WAGENINGEN UNIVERSITY

USING LADDERING THEORY TO EXPLAIN THE INFERENCES FOR SUBOPTIMAL FOOD PRODUCTS

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Date: 18-12-2015

Introduction

Food waste is becoming an increasing problem for both farmers and the society as a whole. A large part of fruit and vegetables is not used for the primary function they were produced for. Food is thrown away or used to feed livestock – mainly pigs – because of very strict cosmetic standards. This food often has the same quality in taste as A-class produce, but does not meet the aesthetic requirements.

Previous research of Horning (2015) has identified a model for the choice procedure when suboptimal foods would be introduced in the market. When making a choice between products, consumers have to evaluate which products have similar or different attributes and/or benefits. Grouping products together on their similarities makes the amount of products more manageable for consumers. This process is called categorization and can take place on several levels of abstraction. . It is important that suboptimal food products are not seen as products which are not edible and that they are considered for purchase.

Appearance attributes play a large role in this, as they can create utility for consumers in various manners. They create the perceived utility of a product by making inferences from search attributes, which include appearance attributes. Specific attributes lead to specific consequences or benefits, and thereby lead to the achievement of personal goals. Consumers have to find out what products have the attributes that help them best to achieve those goals. This leads to one of the main questions addressed in this research: *to what extent of damage are consumers willing to buy suboptimal food products?*

A question that follows from this, as well as the model of Horning (2015), is if this acceptance is dependent on factors other than the amount and type of deviation in appearance? The goals and personal characteristics of a consumer could influence this acceptance as well. So, are consumers more willing to buy fruit and vegetables with cosmetic damage for certain usage situations? Thereby, a look will be taken into the inferences that people make when observing suboptimal food products and how the appearance attributes are related to specific goals.

The influence of usage-situations forms the linkage between the inference formation and the want formation in the model of Horning (2015). It will explore how the perceived utility of suboptimal products is influenced by the relation between goals and the perceived utility of the product.

To find the goals consumers have, as well as the relation to consequences and attributes, it is needed to force consumers into thinking about these relations. This can be done with various laddering-theories. By laddering, the use of a specific interview format is meant. This format is used to create the linkages between attributes, consequences and values. These linkages are called ladders, and are the basis for defining groups of products (Reynolds and Gutman, 1988). The way in which this method is used will be explained in the method section. Testing to what extent of cosmetic deviation is accepted, gives a rough indicator of the line between the inedible and edible category. The interviews can serve as a basis for more in-depth research on the positioning of suboptimal food products.

Theoretical framework

A product is seen as suboptimal when it deviates from the reference product in the mind of the consumer: a reference product does not have to be the same for every consumer in categorizing suboptimal food. Reference products can be explained as the typical example of a specific product or product type. They are linked to the process of exemplar-based categorization, where consumers classify products or events in a certain category on how they resemble other products or events in that category (Lamberts, 1994). The less similar a product is to the exemplar, the less likely that it is put in the same category. For fruit and vegetables deviation can exist in three ways: deviation in size, deviation in shape and deviation in colour. As stated in the research of Horning (2015), consumers can categorize suboptimal food and vegetables in the category edible products, inedible products, or they could create a new category, which would be called suboptimal products. If a product is different from the reference product, it is expected that people have different inferences than with the reference product. This can consequently lead to a different perceived utility. The total perceived utility is formed by three types of utility: functional, social and emotional value (Horning, 2015). When observing suboptimal food products, it is expected that consumers create inferences that have a negative influence on the three types of utility. For functional utility, consumers might perceive that the product is less in quality, because they feel as if the product is not fresh or that it less safe than other products. Thereby, if the product is weirdly shaped this could be inferred with inconvenience in usage. If suboptimal foods would be available in supermarkets, consumers might not buy them because they are not yet used to it. The norm is to buy cosmetically perfect food products, and it might counteract the social group they want to fit in with. On the other hand, because the product has flaws, consumers might infer it with naturalness, which makes it suitable for a certain group of consumers who find this important. On the emotional level are suboptimal foods likely to have lower preference since they do not have the aesthetic appeal that perfect foods have. It has been found that products with a high aesthetic appeal lead to instant feelings of desire towards that product (Pol, 2013).

This research aims to identify these inferences, what inferences are the most prominent, and most importantly, if the willingness to buy suboptimal food products is dependent on the usage situation of the product. Usage situations are linked to the concept of goals, as the definition of goals made by Ratneshwar, Barsalou, Pechmann and Moore (2001) will be used. They defined goals as *"… the level of benefits sought by the individual consumer in a particular consumption or use situation" (p. 148).* According to Pieters, Baumgartner and Allen (1995), goals influence both the direction of behaviour and the intensity of the behaviour. They also state that goals that influence a certain behaviour, can be visualised in a goal structure. If people would use fruit or vegetables for a purpose in which the appearance is less visible, they could have different goals than when the product is used for a purpose where the appearance is less visible.
Therefore, the following expectation is guiding this research: *Consumers are less willing to buy fruit and vegetables with a cosmetic deviation if the appearance of the product is more visible in the usage situation*

More generally, it is expected that the willingness to buy fruit and vegetables with a cosmetic deviation is dependent on the goal of the consumer.
The goal of this research is to find what the relation is between the attributes of suboptimal foods and the perceived utility of those food products. Thereby it is analysed whether there is a

relation between the situational context in which the product is used and the willingness to buy suboptimal food products and if this is dependent on the type of damage

Methodology

. In order to answer the proposed questions, laddering interviews will be conducted. The traditional laddering method as proposed by Reynolds and Gutman (1988) is not fully suitable for this research, since it is used to find ladders leading to values. Therefore, the method is adapted to obtain the subjects' goals rather than his values.

Participants

The interviews were with students of Wageningen University, whom are generally between 18 and 24 years old. This convenience sample is purely for the ease of this research and therefore the results of this qualitative research will not be generalizable for the whole population.
For this research, the number of interviewees is dependent on the information that is found. Because of time constraints, 10 interviews will be conducted, excluding the pilot interview.

Interview environment

The interviews were conducted in a room in the Forum building of Wageningen University. They have beenrecorded with a mobile phone if the interviewee allowed the interviewer to do so. Recording the interview is needed so it can be re-listened if the notes made during the interview are not clear or sufficient. For the ease, a photo will be made of the groups that the interviewee makes, so that the interviewer does not have to write down everything during the interview itself. By doing so, the focus is on the person being interviewed.

Method

For this qualitative study, the laddering method will be used to find what the relation is between the attributes of suboptimal foods and the perceived utility of those food products. Thereby it is analysed whether there is a relation between the situational context in which the product is used and the willingness to buy suboptimal food products and if this is dependent on the type of damage. Because of this, the traditional laddering method is changed to obtain the subjects' goals rather than his values since situational contexts influence goals rather than values.

There are four general steps in the laddering procedure: 1) selection of the products for the interviews, 2) elicitation of product attributes, 3) in-depth interviewing and 4) analysis of the data.

Product selection

The first step in laddering is selecting the group of products that is used in the interviews. Therefore, suboptimal foods have been selected by the researcher that are thought to be a good representation for suboptimal foods. The products are split into fruit and vegetables, as well as the type of defect they have. Three types of cosmetic damage are found on webpages about cosmetically damaged fruit and vegetables, namely deviations in shape, size and colour. For this research, colour is separated into the vibrancy of the colour and skin blemishes. The effect of size deviations will not be measured, since it will only be possible to use images of products instead of real products. With the selection, it was important that the products can have damage of all three types, so that they fit into each category. After research on various websites of stores (Fredieu, 2015; "Inglorious Fruits and Vegetables", n.d.; "Imperfect Picks", n.d.) where suboptimal food products are sold, two types of fruit and two types of vegetables were selected. The following selection of products was seen as most suitable for the interviews:

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Shape (S)	Normal	X	X	X	X	X	X	X	X	X					
	Moderately deviating										X	X	X	X	X
	Extremely deviating														
Colour vibrancy (C)	Normal	X			X	X					X			X	X
	Moderately deviating		X				X		X			X			
	Extremely deviating			X				X		X			X		
Skin blemishes (B)	Normal	X	X	X							X	X	X		
	Moderately deviating				X		X	X						X	
	Extremely deviating					X			X	X					X

		15	16	17	18	19	20	21	22	23	24	25	26	27
Shape (S)	Normal													
	Moderately deviating	X	X	X	X									
	Extremely deviating					X	X	X	X	X	X	X	X	X
Colour vibrancy (C)	Normal						X			X	X			
	Moderately deviating		X	X				X				X	X	
	Extremely deviating	X			X	X			X					X
Skin blemishes (B)	Normal						X	X	X					
	Moderate amount	X	X			X				X		X		
	Extreme amount			X	X						X		X	X

Table 1: Product grid

This table can be summarized as a systematic design of 3 attributes that all have 3 levels, of which all possible combinations are presented to the interviewees. The pictures are included in appendix I.

Prices

The pilot interview (N=1) confirms the previous idea that few consumers would buy cosmetically deviating fruit or vegetables (Horning, 2015), when they are the same price as aesthetically perfect foods. Different discount percentages will be used in the pricing of the products in the grid, in order to prevent that all the products with a cosmetic deviation are immediately excluded, and no associations could be made. The basis for the prices were chosen from current supermarket price for carrots and Elstar apples. The following prices were found: €1,89 per kilo for carrots and €1.29 per kilo Elstar apples (AH, 2015). As it would be very inconvenient to use 27 different pricings, the decision has been made to solely focus the pricing strategy on the deviations in shape and amount of blemishes. The discounts that are used in the interviews are displayed in table 2. In the pilot interview, it was mentioned that the interviewee would accept more blemishes if the shape was good and vice versa. From this perspective, the discounts have been chosen. When both shape and blemishes are normal, there is no discount. When one type of these deviations is normal, or non-existent, but the other deviation is moderate, the discount is 10%. A moderate deviation in shape and amount of blemishes leads to a reduction of 25%, and products with an extreme shape or amount of blemishes in combination with a moderate deviation have a price reduction of 35%. The pricing strategy used is the same for both the apples as the carrots, and the discount percentages are presented as discount stickers on all the pictures.

