Consumer preferences towards the development of a food consultancy app

MASTER-THESIS

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INTRODUCTION

Food, it is essential for human beings to stay alive. We need it in order to fuel our bodies and to provide us with the necessary energy to keep our system functioning. But it is essential to have a balanced diet that consists of the right nutrients in the right amount. It follows from numbers of the Central Bureau of Statistics that in 2016 43.3% of the Dutch population was overweight ("Length and weight of people, underweight and overweight from 1981", 2017). On top of that 12.3% of the total population suffered from obesity. Obesity is a major risk for diabetes, cardiovascular disease, cancer, sleep apnea, nonalcoholic fatty liver disease, osteoarthritis, and other ailments; and has been associated with disability, mortality, and enormous health costs (Ahima & Lazar, 2013). The contradiction is arisen that the dietary habits of people in the modern world became a cause of death while food still remains a condition for human beings to survive.

Under the influence of technological developments food manufacturers are able to preserve food for a longer time, change flavor of products (or even refabricate a taste), make food look better, add coloring agents and artificial essence to food in order to match consumers taste etc. But mostly done regardless of the healthiness of the products. On top of the food production the producers also make use of marketing in order to boost their sales. The claims they make on the packaging of food can be very misleading to customers. For example 'Light Crisps'. A healthier version of the normal crisps but still not healthy.

In order to overcome the issue of bad dietary habits that occurs mainly in the developed countries, intervention is necessary. In 2003 the World Health Organization and the Food Agricultural Organization called for action. They wanted the food business itself to take responsibility. By producing healthier products they had to make the right choice for consumers.

The predecessor of the food consultancy app, the 'Ik kies bewust logo'
In several countries such as the UK, Belgium, The Czech Republic, Poland and The Netherlands a variety of food products bare a mark that informs customers about the healthiness. For example, in 2006 a logo on the packaging of products was

initiated in The Netherlands by an organization called 'Het Vinkje'. This initiative was supported by the Dutch ministry of Health, Wellbeing & Sports as it aimed to improve the health of Dutch civilians.

Based on the daily advised amount of different nutrients our bodies need, there were two varieties of the logo introduced on the market in The Netherlands.

Figure 1 - Het vinkje green variant 1

The green variant (Figure 1): this logo indicates that the specific product is the better choice within a product group. These products contain: (1) a significant part of the nutrients that we need on a daily basis and (2) don't contain a lot of additives that would harm the healthiness of the product.

The blue variant (Figure 2): this logo means that the specific product is the best choice out of the product group it belongs to, but should be regarded as 'extra'. These products might contain nutrients that we need, but overall aren't a necessary addition to our diet on a daily base.

Figure 2 - Het vinkje blue variant 1

Together with scientists of Dutch universities and a representative of the national food center, organization 'Het Vinkje' was responsible for the division of the products into the two different categories. This division was made based on international food criteria (''Stichting ik kies bewust'', 2017).

The replacement of the 'Ik kies bewust logo'

Last year (2016) Edith Schippers (Dutch Minister of Public Health) decided that the logo will no longer be allowed to be printed on the packaging of products. As of 2018 all logos are supposed to be disappeared from supermarkets (''Logo ik kies bewust verdwijnt van verpakking'', 2016). The reason for this is threefold:

1. The meaning of the logo was unclear: customers weren't aware of the differences between the two logos. When the two logos are confused consumers might end up thinking that they have bought healthy products while it are actually products that shouldn't be part of their daily diet. This causes the logo to be ineffective.

2. Companies were not obligated to take part in the initiative: it wasn't mandatory for food producers to bare the logo on their packaging. This influenced the meaning of the logo. The label only compared the products of producers who were striving to bare the logo. So on one hand it was a good motivation for some producers to make their products as healthy as possible. On the other hand there still was a selection of products that didn't take part and might therefore be healthier than or just as healthy as the participating products. Producing companies also had to pay a fee in order to participate in the initiative, which most likely is a small cost for large companies but for smaller sized producers this fee might prevent them from taking part.

3. The foundation 'Het Vinkje', who was the organization behind the logo, was initiated by three larger food producers. Campina, Friesland Foods and Unilever worked together with the Association of Dutch Catering organizations to realize the foundation. Therefore the initiative didn't originate from independent intentions.

But the problem of people not eating healthy still exists. The need to influence their food consumption remains urgent. The Dutch minister proposed the introduction of a food consultancy app in 2018 to inform consumers about their consumption. Important aspect of the app is that it must be personal. The current logos in The Netherlands and the front-of-package labels in other countries don't answer individual needs. A consumer who is allergic to gluten has need for different information than a consumer who suffers from heart or cardio/vascular diseases. And someone who is lactose intolerant needs to have a different diet than a pregnant woman. By creating a personal account (including ones specific dietary needs), customized information can be provided to an individual customer. But before this app can actually be made, market research must be executed first to see whether this initiative can become a success. That market research will be the main focus of this research.

Basically, there are two relevant parties that influence the success of the introduction of the app: the consumers and the producers. The consumers are the ones who have to use the app and the producers have to create the app that matches the preferences of the customers. Based on this idea two main research questions arise:

1. **What determines the intention of a customer to use a food consultancy app?**
   Within this research the Theory of Planned Behavior will serve as the underlying construct. Based on the traditional variables Attitude, Social Norms, Perceived Behavioral Control and the added variables Involvement (Diet & Level of Sport Activity) and Demographics (Age, Income, Education, Gender) the intentions of people to perform the desired behavior, the usage of the app, is predicted by a linear regression model.

2. **How should a food consultancy app be designed in order to be attractive for customers?**
   What components should the app contain and how should it function in order to enhance the likeliness of using the app: this part is exploratory and intends to reveal the preferences of consumers towards the components that are required in order to make the app a success. First insights into these preferences will be derived from a group discussion and a questionnaire. These insights will then be used to set up a conjoint analysis which will then be tested among the respondents in order to make a more detailed recommendation about what the app should look like.

THEORETICAL FRAMEWORK

This thesis tries to (1) identify the intention of consumers to use an application that supports them in making healthy choices and (2) how the app should be designed in order to enhance the likeliness of consumers using the app. In order to create a model that predicts the intention of consumers a behavioral model is required. Within this model determinants of the intention of consumers to use the app need to be identified. The underlying theory for this research paper will therefore be the Theory of Planned Behavior (TPB) which is a model created by Icek Ajzen (1985). This construct is built on an earlier model also created by Ajzen, which is the Theory of Reasoned Action (TRA). To have a better understanding of the TPB, first the TRA will be explained.

(I) The Theory of Reasoned Action (TRA)

The TRA explains the relationship between Behavior, Behavioral Intention, Attitude and Social Norms. Attitude and Social Norms are the variables that are used to predict the Behavioral intention. Behavioral Intention mediates these variables to make a proper prediction about the actual performed Behavior. Before one actually performs a specific behavior, there first needs to be the intention of doing so. Underlying assumption of this model is that people are rational and process information systematically (Fishbein & Ajzen, 1975).

Attitude is a construct of an individuals' belief about the behavior and how one evaluates the specific belief. For example, people daily have to eat a sufficient amount of vegetables, this can be considered as behavior. The respondent to the questionnaire has to identify to what extend he/she agrees with this and whether he/she likes to comply with this behavior. Based on this information an insight is created about the relation between ones attitude towards eating sufficient vegetables and the strength of the intention this person will have to actually eat sufficient vegetables.

Social Norms is a construct that indicates the influence of referents, such as parents, family, friends, colleagues etc., on an individual's Behavioral Intention. In this case it is important to identify to what extend the individual thinks his/her

referents belief performing the specific behavior is desirable/good. Next, the individual has to indicate his/her willingness to comply with the believes of his/her referents. These two components combined lead to a Social Norms score.

A Schematic presentation of the TRA is presented in *Figure 3-Theory of Reasoned Action*:

Figure 3 -Theory of Reasoned Action

(II) The Theory of Planned Behavior (TRA)

According to researchers the TRA was incomplete. The TRA assumes that people have full volitional control over their own behavior and face no limitations if they are willing to perform the behavior. But it is possible that they face obstacles beyond their power that might influence their Behavioral Intention or withhold consumers from actually performing the behavior (Armitage & Conner, 2001)

To clarify these obstacles, the example where people need to consume sufficient vegetables is considered again. Consumers might be constraint by the fact that there isn't a sufficient variety of vegetables available and therefore they are unable to perform the desired behavior. Another hypothetical possibility might be that vegetables would be very expensive and consumers might therefore face a budgetary constraint and are unable to purchase the desired product. Finally, it could also be that consumers don't know how to prepare these vegetables and therefore are thus unable to consume them.

