriend, mostly for political and economic reasons rather than ethical reasons because I found out how industrialized meat was produced, how bad it was for the environment and treatment of animals, and I decided that I didn't want to support that industry. Sometimes, for special occasions, I go to the ecological store to buy meat that is healthier and not produced in mass production." (DE-5_16)

Figure 8 - Awareness influences on meat consumption

Initial reactions to clean meat

The first goal of the interviews was to test the gut reactions of participants. Some participants were familiar with the concept of clean meat because they participated in the online survey (see Section 5.1), while others had little to no exposure to the concept of clean meat. The first emotions expressed stem from apprehension about the development method. Often, participants initially

referred to clean meat as "unnatural" or "artificial" in some way (Figure 9, A-C). This is primarily an emotional reaction, likely stemming from fear of the unknown.

Interestingly, even when the benefits of clean meat were acknowledged, there was still a reaction of bewilderment by many participants. Even participants in their 20s, who are generally more active in social awareness issues, expressed feelings of apprehension. There was no clear distinction between differing age groups in this regard. It could be argued that there is simply not enough information about clean meat available to the public yet. Had the participants been better informed about the development process of clean meat, they may have reacted less negatively. Negative initial reactions may also stem from doubts about scientifically engineered foods (Figure 9, C). The mental connection between clean meat and laboratories invokes images of chemicals, lab coats, strange environments and unnatural products. This explains why clean meat is associated with genetically modified foods and cloning for certain individuals.

Some participants described clean meat as something from science fiction (Figure 9, D-E). This association invokes the perception that clean meat is abnormal. Several participants made references to the TV show *Star Trek*, implying that clean meat sounds like something futuristic. However, the connection between clean meat and Star Trek is perceived positively, viewed as scientific and technological progress.

Unnatural

A "When I heard this kind of meat, I thought it's just plastic." (FI-10_24)

B "My first feeling is that I thought it was really, like plastic, anything unnatural." (DE-8_20)

C "It feels unnatural, it's like cloning. What comes to mind for me is really cloning." (US-8_24)

Science fiction

D "Well, to be honest, something like Sci-Fi. Kind of like science fiction. Something artificial, I guess. Just the first thing that comes to mind." (FI-7_20)

E "Lab meat sounds kind of weird, like in a sci-fi kind of way. Like, what you actually read in some sci-novels where they grow everything in a lab." (DE-6_24)

Conflicting ideas about "clean"

F "Not producing so many emissions and stuff like that. That would be my idea when I think of clean." (DE-7_16)

G "Free range, relatively low environmental impact. […] I see that as relatively clean to environment and sustaining." (US-7_16)

H "When I think of clean meat, I think of meat that is grown or raised traditionally on a farm, to be raised in a natural way without hormones and antibiotics and all that." (US-8_18)

Figure 9 - Initial reactions to clean meat

Still, some participants held other ideas about what the term "clean meat" meant. Instead of referring to cultured meat, some felt that clean meat related to meat that is environmentally-friendly (Figure 9, F-G). Others believed clean meat referred to the lack of artificial substances, such as hormones, antibiotics and GMOs (Figure 9, H). The participants' judgement of clean meat as "clean" in the sense of the environmental impact and health benefits is not that far off; these are proposed benefits of clean meat and the reason this term was chosen (CleanMeat.org). This demonstrates the name "clean meat" succeeds in generating positive connections to the environment and health. However, because the rest of the interview relied on a full understanding of what clean

meat was, the correct meaning of "clean meat" was explained to participants according to research by Post (2012).

5.3.3 Consumer perceptions of clean meat

Next, five main findings about consumer perceptions of clean meat are presented. These findings summarize the important aspects of the consumer interviews, leading to an understanding of how consumers categorize clean meat, as discussed in Section 6.3.1. Furthermore, the implications from these findings are applied in Section 6.4.1 to formulate company marketing recommendations for enhanced consumer adoption.

Finding 1: Consumers care about sustainably-produced meat.
Consumers are interested in socially-responsible meat production. With clean meat, those concerned about the negative impacts of conventional meat production could continue to consume meat without betraying their values (Figure 10, A-B). This was a major factor in clean meat being viewed as personally beneficial. This is especially important to participants with low budgets, such as students, who would like to support organic or eco-friendly meat but cannot afford it.

Personal benefits

A "I'm now a student, and I must buy the cheap food, or the cheap meat, and maybe this would be the way how I can buy cheap meat but it's clean meat, so it would be better for me, for my conscience." (DE-1_82)

B "I want to eat less meat, but I also really love eating meat, so if I could replace it with clean meat, that would be, I could satisfy my desire with less guilt." (US-4_50)

Social benefits

C "The prospect of not using actual animals is interesting, and worthy to strive for, I think, because it's a way where beings don't need to be killed." (DE-7_74)

D "But for the environment, it would be better, because they don't need water that much." (DE-3_126)

E "Clean meat would be a process that provides meat in a sustainable way where the animals […] are not prone to diseases, they don't have to expose them to so many chemicals and other processes to make them natural." (US-3_26)

F "I think that the most interesting thing would be the opportunity to generate really high volumes of [clean meat] so it would contribute to the global food security and hopefully reduce the amount of mass production that is currently going on. And all these things by not harming the nature, actually, or not harming animals, so that's kind of an interesting solution." (FI-6_72)

G "The interesting thing is in general the idea that you can basically skip nature in some way that benefits nature, actually. So, I think it seems like a breakthrough." (DE-6_64)

H "For example, one of my favorite TV shows is Star Trek, and they use the replicator to compose the food of molecules, it tastes the same, but it's also made from vegetables. Basically, I don't find the idea of lab-grown meat that foreign to me because I saw this as a kid and maybe that's one factor." (DE-7_76)

I "I think it's really progressive, like a future where we don't have to slaughter animals to sustain ourselves. We go on this circle of life, and obviously it doesn't eliminate the circle of life, but it takes us out of this complete overuse of the circle of life." (US-1_92)

J "I think the fact that it might completely change the way we see meat consumption and the way the production of meat affects the world. We could actually save the world." (FI-1_103)

Figure 10 – Personal and social benefits of consuming clean meat

In addition to personal benefits, many participants found clean meat beneficial for society, especially in terms of ethics, the environment, health, food security, and technological and scientific advancement. The advantages for the

welfare of animals were especially important for participants, who saw clean meat as a way to eliminate animal suffering (Figure 10, C). Similarly, concern for the environment was viewed as a major advantage of clean meat (Figure 10, D). The health advantages of producing meat without the use of unnatural ingredients, such as antibiotics or hormones, was also perceived as an improvement upon conventional meat (Figure 10, E). Considering growing concerns about the world population and food availability, some participants felt the ability of clean meat to enhance food security at the global level was a significant contribution to society (Figure 10, F).

Others viewed the advanced technology behind clean meat as advantageous to society because it creates a more sustainable future for food production (Figure 10, G). Some participants felt this could be a future that resembles the society idealized by Star Trek. One individual credits this show as a reason why he is so open to the idea of clean meat (Figure 10, H). Another invokes Star Trek to invoke a future where the "circle of life" is restored, rather than exploited (Figure 10, I). In both cases, clean meat provides hope for a better future and a way to "save the world" (Figure 10, J).

Finding 2: There is an overall lack of information about clean meat and the companies producing it.

Because of a lack of information about clean meat, many participants connected consumption of clean meat with risks. In some cases, this occurred even when societal benefits were acknowledged. The lack of information about the product and how it is made was a significant hindrance (Figure 11, A). Some participants felt they were unable to make informed decisions about certain traits of clean meat, such as its nutritional value, or whether they would consume clean meat (Figure 11, B). Overall, the absence of long-term research was a major source of apprehension and skepticism (Figure 11, C).

Some participants were even cautious about the general consequences of introducing clean meat to society. For instance, there are concerns about the loss of farming jobs (Figure 11, D). Some participants preferred organic or eco-friendly meat over clean meat for this reason. Others were concerned about the good intentions of clean meat being compromised by industry and capitalism (Figure 11, E). The environmental footprint of clean meat is also a point of skepticism (Figure 11, F). Incredulity is transferred to clean meat from other "green" products that later proved to be less environmentally-friendly than expected. Although these participants would like to believe in clean meat, uncertainty remains a significant factor.

The healthiness of clean meat was an interesting point of discussion for the participants. Some participants did not see any serious health concerns (Figure 12, A). For others, the prospect of possible additives, chemicals, or growth factors needed to grow the product was a reason to reject the product (Figure 12, B). Despite what proponents of clean meat claim, some participants felt that clean meat would still be prone to the same diseases as conventional meat (Figure 12, G). Others felt that clean meat would be healthier than conventional meat because it is leaner (Figure 12, C), free of antibiotics

(Figure 12, D) and because of controlled environments (Figure 12, E). Many participants even displayed faith in the producers of clean meat because of their expertise and ability to scientifically enhance the healthiness of clean meat (Figure 12, D). However, there is a concern that producing clean meat in such large quantities as industrialized meat is currently produced could introduce safety and regulatory issues (Figure 12, E). Furthermore, the healthiness of meat in general was also debated. Because some claim that conventional meat is unhealthy, they believed clean meat would also be unhealthy (Figure 12, F).

Personal Risks	
A	"The reason I would not eat this meat is because I don't have any information about how they produce it." (DE-8_66)
B	"I just don't know that much about it, so it's hard for me to think one way or the other, for it or against it, until I learn more about it." (US-5_104)
C	"It's not that well-understood, there is no long-term research. They say it's healthy, but you never know what will happen in twenty years." (DE-10_26)
Future risks	
D	"With organic meat, I can give my money to that and maintain this job. And I think it's important to protect farmers of organic production...How would [clean meat] affect the farmers? Would it get people to work, or the opposite?" (FI-9_56)
E	"When you have a nice, pure, good idea and you have people motivated by greed and profit trying to get control of that good idea, then the idea necessarily doesn't lead to good...This knowledge, the science behind it is not bad, but I don't think it will change the world. It can, but as any technology it's always utilized for profit and not necessarily for saving the world." (US-3_78)
E	"I think the problem in general when you talk about clean things like larger cars, or solar powered, is we say "Oh, it will reduce this much waste over its lifetime" or whatever, but what gets hidden a lot is the amount that goes into its actual production. And so I think to do a good balance, you really need to take all of that into account. And a lot of that stuff is hidden and harder to find, because the people making it are trying to portray that it's such a great product, and maybe it's not." (US-7_24)

Figure 11 - Personal and social risks of consuming clean meat

Healthiness	
A	"It depends on other things you're eating as well, but if I say that conventional meat is healthy, then I think clean meat is healthy." (US-2_82)
B	"I don't see a case where you have animal cells by themselves and they can grow on their own, so something has to be added in order for them to grow into flesh. So, then my question, is what are those components that are being added? Are they chemicals? Are they steroids? Are they hormones?" (US-10_48) "I don't think there is a difference between lab-grown meat and the meat we eat today, because it's the same cells and the same diseases that would follow into the lab. I don't think we could get rid of the diseases even though it's lab-grown. So, the risks are the same." (FI-9_66)
C	"My guess is that clean meat would be leaner than traditional meat, which would be healthier." (US-4_60)
D	"I think it might be healthier in that it's free of any weird medication, because I know if you feed animals medication, some of the remnants stay in the meat and you eat that along with the meat. That can't be healthy. […] I think the experts producing clean meat know how to produce it so that the nutritional value is the same." (DE-6_58)
E	"If it's very controlled, then it should be healthier than the industrial meat. It could also be healthier than the organic meat, depending on how it's grown. But, it would be produced by a company, and you never know what's going. It should be healthy but not if there were industrial mistakes." (DE-9_70)
F	"It's still meat, even though it would be lab-grown, so I think that would be the reason why I would say I think it's not healthy for me." (FI-4_68)

Figure 12 - Healthiness of clean meat

Finding 3: Consumers demand transparency from the companies, especially regarding the development process and the motivations for producing clean meat.

One element consumers felt was missing from the companies was transparency. For example, participants would like more information about the companies (Figure 13, A), such as videos about their product (Figure 13, B). As discussed in Section 3.3, JUST Inc. is the only company that has produced a video showing their operations. Understanding why companies joined the clean meat movement is also of interest to participants. Specifically, participants want to understand the "intentions" behind producing clean meat (Figure 13, C-D) and how the companies will brand their products (Figure 13, E). The packaging, branding, and labeling of clean meat products are also of interest to participants (Figure 13, F).

A	"Maybe also the company, what kind of company's doing it." (FI-3_130)
B	"When and where I can buy it? Because I just want to try it. And maybe a short video about how it is made that I can see." (DE-1_68)
C	"I would like to know about the companies, or how they produce this meat, why they produce this meat, what kind of intentions they have." (DE-8_32)
D	"I just, you know, I want to know what the purpose and the motives are behind it, that's all. Is it going to be really beneficial for people or is it just another for money to be made?" (US-9_94)
E	"I would be really interested to see how they would package it. Like, how they would brand clean meat, and everything, because I think that says a lot about who they're trying to appeal to." (US-2_102)
F	"I do think it's a better thing for the big production of meat to produce it in vitro, but it should be labelled so that I can decide if I want to eat it or not." (DE-9_24)

Figure 13 – Consumer interest in company transparency

Finding 4: Although clean meat has not been introduced to the market, consumers are already able to form opinions about the product.