	Normal shape	**Moderate shape**	**Extreme shape**
No blemishes	-0%	-10%	-25%
Moderate blemishes	-10%	-25%	-35%
Extreme blemishes	-25%	-35%	-35%

Table 2: Discounts of the stimuli used in the interviews

Interview introduction

At the beginning of the interview, the interviewee is told what the interview is going to be about. The interviewer tells the interviewee an introduction that goes approximately like this: “Thank you very much for coming here today. I will start by explaining you something more about the idea behind the research and how the interview will go. This research will take a further look into the interest of people in buying fruit and vegetables with a cosmetic deviation from the stereotypical products. All the deviations are purely cosmetic, have no effect on the quality of the product, and the products meet the required safety standards to be sold in supermarkets. The interview consists of two parts. You are first asked to divide the products that you are given into two groups, one that he or she is willing to buy and one that he or she is not willing to buy. This is done for different usage situations. I will explain these situations later. Then, you have to explain to me why you have put certain products in one group and other products in the second group. After doing this, the in-depth interview starts and I will go and ask you some questions to find out if you would be more willing to buy certain products for different usage situations. There are some important things that you need to know when starting this interview. The apples are all Elstar apples. The prices are dependent on the amount of deviation they have; the more deviating a product is, the higher the discount is. I have taken the current market prices of Elstar apples and carrots, which will serve as a base for the decisions you have to make. The price of Elstar apples is currently €1,29 per kilo and for carrots €1,89 per kilo.” After this the attribute elicitation will start.

Attribute elicitation

Since it is not yet known what attributes consumers find important when observing fruit and vegetables, an unrestricted attribute elicitation method is used. In this method, the participants create their own lists of attributes (Steenkamp, van Trijp and ten Berge, 1994). There are several ways in which this method can be implemented, one of them being the differences by occasion method. In this research it is used to find out if the importance of certain attributes is dependent on the usage situation, and thereby, if they have different values and goals for various usage contexts. Two types of usage situations are given to the interviewees, a situation in which the appearance of the product is more visible in the consumption of the product, and another where the appearance attributes are less visible. The interviewees will do this for the pictures of apples and carrots separately. Situation 1: buying apples to bake an apple pie, situation 2: buying apples as decoration for a fruit bowl , situation 3: buying carrots for a side dish, in which the carrots are served as a whole, and situation 4: buying carrots for carrot soup. The experimental design in this study is consequently as given in table 3.

Two categories	**Two situations**
Apple	Visible
Carrot	Less visible

Table 3: Experimental design

The interviewees are presented all the 27 pictures of either apples or carrots and given the usage situations they have to group the stimuli in two groups: one group of products that he or she is willing to buy and one group of products that he or she is not willing to buy. The participant has to explain why he or she has made the groups in the way that they are. In this explanation, attributes of the products are named. It is expected that these attributes are one of the damage types, since these are the only differences between the products. The interviewer will write down all the attributes that are named and thereby will create a list of product attributes, which are the starting points of the in-depth interviews. This process will be repeated for all the situations.

In-depth interview

After elicitating all the attributes, the in-depth interview will start. The interviewer then asks what it says for or means to the person that a product has this specific attribute. This will result in a certain consequence of the attribute. Lastly, the interviewer will ask when the person finds this consequence important.

By asking these questions in this specific order, the start is the product itself and its attributes. The second question is drifting away from the product and going more to the person, and the last question focuses solely on the person and not on the attribute of the product anymore. Consequently the ladder attribute – consequence – goal will be derived.

Analysis

The first step in the analysis of the data is creating a table with all the choices that are made in the interviews. This table will be a representation of the product choices of the interviewees for the different usage situations. After this, all the data of the interviews will be analysed, to create ladders with attribute, consequences and goals. For each level, the key elements are summarized by using a standard content-analysis procedure (Reynolds and Gutman, 1988). In this

procedure, things named by the interviewee which have a similar meaning are coded under a new, summarizing name. When this is done, an implication matrix is created, where all the connections between attributes, consequences and goals are given. This matrix can be visually represented in a tree diagram, which is called a hierarchical value map (HVM), and shows all the linkages across the different levels of abstraction.

By following this process, a clear image can be given on the underlying motivations for buying products with certain attributes. So, what goals are linked to specific product attributes. It thus shows how consumers perceive certain product attributes and how these attributes can create benefits for them.

The interviews will be recorded, but there will not be made a transcription of the interview, since the full sentences of the interviewee are not needed for the analysis.

Results

Product choices

During the interviews, pictures were taken of the groups that were created in each situation. By doing this, a table could be created that shows the amount of interviewees who would buy a certain product in a specific situation.
The coding of the products can be explained as following: the first letter indicates the level of deviation, which can be normal (=N), moderate (=M), or extreme (=E). The second letter indicates the type of deviation, which is shape (=S), colour (=C), and amount of blemishes (=B).

	NS NC NB	NS MC NB	NS EC NB	NS NC MB	NS NC EB	NS MC MB	NS EC MB	NS MC EB	NS EC EB	MS NC NB	MS MC NB	MS EC NB	MS NC MB	MS NC EB	MS EC MB	MS MC MB	MS MC EB	MS EC EB	ES EC MB	ES NC NB	ES MC NB	ES EC NB	ES NC MB	ES NC EB	ES MC MB	ES MC EB	ES EC EB
Pie	8	8	8	8	4	7	4	4	2	8	8	8	7	3	3	5	3	4	4	8	8	7	7	4	7	3	2
Fruit bowl	10	9	7	4	1	2	0	1	0	8	7	6	3	1	0	1	1	0	0	7	7	3	3	1	2	1	0
Side dish	10	10	6	8	7	8	3	4	2	8	7	2	6	5	1	5	3	1	0	2	1	0	2	1	1	1	0
Soup	10	10	6	10	7	9	5	6	5	9	9	6	8	5	3	6	5	2	2	8	6	2	6	4	4	3	1

Table 4: Choice representation of all interviewees together

Since there is quite a large amount of data in table 4, it would be hard to draw conclusions from. Therefore, the data is reduced to give a more clear overview of the choices of the interviewees. Only the products that have been chosen by seven or more interviewees in a certain usage situation are used to find the similarities between the products that people are willing to buy. By doing this, it is also more easily possible to analyse the differences in product characteristics that the interviewees selected most, between the situations. In these tables, which can be found in Appendix II, the characteristics of the products chosen in a specific situation are given. All the numbers in one row are equal, as they represent the choice for the same product. The amount of people that chose a certain product is summed for the all the products in total that are chosen more than 7 times. The number in the sum M+E row are the total of products chosen that deviate in a certain manner. The lower this number, the less willing consumers are to buy products with a specific cosmetic deviation.

From these tables, which can be found in Appendix II, several results have been found. The first situation was baking an apple pie. In this situation, the amount of blemishes seems to be the most important factor in the choice for apples. In total, the moderate and extreme blemishes were only chosen 36 times in situation 1. That is, 36 times, apples with moderate or extreme blemishes were chosen, while moderate or extreme shape or colour were chosen respectively 68 and 61 times. For the situation of buying apples for the fruit bowl, the results are in the same line. It has to be noted that in this situations, less products had been chosen at least seven times, so consequently the sums are lower than in the first situation. Also in this situation, blemishes were the most important factor on which the participants based their decisions. Apples with a moderate or extreme amount of blemishes were chosen zero times. Relatively, the extreme colour and shape were chosen less often than in the first situation.
In the third situation the interviewees had to choose carrots to create a side dish, in which the carrots would be served as a whole. Here, the acceptance towards the types of deviation were spread more equally than with the apples. It is still noticeable that shape was the most

important factor, as carrots with a deviating shape were only chosen 15 times. None of those 15 were the choice for an extreme shape, meaning that only a small deviation in shape was acceptable. Also, none of the carrots with an extreme colour were chosen more than seven times. The fourth and last situation showed the choice of carrots to make carrot soup with. In this situation, the most important factor seems colour, as deviating colours were only mentioned 19 times. Shape and blemish were less important in this situation compared to the colour of the carrots.
So for the carrot soup, the interviewees found shape less important and colour more important compared to buying carrots for a side dish. Thereby, less products were chosen more than seven times in situations 2 and 3 compared to situation 1 and 4. So, generally, interviewees accepted less products in the situations where the appearance of the product was more visible than in the situations where the appearance was less visible.

From table 4, graphs are created that show the turning point for the acceptance of a product. This turning point is defined as the point where the graph changes most in the number of interviewees willing to buy.
For apples, the edge of acceptance lies approximately at the combination of a normal colour with moderate blemishes or at a moderate colour with moderate blemishes. The shape plays a less important role in this, as it is visible that there a no products accepted that have extreme blemishes, even if the shape is normal. So the products that are more deviating than that, are generally not accepted by the interviewees.