To overcome this problem with TRA, Ajzen (1985, 1991) added another determinant to the model: The Perceived Behavioral Control (PBC). This variable has to capture the degree to which a consumer believes he/she is possible to perform the specific behavior. The idea is that a higher PBC enhances a stronger

Behavioral Intention. At the same time the PBC can influence the specific behavior directly. Which means that despite a positive Behavioral Intention, PBC still has a significant influence on whether the Behavior is performed in the end. Therefore it interacts with BI but also affects Behavior directly. The model that arises from this addition to the TRA is called the Theory of Planned Behavior (TPB), in the figure below a schematic overview is represented in *Figure 4 – Theory of Planned Behavior*.
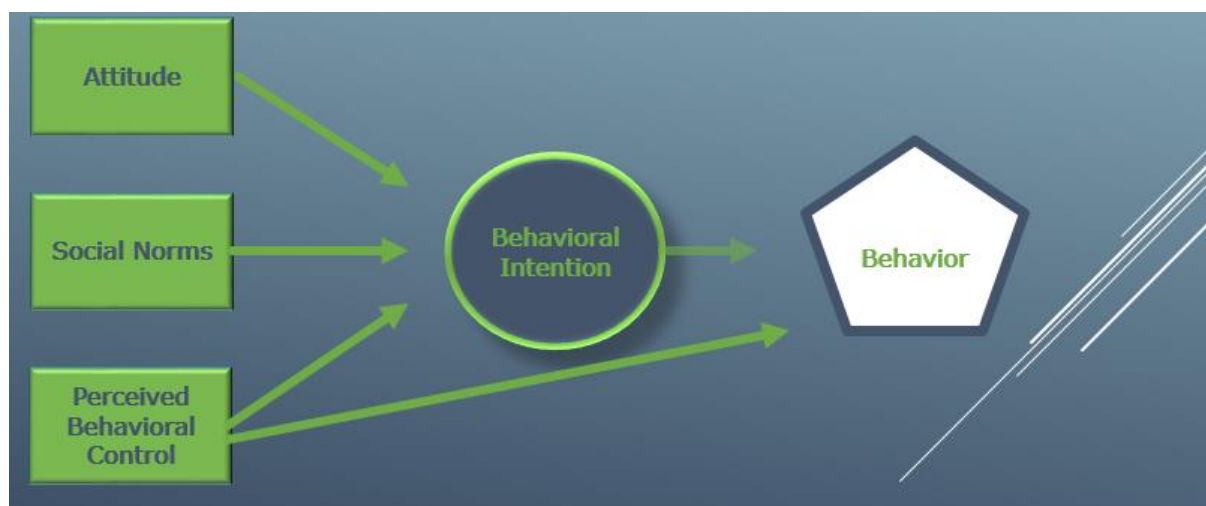
Figure 4 -Theory of Planned Behavior

Although the addition of PBC led to the formation of the TPB, it is not an entirely new concept that was added to the TRA. In more specific fields of research where de TRA was used to conduct studies other constructs were added already:

- In health belief models researchers added a concept named 'Barriers' (*Kirscht,* 1966)
- In a model of interpersonal behavior a similar concept called 'Facilitating conditions' (*Triandis,* 1977)
- 'Self-efficacy' was part of the model of Bandura (1977, 1989, and 1997).

In scientific literature Self-efficacy is considered as the most influential concept of the three on the TPB. According to Aizen (2002) the PBC can be seen, in relation to the aforementioned terms, as a second-order construct that captures the elements that are covered individually by the previous constructs. This results in the idea that Perceived Behavioral Control consists of two components: Perceived

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Self-Efficacy and Perceived Controllability. In *figure 5 – Perceived Behavioral Control* this is clarified:
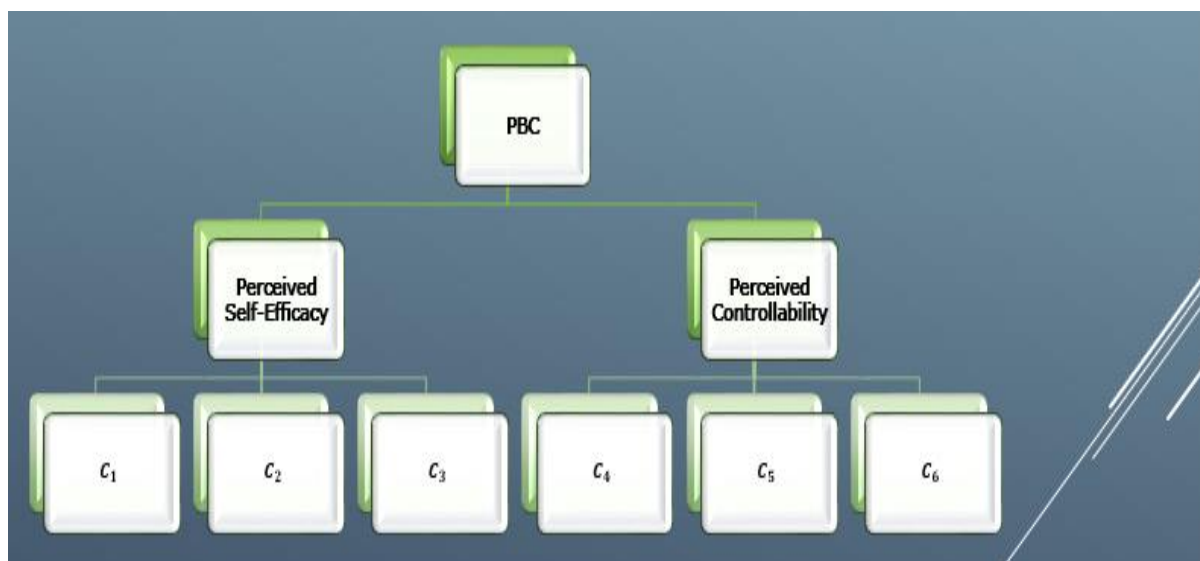

Figure 5 - Perceived Behavioral Control

The c's in the level below Perceived Self-Efficacy and Perceived Controllability are the control indicators. So for example c_1 could be an individual's assessment of his/her will power to perform a behavior. If will power is scored as high, the self-efficacy will be positively influenced which results in a higher PBC. When the desired behavior would be the purchase of a specific product, c_4 could be the availability of a product in stores. When this score would be low, ones perception of control over the purchase of the product would be lower.

The concept of PBC has led to controversy among researchers. According to Terry and O'Leary (1995) Self-efficacy and controllability tap into external and internal factors and therefore are two distinct concepts. Self-efficacy is considered to be the ability of an individual to perform a specific behavior (internal), where controllability is the influence one really has on the desired outcome (external). They claim that there is a sufficient base of evidence to support the idea that these internal factors have a bigger impact on behavioral intention than external factors do. In line with this idea, a research on healthy eating behaviors of urban Native American youth that used TPB as underlying model, incorporated a PBC, Self-Efficacy and a Barrier construct in one model together with Attitude and Social Norms (*Fila & Smith*, 2006). In the model these variables were used to predict the Behavioral Intention. It followed that Self-efficacy explained the largest part of the variance. But on the contrary, when they estimated the model with actual Behavior

as the dependent variable, the PBC construct came out as the most predictive. Which indicates that when it comes down to performing the actual behavior external factors play a more significant role.

Ajzen (1985) clearly state that the PBC-measure might fail accuracy if respondents have little information about the behavior, new/unfamiliar elements have entered the situation or if requirements or available resources have changed.

(III) Additional variables

Next to the traditional variables Attitude, Social Norms and Perceived Behavioral Control other variables could influence the Behavioral Intention too. In order to enlarge the predictive power of the model, external variables can be added. Several researches suggest possible added variables to the TPB. Personality, demographics and the traditional variables could enhance the explanation of the intention of consumers to perform a specific behavior (*Ajzen & Fishbein*, 1980). But also past behavior, past experience and involvement could enrich the TPB in predicting behavior (*Bagozzi et al*, 2000; *Bunce & Birdi*, 1998; *Shim et al*, 1989). Involvement, if we apply it on the case of this thesis, means that someone is involved into having a healthy lifestyle. This might contribute significantly to the prediction of ones intention to use the app. Jackson et al (2002) conducted research in performing physical activity among UK college employees. The TPB was extended with descriptive norm, moral norm, anticipated affective reaction, self-identity and past behavior. They found that moral norms, self-identity and past behavior contributed significantly to the explained variance in relation to Behavioral Intentions. In relation to Behavior, it appeared that Behavioral Intentions, self-identity and past behavior where significant variables and thus serve as proper predictors of Behavior.