Consumers were able to make decisions about clean meat even though they have not been able to try the product. This is unique because most consumers form opinions about products after they have tried them.

The two most significant deciding factors with regards to willingness to buy clean meat were taste and price. For some, price was the most important factor (Figure 14, A). For others, price and taste were equally important (Figure 14, B). When standards for taste and price are met, clean meat is viewed as a better product due to benefits for the environment and animals. Because of these benefits, some participants were willing to purchase clean meat even if it were more expensive (Figure 14, C). Most participants were willing to pay 30% to 50% more than the current cost of conventional meat, with several being willing to pay up to 100% or 200% more.

Interestingly, some participants would view clean meat less favorably if it were cheaper than conventional meat, associating lower prices with poor practices (Figure 14, D). This is an interesting perspective, one that may require clean meat companies to reconsider their marketing strategies pertaining to price. The cost of clean meat must be comparable to existing meat products to receive widespread adoption. But some consumers associate cheaper prices with poor quality. The marketing of clean meat should emphasize its benefits rather than cost.

Curiosity about the taste played a role in participants' interest in trying clean meat. In some cases, participants would prefer the taste of clean meat to be like that of conventional meat, but they may be open to it tasting differently if the new taste is acceptable (Figure 14, E). Interestingly, the way clean meat is developed is not a major factor for most participants; it's more important how it tastes (Figure 14, F). This decision boils down to preference: "Why would I buy something that doesn't taste good?" (DE-7_48). But several participants were open to a "lifestyle change" (Figure 14, H), if taste and accessibility requirements are met (Figure 14, G-H). Accessibility was especially important to participants from Finland and Germany, as clean meat currently have yet to be established in those countries.

Finally, safety was an evident factor, but not as common as taste and price. For instance, Finnish participants were very confident that if clean meat was sold in Finland, it would be safe to consume because the regulations are strict (Figure 14, I). But participants from other markets noted their concern about oversight and regulation. Participants are interested to see how clean meat will be regulated by the government (Figure 14, N).

Price

A "Because it's brand new, it comes down to price. If it's too expensive, I'm not going to buy it, if I'm being realistic." (US-6_62)

B "The price would have to be quite the same, and also the taste would have to be quite the same, or at least tasty. I think those are the two main things, because when those are on par with normal meat, then the benefits of clean meat actually outperform normal meat." (FI-3_76)

C "I would say that 150% of the price of normal meat, non-organic meat, or maybe even 200%, which should be in the range of organic meat, would be acceptable." (DE-4_80)

D "If it's the same price as bio-meat then would probably buy it more. I would be skeptical if it costs less than conventional meat." (DE-5_54)

Taste

E "It has to taste about similar. If it tastes good, then it's okay. It might have a special new taste, but I really prefer if the taste is about similar to normal meat." (FI-10_74)

F "I think it's more about the taste in my case, not about how it's fabricated." (DE-7_48)

G "I would try it, as a potential lifestyle change. [...] If it was accessible and [tasted] good, then I don't see a reason why I wouldn't incorporate more of it than conventional meat." (US-2_72)

Accessibility

H "If I have to order it from a different country, I'm going to go to a store. I'll try it once and if it's easy to order, maybe I'll keep doing that again, but that's a large threshold to overcome." (US-6_64)

Safety

I "All the food which comes to Finland is normally checked pretty well, so I wouldn't have problems there." (FI-3_138)

N "As long as these methods are observed by a third party and it can be said 'There's no direct risk,' then I would say, yes, why not." (DE-4_70)

Figure 14 - Deciding factors regarding willingness to buy clean meat

Finding 5: The acceptance of clean meat comes more easily to individuals with an interest in science.

Participants with scientific backgrounds and interest in science proved to be more receptive to the idea of clean meat than participants with non-scientific backgrounds. This indicates a possible connection between knowledge and acceptance. Nearly everyone with a background in natural science, medicine, nutrition, and technology was open to the concept of clean meat. Many participants, both from science fields and other fields, referenced Star Trek to demonstrate comfort and interest in the idea of clean meat. For these consumers,

clean meat will not be an unfamiliar or frightening product, suggesting that acceptance of clean meat will come naturally. Conversely, participants with non-scientific backgrounds were evenly divided between those who were receptive and those who were apprehensive.

The relationship between knowledge and acceptance is interesting. It suggests that, ideally, companies should target those with scientific mindsets to become early adopters to promote the product to other consumers. This refers to the S curve diffusion model, which shows that a small set of consumers ("early adopters") use a new technology before most consumers adopt it (refer to Section 2.4). With a natural interest in science and advanced technologies, these individuals are likely to try the product and tell others about it. With their expertise, they can influence and help shape consumer perception, leading to faster acceptance on a larger scale.

5.3.4 Cognitive process model

The general findings of the consumer interviews presented in the previous sections are summarized in a cognitive process model to illustrate how the influences, benefits, risks, and deciding factors most important to participants are connected and lead into perception formation about clean meat. This model can be utilized by clean meat companies to strengthen marketing strategies, as discussed later in Section 6.4.2.

The factors that currently influence meat consumption - upbringing, health, culture, price, personal preferences, and social issues - serve as the foundation for pre-conceived notions about clean meat (Box 1 in Figure 15). The strength of these notions can be seen throughout the process of breaking down feelings and perceptions towards clean meat. Importantly, health (Box 3b) and price (Box 4) play essential roles later in the process.

Initially, many participants struggled with the concept of clean meat due to its perceived unnaturalness (Box 2), but interest increased as participants entered personal reflection (Box 3a) and formed opinions about the benefits and risks of clean meat (Box 3b). Engaging in benefit-risk analysis was an important step in the cognitive process. Many participants found clean meat beneficial for society in terms of animal welfare, environmental protection, human health, and technological progress. However, there was significant concern regarding the lack of information about clean meat and long-term research regarding health and side effects. In some cases, personal struggle in weighing the benefits with the risks resulted in a change of judgement (Box 3c).

Once participants formed ideas about clean meat based on its social and personal benefits and risks, they solidified their opinions based on certain factors important to them (Box 4). Thus, purchasing decisions about clean meat are ultimately based on price and taste, to a high degree, and accessibility and safety, to a lesser degree. While most participants engaged in the full cognitive process, a few participants jumped from preconceived notions (Box 1) to initial reactions (Box 2) to form perceptions of clean meat (Box 5).

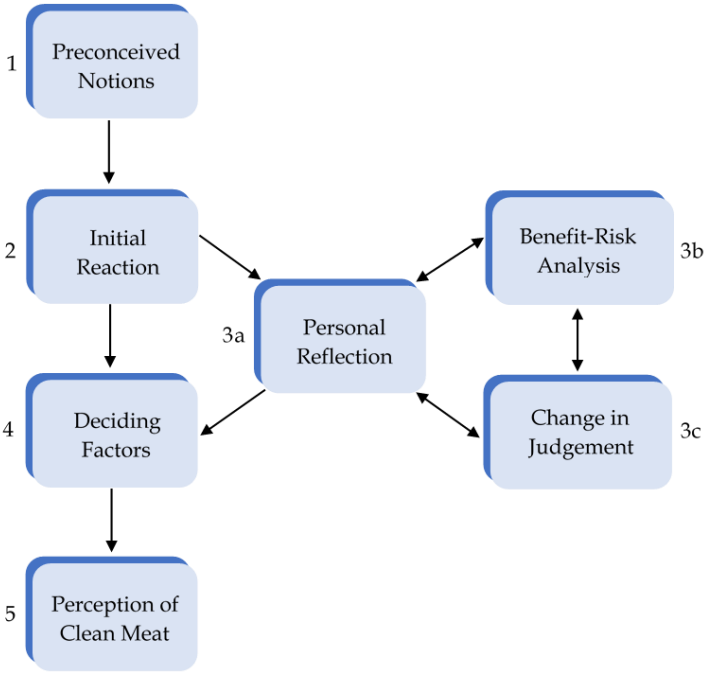


Figure 15 - Cognitive process for perception formation about clean meat. The process shows how personal influences and reflection connect to consideration of important deciding factors, ultimately leading into perception formation about clean meat.

5.3.5 Consumer exposure to clean meat

This section examines the level of participant awareness pertaining to clean meat in general and the clean meat companies. This information is used to evaluate the strength of the marketing activities discussed in Section 5.4.1 and substantiate the recommended marketing strategies presented in Section 6.4.1.

Most participants were already familiar with clean meat due to news exposure about the startups, technology, or major developments, such as the first clean hamburger produced in 2013. Several participants learned about clean meat for the first time through the online survey conducted for this study. But for others, clean meat was an entirely new concept.

The level of conversing about clean meat was found to be low. Some participants had discussed the concept of clean meat in social settings, but primarily in a hypothetical manner. This shows that neither the topic of clean meat nor the companies that engaged in producing it have become household names.

Each of the participants were asked about their knowledge of clean meat startups and if they had seen any advertisements about clean meat. Overall, there was very little to no familiarity with clean meat companies. In a few instances, participants recalled reading an article that involved one of the startups, but they could not remember which one. None of the consumer interview participants had been exposed to any advertisements, except for one participant who had seen promotional content at a conference where clean meat was discussed. However, this is not surprising, since none of the companies interviewed for this study had begun advertising.

5.4 Results from the company interviews

As previously shown, it was necessary to conduct interviews with clean meat companies to understand current marketing strategies and how they can be used to influence consumer categorization. In this section, the findings of the company interviews that are detailed in Section 4.2.3 are presented in two steps. In Section 5.4.1, the marketing strategies employed by the companies are examined. In Section 5.4.2, the concerns raised during the consumer interviews are answered. Additionally, the section ends with a summary of the motivations for producing clean meat.

It is important to note that SuperMeat is excluded from discussions pertaining to the companies in this section as they were not available for an interview for this study. Hereafter, company interviewees are referred to as "companies."

5.4.1 Marketing strategies

This section summarizes the strategic tactics of the companies with regards to market entry – including target customers, target markets, and entry strategy – as well as marketing strategies and perceived competitors. These strategies reveal how the companies position themselves to consumers and in contrast to other companies. Future challenges are also addressed. This data is compared to the findings presented in Section 5.3.5 which evaluates consumer awareness of clean meat firms. The resulting implications are implemented in the recommended marketing strategies offered in Section 6.4.1 which serve to increase consumer acceptance of clean meat when it becomes available on the market.

Market entry strategies

Each of the companies has different visions for the first product types they will bring to the market: Memphis Meats is beginning with beef, chicken, and duck (Figure 16, C). JUST, Inc. is beginning with avian products (Figure 16, B). MosaMeat is focused on beef due to the environmental impact of conventional beef production (Figure 16, D). Finless Foods is specializing on fish production, beginning with bluefin tuna (Figure 16, A).

Each company has slightly different strategies for bringing their product to market. All clean meat companies intend to serve consumers that purchase meat, but consumers are not the primary customer for some companies. Instead, they are the end users, while the target customers are other businesses. JUST, Inc. and Finless Foods plan to sell their first products to restaurants (Figure 16, E-F) whereas MosaMeat plans to license its technology (Figure 16, H). Memphis Meats views consumers as their primary customers but did not specify a pathway for selling their products (Figure 16, G).

At this stage, it is unclear which geographical markets will be served first. JUST Inc. and Memphis Meats are exploring domestic and international markets as possible entry points (Figure 16,I-J). However, MosaMeat plans to target EU

markets, where their market research suggests the product will be most successful (Figure 16, K). Finless Foods did not specify which markets they plan to target first.