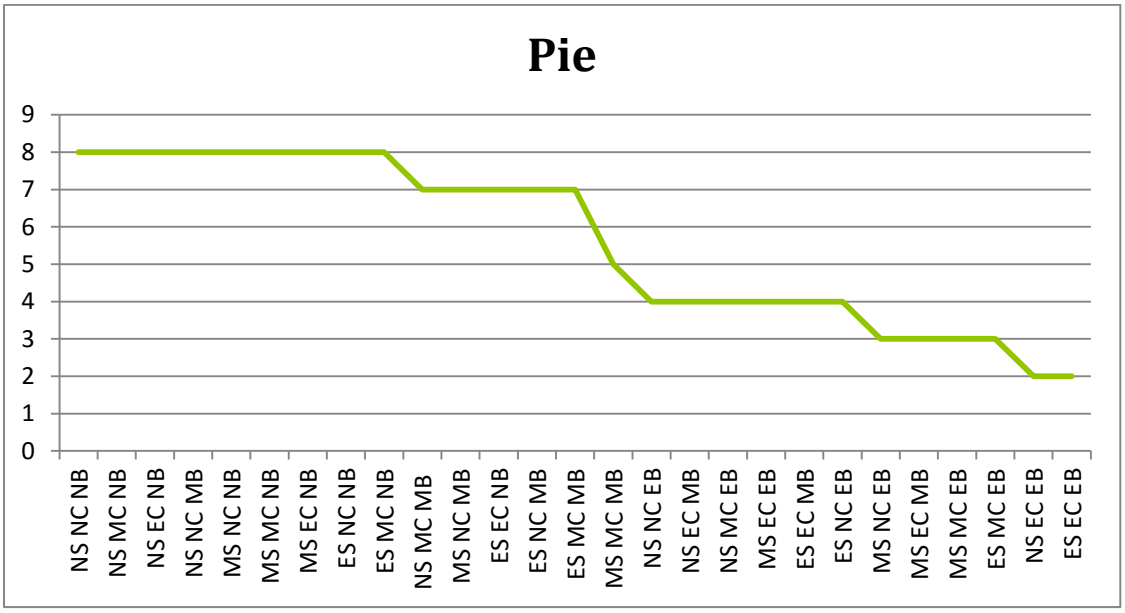

Figure 1: Choice representation in buying apples for an apple pie

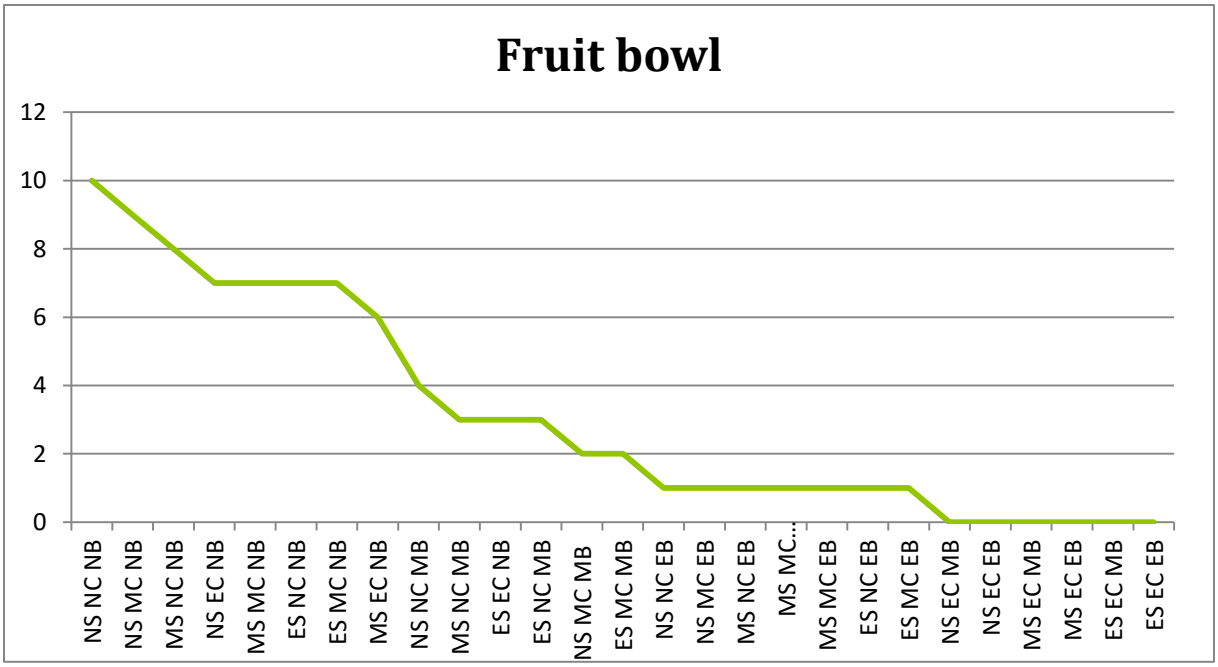

Figure 2: Choice representation in buying apples for fruit bowl

For carrots, this turning point is harder to define. Therefore there has been chosen to set the edge of acceptance at 6, as this is the majority of the interviewees. So only the products that have been chosen 6 or more times are in within level of acceptance. Here, the turning point lies approximately at a normal shape with moderate colour and moderate or extreme blemishes.
The turning point differed across the situations, as in the usage situations where the appearance of was more visible, interviewees were more strict.