Currently there is no scientific literature available yet on the application of the TPB on the usage of a food consultancy app. But, based on the literature used for this theoretical framework, it may be concluded that there are several researches that proved to be successful in explaining healthy behavior and healthy behavioral intention by implementing the TPB. And therefore it is worth to try to apply the model on the use of a food consultancy app that aims to improve health behavior.

Based on the success of explaining health behavior by the TPB this research aims to extend this to the usage of an health app. Because the idea behind the usage of the app is to improve/support a healthy lifestyle it makes sense to believe that this extension will prove to be successful.

(IV) The development of health apps

Several researchers have investigated health apps and the usage of such apps in various designs. Interestingly the apps are used in different medical circumstances, from general health apps to, for example, an app especially focused on diabetes type 2 patients. These researches led to several insights. According to Matila et al (2010), who set up a wellness diary app, it is crucial to users that they get feedback and analysis of the data that come from recording their own behavior. By receiving this feedback the consequences of their own behavior are revealed. In the case of this thesis it means users are able to see the influence of their behavior on their health. By learning from these consequences users are able to improve their health behavior. Users consider advice from experts as a valuable benefit and therefore are likely to stimulate usage of the app. Another app that has been introduced was designed by Lee et al (2010) who created a Diet weight loss game. It appeared that this app was effective among people suffering from obesity who had to lose weight. The game was supposed to overcome lack of engagement and motivation among users (*Ahtinen et al,* 2008 & 2009, *Consolvo et al* 2006 & 2008). According to Ahtinen et al (2008) people are less inclined to use the app at times they are busy. In order to overcome this problem and to overcome the lack of motivation it is important that the app earns a place in the daily routine of its users.

Arsand et al (2010) developed a self-management app for diabetes type 2 patients. They found that, compared to other available apps, their app was a success because of the way it operated. It was simple and easy to use. These findings are supported by the research of Varnfield et al (2011). They developed an home-care cardiac rehabilitation app and their users claimed that the app works because of its simplicity but also because of the possibility to have contact with professionals. Simons et al (2013) expect that in the near future total health apps will be created. These apps are not focused on improving a specific aspect of one's life, but are able to assist an individual based on his/her specific condition (quit smoking, diseases, obesity etc.). Again the interaction of a user with a coach or expert is

found to be crucial for the success of the app. According to them the introduction of these type of apps combined with the interaction possibility causes the population to be more healthy. The process behind this a fourfold:

1. Higher awareness and education on a healthy lifestyle
2. More planning and reflection on one's lifestyle
3. Reciprocal responsibility effects because of the interaction with a coach
4. Increased self-efficacy, users are more competent in adopting and maintaining a healthy lifestyle

METHODOLOGY

(I) Theory of Planned Behavior

Based on the Theory of Planned Behavior described in the previous section this research will estimate a linear regression model in order to predict the Behavioral Intention of Dutch customers between 20-30 years old to use the app.

Dependent variable

Behavioral intention (BI): previous section gave insight into the Theory of Planned Behavior. In the traditional model Behavioral intention was (1) a dependent variable of *Attitude, Social Norms and Perceived Behavioral Control* (2) and served as an independent variable of Behavior. Currently it is not possible to measure actual behavior of the respondents because the app doesn't exist yet. This means that *Behavior (B)* won't be estimated based on *PBC* and *BI* because it is not possible to create a reliable number for B. Therefore during this research only the first part of the model will be used. *BI* will be measured by asking respondents the question whether they intend to use the app at least once a week when it becomes available. They answer by indicating their intention on a 7-point Likert-scale where 1 denotes not likely at all and where 7 denotes very likely.

Traditional independent variables

The traditional variables that are included in the model to predict the dependent variable Behavioral Intention are:

Attitude (Att): *Att* is a measure of beliefs (b_i) and the evaluation of the belief (e_i). The formula to calculate this variable is as follows:

$$Att = \sum_{i=1}^{n} b_i \, e_i$$

In the specific case of using the app this would mean whether the respondent believes it would be good for him/her to use the app and whether it would be fun/wise/pleasant to use the app. For example one might believe that being well informed about the food that is consumed is important but might also evaluate this believe as unpleasant to gather the information.

Social Norms (SN): the SN-variable is a measure of normative belief (n_i) and the willingness to comply with it (m_i). The formula to calculate this variable is as follows:

$$SN = \sum_{i=1}^{n} n_i \, m_i$$

In the specific case of this research this would mean to what extend respondents think their referents (friends, family, colleagues etc.) believe it is important to use the app and whether they are willing to comply with the social expectation. For example if ones referents believe it is important to eat healthy and the respondent thinks it is important to live up to expectations of people surrounding him/her it is more likely one will intend to perform the desired behavior.

Perceived Behavioral Control (PBC): the PBC-variable shows whether it is within the power of the respondents to perform the desired behavior. The formula to calculate this variable is as follows:

$$PBC = \sum_{i=1}^{n} c_i \, p_i$$

Where c_i denotes control belief and where p_i denotes the perceived power of the control belief. Translated into this specific research this means whether people are able to use the app due to barriers and to what extend they are held back by these obstacles. For example not having a phone/electronic device to download the app upon could be an important barrier, but these days almost everyone in The

Netherlands is in possession of such a device and therefore the power of this barrier is likely to be very small. Other potential barriers could be: not knowing how to use apps, lack of healthy products in store or not being able to shop for groceries.

The respondents are presented with four groups of statements concerning the TPB-variables. By combining the scores regarding the statements (according to the formulas stated in the previous section) within in one group a score is calculated for each of the variables. The statements are formulated based on the guidelines of Ajzen (2006). Which means there is a clear target, action and context element. A fourth element that is left out of the statements in this research is a time element. The reason for this is the fact that the app doesn't exist yet and therefore respondents must recall on their imagination. It could be that they overestimate the effort and time that it will cost to perform the behavior. Therefore this element is left out.

Added Variables:

These variables are added to the model as it is expected that they will enhance the predictive value of the model. Because these factors aren't explicitly captured by the traditional variables they are included separately in the model. As mentioned before in the Theoretical framework, past behavior, past experience and involvement are variables that can improve the predictive value of the TPB (*Bagozzi et al,* 2000; *Bunce & Birdi*, 1998; *Shim et al*., 1989, *Conner & Abraham,* 2001).

Past behavior/experience has been covered already in the variable Attitude by adopting a statement concerning the use of the Choice logo. The reason for doing this is that it can be expected that the usage of the logo is strongly positively correlated with the Attitude towards using the app.

Involvement will also be part of the model. But because there can be two different main reasons for being involved into the usage of the app both reasons will be adopted in the TPB as separate variables (*Belleau & Summers,* 2007). These two variables are Diet and Level of Sport Activity.

The Level of Sport Activity (LoSA): people that engage often in sport activities might believe it is important to eat healthy. In this way they benefit most from

their activity and might reach their goals earlier (maintaining weight, growing muscles, run a marathon etc.). It is expected that a high level of sport activity results into healthy eating behavior and therefore might increase the intention of using the app. Alternatively it could also be that respondents practice sports in order to compensate for their bad eating habits. This would mean they will not intend to use the app. A third possible outcome could also be that people who practice sports are already highly involved into their dietary habits and therefore have a high understanding of the food they consume. Therefore they don't need to use the app.

Diet (D): respondents might be on a specific diet because of diseases, allergies or social believes. For these people it might be extra important to know what a product contains. This might increase the chance of them intending to use the app. Alternatively it could also be that these people might know a lot about their food consumption already and therefore might not need the app.

The last variable that will be added is Demographics. According to Ajzen and Fishbein (1980) Demographics can provide a significantly larger explanation of the variance and therefore improve the model.

Demographics (Dem): this will not be captured in the model as a single variable but Demographics is for the sake of simplicity used as a collector name. The variables *Age, Gender, & Education,* will be added individually to the model.