Target Products	
A	Finless Foods "We're very much trying to create a platform for production of all sorts of different types of fish. We've worked with different species of fish. That said, our focus is very much on bluefin tuna."
B	JUST, Inc. "Eventually, we want to make all meat, that's our goal. We want to bring our product, subject to a regulatory vehicle, out by the end of 2018. It's most likely going to be an avian species."
C	Memphis Meats "The three that we've publicly unveiled have been beef, chicken, and duck. But our goal is to develop a platform that allows us to produce any type of commonly eaten meat."
D	MosaMeat "We chose beef because beef production by far has the most impact on sustainability issues that are associated with it."
Target Customers	
E	Finless Foods "At first, we're looking for it to be a restaurant place, sort of how the Impossible Burger has gone."
F	JUST, Inc. "We're not exactly sure yet, especially while it's on a smaller scale, probably to a few restaurants, or something like that."
G	Memphis Meats "I'd say the target consumer is just meat eaters, which is 90%+ the world's population. […] We're firmly focused on those who love meat."
H	MosaMeat "We want to target the devout meat-eaters, the really hardcore guys and girls who cannot let meat go. We will not be a large-scale producer of meat directly selling to consumers. The way we're looking at it now, we will sell technology, we will sell licenses. Because that it the fastest way to spread the technology."
Target Markets	
	Finless Foods - N/A
I	JUST, Inc. "We haven't officially decided where our first product will be sold but we're talking to a lot of key players [across the world]. Whenever it becomes clear that one option is more effective than another, then that's where we're going to sell it."
J	Memphis Meats "I think we want an all global presence, because the challenges associated with meat production are certainly not limited to a particular geographic region, the US or elsewhere. But in terms of which markets will be first to have access to our products, it's not entirely clear at this point."
K	MosaMeat "It's logical to assume that we'd be introducing in the EU, and probably in The Netherlands because that's where we are. So, The Netherlands, or let's say western Europe – Germany, The Netherlands, Scandinavia, the UK. They seem to be the markets that are most open to accepting these products."
Market Entry Timing	
L	Finless Foods "We think we'll have something that is ready for market around 2020, to be put into restaurants in a limited amount. We were saying that we'll put ourselves into restaurants in very limited quantities at the end of 2019, but that might just be a one off."
M	JUST, Inc. "Subject to regulatory approval, our goal is to have something out by the end of this year, 2018."
N	Memphis Meats "At one point in our early days, we were saying 2021 for a timeline to market. I think our recent funding rounds have accelerated that timeline."
O	MosaMeat "We think about three years from today we'll be ready to do a first initial, small-scale, premium-priced market introduction."

Figure 16 - Market entry strategies for clean meat companies

As shown in Table 1 (Section 3.3), some of the companies have made public announcements about their expected product release date. The companies were also asked about this during the interviews to see if changes have been made. Whereas Finless Foods initially planned to be market-ready in 2019, that timeline may be revised to 2020 (Figure 16, L). This is primarily due to the regulatory process, something that all companies still need to complete. JUST, Inc. is still working towards a launch date by the end of 2018 (Figure 16, M), while Memphis Meats and MosaMeat are both aiming for 2021 (Figure 16, N-O).

Marketing strategies

Because the companies are still primarily in the research and development phase, marketing is currently not a high priority for them. Instead, there is a heavy focus on information sharing (Figure 17, B-C) and increasing visibility (Figure 17, A), both about their work and clean meat in general. Methods to accomplish this include social media (Figure 17, A) and participating in interviews (Figure 17, A-B).

	Marketing activities
A	Finless Foods "We're just trying to make ourselves as visible and public as possible. Also, we have a lot of fun on the Facebook page. But beyond that, no marketing yet. Partially because we don't have the resources, but partially because it's a little bit early."
B	JUST, Inc. "What we're currently focused on is familiarizing the general public with these concepts. So, we need to do things like familiarizing the public with these terms – what a cell line is, what a bioreactor is, things that sound scary."
C	Memphis Meats "A vast majority of our resources right now are going into research and development, not communications, just because that's the stage we're at. We have put out a small amount of energy and resources into the communications piece, and I think that one of the things we're really focused on is getting the information out there, spreading the word, and being open and transparent from the very beginning."
D	MosaMeat "No, not yet. Well, customers, not actively but passively, yes. One of our investors is a potential customer."

Figure 17 - Description of current marketing activities of clean meat companies

Competition

The companies were asked to evaluate their competition. Doing so reveals which category the companies each claim membership to. On the one hand, the companies considered themselves to be in the same category as traditionally raised meat products. On the other hand, the companies also discussed competition from clean meat companies.

In terms of the existing meat markets, most of the companies are seeking to enter conventional market segments (Figure 18, B-D), with the exception of Finless Foods, who is actively seeking to compete with luxury products (Figure 18, A). Curiously, MosaMeat also views producers of meat substitutes as potential competitors (Figure 18, D). However, this is not because they are specifically looking to enter the meat substitutes market, but because these products are increasingly, albeit slowly, taking the market share away from traditional meat products.

Competing products	
A	Finless Foods "It depends on what your timeline is. At first, looking at current luxury products."
B	JUST, Inc. "It's most likely going to be an avian species."
C	Memphis Meats "Anybody who is putting products, or aims to put products, on the shelf in the meat department is a potential competitor, but also a potential collaborator."
D	MosaMeat "We have two. One is the traditional beef, and the other are meat substitutes made from completely different sources, like from plants, or insects, or fungi, or algae."
Competitive edge	
E	Finless Foods "We have a running head start on a few companies. […] [Wild Type] is working in a different area from us, they're working in salmon. We have a bit of a head start on them, but really, we're just going for different market segments… I would say our advantage over […] Wild Type is that we're working with a higher-valued fish, and we can get to market faster than they can and keep the branding of this higher fish, whereas they really have the lower branding of the salmon. On top of that, picking salmon means you're picking a fight with the entire aquaculture industry, which we didn't want to do."
F	JUST, Inc. "We have been doing this for longer than the other clean meat companies. We've been in this food space, so we're a well-established company. We have over 100 employees, over 50 R&D members, we have computational biologists from Stanford, we have top-commissioned star chefs, we have people from Kraft and Campbell's and other food companies. […] We also have a few years more experience, we have operations figured out, all those things that new companies need."
G	Memphis Meats "I can refer you to some articles that suggest that we are likely the furthest along in terms of technological development. But it's all kind of speculative at this point. I think one thing that's definitely true is that there's room for multiple companies in this space."
H	MosaMeat "I think we're sort of at the same level as the others. […] We do have a lot of experience. We've been working on this for over ten years now at the lab. We have a couple people who have a lot of experience with this. Also, I think we have some pretty neat ideas about tissue production."

Figure 18 - Competitive nature of clean meat companies

In terms of the emerging clean meat market, the companies view themselves as well-positioned against their competitors, either due to technological advantages (Figure 18, F, G) or strategic planning (Figure 18, F, H). Experience (Figure 18, F, H) and human capital (Figure 18, F) are also cited as sources of competitive advantage. For Finless Foods, branding is also viewed as an important source of competitive advantage (Figure 18, E).

On the surface, it seems the companies are competing on two fronts because on the one hand, they are racing each other to enter the market and on the other hand, they are competing with existing meat producers. However, the companies do not feel they are competing with each other (see Section 5.4.2). Moreover, the existing meat market is what the companies are seeking to enter. Any alleged competitive advantages over other clean meat companies, i.e. knowledge or technological capabilities, is ultimately what gives way to better performance in the existing meat market.

Future challenges

According to the companies, the two most significant challenges they face are cost reduction (Figure 19, A-C) and scaling up production (Figure 19, B-D). Interestingly, none of the companies listed regulatory approval or consumer

acceptance as major challenges, suggesting strong confidence about these potential threats.

	Future challenges
A	Finless Foods "It's all a cost-dropping exercise and every aspect of this that we're actually working on is associated with dropping costs."
B	JUST, Inc. "The biggest challenge is scale up and cost reduction."
C	Memphis Meats "The biggest focus right now is on reducing the cost of production and increasing scale. That's where the vast majority of our resources are going into."
D	MosaMeat "The really relevant stage only starts [after market introduction] because then you need to upscale the process, upscale the production of the food for the cells, and these two are key to ultimately reaching a price point that is comparable to retail."

Figure 19 - Future challenges for clean meat companies

5.4.2 Responses to consumer concerns

This section provides company perspective on concerns raised during the consumer interviews. These are the environmental footprint, nutrition, ramifications for farming, and motivations associated with clean meat. This information illustrates how the companies address consumer concerns and provides valuable information about how they market their products. As discussed in Section 5.3.3, consumers care about having sustainably-produced meat, and these responses can provide insight into how the companies can better market clean meat to increase consumer acceptance.

Environment

Two main strategies are used by the companies to describe the environmental footprint of clean meat. The first is explaining how clean meat outperforms current industry practices (Figure 20, A-B).

According to Finless Foods, aquaculture places a heavy toll on the environment because of the pollutants the industry uses (Figure 20, A). Aquaculture is not an industry Finless Foods aim to replace immediately but intends to in the future. Per JUST, Inc., clean meat is more environmentally-friendly because it saves valuable land resources and reduces greenhouse gas emissions because it removes the need to grow the entire animal system (Figure 20, B).

The second strategy is citing the lifecycle analysis performed by Tuomisto and Teixeira De Mattos (2011) (Figure 20, C-D). For a discussion of the main findings of this study, refer to Appendix 1. Presently, the companies have not conducted environmental analyses about the environmental footprint of their meat. JUST, Inc. offers a good explanation for this:

> *I think the science still needs to be figured out. Our first products are going to be captured in a very different way than the final products will be.*

This is likely because the environmental efficiency of clean meat products will increase after efficiencies in production have occurred.

Environmental footprint of clean meat	
A	Finless Foods "By our estimations, it'll probably be pretty similar to current fish production. I don't see it reducing greenhouse gases by a lot. […] We can reduce aquaculture eventually once we move into species like salmon. Aquaculture has a massive effect on the environment, the insecticides, fungicides, herbicides, pesticides that are done in terms of mariculture leak out into the environment, causing massive ocean dead zones."
B	JUST, Inc. "It's been reported that the livestock industry is draining earth's resources. It's using 30% of the world's arable land and it's a major driver of deforestation. For example, in Latin America, about 70% of the forests have been turned over for grazing for cows, for livestock production. It's also been reported that the livestock industry uses more greenhouse gases than the entire transportation industry combined. So, I think there's a lot of good evidence on the current livestock and we believe that we're going to be much more sustainable. I think a big reason why is that we're replacing an entire huge part, and that's the need to grow animals that need to breathe, and see, and have tails. We're not growing that, because that takes a lot of resources. And we're not producing manure. I've read studies that say that a lot of the gases from meat stem from the manure, so that's a huge devastating consequence of conventional agriculture."
C	Memphis Meats At scale, what we expect is that our meat uses up to 90% less land, water and emits up to 90% fewer greenhouse gas emissions. And I think the energy footprint is expected to be about 45% less than conventionally-produced meat. That's not analysis that we have done internally; that's based on an independent third-party researcher."
D	MosaMeat "I would refer to studies that have been done in that area, so-called life cycle analysis studies. Several have been done. In most of them, if not all of them, you see a large reduction in land use, water use, and greenhouse gas emissions. Where they differ in outcome, is in energy use. […] What you should not mix up here is energy production and CO_2 emissions that come from that and greenhouse gas emissions, because the majority of the greenhouse gas impacts of meat production is not in CO_2, so not in fossil fuel energy, but it's in methane and nitrous gases that are produced either directly through manure or by the animals themselves, directly because of deforestation and changes in the soil, etc."

Figure 20 - Company responses on the environmental footprint of clean meat

Nutrition

There are mixed responses to the question of the nutritional makeup of clean meat. On the one hand, companies argue that clean meat is healthier due to the lack of antibiotics and foodborne illnesses (Figure 21, A-C, p. 65). However, any current health concerns associated with the consumption of meat, such as cardiovascular disease, will continue to exist with clean meat unless nutrient profiles are technologically altered (Figure 21, C). Yet the technology behind clean meat can enhance the nutritional value of meat (Figure 21, B-C).

Farming

There are several beliefs about how clean meat will affect farmers. In one view, clean meat does not affect farmers, but instead creates an entirely new sector (Figure 22, B, p. 66). In another view, farmers are brought into the clean meat process as suppliers of the plant resources needed to cultivate clean meat (Figure 22, A, C). In this view, farmers play a vital role to the success of clean meat.

Moreover, the companies do not want to displace responsible, sustainable farmers. First, they preserve the emotional link between humans and meat (Figure 22, C). Second, the companies are more interested in transforming large-scale, industrialized meat production. The investments by Tyson Foods and Cargill, Inc. indicate that transformation has already begun, and that this is a

welcome development in the agricultural sector (Figure 22, B). Third, any loss of jobs resulting from this are justified by the benefits for employees and public health (Figure 22, A, C). In fact, it has been argued that creating new jobs in the clean meat sector is beneficial for farmers as it offers an avenue for portfolio diversification and provides safer jobs (Figure 22, A).