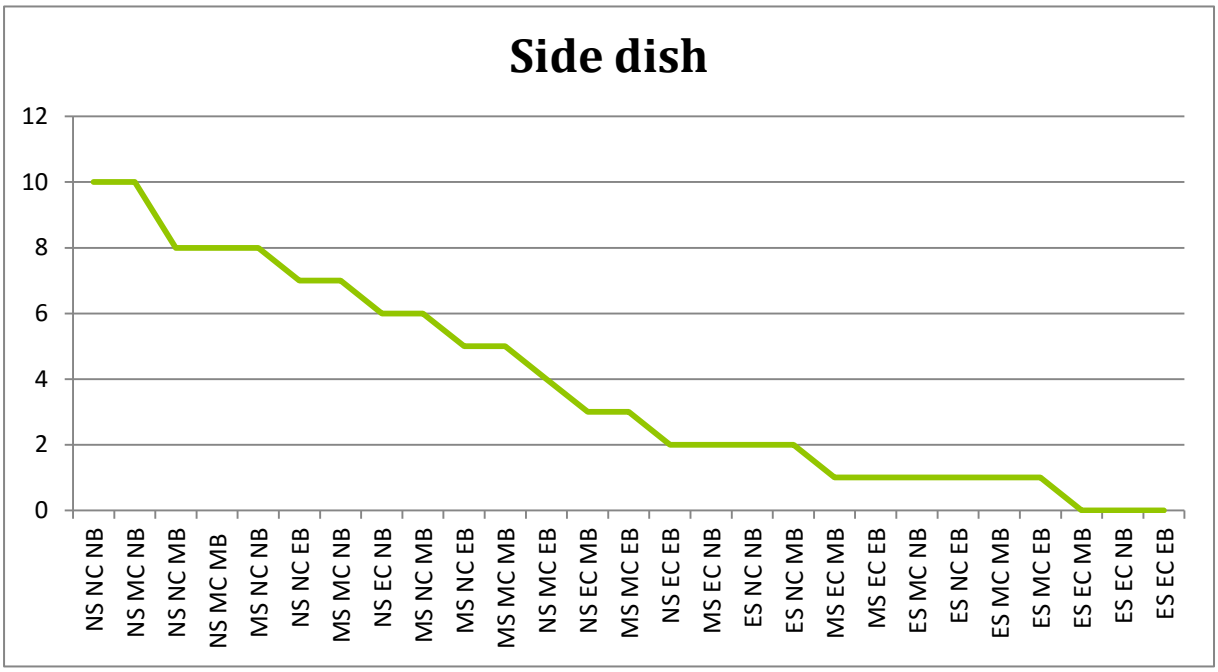

Figure 3: Choice representation in buying carrots for side dish

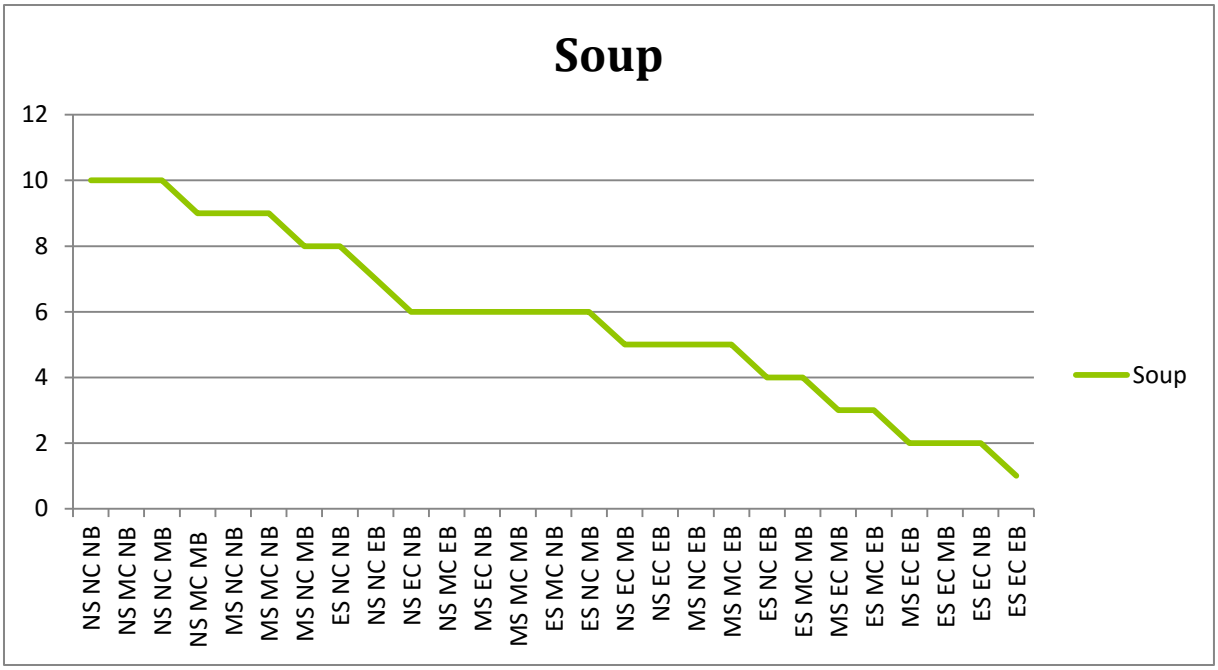

Figure 4: Choice representation in buying carrots for soup

In-depth interviews

From the in-depth interviews, ladders can be created. These ladders represent the cognitive structures of people when observing apples and carrots with cosmetic deviations, and go from product attributes, to consequences of these attributes, to goals for which these consequences are important.
The individual ladders can be summarized and put together by creating an implication matrix. The numbers in these matrices represent the linkages between the attribute, consequences and goals. In this matrix, the first number stands for the direct relations, and the number after the '.' are the indirect linkages. Indirect linkages mean that there are elements in between the two concepts related. So there is a relation between two concepts, but this relation is formed by an intermediate concept.

	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1 Spots	6.01	3.01	3.01	1.00		1.00	2.00	2.02	2.01	0.02	5.04			3.00		1.00			0.10	0.05	0.01	1.02	0.01		0.02
2 Dull	2.00			0.01	2.01						2.02	2.00						1.00	0.01	0.01					0.01
3 Sallow	4.00	2.01	1.01		4.00				1.00		2.02	2.00							0.01						0.02
4 Discount							1.00					1.00								0.01					
5 Weird shape	1.00					2.00	1.00		3.00		1.01	1.00	2.01	1.00	1.00	1.00	0.01	2.00	1.02	1.02		1.02		0.01	
6 Less appetizing				1.00	1.00			1.00			1.00								5.00	4.00					
7 Less crunchy			2.00								1.00								1.00						
8 Mealy		1.00									3.00								1.00						1.00
9 Less juicy																									
10 Older											1.00								1.00						1.00
11 Less natural													1.00												
12 Lower quality								1.00		1.00									1.00						
13 Downgraded	1.00								1.00		1.00										1.00				
14 Not healthy										1.00	1.00								1.00						
15 Less nutritional value																			1.00						
16 Different taste		1.00									1.00								2.00			1.00			2.00
17 Less pretty																				3.00		1.00			1.00
18 Not normal looking																						1.00		1.00	
19 More effort																				1.00			1.00		
20 More local																	1.00		1.00						
21 Looks cheap																				1.00		1.00			
22 Better taste																									
23 Funny look																									
24 Eating out of hand																									
25 Appearance is visible																									
26 Not eating immediately																									
27 Serving to guests																									
28 Prefer less effort																									
29 Wanting to belong to normal society																									
30 Always																									

Table 5: Implication matrix apples, yellow numbers are at or above cut-off level two

	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1 Sallow	3.00	1.01	2.00					3.00		3.01	1.00	2.00					1.00		0.01	0.01	0.01	1.00	1.01	0.05
2 Dull										1.00										0.01				
3 Spots	1.00	1.00	2.00	0.01		2.00		3.00	3.02	2.01						2.01				3.03				
4 Weird shape			3.00	1.00		5.01	1.00	1.00		1.00		4.00	2.00	0.01	1.02			1.00		0.02	0.03	0.02	1.05	0.02
5 Discount																							0.01	
6 Older		1.00							1.00															
7 Different texture									1.00															
8 Does not look normal						1.00				1.00											1.00		1.00	
9 Not natural																								
10 Unhealthy																								
11 Inconvenient																				2.00		1.00	2.00	
12 Looks funny																								
13 Less appetizing																				3.00			3.00	
14 Rot				1.00						1.00						1.00								
15 Different taste																			1.00	1.00				4.00
16 Less juicy																								
17 Less pretty																				1.00	2.00	1.00	2.00	
18 Locally produced														1.00	2.00									
19 Good taste																								1.00
20 More natural																								1.00
21 Lower quality																								
22 Unripe																								1.00
23 Looks cheap																					1.00			
24 Safe alternative																								
25 Use for snacking/with peel and raw																								
26 Serving to guests																							2.00	
27 Serving as a whole																								
28 Appearance is visible																								
29 Always																								

Table 6: Implication matrix carrots, yellow numbers are at or above cut-off level two

From this implication matrix, a hierarchical value map (HVM) can be created, which is a graphical representation of this matrix. This mapping is needed to give a better organized overview of the linked concepts, and how strong these linkages are. If all the linkages would be represented in the map, it would become very unclear. Therefore, a cut-off level of two is used. This means only the relations of which the sum of direct and indirect links is higher than two, are used (Reynolds and Olson, 2001, p.129). This specific cut-off level is chosen because the

concentration index is most optimal, in combination with the clarity of the map. Following the theory of Pieters, Baumgartner and Stad (1994), the concentration index of apples was 71%, and for carrots 73%, with a cut-off value of two. A higher cut-off value would lead to a lower percentage of linkages represented by the HVM, and a lower cut-off value would lead to a very unclear HVM, as all the relations made by the interviewees would then be visible. Two separate maps are created for the apples and the carrots.

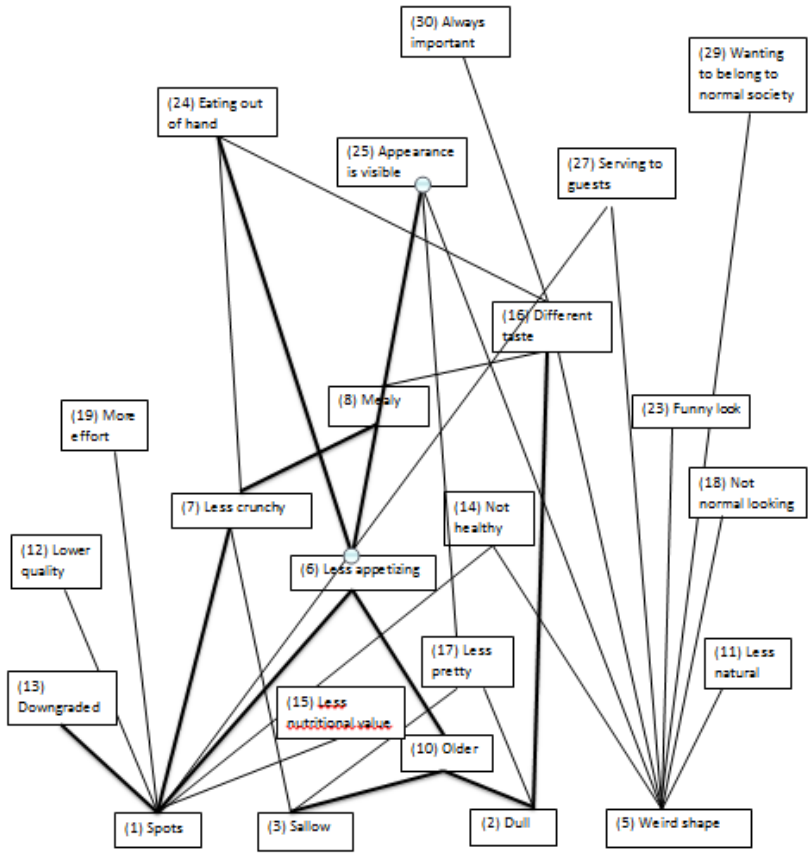

Figure 5: Hierarchical Value Map apples

The HVM for apples gives in combination with the implication matrix of apples, a clearer vision on the inferences people make when observing apples with a cosmetic deviation. In the HVM, the relations that are mentioned more have thicker lines between the elements; 2-3 times = thin line, 4-5 times= medium line, and 6 or more times= thickest line. This is the same for the carrots. When comparing the implication matrix with the map, it is visible that not all the relations that are mentioned the most have the thickest line. This is because these relations are often indirect, and the route they follow to come to the goal was very diverse for the different interviewees. Thereby, in the HVM, indirect and direct relations are put together, so for the direct relations there are no extra lines in the map that go directly from attribute to goal, if there are indirect relations given as well. With apples, this is the case for the link between 'spots' and 'different taste', and the link between 'spots' and 'eating out of hand'. The most important things that are visible in the HVM and the implication matrix will be explained.

One of the first things that is visible, is that the interviewees separated the attribute sallow from dull, while in the theory they are combined as the variable colour. Spots were four times related with a mealy taste of the apple. This is related to the crunch of the apple, which is perceived to be lower when an apple has spots on the surface. Apples with a less bright colour, are perceived as older, which leads to a different taste. The element 'different taste' is positioned in a negative way for this research. This consequence was named most often by the interviewees. Dull and sallow apples were also seen as less pretty by some interviewees. This attribute was seen as most important when the eating the apples out of the hand and when buying them for a fruit bowl. Some interviewees named the redness of the apple as an indication for good taste and texture. Thereby quite some interviewees related the amount of spots, the colour and the gleam of the apple with the appetite they got from seeing the apple. The more deviating one or more of these elements, the less appetite they got from the apple. Apples with a weird shape were seen by some interviewees as 'not normal looking', and they sometimes were afraid that something was wrong with the apple because they had never seen an apple like that. Interviewees generally found the amount of spots most important when eating the apple out the hand, but they minded them less when the appearance of the product was not visible in the end-product. None of the relations between the weird shape of the apples and the goals were mentioned very often. Some interviewees did not want to show the apples with a deviation in shape to guests.