- *Age:* out of studies considering the use of food labels regarding nutrients of products came that older people didn't understand or didn't use the information that was provided. At the same time Vyth et al. (2009) found that the elderly are the ones who especially expressed their needs for a logo. This group of people have an increased chance to suffer from health issues and might thus have a higher interest in information about the products they consume. For this master thesis the focus will be on respondents between 20-30 years old. It is interesting to see whether there exists an age effect within this group of younger aged respondents.
- *Gender:* From previous researches to the effect of front-package labelling, evidence exists that female are more in need of this information than male (Vyth et al. 2009). As the logo is being

replaced by the app in the future it could be that this effect will be similar with the usage of a food consultancy app. When it follows that there is significant difference between these two groups this might influence the choices made concerning the design and the marketing of the app. If for example female tend to have a higher intention of using the app it might be smart to focus on their preferences. If it follows that male have lower intentions of using the app, the creators might want to focus on heavier marketing actions towards them or maybe create another version of the app to meet their preferences.

▪ *Education:* out of studies considering the logos on the front of food packaging followed that people who were educated on a lower level didn't use the logo's as much as higher educated respondents. This could be due to not understanding the provided information, not being aware of the importance of a healthy diet, disinterest or possibly other reasons too. Therefore it is interesting to see whether the same effect is present when the logo is replaced by an app (Vyth et al. 2009)

In *Figure 6 - Overview of the model* a schematic overview is provided of the dependent variable and independent variables:
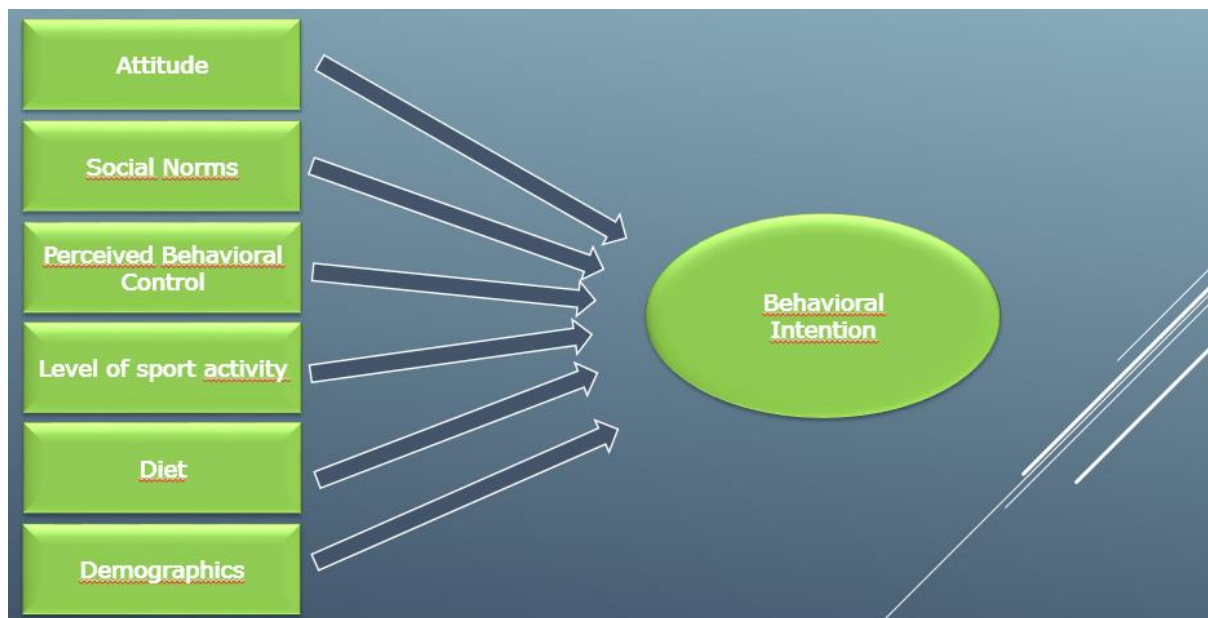

Figure 6 - Overview of the model

Estimated Models

In order to see which of the previously specified variables serve as the best predictors for Behavioral Intention the following models will be estimated:

Model	Variables
1.	$BI = Att + SN + PBC$
2.	$BI = Att + SN + PBC + LoSA$
3.	$BI = Att + SN + PBC + D$
4.	$BI = Att + SN + PBC + Dem$
5.	$BI = Att + SN + PBC + LoSA + D$
6.	$BI = Att + SN + PBC + LoSA + Dem$
7.	$BI = Att + SN + PBC + D + Dem$
8.	$BI = Att + SN + PBC + LoSA + D + Dem$

Table 1 - Linear Regression Models

BI	Behavioral Intention
Att	Attitude
SN	Social Norms
PBC	Perceived Behavioral Control
LoSA	Level of Sport Activity
D	Diet
Dem	Demographics

Table 2 - Explanation of abreviations

The steps that will be undertaken in order to assess the strength and predictive value of the model are as follows:

1. Test whether the assumptions of linear regression are violated:

1) Causal relationship between dependent and independent variables

2) All of the relevant variables must be taken into consideration

3) Dependent and independent variables must be at least interval scaled. Nominal variables should be converted into dummy variables.

4) A linear relationship between the dependent and independent variables must exist

5) An additive relation is assumed

6) Residuals: are independent from each other, are normally distributed, homoscedasticity; residuals must have the same level of variance for each value of the independent variable, there cannot be a relationship between subsequent residuals otherwise autocorrelation might be present

7) A sufficient number of respondents *(=N);* at least five times as many observations than the number of variables added to the model

8) No multicollinearity; the independent variables are not allowed to be highly correlated

9) Identify possible outliers and decide to keep them in the analysis if they do contain valuable information or delete them if they bias the model too heavily. (*Marketing research with SPSS*, Janssens et al. 2008)

2. **Determine the meaningfulness of the model by judging the significance of the coefficients and the R^2**

Important to take into account is the fact that R-square for psychological models tends to be somewhat lower. It is not uncommon that R-square drops below 50% in these type of researches. The reason for this is the fact that the independent variable is based on human behavior. Because human behavior is unpredictable sometimes it is harder to create a fitting model. But the models are still valuable if the significant coefficients provide insight into the human behavior. An overview of all hypotheses that are tested regarding the significance of the coefficients is given in the Appendix: TABLE A – *Overview of hypotheses Linear Regression Models*.

3. **Interpret the coefficients**

Translate the output provided by SPSS into practical meaning.

(II) Exploratory research

For this part a focus group discussion was held. Though there isn't an absolute truth about the underlying assumptions of a focus group discussion, according to Fern (1982) there are four assumptions commonly accepted:

1. The groups output is in some way better than the output of individual interviews
2. The role of the moderator is key to the outcome of the discussion
3. Groups should be composed of eight to twelve participants
4. Participants should be strangers

These assumptions combined with the guidelines of Assema et al (1992) served as a starting point for this group discussion to ensure a good result. Assema et al defined three phases:

1. Preparation: goal formulation, selecting participants based on criteria, size of group + number of interviews, prepare questions
2. Execution: introduction, proper setting, discussion, take notes

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3. Results: work out impressions, summarize and put to use

The actions mentioned behind each of the three phases are not all actions defined by Assema et al. Some steps were not necessary to take. For example the discussion hasn't been recorded, but notes where taken by the researcher together with another person who didn't take part in the discussion. Because of the group size and number of questions this was sufficient to register all things said during the session. Also there was no need for payment of the participants as they volunteered to take part.

The discussion is held to discover the preferences of respondents concerning the app. As the app doesn't exist yet respondents have to recall on their imagination, and try to imagine themselves using the app. This is hard to achieve when a subject is only presented with a questionnaire.

Therefore one group discussion has been held with 5 subjects in a closed classroom at the Laurentiusschool in Delft. The number of participants is somewhat lower than the standard of Fern (1982). By lowering the number it is expected to get a more in-depth discussion instead of just more opinions on the topics. Fern also emphasizes in his paper that the number of participants in academic research is often divergent from eight to twelve, so this is not expected to be a problem for the quality of the outcome.

The subjects weren't strangers to each other and therefore the fourth assumption is violated. But all of them were strangers to the topic of the discussion and were blank on the others opinions about the topic. Therefore it is not expected to be a problem. It might be that the group dynamic is different than that of a group of strangers. But this does not have to be a negative, because I expect more honest answers and less hesitant reactions than a groups of strangers would come up with.