Nutrition	
A	Finless Foods N/A
B	JUST, Inc. "First, the current livestock industry uses about 70% of all the antibiotics that are produced in the United States. They go into these farm animals and people are eating the residual amounts of antibiotics and that's really fueling the rise of antibiotic resistance. […] Within the next 60 years or so, the UN report says that more people will die from antibiotic resistance related disease than from cancer. And meat consumption is supposed to double by 2050. We're not going to use any antibiotics…The other issue is that there's a lot of food-borne illnesses related to current meat consumption. A lot of times there are microbes in the intestines of the animals, and feces, and other infectious agents that come into contact with the meat. With our meat, that issue goes away…But at a higher level, if we're being transparent, we're making real meat. We're making meat that is molecularly identical to the best, highest quality of meat available. We don't have antibiotics, and the hormones, and the pesticides, and all of that the conventional meat has. We just have real, natural meat."
C	Memphis Meats "Because we have so much control in the process, we can, at least in theory, change nutrient profiles for the better. So, what if we replaced saturated fat, or reduced cholesterol levels, or increased protein or iron content? These are all things that we're actively discussing. Our CEO is a cardiologist by training, so he cares a lot about these issues. But we haven't made any announcements in terms of what the initial products will look like in terms of nutrient profiles. […] We expect, from a public health perspective, for clean meat to have pretty significant advantages over conventionally-produced meat. And there's a number of reasons why we believe that to be true, but a few of them include the reduced risk of bacterial contamination. Most bacterial contamination in conventionally-produced meat comes from intestinal pathogens in animals – salmonella, E. coli, Campylobacter. Since we're not growing intestines, that's not something that is a great concern for us. So that has implications in terms of food-borne illness and food safety. We are also looking into opportunities to reduce, if not eliminate, the use of antibiotics in meat production, which is a public health hazard. The overuse of antibiotics leads to antibiotic-resistance superbugs. One of the reasons it's been termed "clean" is because it's literally cleaner than conventionally-produced meat. We're very happy and very confident that we have a good story to tell because we think our products have significant advantages over conventionally-produced meat."
D	MosaMeat "The truth is we don't know. There are health issues associated with overconsumption of meat and processed meat. This is a relatively modest impact, but it is there, and it is measurable and statistically significant, but what causes it is not known. It might be the heme, it might be other ingredients in the meat. In other words, if we match meat 100%, that's our goal, we're going to have the same issues with overconsumption of our meat. […] The difference between us and traditional meat is we can tune the composition. […] So, for instance, we're able to grow fat tissue than has unsaturated fatty acids in it, or omega-3 fatty acids in it. We could create fat tissue that has healthy fatty acids in it. We could reduce the lean contents of the meat, if that's the factor that causes it… I'm only referring to the composition of the meat, by the way, I'm not referring to the indirect health issues associated with meat, like diseases transmitted from animals to humans. That's a growing concern and are all associated with high concentration of animals close to humans, and that's essentially gone when you produce meat this way. […] And we don't use antibiotics, so that's out of the picture as well. So, overall, I'd say all this is positive, but any health issue that is just related to the composition of meat will essentially be there when we make meat as well, because it's the same product."

Figure 21 - Company responses on the nutritional differences between conventional and clean meat

	Farming jobs
A	Finless Foods N/A
B	JUST, Inc. "We're definitely going to need small farmers because we are in need of supplying ourselves protein other than from animals and farmers that can make glucose for us, and plant protein that eventually can replace FBS [fetal bovine serum]. So, we need a lot of plant farmers to make this commercially viable. If we're going to try and feed the entire world healthy, clean, natural meat, we're going to require a lot of people. It's very clear to a lot of the clean meat companies that farmers want to shift in this direction, they want their companies to shift in a way that de-risk their product. A lot of people working on farms work under really horrible conditions, there's so much ammonia that they can barely breathe, there's germs, there's feces everywhere. We're giving those farmers better jobs, not taking jobs."
C	Memphis Meats "We're not out to abolish animal agriculture. We're not out to put farmers out of business. I think there will always be a sector of the economy that welcomes farmers, and I think that we're just providing a new option for folks. Especially as demand for meat increases globally, there needs to be additional options. We can't just keep levels constant, we need to drastically ramp them up. And so, we don't see this as being a major threat to livestock producers. And case in point again, we have Cargill and Tysons as investors, and they have spoken out in favor of the innovations that we're developing, and that's something that we're pleased about. […] I would dispute the premise that clean meat necessarily entails a loss of farming jobs. I think those jobs will continue to exist. I think a new sector will be born – the cellular agriculture sector – and that will be one which produces clean meat and needs slightly different skill sets than livestock production does. But I don't think there's any reason to think there will not be room for animal farmers."
D	MosaMeat "Farmers are pretty flexible. But there is no way to sugarcoat it. If this technology were indeed to take over in the next decades or so, it's going to change the industry. I mean, that's a fact. And the loss of farmers jobs, as sorry as I am if that would happen, is more than offset by the gain of private health, any of those issues associated with the overconsumption of meat. But cells have to eat as well. So, we will farm food for cells in the future, but that will be a different type of farming, maybe. It might be that farmers need to invest in growing algae, because that seems to be a pretty efficient source of food for cells. […] And also, farmers that have the emotional link with the meat that consumers have, in a good way – treat their animals well and let them have a good life and in the end make meat from them, but meat that is really a treat, something we do on special occasions and not something we do four times a day – those type of farmers are going to be around for a long time. It's the factory farming, the large-scale production stuff that's going to go away."

Figure 22 - Company responses on how clean meat effects farmers

Motivation

There are two primary drivers for producing clean meat: morals and health. Moral-based motivations include the poor treatment of animals (Figure 23, A, C), social issues (Figure 23, A, B), and environmental destruction (Figure 23, A, C). Health-based motivations primarily refer to building a better food system, where "healthier, better food" (Figure 23, A) is more readily available and "everybody eats well" (Figure 23, B). Remarkably, neither the investment potential nor the potential to generate profit were mentioned as motivations.

	Motivation
A	Finless Foods "My main desire to do this it to stop the slaughter of fish. It's like a holocaust every single year over and over again for fish, specifically. They're the most widely-suffering animal on the planet just because of their numbers. One cow can feed 300 people; a fish, you can eat a whole can of sardines at once. So, you're killing a lot more things at one time that can feel pain and can understand the idea of death…Also, there are a lot of social issues attached to fishing. And I'd really create a most just food system. I'd like to create a world in which we can have healthier, better food more available for people in more places. And I think this is one way of creating a better food supply. Really, the health, animal welfare, and environmental aspects are all super important to me."
B	JUST, Inc. "Our company's main goal is to build a food system in which everybody eats well. And we believe that the biggest way to change the food system is change the way people eat meat. Everyone within the company may have different motivations like the environment, the animals, things like that. But the overall mission is that everyone eats well, and that's why we jumped into this field."
C	Memphis Meats "The broad vision is this: One, we think that meat as a product is great, it's delicious and it is such a core component of human history and human culture. Like I mentioned, 90% of the population eats meat and demand for meat is expected to drastically rise in the coming decades. But two, the process with which meat is produced today has some challenges associated with it. In particular, there's some challenges for the environment, for animal welfare, and for human health. I think what we're focused on is asking ourselves every day, "Is there a way where we can give folks the same products that they have enjoyed for millennia but in a process that's significantly better for the environment, animals, and human health?" So that's what we're focused on. We think, at scale, clean meat will be able to deliver significant improvements on these fronts. That's really what drives us."
D	MosaMeat "For me, it just makes no sense not to do it. It fits all the boxes. It's so rare in history to see a development coming out that is potentially so relevant for our future. That sounds a little bit dramatic, but I think it really is. It's just really exciting and energizing to be a part of that, and that's what drives us."

Figure 23 - Company responses on motivations for producing clean meat

6 DISCUSSION AND LIMITATIONS

In this section, the main findings from the previous section are discussed to derive key implications about consumer categorization. This section ties together the triangulated data, compares the findings of this study to previous studies, presents the primary categorization strategies resulting from this study, and transforms the main implications into marketing recommendations for clean meat companies.

First, the consumer perceptions of clean meat discovered in the three data sets are compared in Section 6.1. Next, the findings are compared to previous studies on consumer acceptance of clean meat in Section 6.2 to illustrate similarities and differences. The categorization strategies used by consumers and companies are then compared in Section 6.3.1. The primary contributions to the field of category studies are presented in Section 6.3.2 to demonstrate the importance of the consumer and to substantiate self-categorization as a legitimate strategy. Next, the findings of the consumer interviews, discussed in Section 5.3.3, are used to derive marketing recommendations that foster consumer adoption of clean meat. This is presented in Section 6.4.1. In Section 6.4.2, an adapted version of the cognitive process model is illustrated to highlight the stages where marketing is most effective. Finally, the section concludes by addressing the primary limitations to results of the study in Section 6.5.

6.1 Congruence of the triangulated data

This section describes how the findings of the three data sets compare to each other, demonstrating the strength of the triangulation method.

The initial reactions to clean meat from both the survey and the consumer interviews were highly comparable. The terms initially used to describe clean meat, such as "unnatural," indicate unfamiliarity and discomfort with the topic. This is a natural and commonly-occurring phenomenon for any new and atypical product. However, the interviews demonstrate that initial feelings of negativity toward clean meat can be outweighed by social concerns, such as benefits for the environment or animal welfare. This is an important discovery, revealing that initial reactions are not critical factors in the question of whether consumers will accept clean meat.

The survey revealed that taste, nutrition, and price were the three most important factors affecting purchasing decisions. Analysis of the data from the consumer interviews revealed that taste and price are key factors in final decision-making about clean meat. Similarly, health was cited as one of the six key discourses on clean meat presented by the media. However, evaluation of the healthiness of clean meat revealed that only about half of the participants were concerned about the healthiness of clean meat. Others were confident that

since clean meat was molecularly identical to conventional meat, it would not be less healthy. This confirms that some consumers evaluate clean meat in the way it was intended to be: clean meat is the same product as conventional meat, but it outperforms conventional meat because it is not harmful to the environment or to animals. Additionally, some participants felt that the absence of antibiotics and hormones typified by conventional meat made clean meat the healthier alternative. The critical thinking evident in these findings suggest that the healthiness of clean meat can be demonstrated and useful in promoting widespread adoption.

Several of the primary social benefits of clean meat identified in the consumer interviews were synonymous with the key discourses presented by the media: the environment, animal welfare, and food availability. Clean meat was perceived to provide significant advantages on these fronts. This is in line with the growing "green" movement common among millennials today, showing that consumers are increasingly interested in buying socially-responsible products.

On another level, this study provided insights about the ethical dilemma of consuming meat. In many cases, a mutually exclusive relationship existed between personal convictions about the environment or animal welfare and the desire for affordable meat. This finding is substantiated by media texts that adopt legitimation strategies to demonstrate why conventional meat is unethical. By using phrases such as "*humans kill an unsustainable number of animals every year*," readers are pressured into feeling guilty about their meat consumption habits. Clean meat absolves consumers of this dilemma, which is viewed as a significant personal benefit by participants.

Overall, the survey presented the overview of how consumers perceive clean meat, while the interviews revealed the underlying mechanisms that lead to such perceptions. The news articles substantiated these results by revealing opinions that are supportive or dismissive of clean meat. The benefit and risk assessment conducted by participants regarding the environment and animal welfare turned out to be essential in understanding how consumers categorize clean meat. Together, these elements provide a complete portrayal of consumer categorization of clean meat.

6.2 Similarity of results to previous studies

This section compares the main findings of this study to previous studies on consumer acceptance of clean meat. As discussed in Section 3.4, a study by Verbeke, Marku et al. (2015), who were the first to develop a framework about consumer attitudes toward clean meat, concluded with four main ideas about how consumers perceive clean meat. In this section, these ideas are compared to the main findings of this study.

Previous studies found that consumers categorized clean meat as "unnatural" (Laestadius and Caldwell, 2015; Verbeke, Marcu, et al., 2015), which is confirmed in this study. However, this study also shows that clean meat has

additionally been categorized as sustainable and animal-friendly. Strong interest in clean meat due to its perceived advantages over conventional meat was demonstrated. Only in one case was a participant completely opposed to clean meat, showing an otherwise general openness to the product. The number of individuals willing to try, and, in some cases, buy clean meat overwhelmingly outnumbered the number of individuals who were unwilling to do so. This was primarily due to perceived social benefits for the environment, animal welfare, safer meat consumption, and food security.

To a certain degree, the results of this study are consistent with the work of Verbeke, Marcu et al. (2015). They found that consumer initial reactions were predominantly influenced by feelings of disgust and unnaturalness. These feelings were also expressed in the online survey and interviews with consumers. But the results of the consumer interviews indicate that personal reflection about societal and personal benefits outweigh the effect of initial feelings. Thus, initial feelings about clean meat are less important in final assessments than previously thought. Additionally, Verbeke, Marcu et al. (2015) concluded that consumers would not be willing to compromise on certain factors, such as price, taste, and safety. In this study, price was also found to be a critical factor in the decision-making process, but there is evidence that some consumers are willing to pay more for the enhanced benefits to the welfare of animals and the environment. There is also evidence that consumers may be willing to sacrifice taste in exchange for these benefits. Verbeke, Marcu et al. (2015) also concluded that consumers will form decisions about clean meat based on image transference from familiar products, and, therefore, positioning clean meat as an alternative to conventional meat would be critical to its success. The results of this study indicate that consumers already view clean meat as a substitute for conventional meat. Finally, Verbeke, Marcu et al. (2015) suggested that the lack of scientific knowledge among consumers increases uncertainty about clean meat technologies. While this was true for half of participants with non-scientific backgrounds in this study, several others were not hindered by the knowledge gap. This shows there is a small level of trust in the technology and producers of clean meat, and this level could be increased with the use of key influencers and introduction of consumers to relevant technological terms and key development processes, as suggested in the marketing recommendations found in Section 6.4.1.