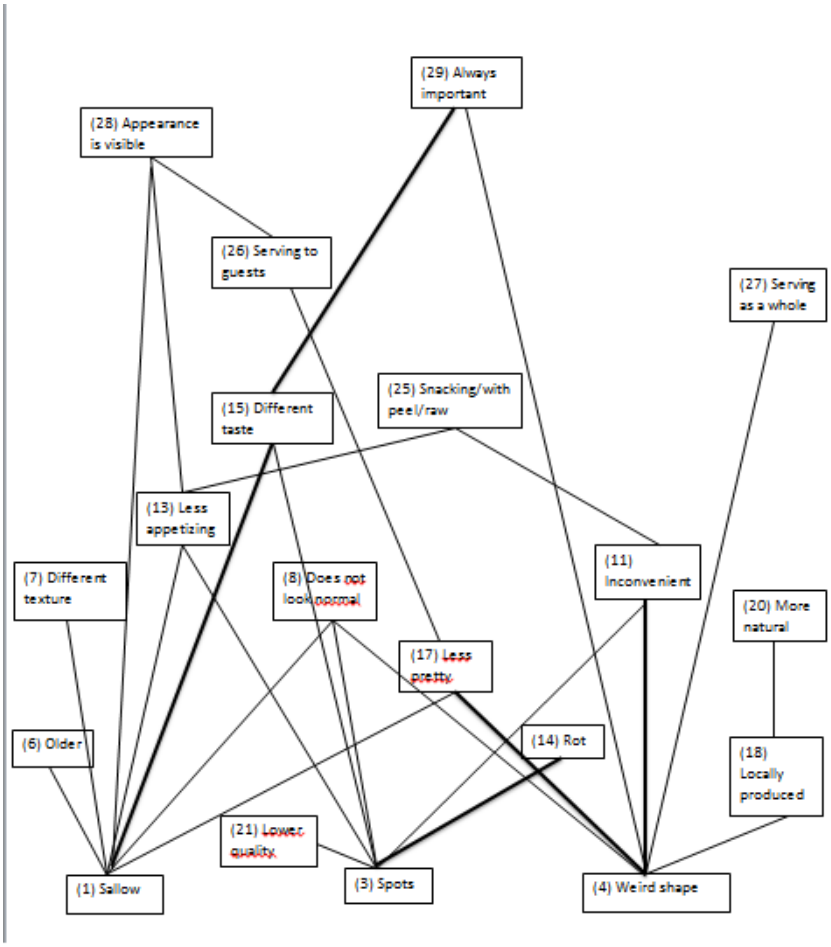

Figure 6: Hierarchical Value Map carrots

The results for carrots were different than for apples. For carrots, no interviewees named the gleam of the carrot, so for this product sort, there are only three concrete attributes in the HVM.

Some interviewees found the carrots that were less orange, less pretty, less appetizing and less fresh. Thereby some people thought it influenced the taste of the carrot. Some interviewees found the colour of the carrot always important, as they associated it with the typical taste of a carrot.
Several interviewees found the carrots that deviated in shape less convenient, as they didn't know how to prepare them. This was for some people related to the fact that they had never seen a carrot that looked like that. This inconvenience was less relevant if they would use the carrots in for example a soup, as they could cut the carrots. These carrots were seen as less pretty than the straight carrots, and some even called them "very ugly". Interviewees especially did not like the carrots that deviated in shape when the appearance was visible in the end-product. This was related to the inconvenience of the carrot if they did not cut them, and the less appetizing look of these carrots.
Some of the interviewees related the spots on the carrots with rotting and found them less appetizing. This caused that they less liked the carrots with spots if they would eat them as a snack. Several interviewees thought the spots were only on the surface, so if they shred the carrots it would be less important.

Conclusion

At the beginning of this research, the expectation was set that consumers would be more willing to buy fruit and vegetables with a cosmetic deviation if the appearance was less visible in the usage-situation. This expectation is confirmed, as people chose less products with a moderate or extreme deviation in the situations where the end product was more visible. For apples, the choice was mostly based on the amount of blemishes on the apple. This was the variable in which the interviewees allowed the least deviation. For carrots, the acceptance of deviation was more spread across the variables, but when making carrot soup, they found colour more important than when preparing the carrots as a side dish.
Thus, for apples it is expected that blemishes are the most important decision factor, and for carrots the colour. This finding could be interesting for marketeers who want to promote apples and carrots with a deviation, as this research gives an insight in the willingness to buy fruit and vegetables with a certain deviation for different usage situations.
Another important finding is that even though the interviewees are told that the deviations are purely cosmetic, they still associate the spots and deviation in colour negatively with taste and structure of a product.
Unfortunately it is not possible to generalize the findings of this research for all types of fruit and vegetables, as the findings varied greatly across the carrots and apples. This is because the interviewees created different inferences when observing for example spots on apples and carrots. It is expected that the findings can be generalized for fruit or vegetables that are similar to apples and carrots in their structure and skin. The inferences might be very different for example an orange, which has a thick skin you have to peel. On the contrary, a pear is quite similar to an apple, as they both have a thin skin, so people could make the same inferences with this type of fruit as with an apple.
So people infer consequences of products from the looks that they have. Bringing the results of this research back to the model of Horning (2015), consumers infer the deviations in appearance attributes of fruit and vegetables mostly to the functional value of a product, as they find the taste very important. Contrary to this, they accepted less cosmetic deviation when the appearance of the product was more visible in the usage situation. This could be because people want a product that looks appetizing, and if they process the product, the appearance is less visible. Emotional value does play a small role in this, as people also said that they like the products that do not look normal or typical less. The social value of products with a cosmetic deviation could be lower as consumers "want to serve something good to their guests". If cosmetic deviation was more normal to consumers, this could influence the social norm.

Concluding, the problem with suboptimal foods is different for fruit and vegetables. For fruit is mainly dependent on the colour and blemishes, as these factors influence the appetite people get from the product and the expected taste. This is in line with earlier research of Yue et al. (2007). So there is mainly a negative association with the functional value. When the product is more visible, people are even more strict in choosing a product and they are stricter on the impact of the social value of the product. For vegetables, shape is more important, mainly for convenience, and when the product is more visible, how pretty it looks on the plate. So like with fruit, the social and emotional value are more important when the appearance of the product is more visible in the usage-situation.

Discussion

Even though the results of this research bring more insight in the inferences people make when seeing apples and carrots with a cosmetic deviation and their willingness to buy these products, several things have to be noted. The amount of interviews conducted was quite low, and more interviews could lead to different results. Because of this small amount of interviews, the cut-off level of the implication matrix was set quite low, which caused that most of the elements were visible in the hierarchical value map, while not all of these elements might have been important if *n* was larger. During the interviews, the only decision interviewees had to make was whether they would or would not buy the product. Looking back, it would have been better to use the grouping of evoked set categorisation, where a consideration set, inept set, and inert set are made. Thereby, people are likely to make different decisions when they actually stand in the supermarket, compared to making decisions in a fictitious setting.
The use of different pricings was necessary to conduct the research, but it implicates the findings, as the price could have influenced the product choice as well. In future research, the price elasticity of suboptimal food products could be further investigated, to find if and how the price correlates with the acceptance of a product with a specific deviation in appearance.

This research can be seen as explorative in this topic, and further research is definitely needed to create more extensive and valid insights. It is a basis for future research and opportunities for supermarkets to sell products with a cosmetic deviation as well. To do this, they should take a further look in the options of product positioning for these suboptimal foods.