Each participant was between the age of 20-30, which is according to the chosen target group for this thesis. For gender variety there were two women and three men present. Because the discussion only serves as a first insight into the preferences, one session is sufficient. The outcomes are later on processed into the questionnaire and are tested there again. Finally, part of these preferences are used in a conjoint analysis. Because of this threefold process, one session is deemed sufficient.

During the discussion four topics selected by the researcher had to be addressed. The questions asked need to be open ended and guided by clear examples. Further, the session wasn't structured in order to ensure that all information from the participants was coming to the table. When over structuring the discussion one might risk that information is missed (*Powell & Single*, 1996). In terms of experience the moderator (same person as the researcher) was relatively unexperienced. But the discussion leader did have several trainings in Socratic conversation techniques and is therefore a qualified interviewer.

The questions were:

- Who should create the app? One reason for replacing the 'ik kies bewust' logo by an app was the fact that the logo wasn't owned by a neutral organization. Therefore it is interesting to see how the subjects think of this matter.

- How should the app should function? The logo wasn't used enough and wasn't clear enough for consumers to use it properly. To overcome this problem with the introduction of the app it is interesting to see with what way of operating the subjects feel comfortable. As follows from the Theoretical Framework it is vital for an app that it is simple and easy to use (*Arsand* et al, 2010, *Varnfield* et al, 2011).

- What extras are beneficial to the subjects' intentions of using the app? An app offers the opportunity to consist of more components than just providing information about food. These extra components could stimulate consumers to use the app. This is in line with the research conducted by Lee et al (2010) who added a game to their app that was meant to record peoples food intake and weight loss.
  During the discussion the subjects were asked for suggestions. To help them in the thinking process, several suggestions were made. Based on desk research through existing (food) apps suggestions were prepared by the researcher: recipes, calorie counter, sporting schedules.

- For what product group would you use the app most likely? Possibly, subjects are more familiar with a specific product group or believe a specific product group is harder to judge. Therefore it might be that the app could be focused more heavily on these specific product groups in order to serve

the consumers' needs the most. Based on the 5 different basic food product groups the choices were made ("Gezond eten met de schijf van vijf", 2017).

The topics that were discussed during the session were based on:

- The problems that exist with the 'Ik kies bewust' logo and are causing the dysfunctionality of it.
- The input of the researcher during the discussion (who used existing food applications, such as FatSecret, as reference frame for the design of a new app)
- The Theoretical Framework

The answers that came out of the group discussion and the information obtained during the literature study during the process of writing the Theoretical Framework served as the base for the questions and answers of the (closed) questions in the exploratory part in the questionnaire (the questionnaire can be found in the Appendix – QUESTIONNAIRE).

(III) Conjoint Analysis

Based on the exploratory research conducted in part (II), a conjoint analysis is carried out. There are many different types of conjoint analysis. Currently, Choice Based Conjoint (CBC) analysis is the most used method by researchers and companies. It is a convenient method for comparing different product of different brands. For companies it is a good way to see how their product performs compared to the competition.

But for this research Rank Based Conjoint Analysis (RBCA) is used. Here each set of attributes that is shown to the respondent consists of a level of all product attributes (*Chrzan & Orme* 2000).

Both CBC and RBCA belong to the Full Profile Conjoint Analysis. The number of attributes that can be used for both these types of analysis is somewhat lower compared to other conjoint types. Several studies conducted research to find out whether one method has more predictive value than the other. According to Elrod et al (1992) there is no significant difference. Pignone et al (2012) & Vriens et al (1998) found that there is a difference in the pattern of results that come out the analysis when using CBC or RBCA. It seems like Choice based conjoint analysis

segments the attributes stronger. But as both models don't differ significantly in predictive value it is hard to say whether one is better than the other. The biggest advantage of CBC compared to RBCA is that the data it provides is more easy to work with and the reporting of statistics is easier. Since SPSS produces all the statistical output this is not an argument in this case (*Elrod et al* 1992). But why choose for RBCA instead of CBC? The first reason for using the RBCA design is the fact that it was most convenient for collecting the responses. By sending the set of cards to the respondents, they could easily rank the cards in an Excel-file and send them back digitally. This way was the best option concerning the available resources and it also saved time because respondents didn't have to show up to a physical place to review the different product profiles. CBC for example requires that a number of different product profiles are presented at the same time and then the respondent chooses the most preferred option. This is less convenient when collecting your responses online and therefore not chosen for this research. Another reason for using RBCA is the fact that the analysis was carried out via SPSS and it is the most convenient way offered by SPSS (*Green et al* 2001).

Based on the group discussion the most relevant, important, necessary or convenient attributes came forth. By defining different levels of these specific attributes, a conjoint analysis can provide insight into the preferences of respondents between these best attributes. A list of possible combinations of different attribute levels is presented to 50 respondents. Based on the scores they give to each combination it is possible to identify the optimal level of each attribute. Based on this information the ideal app can be composed.

The following attributes were derived from the exploratory research based on the guidelines from Orme (2002):

1. **Way of operating:** respondents were presented with the choice between a product scanner and making a grocery list. These two concepts were defined as follows:

Product scanner: the app enables you to scan products in-store and tells you whether this product classifies as healthy, all right or unhealthy. It also tells you whether this products fits within your specific diet and provides you with additional, relevant nutritional information.

Grocery list: before you buy shopping for groceries, you make a list of items you intend to buy. The app will automatically suggest the products that are the healthiest or the ones that fit within your diet (in case you live according to a diet)

The respondents preferred the grocery list (55.8%) over the product scanner (44.7%). However, the difference is only about 10% and therefore it is worth to create a more in-depth insight into this attribute. As consumers where presented with the choice between two options, the outcome is rather bold. But when consumers have to decide on their most desired combination of attributes the role of the operating mode might appear to be of less importance. For this reason the same question is obtained within the Conjoint Analysis.

2. Coaching: Within the questionnaire respondents were presented with a list of possible options that might enlarge their usage of the app. These options were based on the outcomes of the group discussion held earlier on. Respondents were allowed to select the three best options in their opinion. In *Figure 7 - Answers regarding Coaching* the answers are graphically displayed:
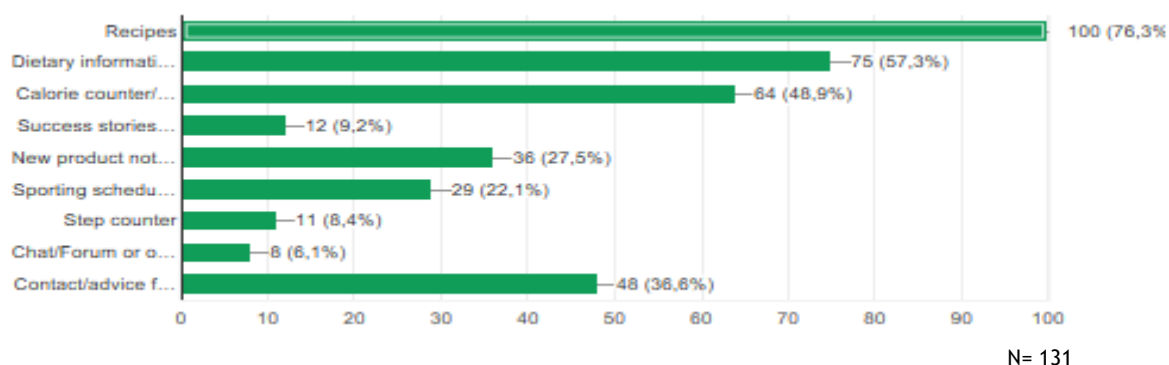

N= 131

Figure 7 -Answers regarding Coaching

It follows that Recipes, Dietary information and Contact/advice with/from professionals are the most desired options. These three options fall within the same category: to inform people on how to eat healthy. Therefore these options are obtained within the Conjoint Analysis to see which one would be the most beneficial attribute to the app.

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3. Ownership: during the group discussion there were four different possibilities considered. In *Figure 8 – Answers regarding Ownership* below, it shows that the majority of the respondents (77.9%) agree upon the fact that an independent acting authority would be the best party to develop the app. Second best would be government (13%), followed by a company active in wholesale (5.3%) and a food production company (3.8%).

Figure 8 - Answers regarding Ownership

Despite the overwhelming preference of the respondents for a single option, the ownership will still be part of the Conjoint Analysis. The reason for this is that I expect this attribute to be of lower relevance to respondents than the other ones. This expectation is based on the group discussion were one of the participants stated this opinion. He claimed that the goal of the food consultancy app is to improve the users' lifestyle and therefore attributes directly related to that will be valued as more important. The other participants agreed with him, so to see whether this truly holds it needs to be part of the analysis.