6.3 Categorization findings

This chapter builds on the findings presented in Sections 5.3 and 5.4 by analyzing the categorization strategies related to clean meat used by consumers and companies. First, comparisons are made between the categorization tactics used by consumers and by companies to identify potential gaps in categorization strategies, shown in Section 6.3.1. Second, the general findings about categorization are presented in Section 6.3.2 to demonstrate how this study contributes to the field of category studies.

6.3.1 Comparison of categorization strategies

In this section, the categorization strategies identified in the consumer and company interviews are discussed. These strategies importantly reveal how consumers categorize clean meat and how clean meat companies categorize themselves.

Category labeling
In Section 2.1.3, the question of how category labels are adopted by firms was addressed. The clean meat industry is an emergent one. The companies in this new market have only gained traction in the past three or so years. Because of this, it is interesting to consider how the new market category has been labelled. Interestingly, most of the startup companies prefer not to use the term "clean" to describe cultured meat products. However, The Good Food Institute, an influential non-profit working in advocacy about clean meat, has been promoting the usage of this term. In doing so, the companies have also adopted this term and self-categorized themselves as belonging to the clean meat market space (see Section 2.2.1). But the companies dislike the term "clean" and generally prefer to call their products "meat." From their point of view, it is molecularly identical to traditional meat, and does not require a different label.

Category emergence
Another salient finding related to categorization was category emergence. As discussed in Section 2.1.3, category emergence explains how new markets are created. Kennedy (2005) argues that competition is key to the establishment of a new market because of their interactions and competitive actions. The establishment of multiple clean meat companies created a competition that led to the emergence of the clean meat market. However, the companies do not feel like they are in competition with each other. For one, they are not competing based on product type. Each company focuses on different meat types. Furthermore, the companies have engaged in a high level of collaboration by participating in annual conferences and summits to share information. Lastly, they believe their true competition is the conventional meat market. Instead, their competitive nature stems from technological advancements and investments.

Category membership
An overwhelming number of participants placed clean meat in the same category as traditional meat products (for a description of category membership, refer to Section 2.2.2. This is an important finding, as it indicates there is agreement between consumers and the companies about how clean meat should be categorized, which is key to the success of the companies (Vergne and Wry, 2014), as discussed in Section 2.2.2. Some individuals specifically linked clean meat as a substitute for processed meat products, such as deli meat, or fast-food meat

products. But very few consumers said clean meat did not belong with meat products, or that it should replace meat substitutes.

Category straddling

Clean meat companies are almost always focused solely on producing clean meat. The technology they use creates very clear boundaries for category members. As discussed in Section 2.3.3, this is beneficial for them, as belonging to more than one category can decrease favor among consumers (Hsu, Hannan, and Koçak, 2009). One exception to this is JUST, Inc., who produces plant-based foods and vegan dairy products in addition to clean meat. While some consumers may find their product offering unfocused, others will view it positively because the products they offer are innovative and mutually supportive in that they are all sustainable foods (Vergne and Wry, 2014).

Stigmatization

As shown in Section 2.1.5, it is imperative that new companies prevent and counter public disapproval, which could hurt investment opportunities and affect their ability to get customers (Vergne, 2012). In the case of clean meat, the category may be stigmatized as "unnatural," as indicated by the number of participants that referred to it as such. However, many participants were supportive of clean meat despite referring to it as "unnatural." Moreover, the companies can combat this stigma by advertising clean meat as more "natural" than conventional meat, which confines animals in large-quantities in unnatural environments and uses additives like hormones and antibiotics. This indicates that with increased information sharing about clean meat and promotion about the benefits it offers, this stigma can be eliminated. A more plausible stigmatization that could emerge is that of the conventional meat producers, who would be increasingly associated with environmental degradation and animal cruelty as clean meat becomes more popular. That could be one of the reasons Tysons and Cargill, two of the largest meat producers in the world, have invested in Memphis Meats. By associating themselves with clean meat, the companies engage in stigma dilution (Vergne, 2012) as they diversify their portfolios and add distance between themselves and industrialized farms.

6.3.2 Contribution to literature on categorization

In the last section, the categorization strategies observed in this study were discussed. Based on these findings, two new contributions to the field of category studies are presented in this section. First, the link between consumer and company categorization is a much more connected process than previous literature suggested. Second, self-categorization can be a viable pathway for successful competition in existing and nascent markets.

According to Vergne and Wry (2014), most studies after Porac et al. (1989) pertaining to self-categorization were unsystematic and left many gaps in the

field. In this study, one of these gaps was filled by exploring the connection between company and consumer categorization. Based on the findings of this study, it can be argued that consumers treat categorization similarly whether it stems from external or internal forces, as shown in Figure 24.

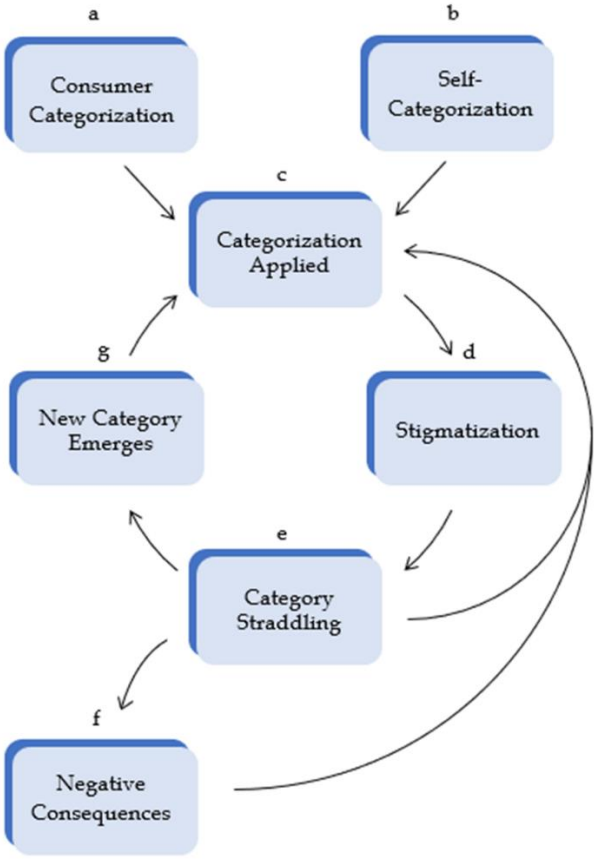


Figure 24 - The evolution of company categorization, based on the influence of consumers, leading to the emergence of new categories

Figure 24 illustrates that companies go through a similar process regardless of where the initial categorization stems from. A categorization is applied to a firm (Box c in Figure 24), either by consumers (Box a) or the firm itself (Box b). Depending on the level of consumer approval of the firm's performance in the category, the firm gains approval or risks stigmatization (Box d). If stigmatization occurs, firms can use category straddling to lessen the effects and strengthen financial success (Box e). For instance, a company in a stigmatized industry such as weapons development may diversify their product offering to lessen the effect of the stigma and increase favor among consumers. Alternatively, in the case of self-categorization, a restaurant may categorize themselves as a luxury establishment because they serve high-priced items, but they also offer take away to entice a more casual audience. Both are examples of category straddling. This can also result in negative, consumer-driven consequences for the firm (Box f). When this occurs, firms may revert to the beginning of the process to reassess their categorization. But as discussed in Section 2.2.3 of the theoretical framework, category straddling can lessen the effects of the stigma when applied well and, more importantly, can lead to greater levels of innovation and the emergence of a new category (Box g). This cycle importantly demonstrates that the two primary

views about how new categories emerge are not mutually-exclusive. Instead, there is a balance between the two. In both scenarios, firms must be cognizant of how consumers perceive the categorization they belong to, whether by choice or otherwise.

The second key contribution to the field of category studies is evidence that self-categorization by firms is a legitimate strategy. Whereas existing literature emphasizes market-driven categorization, this study demonstrates that the self-categorization pathway introduced in Section 2.2 can be equally as successful. As previously stated, the primary determinant in the success of self-chosen categories is the agreement of consumers. In this study, self-categorization by clean meat companies as belonging with conventional meat products is appropriate because consumers apply the same categorization. If instead consumers believe that clean meat belongs in the meat substitutes category, along with meatless products, the disconnect would be problematic for the clean meat firms. Thus, it is imperative that firms perform market research to confirm consumer interest prior to launching products in the chosen category. Otherwise, they risk alienating themselves in the eyes of consumers and face stigmatization.

6.4 Recommendations for successful consumer adoption

This section presents recommendations for companies to enhance consumer adoption of clean meat based on the findings from Section 5.3.3. This supports the research question by demonstrating how clean meat companies can influence consumer categorization.

The results of the consumer interviews are relevant to clean meat companies for two reasons. First, the primary findings of the consumer interviews discussed in a previous chapter can be applied to marketing recommendations for companies to better communicate with consumers. Second, the cognitive process model presented earlier can be adapted to help companies determine when to begin targeted messaging to consumers.

6.4.1 Marketing strategies for enhanced consumer adoption

The following recommendations are offered to strengthen the marketability of clean meat and improve conditions for subsequent consumer adoption. These recommendations are derived from the five key findings of the consumer interviews presented in Section 5.3.3.

Enhanced social media

As previously discussed regarding Finding 1, it was discovered that consumers care about the personal and societal benefits that clean meat offers. Demonstrating these benefits should be a priority in marketing. Companies should increase activity on social networks. This will enhance familiarity among consumers and increase interest in trying the new product via social pressure.

Incentives on social media can be used to attract more followers. For instance, tours of the facility could be won via social media by offering incentives for post sharing or friend referrals. Additionally, this increases social pressure to discuss clean meat. The social aspect of consumer adoption was identified in a consumer interview, where the interviewee recognized that she would be more likely to use clean meat products if her friends were also using them, and less likely to use it if her friends were opposed. Thus, it will be important for clean meat companies to increase the number of positive experiences associated with clean meat and to increase the visibility of these experiences to influence potential adopters (Yeon et al., 2006). Social media is an effective method to accomplish this (Akar and Topçu, 2011).

Digitally shareable content

As demonstrated by Finding 2, the overall lack of information about clean meat and the companies producing it presents a barrier to acceptance. However, consumers are interested in learning more about this product. Offering opportunities to learn about clean meat should be a marketing priority, as consumer education is an important predecessor to consumer adoption. By informing consumers about their products, clean meat companies can reduce uncertainty about the product, increase trust, and improve comfortability about using the product (Eng and Quaia, 2009). The primary method currently used by most clean meat companies to educate consumers about their products is social media. This is an excellent platform for marketing clean meat products because it appeals to a large audience and is easy for viewers to follow. However, most online content to-date involves news articles. Creating shareable content, such as photos, graphics, and videos, is effective in increasing visibility and expanding clientele. A focus should be placed on videos that explain what clean meat is and how it is developed. These videos should emphasize who the company is, what they are producing, and why they are producing it. This will reduce uncertainty about the development process, and in turn, decrease reluctance toward the product.

Transparency

As a result of Finding 3, it was determined that the development of clean meat, including the process and potential additives, and the motivations for producing clean meat are important considerations for consumers. The companies should enhance transparency as much as possible. The companies should feature their employees in marketing materials, such as online biographies and photos of staff members in action shared on social media. This increases familiarity of the public with the companies and offers potential customers a look into company operations. Hosting a webinar or a Facebook Live session would also be a valuable way to increase transparency and build trust. These platforms are optimal because viewers can ask questions while they watch, but Facebook may be more effective in reaching a larger audience. Suggested topics include introducing clean meat concepts (i.e. muscle cell types, bioreactor, and culture

medium, to name a few), answering frequently asked questions, and explaining how the technology works.

Availability information
As shown by Finding 4, although clean meat has not been introduced to the market, consumers are already able to form opinions about the product. This means consumers should be given the opportunity to try clean meat as soon as possible to form positive perceptions, instead of negative misconceptions. Consumers are both apprehensive and eager to try clean meat products. Information about opportunities to try the product should be broadcasted as much as possible. When the product is market-ready, a list of restaurants and stores where the product can be purchased should be made available on company websites.

Key influencers
As explained by Finding 5, the acceptance of clean meat does not appear to be a problem among technologically-progressive and scientifically-minded individuals. However, adoption by the general, non-scientific population decreases to 50%. Increasing public acceptance of clean meat involves messaging to the right audiences. Companies should work to build partnerships with an influential person that already has a wide following. They would be beneficial in promoting clean meat to followers that are potential customers. This study revealed scientifically-minded individuals, such as scientists and Star Trek fans, as optimal early adopters. Because they are already accustomed to the idea of clean meat, combined with their scientific knowledge and natural interest in new technologies, these individuals can excite others to try clean meat and increase confidence in the product. Another key type of influencers is food and nutrition bloggers, as these individuals already have some influence over consumers and can normalize clean meat by demonstrating how clean meat can be prepared and cooked.

Recipes
Furthermore, Finding 5 suggests that adoption of clean meat by the general population could be aided by the promotion of recipes involving clean meat. To increase comfortability with using clean meat products, companies can offer recipes and cooking tips. This is an ideal way to illustrate similarities or differences to traditional meat products, which helps consumers understand more about the product. The recipes may not differ, but it will be important to demonstrate that clean meat can be prepared in the same way as conventional meat to decrease uncertainty about the product. Moreover, consumers who try a new recipe and use social media to share their results bolster word-of-mouth marketing.