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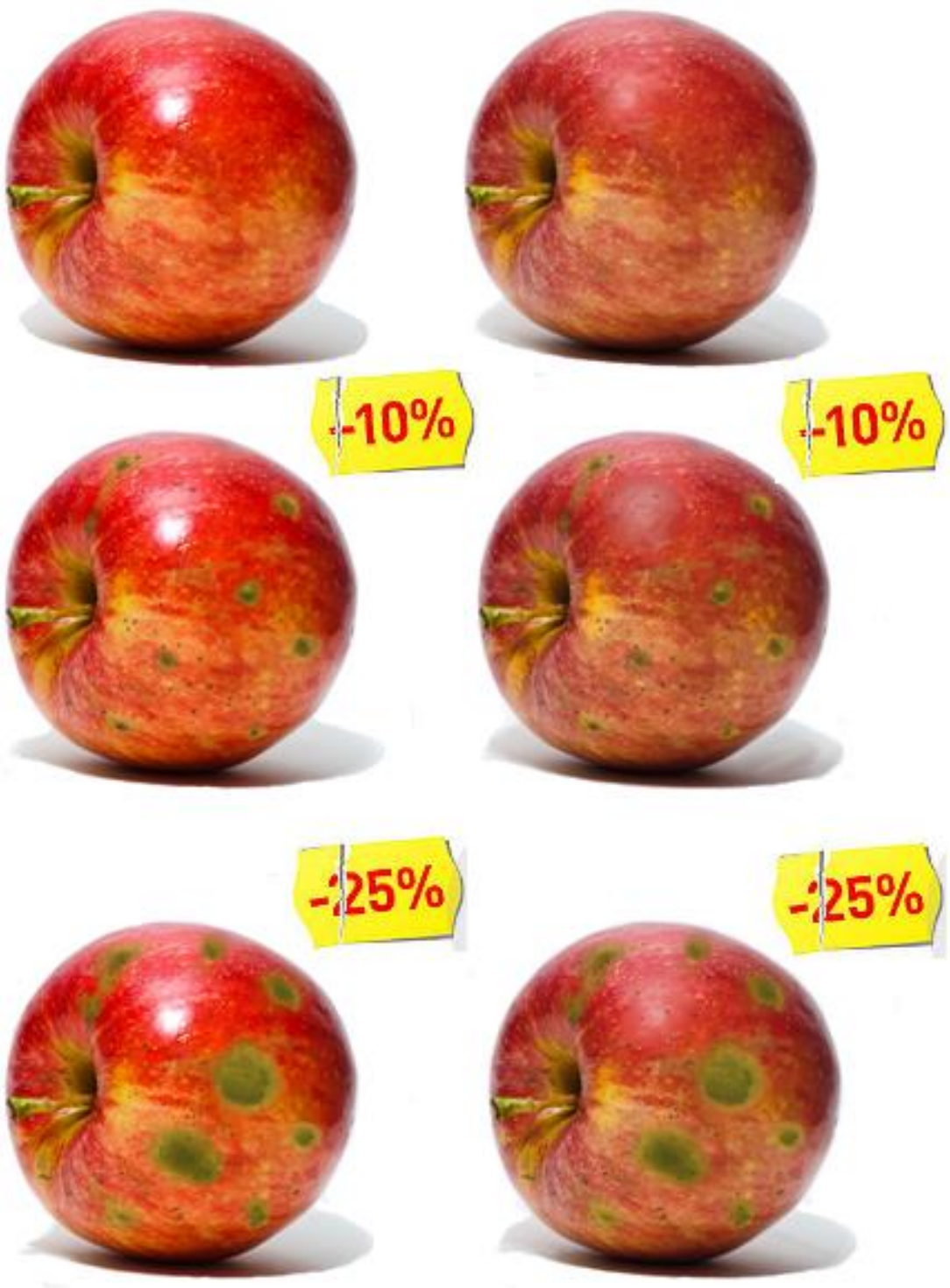
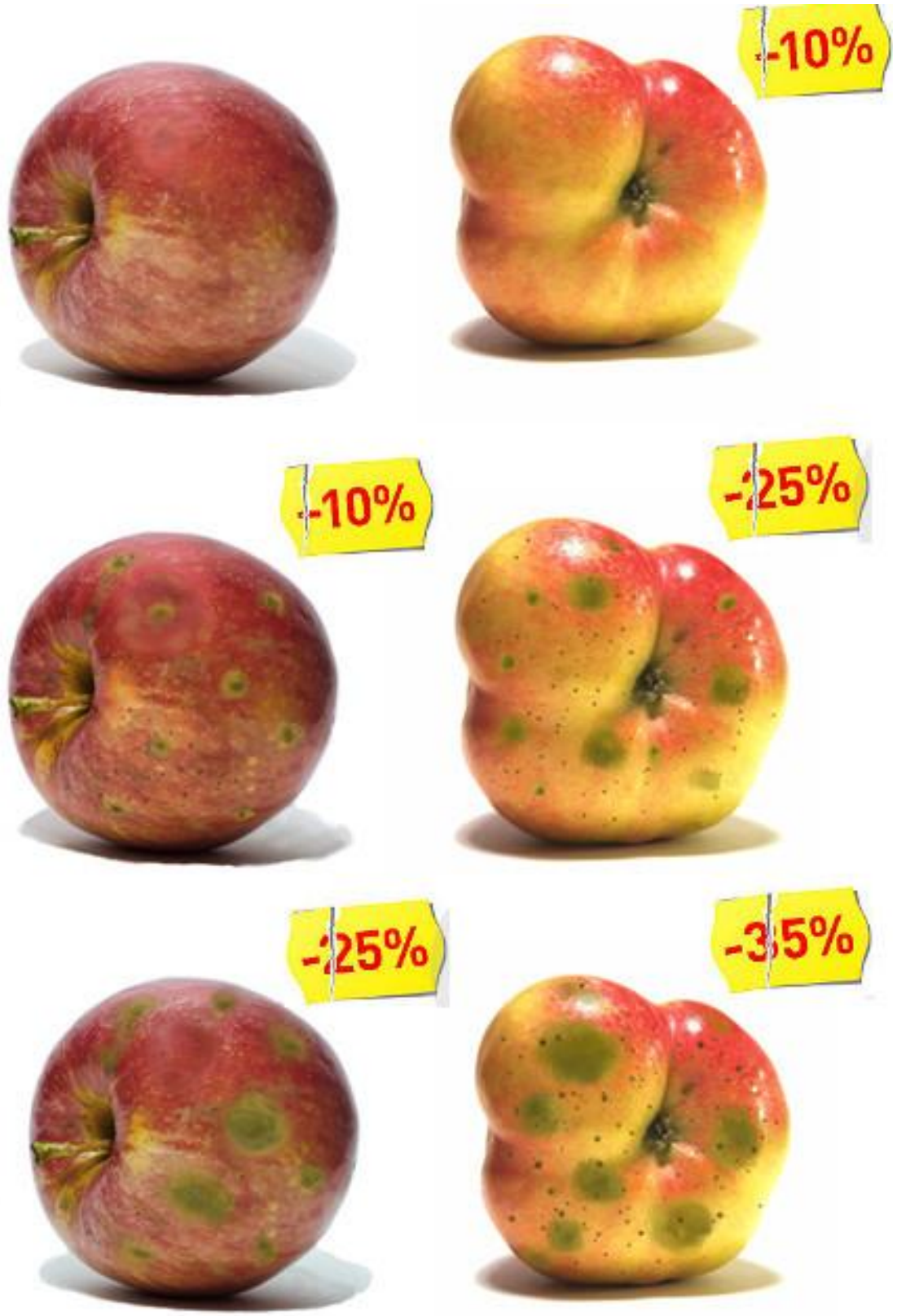
Appendix I: Product grid