4. Offers: respondents to the questionnaire were given the opportunity to come up with ideas for attributes that weren't obtained within in the list of presented options. There were 12 suggestions of respondents who were interested in product offers, locations where they could by specific products or what healthy products their own supermarket had to offer. These remarks are combined and obtained within the Conjoint Analysis as Offers. 12 Suggestions out of 131 isn't a great share, but as it wasn't a choice option within the questionnaire it might be possible that when this option would have been presented to all of the respondents it came out as one of the most preferred attributes.

5. Counting: respondents indicated that they liked the idea of a calorie counter/weight log as 48.9% chose this option. Less preferred were the step

counter (8.4%) and sporting schedules (22.1%). This indicates that a smaller part of the respondents is interested in exercising and monitoring of their work outs. Out of desk research it appeared that existing health apps often combine calorie counting, step counting/sports activities in order to provide an overview of calorie intake and the burning of calories (for example: *Fatsecret)*. Therefore Counting is the final attribute adopted into the Conjoint Analysis.

In table 3 an overview is provided of the different levels of the attributes:

Way of operating	Level of support	Ownership	Product offers	Counting
Product scanner	General dietary information	Government	None	No counting
Grocery list	Recipes	Wholesales/Supermarket	Weekly offers of all supermarkets nearby	Calorie counting
	Food schedules	Independent acting authority	Weekly offers of your supermarket	Step/exercise counting
	Weekly coaching		Offers presented to you based on diet	Calorie + step/exercise counting

Table 3 - Attributes Conjoint Analysis

Based on these attributes and their accompanying levels SPSS created 16 random cards. In *figure 9 - Cards conjoint analysis* these cards are presented.

ID	Way of operating	Coaching	Ownership	Offers	Counting
1	Grocery List	Food schedules	Independent acting authority	None	Step/exercise counting
2	Product Scanner	Recipes	Wholesales/supermarket	None	Calorie counting
3	Grocery List	General dietary information	Independent acting authority	Weekly offers of your supermarket	Calorie counting
4	Grocery List	Recipes	Government	Weekly offers of all supermarkets	Step/exercise counting
5	Grocery List	Daily coaching	Government	Offers presented to you based on diet	Calorie counting
6	Product Scanner	General dietary information	Government	Offers presented to you based on diet	Step/exercise counting
7	Grocery List	Recipes	Government	Weekly offers of your supermarket	No counting
8	Product Scanner	Daily coaching	Wholesales/supermarket	Weekly offers of your supermarket	Step/exercise counting
9	Grocery List	Food schedules	Wholesales/supermarket	Offers presented to you based on diet	No counting
10	Product Scanner	Food schedules	Government	Weekly offers of all supermarkets	Calorie counting
11	Product Scanner	General dietary information	Government	None	No counting
12	Product Scanner	Recipes	Independent acting authority	Offers presented to you based on diet	Calorie + step/exercise counting
13	Grocery List	Daily coaching	Government	None	Calorie + step/exercise counting
14	Product Scanner	Food schedules	Government	Weekly offers of your supermarket	Calorie + step/exercise counting
15	Grocery List	General dietary information	Wholesales/supermarket	Weekly offers of all supermarkets	Calorie + step/exercise counting
16	Product Scanner	Daily coaching	Independent acting authority	Weekly offers of all supermarkets	No counting

Figure 9 - Cards conjoint analysis

These cards were shown to 50 respondents belonging to the chosen target group for this research of people between 20-30 years old. They were asked to rank these cards from 1 to 16. Based on the combined preferences of these respondents, SPSS generates output that gives insight into the trade-off effects between the different attributes. Based on these outcomes, an indication of the ideal combination of attributes in the eyes of 20-30 year old people can be given.

RESULTS

In this section the results of the regression analysis and the conjoint analysis will be presented. (I) The linear regression model will be divided into separate chapters, each concerning a different model. These are the models that were presented earlier on in the section Methodology. (II) The conjoint analysis will provide insight into the preferences of 20-30 year old consumers concerning the attributes of the app. Based on the utility scores derived from the analysis the preferences of the respondents will be revealed.

(I) Linear regression model

In this section eight different linear regression models will be discussed (see Table 1 in the previous section). All are based on the TPB and aim to predict the Behavioral Intention of consumers. The analysis of these models should provide insight into: the relevant variables that can be used to predict an individual's Behavioral Intention, the specific influence of a variable on Behavioral Intention and which model explains the largest share of the variance (and therefore is the most powerful model).

Before executing the regression analysis the underlying assumptions of the model must be checked. In the theoretical framework these assumptions were already presented. Now they need to be checked. (1) In the Appendix TABLE B - Correlations it follows from the correlation matrix that there are two variables that do not show a significant correlation with BI. These variables are Age and Education. Therefore they will be deleted from the analysis. (2) For this research the intention was to capture the most influential variables, but it is not certain that *all* variables are obtained within the model. (3) All dependent and independent variables are at least interval scaled and the nominal variables are coded into dummy variables.

(4&5) A linear, additive relationship is expected to exist between the dependent and independent variables. The accompanying hypotheses are presented in Appendix Table – A. The hypotheses will be tested during the analysis. (6) The Durbin-Watson test is performed during the analysis to ensure that autocorrelation among the residuals is absent in the models. The value must lie within the range of 1.5-2.5. For all estimated models the value of the Durbin-Watson statistic fell within the range of 1.4 – 1.8. (7) Based on the maximum number of 7 variables adopted in the model there should be at least 35 observations. In this case N=131 which means this is sufficient. (8) The independent variables are not allowed to be highly correlated with each other. SPSS produces VIF-statistic which should not be higher than 3 to be sure that the variables aren't highly correlated. For all estimated models the VIF-value fell within the range of 1 and 2 and therefore we may assume that the independent variables are not highly correlated to each other. (9) No disturbing outliers were identified. There were some respondents that had an outlying income (highest: €100.000 and the lowest: €0), but because these differences do exist in life they should not be banned from the analysis. Valuable information might be lost in that case.

The population that responded to the survey was on average 26.09 years old and 62.6% of them was female. The average yearly income was €23244.69 which seems to be rather low. But considering the fact that the targeted respondents are 20-30 years old it is likely that the younger participants were still in school and therefore do not earn a full income yet.

On average Behavioral Intention towards using the app was 4.95, which means that, on a scale from 1-7, the respondents are quite positive about using the app. Of all respondents 38.2% was on a diet (regardless of the reason) and 39.7% practiced sports/worked out more than 3 times a week.

	Constant	Attitude	Social Norms	PBC	Sports	Diet	Income	Gender	R-square	Durbin Watson
Model:										
1	2.581	0.022**	0.007	0.001					0.335	1.725
2	2.453	0.022**	0.005	0.001	0.436*				0.357	1.473
3	2.633	0.021**	0.004	0.000		0.529*			0.364	1.763
4	2.770	0.022**	0.005	0.004			1.70E-02*	0.153	0.375	1.692
5	2.511	0.021**	0.003	0.001	0.408*	0.504*			0.384	1.775
6	2.583	0.021**	0.004	0.004	0.397		-1.429E-5*	0.239	0.384	1.703
7	2.788	0.020**	0.003	0.003		0.491*	-1.599E-5*	0.178	0.400	1.724
8	2.609	0.020**	0.002	0.003	0.381	0.477*	-1.302E-5***	0.260	0.416	1.733

*means the variable is significant at α=0.05

** means the variable is significant at α= 0.01

***means the variable is significant at α=0.1

No * means the variable is insignificant

Figure 10 - Results Linear Regression

MODEL 1: $BI = Att + SN + PBC$

The first model concerns the traditional TPB model including the variables Attitude, Social Norms and Perceived Behavioral Control. From the analysis (results are shown in fig. 8) can be concluded that Attitude has a significant (p= .000) and positive influence (0.022) on Behavioral intention. Evaluating the usage of an app as positive thus enlarges the BI of an individual. At the moment that the Attitude score of a respondent raises by 1, BI raises by (.022). The model shows that SocialNorms and PBC both have a positive influence on BI but as both are insignificant (p= 0.256) and (p= 0.837) their effects cannot be interpreted. The reason for this insignificancy might be found in the Pearson correlation matrix (see Table - B in Appendix). SocialNorms (correlation coefficient= .285) and PBC (correlation coefficient= .231) both have a correlation coefficient rather close to 0. This indicates that the two are only marginally related and therefore they might not be significant in this regression model. This will be the case in all models that will be discussed in this section and therefore this specific explanation serves as the explanation for those models too and will therefore not be repeated.