6.4.2 Opportunities to influence consumer categorization

Previously, the process of how consumers categorize clean meat was demonstrated in a cognitive process model showing how perceptions form, discussed in Section 5.3.4. With this model, companies can understand which marketing messages are important at various times in the consumer decision-making process. First, marketing the social and personal benefits of clean meat will improve consumer analysis of the benefits and risks (Figure 25, Box a). Second, marketing product qualities, such as price and taste, removes uncertainty about the practical factors that affect purchasing decisions (Box b). Both promotions would help speed up the making of informed decisions about clean meat.

With this information, companies can strategically influence consumer categorization by strategically promoting certain attributes of clean meat. Moreover, although a finished product is not yet available, it is advantageous to familiarize consumers with the concept as early as possible. Ordinarily, consumer adoption does not take place until consumers are given the chance to evaluate whether clean meat meets their needs by testing the products. However, consumers are already beginning to form opinions about the product even though it has not been introduced to the market. What is important for clean meat companies at this early stage is reducing the risks that might make consumers hesitate (Arts et al., 2011). By following these recommendations, clean meat companies can preemptively prepare consumers for market introduction.

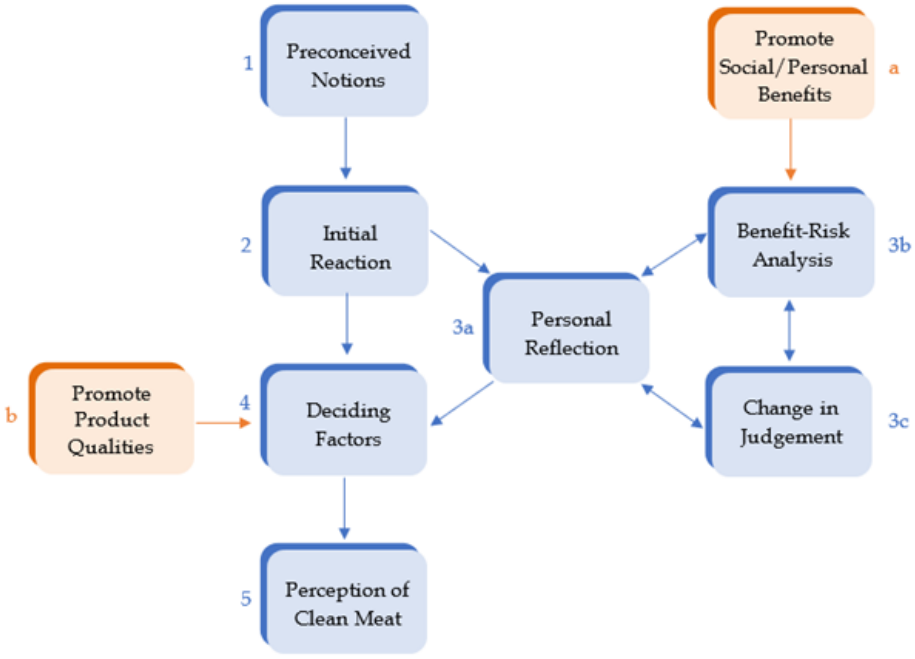


Figure 25 – Opportunities for companies to influence consumer perception formation using the cognitive process model

6.5 Limitations

In this section, the limitations affecting the results of this study are discussed. First, the factors affecting the credibility of the survey, news articles, and the interviews are presented in that order.

The results of the survey conducted for this paper are limited because of the circulation method, small number of Finnish and German survey respondents, and lack of randomness. The two primary opportunities for expanding upon the results found in this study are the age groups, scale, and scope. The survey was circulated by the author of this paper through private and professional networks. This resulted in only 163 respondents, which is high enough for the purposes of gaining a general understanding, but not high enough to be representative. To improve the statistical analysis of the results of this paper, more survey responses would need to be collected.

Additionally, not enough respondents from Germany or Finland answered the survey. Because of this limited number, there is a slight bias toward the US market, which received 109 respondents alone. This also meant that some seemingly positive results are inflated. For instance, the results of the survey found that 35% of Finnish respondents were already familiar with clean meat. This would be an interesting finding if the population of Finnish respondents was larger. To confirm the percentage of 35%, additional survey research would need to be conducted. Furthermore, the personal nature of the circulation method of both the survey and the consumer interview advertisement introduces statistical bias. It may be the results of the survey and consumer interviews are more positive because of the likeness and similarities of the respondents to the author. Naturally, this lack of randomness detracts from the objectiveness of the data and the data analysis.

The low number of Finnish articles could be a major limitation in the analysis of the news articles. However, the number of articles could not be increased unless the range of the article release dates had been widened to a year or more. Because of the high number of articles from Germany and the US that would have resulted from the expanded range, this was not feasible. The two-month time frame was maintained to ensure that all articles were collected in a systematic way.

The number of consumer interview respondents between the age of 40-60 years was generally low. This age group presents a large population of consumers, and additional studies are needed to examine this age range and compare results. Because the individual market research presented in this paper is limited to ten consumers per country, additional research in the Finnish, German, and US markets is necessary to confirm the findings presented. With regards to the companies, only five firms were contacted for participation in this study although up to 15 clean meat companies have been established. However, the selected firms are among the oldest and have receive substantial media coverage, making them valuable candidates for this study.

7 SUMMARY

The purpose of this study was to understand the mechanisms behind consumer categorization of clean meat and to investigate how clean meat startups can influence this categorization. This was explored through a three-phase triangulation method consisting of an online survey, news articles, and interviews with consumers and firms in the clean meat industry to test Finnish, German, and US perceptions about clean meat.

The results of this study suggest that clean meat can be successfully introduced to the market as a preferred alternative to conventional meat based on its social benefits. However, companies must be mindful of five key findings about consumer perceptions of clean meat:

1. Consumers care about sustainably-produced meat.
2. There is an overall lack of information about clean meat and the companies producing it.
3. Consumers demand transparency about the development process and the motivations for producing clean meat.
4. Although clean meat has not been introduced to the market yet, consumers are already able to form opinions about the product.
5. The acceptance of clean meat comes more easily to individuals with an interest in science.

Consequently, marketing activities educating consumers with respect to these findings could greatly enhance successful market introduction. Thus, six marketing recommendations were proposed and are summarized below in Figure 26. These serve to reduce perceived risks about the product and lay the groundwork for consumer adoption.

Recommendation	Purpose
Enhance social media efforts	By increasing activity on social media, companies can increase familiarity, build positive experiences, and bolster interest.
Create digitally shareable content	Shareable content can both educate consumers and motivate them to circulate the content among their networks.
Increase transparency	Companies should increase visibility about their operations and offer ways for consumers to become involved, satisfying the desire for transparency.
Advertise product availability	The opportunity to try clean meat should be promoted as often as possible, showing how easy it is to get the product.
Build coalitions with key influencers	Individuals that already have an audience, such as food bloggers, can help promote clean meat and help influence public opinion.
Offer recipes	Recipes involving clean meat will demonstrate its culinary potential and increase comfort levels about using the product.

Figure 26 - Marketing recommendations to mitigate risks and support widespread adoption of clean meat upon market introduction

Additionally, the consumer interviews illuminated the underlying cognitive process that takes place when consumers form perceptions about clean meat, leading to the development of a new cognitive model (Figure 15). This model builds on the work of Verbeke, Marcu et al. (2015) but incorporates new linkages to illustrate how attitudes may shift during the process. It thereby shows how initially negative perceptions can later evolve into positive ones and, consequently, into positive categorization, resulting in a willingness to buy. This information can be used by clean meat companies to understand the critical moments in the cognitive process where marketing can make a difference.

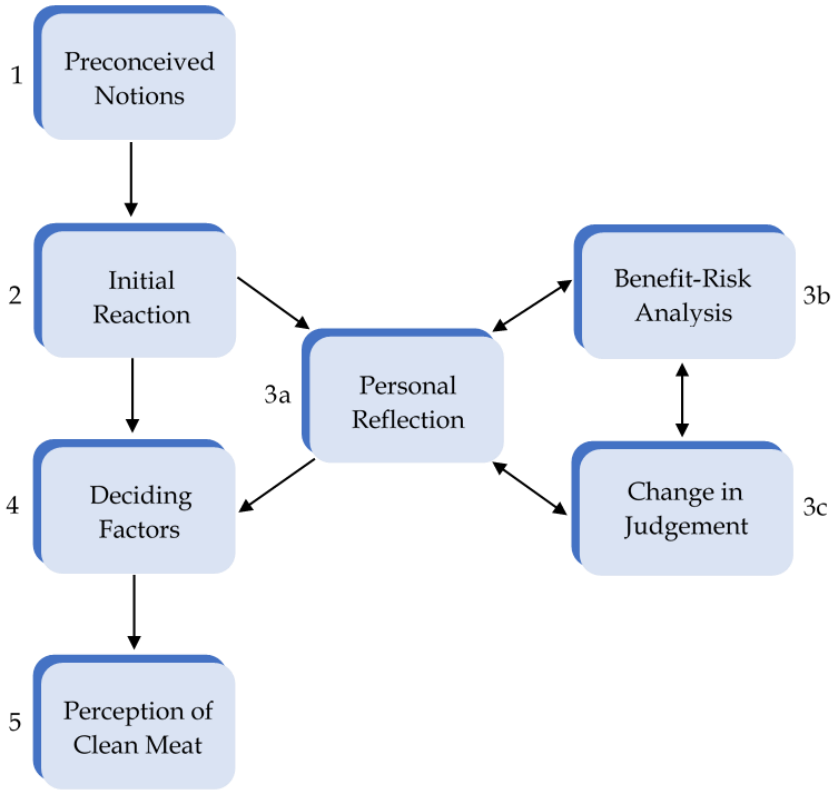


Figure 15 - Cognitive process for perception formation about clean meat

It was shown that clean meat is a viable option for sustainably and humanely produced meat. Moreover, it was discovered that enhanced marketing can propagate widespread consumer acceptance. Consumers largely agree that clean meat is in many regards superior to conventional meat. However, certain factors have been found to reduce favorability among consumers. Clean meat companies must meet consumer expectations about transparency and critical decision-making factors like cost, taste, and healthiness to gain widespread acceptance.

8 OUTLOOK

This study contributes to categorization studies by empirically demonstrating the effect of consumer perceptions on the success of emerging markets. Additionally, previous research on consumer acceptance of clean meat is improved by incorporating the role of clean meat companies. Furthermore, this research improves the current understanding of categorization strategies used by consumers, consumer adoption of nascent products, and legitimation strategies employed by media. By demonstrating the cognitive process leading to purchasing decisions about clean meat and providing information about how clean meat companies position themselves, the way consumers categorize the clean meat market is revealed. This model can be applied by other researchers to unstudied markets to further test consumer perceptions. Additionally, this model can be used by the companies to evaluate their marketing about certain aspects of the process, such as the benefits their products offer, the risks their products solve, and the ways their products meet customer needs.

Future studies can expand upon this data by testing the various consumer segments included in this study more extensively. In Section 5.3.1, the various backgrounds of the participants were compared, including gender, age, occupational status, and dietary preferences. It would be interesting to expand the sample size of these groups to test if members of different demographic backgrounds use different categorization strategies. Future studies can also compare the resulting findings to markets besides Finland, Germany, and the US. Another possibility is looking at other customer segments. The research conducted for this study only considers mainstream consumers at the general level, but more research is needed to look at implications for other applications, such as religious restrictions in diet. The market for meat reared and slaughtered according to Muslim and Jewish traditions and whether these consumers will accept clean meat is a currently unstudied area. Additionally, this research primarily focused on consumer markets, but other business-to-business markets should be explored. This includes grocery markets, restaurants, the fast food industry, frozen and ready-made meals, leather production, and pet food manufacturing, to name a few. None of these other applications were addressed in the research collection. Furthermore, there may be untold consequences for the dairy industry if traditional meat production is reduced. In countries where meat and dairy agriculture is not separated, the introduction of clean meat may have unintended consequences that should be examined.

APPENDIX 1: ADVANTAGES AND DISADVANTAGES OF CLEAN MEAT

In this section, claims regarding the environmental sustainability and animal welfare benefits of clean meat are evaluated. Additionally, research about how clean meat may affect health, involve the use of an unethical culture media, and possibly negatively affect farmers is presented here. These topics have been derived from current research and news articles and serve to provide a more well-rounded understanding of the clean meat phenomenon and consumer concerns.

Environmental sustainability

It has been argued that clean meat is necessary because 1) the worldwide demand for meat is going to increase, and current production methods cannot support this, and 2) livestock produces a lot of greenhouse gases, making current production methods harmful for the environment (Maastricht University, 2013). Because the research field about clean meat is so new, there have not been that many studies published on the matter. Furthermore, any studies that have been published use estimates to compare the environmental differences between conventional meat and cultured meat since clean meat products have not been introduced to the market. However, it is necessary to review the extant literature about the environmental impact of clean meat. Thus, this section first explains the environmental impact of conventional meat before summarizing the projected environmental impacts of clean meat.