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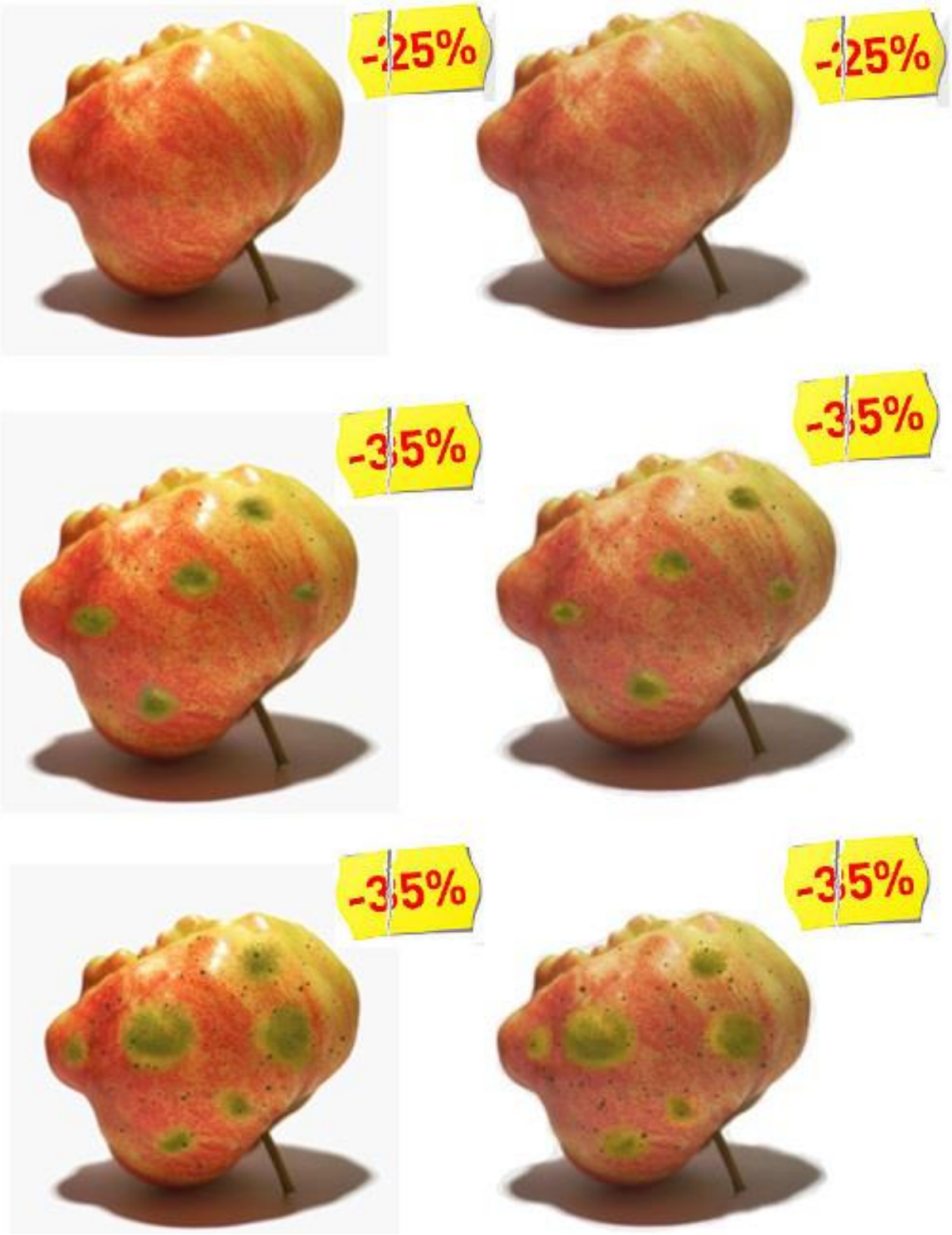
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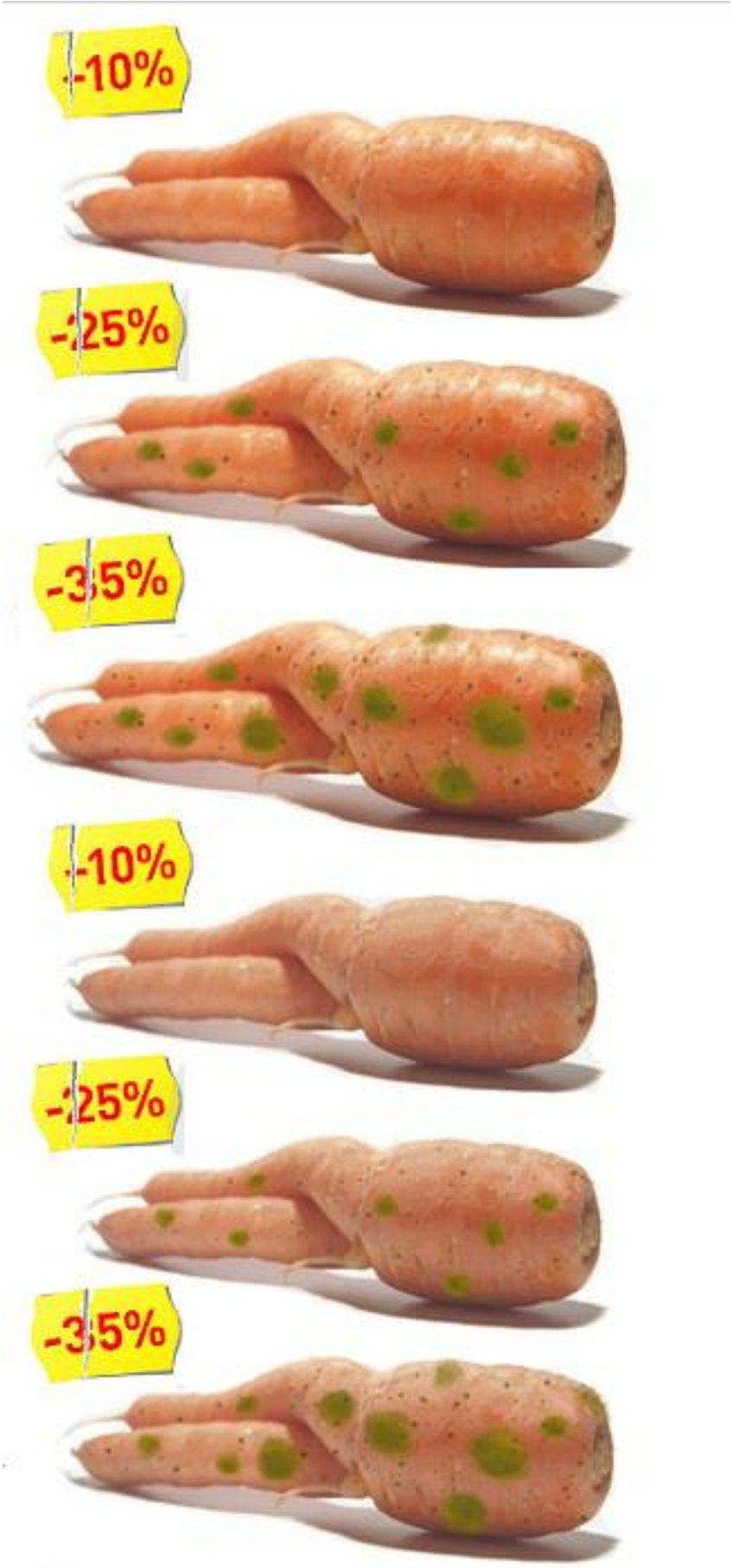
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Appendix II: tables

Sit. 1

	Shape			Colour			Blemish		
	Normal	Moderate	Extreme	Normal	Moderate	Extreme	Normal	Moderate	Extreme
	8			8			8		
	8				8		8		
	8					8	8		
	8			8				8	
	7				7			7	
		8		8			8		
		8			8		8		
		8				8	8		
		7		7				7	
			8	8			8		
			8		8		8		
			7			7	7		
			7	7				7	
			7		7			7	
Total	39	31	37	46	38	23	71	36	0
Sum M+E		68			61			36	

Sit. 2

	Shape			Colour			Blemish		
	Normal	Moderate	Extreme	Normal	Moderate	Extreme	Normal	Moderate	Extreme
	10			10			10		
	9				9		9		
	8					7	7		
		8		8			8		
		7			7		7		
			7	7			7		
			7		7		7		
Total	27	15	14	25	23	7	55	0	0
Sum M+E		29			30			0	

Sit. 3

	Shape			Colour			Blemish		
	Normal	**Moderate**	**Extreme**	**Normal**	**Moderate**	**Extreme**	**Normal**	**Moderate**	**Extreme**
	10			10			10		
	10				10		10		
	8			8				8	
	7			7					7
	8				8			8	
		8		8			8		
		7			7		7		
Total	43	15	0	33	25	0	35	16	7
Sum M+E		15			25			23	

Sit. 4

	Shape			Colour			Blemish		
	Normal	**Moderate**	**Extreme**	**Normal**	**Moderate**	**Extreme**	**Normal**	**Moderate**	**Extreme**
	10			10			10		
	10				10		10		
	7			7				7	
	9			9					9
		9			9			9	
		9		9			9		
		8		8				8	
			8	8			8		
Total	36	26	8	52	19	0	37	24	9
Sum M+E		34			19			33	

Appendix III: Interviews

Individual ladders

Interview 1

Apples

A	Spots
C	Not appetizing
G	Not bad if you peel them
G	In fruit bowl rather without spots

A	Grey colour
C	Softer
C	No good taste
C	Mealy
C	Less fresh
C	Less bright

A	Shape
C	Funny
C	Genetically modified
G	Not serve to other people

Carrots

A	Grey colour
C	Less fresh
C	Rubbery
C	Watery
G	Not attractive when served as a whole
G	Do not mind in soup

A	Other thickness
C	Does not look like carrot
C	Weird to serve
C	Looks like something happened
C	Cross-breeding
C	Other cooking needed
G	Would use if disguisable
G	Use in soup
G	Not use when serving to others

A	Spots
C	Need to shred/peel
G	Would choose less quickly for snacking
G	Would use for dinner, as you wash and peel them

Interview 2

Apples

A Spots
C Product not good
C Started to downgrade
G Important when eating with skin
G Less important when eating immediately

A Shape
C Does not look healthy
C Something wrong/disease
C Something wrong with flavour
C Does not look nice
G Not important when eating out of the hand

A Dull
C Less pretty

A Red
C Looks fresher
C Looks sweeter
G Always important

Carrots

A Weird shape
C Looks funny
C Less convenient to peel
G For soup less important, as bit of skin is not a problem

A Spots
C Need to shred

A Orange colour
C Looks tasty
C Is typical
C Looks nice as whole
G More important for separate eating than in soup

A Sallow
C Looks less tasty
G Less important in soup

Interview 3

Apples

A Discount
C Indication quality

A Weird shape
C Looks like potato
C Does something with flavour
C Does not look natural/like I'm used to
C Does not look healthy
C Not easy to take with you
G You want to give your guests something good
G Always important

A Spots
C Does not look tasty
C Looks like they are softer
C Not nice to put your teeth in
G Would buy to use processed, but not on fruit bowl

A Gleam
C Looks better
C Tastes better
G On fruit bowl more important

Carrots
A Deviant shape
C Has grown good
G If you do not see the shape it does not matter

A Bright colour
C Looks better
C More flavour
G Always important

A Pale colour
C Looks like they are laying there for longer
C Looks less tasty

A Green spots
C Does not look tasty
C Softer
C Rot
C Influences taste and structure negatively
G Less important if you shred them

Interview 4

Apples
A Spots
C Mealy
C Tastes less

C Less appealing
C Less juicy
C You have to cut it out
C More effort
G Prefer less effort
G Taste is always important, has to be fresh

A Misshaped
C Inconvenient with cutting
C More effort
G Especially for apple pie, does not matter when you eat it out of the hand

A Gleam
C Skin looks greasy
C More manipulated
G Especially important when eating out of the hand

A Dull
C Looks more pure
C Fuller taste
C Tastier
G Especially important when eating out of the hand

A Red colour
C Get appetite
C Looks tastier

Carrots
A Pale colour
C All flavour is gone
G Always important

A Orange colour
C Juicy
C Full over flavour
G Always important

A Spots
C Do not get appetite
G Especially when eating out of the hand, with soup some spots are okay

A Weird shape
C Looks nasty
C Do not get appetite
C Do not know how to eat it
G With soup less important since you cut it

Interview 5

Apples

A Weird shape
C Less tasty
C Less pleasant to eat
C Never seen such an apple
G Does not matter for apple pie

A Extra bobble
C More natural than other weird shape
C Looks like apple
G Especially important when buying

A Large amount of spots
C Does not look natural
C Looks mushy
C Not nice
G Would avoid

Carrots

A Weird shape
C Too big, not pretty to put with dinner
G Not buy when eating as a whole and for pretty plating
G Not serve to guests, less good impression, but family is okay

A Low price
C Cheaper
G Would buy if appearance product is not visible

A Spots
G Important when eating with skin

A Orange colour
C Looks prettier
G Important when serving to guests

Interview 6

Apples

A Spots
C Influence on taste
C Skin does not look tasty
C Would not want to eat it → **bij lower quality?**
C No added value from spot
G Not nice to eat out of the hand, when you do not peel it
G Would peel at home, to bring with you rather apple you can eat easily