The power of this model is relatively low considering the R-square (0.335), so only 33,5% of the variance of this model is explained. But as mentioned before it is not uncommon that R-square is lower than usual in psychological researches. But still additional variables should be considered to enhance the explanatory power of the model.

Because the PBC is highly insignificant and the estimated effect is very small (.001) it could be interesting to see whether the predecessor of the TPB, the TRA, might differ a lot in predictive power. This could possibly be due to the fact that the assumption of full volitional control, underlying the TRA, is not violated.

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	2,630	,307		8,574	,000		
	Attitude	,023	,003	,540	6,978	,000	,867	1,153
	SN	,007	,006	,089	1,145	,254	,867	1,153

a. Dependent Variable: BI

Figure 11 - Coefficients TRA

What follows from *Figure 10 - Results Linear Regression and Figure 11 - Coefficients TRA* is that the differences between the two models are close to zero. The R-square of the TRA (see *Figure 12 - Model Summary TRA*) is (.355) and thus is similar to the R-square of the TPB and therefore is just as powerful.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,578[a]	,335	,324	1,164	1,703

a. Predictors: (Constant), SN, Attitude
b. Dependent Variable: BI

Figure 12 - Model Summary TRA

For all the upcoming models the TPB and the TRA were estimated. But the differences were close to 0 and therefore only the results of the TPB will be presented during the latter part.

MODEL 2: $BI = Att + SN + PBC + LoSA$

In the questionnaire the respondents were asked to select the frequency with which they engaged in sporting activity during the week. They could choose between 'never', '1 or 2 times a week', '3 or 4 times a week' and '5 times a week or more'. In order to process this into the linear regression the answers were transformed into a nominal, dummy variable. Based on this nominal variable and the TPB variables the model was estimated. In order to prevent from multicollinearity within the model, SPSS deleted the variable OneOrTwoTimesAWeek. It followed that all variables were insignificant except for Attitude (p= .000) which showed a positive influence (0.023) on BI again. The fact that Sports nominal variables are insignificant is probably caused by the fact that N=131, is not large enough to obtain 6 variables within one regression model. Another reason might be that only 9 respondents answered that they work out '5 times a week or more'. Because this number is quite low it might be insufficient to prove a relationship between BI and this frequency of sporting activity, which

translates into the high insignificance of this variable (0.666). Because of the insignificance the effects of these variables cannot be interpreted. But it doesn't mean that these effects don't exist.

Because the results cannot be interpreted and are not used for further analysis the SPSS-output isn't presented in this research.

In an attempt to overcome this problem the variable must be simplified. If the variable sports can be answered by only two options: 'High' or 'Low', meaning a respondent who sports more than 3 times a week is classified as High (1) and is otherwise classified as Low (0). The nominal variable was called SportsHigh and became significant. The results are shown in *Figure 8- Results Linear Regression* which tells us that SportsHigh is significant (p= .039) and this has a positive effect (.436) on BI. This means that people who practice sports or work out at least 3 times a week have a (.436) higher Behavioral Intention of using a food consultancy app.

The R-square of Model 2 is (.357) which is not very high. This means 35.7% of the variance is explained by this model. Therefore additional variables should be considered to enhance the explanatory power of the model.

MODEL 3: $BI = Att + SN + PBC + D$

The variable Diet is constructed based on a question obtained within the questionnaire. Respondents had to choose between: 'No Diet', 'Pregnancy', 'Food allergies and Intolerances', 'Losing/Gaining Weight'. Based on these answers the nominal variables were created in order to incorporate Diet into the linear regression. But during the analysis the same problem as with the variable Sports occured. Probably due to the low number of N the results that came out for Diet were all insignificant and therefore uninterpretable.
In order to overcome this problem, the variable must be simplified again to: 'Yes' or 'No'. In this case the reason of the diet is no longer of importance but the effect on BI of having a diet versus not living according to a diet is estimated.

The results of the model where YesDiet is included in the model additional to the TPB variables is shown in *Figure 10 - Results Linear Regression.* It follows that YesDiet is a significant variable (p= .017) in this case. It also becomes clear that

living according to a diet has a strong positive influence (.529) on ones intentions of using the app.

The R-square of Model 3 is (.364) and thus 36.4% of the variance is explained by the model, which is quite low. In order to enhance the power of the model other variables must be considered.

MODEL 4: $BI = Att + SN + PBC + Dem$

For this model demographical factors are incorporated into the model. These factors are: Gender and Income. As explained earlier, Age and Education are deleted from the model because the correlation with BI wasn't significant and therefore a causal relation between the variables couldn't be proven.

Besides Attitude (p= .000), only Income is significant (p= .013). Caused by the negative sign of Income (-1.702E-5), having a higher income results in a lower intention of using a food consultancy app. The effect is very small. If a respondent earns 10.000 euro more his/her BI will drop by only (.1702), which on a scale of 1-7 isn't very big difference.

The traditional variables PBC and SN, and added variable Female (Gender) are insignificant and therefore will not be interpreted.

The predictive power of the model in this case remains at the same level as the models before (.375).

MODEL 5: $BI = Att + SN + PBC + LoSA + Dem$

It follows that in this model Attitude (0.021), SportsHigh (0.408) and YesDiet (0.504) have a positive and significant influence on BI. This means that respondents who live according to a diet and work out at least 3 times a week are more inclined to make use of the app once it is available. Their intention is, based on a scale from 1-7, almost a full point higher (0.504 + 0.408).

 Again it follows that SN and PBC are not significant and therefore the effect cannot

be interpreted and possibly is absent. R square (.381) is still quite low but did improve a little compared to the models that were presented before. This can be explained by the fact that Sports and Diet are both significant and thus add explanatory power to the model. But also because the number of variables incorporated in the model went up by 1.

R-square for this model is 38.4%. The R-square went up again which can be explained by the addition of a variable to the model.

MODEL 6: $BI = Att + SN + PBC + LoSA + Dem$

In model 6 Sports and Demographics are added to the traditional TPB variables. The results are shown in *Figure 10 - Results Linear Regression*. For the traditional TPB variables, again, Attitude is the only significant one (p= .000) and still has a positive effect on BI (0.021).

Where SportsHigh earlier on in model 2 was significant, it became not significant (p= .064) by adding the demographics to the model. Because it's not significant it is not sure that the effect is there and therefore SportsHigh will not be interpreted. When looking at Demographics it follows that Female (gender) is not significant just as in model 4. For this reason it will not be interpreted. On the contrary Income remains a significant addition to the TPB model. The effect of *Income* is negative (-1.429E-5), meaning that consumers who have a higher income will have a lower intention of using a food consultancy app. Though the effect is there, it is not very large. When a consumer earns 10.000 euros more, his/her *BI* will drop only by (.1429). As *BI* is measured on a scale from 1-7, the effect can be considered as small.

The R square of the model (.384) is higher than in the case of model 2 and 3 that consist of the TPB and either S (.357) or D (.364). This could be due to number of explanatory variables added to the model.

MODEL 7: $BI = Att + SN + PBC + D + Dem$

Model 7 consists of the traditional TPB variables, Diet and Demographics. The results are shown in *Figure 10 - Results Linear Regression*. The same story for the traditional variables holds again. Attitude is significant (p= .000) and has a positive

influence on BI (0.020). Diet is significant too and therefore has a positive influence (.491) on the BI of a respondent. Which means that living according to a diet enlarges the chance of one using the food consultancy app. For Demographics it follows that Female (Gender) is not significant and therefore cannot be interpreted. But Income is significant (p= .020) and has a negative impact on BI (-1.559E-5). Consumers with a higher impact are therefore expected to have a lower behavioral intention towards using a food consultancy app. Again this effect is rather small compared to the scale BI is measured on. When someone earns 10.000 euros more he/she will see his/her BI drop by (.1559).

The model strength, based on the numbers of *Figure 10 - Results Linear Regression*, is the highest so far. R square (.400) indicates that 40.0% of the variance is explained by the variables obtained within model 7.

MODEL 8: $BI = Att + SN + PBC + LoSA + D + Dem$

In model 8 all variables are adopted into the equation (the results are shown in *Figure 10 - Results Linear Regression)*. Attitude is the only significant (.000) traditional TPB variable and has a positive influence on BI (.020).