Environmental concerns run rampant when it comes to industrialized agriculture. The farm animal industry is the single largest user of land, a significant user of water and energy resources, and a major contributor to greenhouse gases (GHG) (Koneswaran and Nierenberg, 2008). Each of these resources are explained in the following:

- Land: Presently, farm animals and production facilities use more than two-thirds of available agricultural land (Koneswaran and Nierenberg, 2008).
- Water: Agriculture requires 69% of total global water usage (Water Uses, 2016), and nearly one third of this usage is allocated to the production of animal products (Mekonnen and Hoekstra, 2012). Of all the water used in conventional meat production, 98% is expended in the production of animal feed (Mekonnen and Hoekstra, 2012).
- Energy: Most energy use in conventional meat production stems from the production, transportation, storage and processing of feed and processing, preservation, and transportation of prepared meat (Frorip et al., 2012; Petrovic et al., 2015).
- Greenhouse Gases: The greenhouse emissions associated with the production of meat come from the usage of agricultural inputs (i.e. pesticides, fertilizers, etc.), energy and water, as well as animal waste – all

of which contribute to the growing climate change crisis (aan den Toorn et al., 2017).

All of these factors have contributed to the rising climate change crisis. Climate change has brought increased natural disasters, threatening public safety and businesses, and negative environmental conditions, leading to more hunger and disease (aan den Toorn et al., 2017). It is suggested that clean meat, due to its higher production efficiency, will have a lower environmental impact in all of these terms. To date, two studies have been conducted to test this claim.

One of the earliest analyses, performed in 2011 by Tuomisto and Teixeira De Mattos, looked at environmental resource usage in Spain, California, and Thailand (Figure 27). This study boasts highly optimistic figures: "Cultured meat involves approximately 7-45% lower energy use (only poultry has lower energy use), 78-96% lower GHG emissions, 99% lower land use, and 82-96% lower water use depending on the product compared" (Tuomisto and Teixeira De Mattos, 2011). As shown in Figure 27, cultured meat is expected to perform better in every case except for energy usage, where conventional poultry production requires less energy. Another study produced in the EU-27 found reductions of 98.8% in GHG emissions, 99.7% in land use and 94% in water use (Tuomisto and Roy, 2012). These statistics demonstrate profound reductions in necessary resources, making clean meat much more environmentally-friendly.

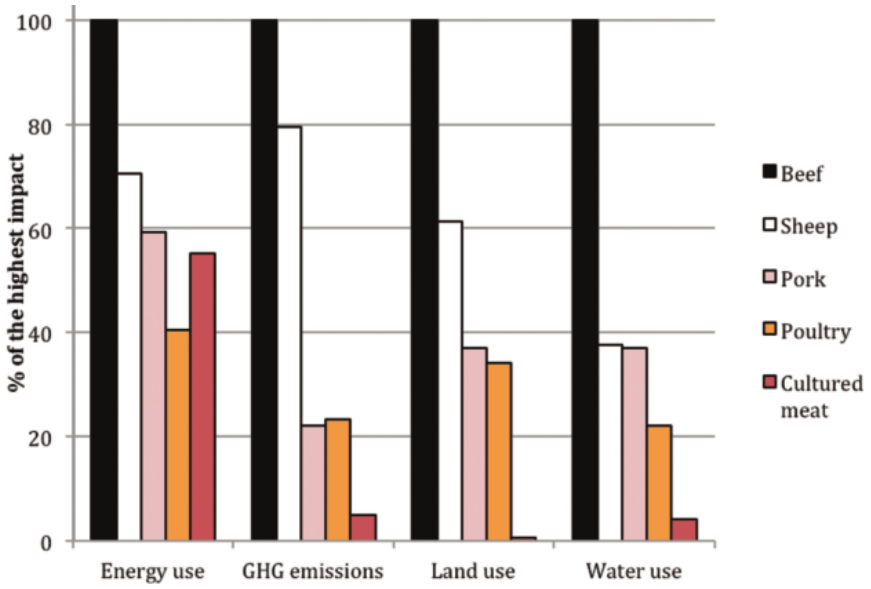


Figure 27 - Comparison of energy input, greenhouse gas (GHG) emissions, land use, and water use of cultured meat production with conventionally produced European meat (Tuomisto and Teixeira De Mattos, 2011)

Based on these two studies, it can be said that clean meat is much more environmentally friendly. Additionally, there are added environmental benefits:

- Land: Reducing the number of crops and fields used for raising production animals frees up land resources for other purposes, especially afforestation and reforestation (Tuomisto and Teixeira De Mattos, 2011; Tuomisto and Roy, 2012).

- Water: Cultured meat production eliminates this need, already saving a significant percentage of the total global water footprint. In fact, the majority of the water required in the production of meat primarily comes from the water required to grow the nutrient source used as a culture medium (Tuomisto and Teixeira De Mattos, 2011).
- Energy: Overall energy usage could also be reduced if the land once used for conventional meat production were converted to bioenergy production (Tuomisto and Teixeira De Mattos, 2011).
- Greenhouse Gases: The study concludes that the majority of GHG emissions in the production of clean meat result from fuel and electricity usage (Tuomisto and Teixeira De Mattos, 2011).

Tuomisto and Teixeira De Mattos' (2011) study is unique in that it was the first of its kind. But it has received some criticism about the high level of uncertainty involved in it. This is because the study relies on so many assumptions. First, the study assumes cyanobacteria hydrolysate would be used for the culture medium, but this has not yet been tested as a nutrient source. As detailed later in the *Culture media methods* section, the most commonly used nutrient source to-date is fetal bovine serum (FBS), which is derived from fetuses of pregnant cows. Second, the study does not investigate how much fuel and electricity is required to produce clean meat. This makes Tuomisto and Teixeira De Mattos' (2011) projected 7-45% reduction in energy use less credible. Third, there are conflicting reports about the percentage of edible portions of animals that should be used to determine the efficiency of conventional meat (Mattick et al., 2015). If Tuomisto and Teixeira De Mattos (2011) use a smaller percentage than other studies, their results will seem inflated. Fourth, there is no guarantee that lands once used for livestock production will be converted to forests (Mattick et al., 2015).

Animal welfare

There are rising concerns about the treatment of farm animals, such as their health and wellbeing. Animals with poor welfare are sick, injured or suffering, exhibit abnormal behavior or unpleasant sensations such as pain, fear, frustration, or have decreased life expectancies or abilities to cope with their environment (Broom, 1991). Just one of these factors is enough to say an animal has poor welfare. Animal welfare problems are rampant at the global scale, as evidenced by the more than 17,000 organizations in over 130 countries (World Animal Net). In the farm animal sector, a significant cause of poor animal welfare is reflected in confinement systems. This is due to inadequate space allowance in housing situations, insufficient kinds of flooring, and threatened air quality, all of which have led to abnormal behavior (Fraser, 2008). With the 56 billion land animals raised and slaughtered for human consumption annually (Koneswaran and Nierenberg, 2008), production facilities have increased in size and decreased in number to support the demand, but the quality of life for the animals they house has not improved. There is also growing concern among the public regarding the way production animals are killed (Kadim et al., 2015). These concerns about the

wellbeing of production animals are compelling arguments for the mass introduction of clean meat.

Health

The healthiness of meat is affected by animal feed production methods and animal rearing practices. Traditional farming techniques that use pesticides, chemicals, antibiotics, and hormones create dangers for public health and make the animal unsafe for human consumption. Scientists maintain that the ability to create meat without the use of harmful chemicals is a major advantage for clean meat (Hultin, 2017). Unlike conventional, large-scale facilities that add antibiotics to animal feed, the meat grown in a lab is free from additives. Cultured food also improves food safety by preventing animal-borne diseases (Hultin, 2017), such as MRSA, Salmonella, Campylobacter, Botulism, Swine Flu (H1N1), Mad Cow Disease, Avian Influenza (H7N9), Foot-and-mouth Disease, Avian Chlamydiosis, Trichinosis, Giardia, Newcastle Disease, West Nile Virus, antibiotics, fecal contamination (JUST, Inc.). Aside from the animal products themselves, the feed that is grown for animal consumption is tainted with pesticides (Hultin, 2017) and synthetic fertilizers (aan den Toorn et al., 2017). Despite these proposed health and food-safety benefits, no study has been made to confirm them or to assess the long-term health effects of clean meat. However, the Food and Drug Administration (FDA) said in a statement, "Given information we have at the time, it seems reasonable to think that cultured meat, if manufactured in accordance with appropriate safety standards and all relevant regulations, could be consumed safely" (Hawks, 2018).

Culture media methods

Each clean meat company requires a culture medium in order to feed and grow its cell cultures in vitro. Fetal bovine serum (FBS) has traditionally been used for cell culturing processes, but the use of it is controversial because it is derived from the fetuses of pregnant cows that are to be slaughtered (Gstraunthaler, 2003). However, it is widely accepted in the bio-medical field because of its unique ability to supply the necessary nutrients for cell growth and proliferation (Gstraunthaler, 2003). When NASA scientists were working on cultured fish for astronaut diets, they used FBS to do this successfully. Interestingly, they also attempted to grow the muscle in liquid mushroom extract, and while the sample survived, it did not grow (Sample, 2002).

Recognizing the ethical concerns of using FBS, JUST, Inc. developed a plant-based serum for its cells (JUST Clean Meat, 2018), although the exact details of this serum have not been publicized. Memphis Meats used FBS for its starter cells but is now working on developing other methods (Bercovici, 2017). No information has been released about the culture media used by Finless Foods, MosaMeat, or SuperMeat. But no company will go to market with a product produced with FBS. In a 2013 TEDx Talk, Dr. Post says they want to use saltwater algae to feed the cells in the future, such as that found in the dead zone in the Gulf of Mexico (TEDx Talks, 2013). Thus, the biggest challenge for clean meat

startups is producing an alternative to FBS that is equally as effective but utilizes plant proteins and is cheap enough for mass production.

Farming and related industries

There is much speculation about the fate of farmers if clean meat became widespread. This section first presents an overview of the meat production options that consumers currently face, and then presents a few outcomes for what could happen post the introduction of clean meat to the market based on expert opinions.

While some consumers may use price as the determining factor for meat purchases, others prioritize the farming method, i.e. the way the meat is raised. Four meat production methods are already available to consumers:

1. Industrial agriculture, otherwise referred to as conventional or commercial meat, and relating to terms 'factory farm' or 'CAFO' (concentrated animal feeding operation). These terms refer to animals being raised on a large-scale and in confinement.

2. Organic agriculture, otherwise referred to as biological farming. This type of farming primarily focuses on raising animals naturally, without the use of chemicals, additives, pesticides, genetically modified organisms, and synthetic fertilizers ("Organic Production," 2016) and by ensuring the proper care of animals ("What is organic," 2018). The size of the farm is not an essential component.

3. Ecological agriculture. This kind of farming may include organic farming methods but primarily has the goal of restoring ecosystems and biodiversity. This type of farming prioritizes protecting the environment through sustainable management of soil, water and climate, not contaminating the environment with chemicals or genetic engineering (Tirado, 2009).

4. Local agriculture. No formal definition exists, although this is generally characterized by small-scale farms, often family-operated farms, that sell products to their local or regional communities (Martinez et al., 2010).

The introduction of clean meat adds a fifth option:

5. Clean meat, otherwise referred to as cultured meat, in vitro meat, lab-grown meat, or cellular agriculture. This type of meat solely refers to meat produced by growing cells in a cell culture to develop meat products.

It is possible the introduction of clean meat only affects the vegetarian meat market, but to limit the discussion to livestock rearing farmers, this possibility is excluded. As the emerging clean meat industry does not aim to replace methods 2, 3 and 4, it can be assumed that two main possibilities could ensue when clean meat is introduced to the market: either clean meat would be sold in conjunction with all other types of meat, or clean meat will replace industrially-raised meat.

On the one hand, it is unlikely that clean meat will replace all currently available types of meat. Mark Post, co-founder of MosaMeat, emphasizes the importance of farmers and claims this important industry will not go away only because clean meat is on the market (Maastricht University, 2013). Other proponents of clean meat have addressed this dilemma by claiming that clean

meat is only meant to replace industrial farming. David Kay, Manager of Communications and Sustainability at Memphis Meats, asserts clean meat will not affect local farms: "We're not out to transform family farms; we're out to transform factory farms. There is a place for sustainable high welfare operations" (Cosgrove, 2017). Yet some farmers and experts object to this argumentation, fearing that clean meat will have a large impact on traditional farmers.