→ **Staan er al in maar plek checken**

G When through something, does not matter

A Red colour
C Looks healthy
C Prettier
G Important when eating out of the hand

A Dull
C Looks older
C Less taste

A Weird shape
C Looks like pattern
C Looks like disease
C Could be swelling
G Less important when you cut it, you can see how it looks inside

Carrots
A Dull
C Taste less
G Especially important when eating raw, with cooking taste is already less

A Green spots
C Looks more natural than with apple
G When eating with cutlery you can cut it off when it's bad

A Deviant shape
C How to prepare?
C Less easy to cut
C More effort
C Very ugly
C Different from what you're used to
G To eat it quickly I would buy straight carrots. In the evening when you're cooking and you have the time, it is less important

Interview 7

Apples
A Spots
C Looks mushy
C Mealy
C Not tasty
C Less crunchy
C Would peel first to see if there are spots inside
G Less important when it goes in the oven and becomes soft
G For raw apple important that it is crunchy, sweet and juicy

A Weird shape

C Looks funny
C Nicer than normal ones, which are plain
C More local
C Could be more tasty
C Not made for in supermarkets
G Especially important when buying them separately, in jam less important

A Light colour
C Looks tastier
C Crunchier and sweeter
G Especially important when eating it out of the hand

Carrots
A Pink/brownish colour
C Not associated with carrot
C Looks softer
C Less tasty
C Less sweet
G Always important because of association with taste

A Shape
C Looks locally produced
C Taste good
C Less conserved
C Less manipulated
G I always like different shapes

A Spots
C Rotting
C Less tasty
G If it is only external I do not mind

Interview 8

Apples
A Spots
C Looks nasty
C Taste it below the skin
C Rough structure
C Structure spots is nasty
C Something happened because of which skin is not clean
C Bad quality
C Less taste
C Less crunch
C Mealy
C Less nutritional value
G Less important when you peel them

G Nutritional value more important when you eat them as a snack
G Freshness more important as snack

A Shape
C Has to look natural
G Always important

A Dark colour
C Does not look tasty
C Looks older
C Looks mealy

A Bright colours
C More sour
C Fresher

A Glowing skin
C Skin looks more appetizing
C Looks fresher
C Looks juicier
G Important when you eat it with skin

Carrots
A Spots
C Does not look like something I have ever eaten
C Looks old
C Starting to rot
C Too many spots is indication bad quality

A Mutated shape
C Different taste
C Different preparation
C Have to think about preparation
G Does not matter when you cut it

A Little colour
C Looks more like potato
C Different taste
C Do not want to eat it
C Does not look like you can eat it raw
C All flavour gone
G Rather safe alternative, what you expect from carrot

Interview 9

Apples
A Gleam

C Looks more appetizing
C Looks fresher
C Tastier
G Always important, because of association with flavour

A Sallow
C Looks old
C Less fresh taste

A Mold
C Untasty
C Nasty
C Expired
C Not totally good for you
C Less desire to eat it
G Less important when it goes in the oven
G With peel not so nice

Carrots
A Tuberous carrot
C Looks weird
C Not pretty
G Important when you serve it as a whole, in soup it doesn't matter
G Don't mind when the shape is not visible

A Coloured
C Fresher

A Mold
C Unattractive
C Expired

Interview 10

Apples
A Lower price
C More important than appearance
G When appearance is not visible

A Green spots
C Not fully good
C Rot
C Looks cheap
C Tastes different
C Looks weird
G Do not want to serve it to guests if they can see it

A Bulges
C Want them to look like the book/normal
C Looks cheap
C Less quality
C You pay for shape so should be round
G Not want to be associated with weird apples
G Want to belong to normal society

A Lower price
C Ugly apple

Carrots
A Wide shaped
C Looks cheap
C Hard to shred
G Would not want to serve it to guests

A Green spots
C Mold/depravity
C Less quality
C Shouldn't be green
C Becoming ill

A Not so orange
C Not long enough in the ground
G If serving to guests, has to look pretty
G In hotchpotch also idea they're not fully grown
G Always important

Coding

Apples

1. Spots :
- Large amount of spots
- Mold
- Green spots
- Spots

2. Dull

3. Sallow:
- Grey colour
- Dark colour
- Sallow

4. Discount:
- Discount
- Lower price

5. Weird shape:
- Shape
- Weird shape

- Misshaped
- Extra bobble
- Bulges

6. Less appetizing:

- Not appetizing
- Does not look tasty II
- Less appealing
- Less tasty
- Skin does not look tasty
- Would not want to eat it
- Untasty
- Less desire to eat it
- Nasty

7. Less crunchy:

- Softer
- Looks like they are softer
- Less crunchy
- Less crunch

8. Mealy:

- Mealy
- Looks mushy
- Structure spots is nasty

9. Less juicy

10. Older:

- Less fresh
- Looks older
- Looks old
- Less fresh taste

11. Less natural:

- Genetically modified
- Does not look natural
- More manipulated

12. Lower quality:

- Product not good
- Indication quality
- Bad quality
- Less quality

13. Downgraded:

- Expired
- Rot

14. Not healthy:

- Does not look healthy
- Something wrong/disease
- Looks like disease
- Not totally good for you
- Could be swelling
- Not fully good

15. Less nutritional value

16. Different taste:

- Something wrong with flavour

- Does something with flavour
- Tastes less
- Influence on taste
- Less taste
- Not tasty
- Tastes different

17. Less pretty:

- Does not look nice
- Less pretty
- Not nice
- Looks nasty

18. Not normal looking:

- Does not look like I'm used to
- Never seen such an apple
- Looks like potato

19. More effort:

- You have to cut it out
- More effort
- Not easy to take with you
- Inconvenient with cutting

20. More local

21. Looks cheap

22. Better taste

- Fuller taste

23. Funny look

24. Eating out of hand:

- Especially important when eating out of the hand
- Not bad if you peel them
- Important when eating with skin
- Important when you eat them with skin
- Less important when you peel them
- With peel not so nice
- Not nice to put teeth in

25. Appearance is visible

- In fruit bowl rather without spots
- Would buy to use processed, but not on fruit bowl
- When appearance is not visible
- Do not want to serve to guests if they can see it
- In fruit bowl important they gleam

26. Not eating immediately

- Less important when eating immediately

27. Serving to guests

- Not serve to other people
- You want to give your guests something good

28. Prefer less effort

29. Wanting to belong to normal society

- Not want to be associated with weird apples
- Wanting to belong to normal society

30. Always important

Carrots

1. Sallow:
- Grey colour
- Pale colour
- Pink/brownish colour
- Little colour
- Not so orange

2. Dull

3. Spots:
- Mold
- Green spots
- Spots

4. Weird shape:
- Other thickness
- Deviant shape
- Shape
- Mutated shape
- Tuberous carrot
- Wide shaped

5. Discount:
- Cheaper
- Low price

6. Older:
- Less fresh
- Wizened
- Looks like they are laying there for longer
- Looks old

7. Different texture:
- Rubbery
- Softer
- Influences structure negatively

8. Does not look normal:
- Does not look like carrot
- Less typical
- Different from what you're used to
- Not associated with carrot
- Does not look like something I have ever eaten
- Looks weird
- Shouldn't be green

9. Not natural:
- Looks like something happened
- Cross-breeding

10. Unhealthy:
- Becoming ill

11. Inconvenient:
- Other cooking needed
- Need to shred/peel
- Less convenient to peel
- Do not know how to eat it

- How to prepare
- Less easy to cut
- Different preparation
- Hard to shred
- Have to think about preparation

12. Looks funny:
- I always like different shapes
- Looks funny

13. Less appetizing:
- Looks less tasty
- Does not look tasty
- Do not get appetite
- Looks nasty
- Do not want to eat it
- Unattractive

14. Rot
- Rotting
- Starting to rot
- Expired
- Depravity

15. Different taste:
- Influences taste negatively
- All flavour is gone
- Less taste
- Less tasty
- Less sweet
- Different taste
- All flavour gone
- Watery

16. Less juicy

17. Less pretty:
- Very ugly
- Not pretty
- Weird to serve

18. Locally produced

19. Good taste

20. More natural:
- Has grown good
- Less manipulated

21. Lower quality:
- Less quality
- Bad quality

22. Unripe

23. Looks cheap

24. Safe alternative
- Rather safe alternative, what you expect from carrot

25. Use for snacking/with peel and raw:
- Would choose less quickly for snacking
- More important for separate eating than in soup
- Important when eating with skin
- Especially important when eating out of hand, with soup some spots are okay
- Especially important when eating raw, with cooking taste is already less

- To eat it quickly I would buy straight carrots
- Less important if you shred them
- When eating with cutlery you can cut it off when it's bad

26. Serving to guests:

- Important when serving to guests
- Would not want to serve it to guests
- If serving to guests, has to look pretty
- Do not want to serve to guests
- Not serve to guests, less good impression

27. Serving as a whole

- Too big, not pretty to put with dinner
- Not buy when eating as a whole and for pretty plating
- Less nice as a whole
- Important when you serve it as a whole
- Not attractive when served as a whole

28. Appearance not visible:

- Use in soup
- For soup less important, bit of skin no problem
- Does not matter when you cut it
- More important when served as a whole than in soup for example
- With soup less important than served as a whole
- With soup less important since you cut it
- Would use if disguisable
- If you do not see the shape it does not matter
- Would buy if appearance product is not visible
- In soup does not matter
- Especially important when eating as a whole, in soup only some spots

29. Always important (because of association with taste)