On the other hand, it's possible the new competition that clean meat will bring would especially affect small agricultural economies. Dr. Rosie Bosworth, food strategist from New Zealand, calls synthetic foods an "existential threat to the agricultural sector, and poses a very real risk to the future of New Zealand's economy" (Bosworth, 2017). Even though Post predicted in 2013 that clean meat and conventional meat would be sold together, he agrees there is a risk to small-scale farmers: "We are focused on (eliminating) factory farming, but the fact of the matter is that we don't live in an isolated world. So I don't want to give any illusion that small-holder farmers are safe. I don't want to give the illusion that *any* farmers are safe" (Bosworth, 2017). To stay current with the new food trend, some producers have begun to diversify their portfolio by investing in clean meat technologies. Tysons Foods, the world's second largest producer of chicken, beef, and pork, announced their investment in Memphis Meats in January 2018 to increase their product offering (Hayes, 2018). Cargill Incorporated, one of the largest agricultural crop and livestock producers in the US, also invested in Memphis Meats ("Protein innovation," 2017). Outside of the US, Israel-based clean meat startup SuperMeat has attracted investors. PHW-Gruppe, a German-based company and one of Europe's largest poultry producers, announced its investment in SuperMeat in January 2018 (O'Hear, 2018). The Chinese government has also invested in SuperMeat, as well as two other Israel-based firms, to reduce the country's greenhouse gas emissions (Roberts, 2017).

As previously discussed, meat production provides useable material for many other applications, such as leather, pet food, cosmetics, pharmaceuticals, and household products (Mattick, Landis, and Allenby, 2015). If clean meat is to replace the industrial meat industry, it also needs to find alternatives for producing the by-products. The USDA has found that 11.4% of gross income for beef and 7.5% for pork comes from by-products (Liu, 2002). These biproducts would be eliminated if clean meat replaced conventional meat production, which may have unintended economic consequences (Mattick et al., 2015). To continue supplying these products, they will need to be created using clean meat technologies, or by other alternative technologies, otherwise industrial farming may continue solely for the purpose of non-edible industrial byproducts. However, there is a lack of information about how by-products are utilized. Additional studies will be needed to find additional information about this topic and how it will be affected by clean meat.

Interest in cultured meat is growing rapidly, but until it reaches the market, there is no way of predicting how it will affect farmers, how much of the meat market it will take, or whether clean meat can replace the industrial, organic, ecological and local meat industries. The successful introduction of clean meat will be dictated by consumer preferences and not by the intentions of producers.

APPENDIX 2: ONLINE SURVEY TEMPLATE

"CONSUMER PERCEPTIONS OF CLEAN MEAT"

1. What is your age and gender?
   a. Under 18
   b. 18-24
   c. 25-34
   d. 35-44
   e. 45-54
   f. 55-64
   g. 64 or older

   Gender (male, female, other): _____
2. Which country are you from?
   a. Finland
   b. Germany
   c. United States
   d. Other: _____
3. What is your primary occupation?
   a. Student
   b. Employed full-time
   c. Employed part-time
   d. Self-employed
   e. Between jobs
   f. Stay-at-home parent
   g. Retired
4. How would you describe your meat-eating habits?
   a. Eats meat daily
   b. Eats meat 1-3 times a week
   c. Eats meat 1-3 times a month
   d. Vegetarian
   e. Vegan

   Would you consider yourself a foodie or nutritious-conscious?
   a. Yes, foodie
   b. Yes, health-conscious
   c. Yes, both
   d. No
5. How familiar are you with the term "clean meat" (or its synonyms "cultured meat," "in-vitro meat," and "lab-grown meat")?
   a. I've never heard of it.
   b. I've heard of it but I don't know what it means.
   c. I've heard of it and I know what it means.
6. Please watch this short video [*The Meat of the Future: How Lab-Grown Meat Is Made*] and answer the following question. Would you be willing to try this product?
   a. Yes
   b. No
   c. Maybe
7. Which factor(s) would affect your decision to buy this product in the future?
   a. Nutrition
   b. Cost
   c. Taste
   d. Freshness
   e. Accessibility
   f. Other:

8. Please fill in the blank to complete these statements:
    a. I believe cultured meat is _____ [more/less/equally] healthy than conventional meat.
    b. I believe cultured meat is _____ [more/less/equally] sustainable than conventional meat.
    c. I believe cultured meat is _____ [more/less/equally] beneficial for animal welfare.
    d. As a vegetarian or vegan, I would be _____ [more/less/equally] inclined to eat cultured meat.
9. How familiar are you with these companies? (Check one per row)

Company	I've never heard of this company.	I've heard of this company but I don't know what they do.	I've heard of this company and I know what they do.
Memphis Meats			
MosaMeat			
SuperMeat			
Hampton Creek			

What other benefits or drawbacks do you see for clean meat?

10. Would you be willing to participate in a short interview? If so, please provide your email address. (Note: You can learn more about the interviews here. Your identity would remain anonymous throughout the whole process. You can withdraw at any time.)
    a. Yes, I'm interested in learning more.
    Email Address: _____
    b. No, thanks.

APPENDIX 3: NEWS ARTICLES SELECTED FOR DATA ANALYSIS

Code	Title	Published Date
FI-1	Applause, lame milk and artificial manure - Future menu displayed in Slush	December 1, 2017
FI-2	How will you eat after 10 years - Will you taste 5 future food trends?	December 4, 2017
DE-1	"Clean Meat": Chicken from the retort will be available from 2021 onwards	January 6, 2018
DE-2	Chicken king Wiesenhof invests in cultured meat	January 14, 2018
DE-3	Without killing a single animal	December 25, 2017
DE-4	The meat atlas is interesting only on the last pages	January 11, 2018
DE-5	Why the Petri dish burger in the Netherlands is a success	January 5, 2018
DE-6	Cultivated steak: Scientists see meat from the laboratory as an alternative to factory farming	January 11, 2018
DE-7	Is meat from the lab a good alternative?	January 8, 2018
DE-8	Millions-funding for meat in a test tube	January 2, 2018
DE-9	Hamburger from the Petri dish	January 10, 2018
DE-10	Farmers' Association sees no potential for in vitro meat	January 6, 2018
US-1	Would you eat "clean meat"?	November 18, 2017
US-2	Lab-made meat startup SuperMeat raises $3M seed to develop 'clean' chicken	January 2, 2018
US-3	Clean Meat, Via Lab, Is On The Way	January 2, 2018
US-4	GFI Exclusive! Interview with Clean Meat Author Paul Shapiro	December 27, 2017
US-5	Lab-Grown "Clean Meat" is Almost Here. Will You Eat It?	November 28, 2017
US-6	Meat alternatives may threaten livestock industry, but cattlemen say nothing replaces the real thing	January 14, 2018
US-7	Paul Shapiro, Humane Society VP, Discusses His New Book, "Clean Meat"	December 7, 2017
US-8	Silicon Valley and the Search for Meatless Meat	December 19, 2017
US-9	Synthetic Meat Unlikely to Impact Protein Market in Near Term	December 8, 2017
US-10	In the Future, the Meat You Eat Won't Come From Living Organisms	December 12, 2017

APPENDIX 4: CONSUMER INTERVIEW PROTOCOL

A. To begin this interview, I'd like to ask you some questions about your background and current meat-eating habits.
(Skip italicized if answered by survey)

1. *Which country are you from? Finland / Germany / US*
2. *Gender: male / female / other*
3. How old are you?
4. *What is your primary occupation?*
   - *i. Student*
   - *ii. Employed full-time*
   - *iii. Employed part-time*
   - *iv. Self-employed*
   - *v. Between jobs*
   - *vi. Stay-at-home parent*
   - *vii. Retired*

   Would you tell me something about your background (job/studies)?
5. *How often do you eat meat? (daily, 1-3 times a week, 1-3 times a month, vegetarian, vegan)*
6. What factors in your life may have influenced your decisions about eating meat? (i.e. upbringing, news, peers, etc.)

B. Thank you for your input. I'd like to now ask you about your familiarity with clean meat.

7. What comes to your mind when you hear the term "clean meat?" Conventional meat? What's the difference?
8. *How familiar are you with the term clean meat (or its synonyms 'cultured meat,' 'in-vitro meat,' and 'lab-grown meat')?*
   - *0-Never heard of it.*
   - *1-Heard of it but doesn't know what it means.*
   - *2-Heard of it and knows what it means.*
9. When was the first time you heard of clean meat?
10. Has this product come up in conversations with others? What main conclusions came from those conversations?
11. What do you know about clean meat companies? (Memphis Meats, MosaMeat, Hampton Creek, SuperMeat, and Finless Foods)
    - Have you seen advertisements? What did you think of them?
    - What kind of information would you like to hear from them?

C. Thank you for your responses. I'd like to now ask you questions regarding your feelings toward clean meat.

12. Let's pretend you were invited over to a colleague's house for dinner. Once you get there, you realize they are serving clean meat. How do you feel about that? Would you eat it?
13. What would be your reasons for trying clean meat?
14. What would be your reasons for not trying clean meat?

15. Would you say that clean meat is healthy? Why or why not?
    - What kind of food do you consider to be healthy and unhealthy?

16. In your opinion, what product does clean meat replace and why? (Plant-based foods? Meat?)
17. What do you find interesting about clean meat?
18. How much is your opinion influenced by environmental or ethical aspects?
    - What other aspects play a role?

D. Before we conclude, has anything come to your mind that we have not discussed yet?

E. Thank you so much for your insight and feedback today. Would it be okay if I follow-up by email if any clarifications are needed? ___Yes ___No

F. I am still looking for a few more interview candidates. Do you know anyone from Finland, Germany, or the US that might also be interested in participating in this study?

APPENDIX 5: DEMOGRAPHICS OF CONSUMER INTERVIEW PARTICIPANTS

Interviewee ID #	Country	Gender	Age	Primary Occupation	Meat-Eating Frequency	Familiarity
DE-1	Germany	Male	26	Student	Daily	1
DE-2	Germany	Female	22	Student	1-3 times a week	0
DE-3	Germany	Female	26	Student	1-3 times a week	0
DE-4	Germany	Male	25	Student	Vegetarian	0
DE-5	Germany	Male	22	Student	Vegetarian	1
DE-6	Germany	Female	27	Student	1-3 times a week	0
DE-7	Germany	Male	30	Student	Daily	1
DE-8	Germany	Female	66	Retired	1-3 times a week	0
DE-9	Germany	Male	45	Employed full-time	Daily	2
DE-10	Germany	Female	27	Employed full-time	Daily	1
FI-1	Finland	Female	27	Student	Vegetarian	2
FI-2	Finland	Male	30	Employed full-time	1-3 times a week	1
FI-3	Finland	Male	29	Student	1-3 times a week	2
FI-4	Finland	Female	26	Student	Vegetarian	2
FI-5	Finland	Male	29	Student	Daily	2
FI-6	Finland	Female	29	Employed full-time	Vegetarian	2
FI-7	Finland	Female	27	Student	1-3 times a month	2
FI-8	Finland	Male	28	Student	6 times a year	0
FI-9	Finland	Female	37	Employed part-time	1-3 times a week	1
FI-10	Finland	Female	60	Retired	Daily	0
US-1	US	Female	26	Student	Vegan	1
US-2	US	Female	28	Student	Daily	1
US-3	US	Male	28	Employed full-time	1-3 times a month	2
US-4	US	Male	27	Employed full-time	1-3 times a week	1
US-5	US	Male	60	Employed full-time	1-3 times a week	1
US-6	US	Male	31	Employed full-time	Daily	2
US-7	US	Male	28	Employed full-time	Daily	2
US-8	US	Female	53	Employed full-time	1-3 times a week	0
US-9	US	Female	46	Student	Vegan	0
US-10	US	Female	50	Employed full-time	Daily	0

Table 7 - Demographic description of each interview candidate and their familiarity with clean meat. (Key: 0-Never heard of it. 1-Heard of it but doesn't know what it means. 2-Heard of it and knows what it means)

APPENDIX 6: COMPANY INTERVIEW PROTOCOL

I. **Background:**
1. Can you give a brief overview of your company?
2. What is your role at the company?

II. **Product:**
3. In one sentence, how would you describe the products you make to consumers?
4. Can you explain the process of how your meat is made, from start to finish? (Including starter cells, growth serum, and possible additives)

III. **Marketing:**
5. Cultured meat has many synonyms. What term does your company prefer?
6. Which existing products will your product replace or compete with?
7. When do you expect to have your product on the market?
8. Which geographical markets will you target? (International markets?)
9. Who is your target audience (consumer segment, businesses, etc.)? What about vegetarians and vegans?
10. What kind of marketing activities does your company do to promote your product?
11. What differentiates you from the other clean meat companies?

IV. **Environment:**
12. How would you describe the environmental footprint of clean meat?
13. Can you tell me how many resources (like water, land, and energy) are used to create your meat?

V. **Health:**
14. What is the difference between conventional meat and clean meat in terms of nutrition?
15. How would you respond to consumers that are concerned about the long-term health effects of consuming clean meat?

VI. **Farming:**
16. How do you think clean meat affects farmers and related industries?
17. How will you address pushback from these industries, as well as from consumers that are concerned about the loss of farming jobs?

VII. **Vision:**
18. What is your company's primary motivation and end goal for producing clean meat?
19. In general, what challenges do you foresee for your company?

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