Demographics consist of the variables Income and Female (gender). In this case both variables are insignificant (p= .055) and (p= .236).
Because gender in all models wasn't significant it is possible that gender doesn't have an effect on ones BI.
YesDiet has a significant (p= .027) and positive influence (.477) on BI as we have seen in the other models. And therefore being on a Diet makes a consumer more likely to intend to use the app.
SportsHigh is not significant (p= .071) on the α-level of (0.05) but still is on the (0.1) α-level. Based on the (0.1) α-level SportsHigh will still be interpreted. Again, when respondents indicate to sport on a high level their intention to use the food consultancy app rises (.381).
The predictive power of the model, based on R Square (.416), is the highest of all models. This makes sense because this model has the largest number of variables. Model 8 accounts for 41.6% of the variance. To improve this percentage other explanatory variables must be added to this model in order to explain a larger share of the variance.

(II) Conjoint Analysis

Importance values

The importance values (*Figure 13)* indicate which attributes are the most important to respondents. Producers of the app would do best to ensure that they

Importance Values

WayOfOperating	15.732
Ownership	27.327
ProductOffers	21.103
LevelOfSupport	22.079
CountingSystem	13.759

Averaged Importance Score

Figure13 - Importance values

meet the demands of customers on the most important factors. This would improve the chance of consumers buying/using the product in the end. In the case of the development of the food consultancy app it appears that Ownership (27.327) is considered as the most important and influential attribute when it comes down to selecting the most preferred combinations. This is in contrast to the outcome of the group discussion where participants indicated that this would be of minor influence. The reason they thought so was that Ownership is not directly related to the main goal of the app: a healthier lifestyle. Based on this result it was justified to keep Ownership as a component of the further analysis.

The counting system (13.759) and the way of operating (15.732) are the least influential factors in the decision process.

So the producers of the food consultancy app should make sure that ownership, the level of support and product offering are on point with the consumers preferences. Of course it would be ideal if all 5 attributes are on the optimal level but not all are equally important. Instead producers could also try to discover two other attributes that customers value as more important. By identifying these attributes the producers come even closer to the ideal product.

Utility estimates

The table in Figure 14 - *Utilities conjoint analysis* displays the utility estimates based on the joint preferences of all respondents. When interpreting these results one should assume that a customer's utility initially is 0. A combination of the attributes leads to a certain level of utility. So a negative coefficient means that implementing this level of the attribute in the product has a negative effect on the

customer's utility derived from the product. And the same holds for a positive coefficient, which means that this level of the attribute has a positive effect on a customer's utility. In the following part each of the attributes will be explained individually:

- **WayOfOperating**: respondents were presented with the choice between the option of a product scanner that customers could use in-store and the possibility of making a grocery list before shopping and then receive recommendations for the products that could best be chosen. It follows from the utility estimate of the level Grocery List (.755) that this is the preferred option amongst the respondents. Because there are only two levels involved in WayOfOperating, the estimate for Product Scanner automatically becomes the inverse (-.755). Based on this information it can be concluded that, if these levels are the only two options when the app is going to be produced, the way of operating should be a grocery list.

- **Ownership**: this attribute consists of three different levels, namely: government (-.156), independent acting authority (1.939) or wholesales/supermarket (-1.784). It follows that respondents aren't accepting wholesales/supermarkets as the owner of the app as the coefficient is strongly negative. But also the government isn't chosen as the preferred option, even the government would have a negative effect on the utility that respondents derive from an app that's owned by them. The best option in the eyes of the respondents is an independent acting authority that boosts utility with almost 2 points.

- **ProductOffers**: this attribute consists of four different levels: none (-.946), weekly offers of all supermarkets (-.005), weekly offers of your supermarket (.212) and weekly offers presented based on your diet (.739). Based on these results it may be concluded that, generally, respondents like to receive information about the weekly offers. But only if the offers are based on the supermarket they always shop or if the offers are based on their personal diet. Remarkably, the latter option was chosen as most beneficial if the app would be produced. This is remarkable because not all respondents were living according to a diet. This means that respondents must have imagined that they were on a diet instead of applying their personal situation on the choice process. A second thought that can be derived from this outcome is that consumers like to receive offers targeted

on their lifestyle instead/regardless of a diet. So when the producers design the app it could be wise to pay attention to this attribute because it could be that they attract more consumers if the app informs them about product offers especially targeted on their preferences.

- **LevelOfSupport:** this attribute was built on four different levels: general dietary information (.766), recipes (1.533), weekly food schedules (2.299) and weekly coaching (3.065). The utility estimates indicate that respondents consider every level of support as positive, but the most intensive level of support is also the most beneficial to their utility.

  For judging this attribute the respondents who are not on a diet had to imagine themselves they actually were on a diet because all levels involve a certain way of support to a dietary lifestyle. Based on the importance level (22.079) it also follows that respondents felt this attribute was an important one. These two facts combined support the suspicion that respondents really thought as if they were on a diet. Or it could mean that customers like to receive some level of consultancy about their own lifestyle and eating behavior, but not necessarily in the form a diet.

- **CountingSystem**: no counting (.475), calorie counting (.950), step/exercise counting (1.425) and a combination of calorie + step/exercise counting (1.900). It follows that an increase of the level of counting results in an increase in the level of utility of a respondent of (.475). This means that the level of counting calories a step/exercise counting is the most preferred by respondents.

Based on these scores it is possible to obtain the optimal product, given the beforehand determined attributes. The optimal app design would operate as a grocery list, owned by an independent acting authority, presents product offers based on one's diet, provides weekly contact with a coach and counts calories and steps/exercising. The combined utility is: 8.398.

Utilities

		Utility Estimate	Std. Error
WayOfOperating	Product Scanner	-.755	.301
	Grocery List	.755	.301
Ownership	Government	-.156	.401
	Wholesales/supermarket	-1.784	.471
	Independent acting authority	1.939	.471
ProductOffers	None	-.946	.521
	Weekly offers of all supermarkets	-.005	.521
	Weekly offers of your supermarket	.212	.521
	Offers presented to you based on diet	.739	.521
LevelOfSupport	General dietary information	.766	.269
	Recipes	1.533	.538
	Food schedules	2.299	.808
	Daily coaching	3.065	1.077
CountingSystem	No counting	.475	.269
	Calorie counting	.950	.538
	Step/exercise counting	1.425	.808
	Calorie + step/exercise counting	1.900	1.077
(Constant)		5.436	1.003

Figure 14 - Utlities conjoint analysis

Correlations[a]

	Value	Sig.
Pearson's R	.924	.000
Kendall's tau	.817	.000

a. Correlations between observed and estimated preferences

Figure 15 - Correlations CA

DISCUSSION

In this part the results of the linear regression and the exploratory part will be combined in order to draw conclusions.

What determines the intention of a customer to use a food consultancy app?

From the linear regression performed it can be concluded that Attitude and whether one lives according to a diet have a positive influence on the intention of a consumer between 20-30 years old to use a food consultancy app. If the significance interval is widened to 0.1 the same may be concluded for consumers who practice sports at least 3 times a week. At the same time the effects of social norms, PBC, income and gender seem to be absent. Based on the idea that interaction with coaches does have a positive influence on people using the app (Simons et al, 2013) it could be interesting to adopt this into the social norms construct. As this is, though in a different way, also a social relationship. Of course this can only be tested if coaching was a standard component of the app. For the PBC variable it followed from the questionnaire that respondents within in the group of 20-30 year indicated that only the maintenance of a diet could be somewhat problematic. But using apps or doing groceries wasn't of any concern to the majority. As all respondents are rather positive about facing the potential barriers it could be that these barriers are irrelevant in their decision of using the app. And therefore the effect was not found during the research.

The effect of income was negative and significant in model 3, but was not significant in the other models. Therefore it could be worth to investigate whether this effect does exists and to see what rational potentially lies behind this effect of people who earn more money are less inclined to use a food consultancy app.

In order to find complementing predicting variables further research must be conducted. For now focus was on psychological factors and behavior closely related to a healthy lifestyle. Other factors could be whether an individual considers him/herself as someone who likes to try new or different types of food. If one is averse of this behavior this might influence the likeliness of using the app. A different factor could be the number of working hours in a week. If the usage of the app might be too time consuming a high number of working hours could result in a lower intention of using the app.

How should a food consultancy app be designed in order to be attractive for customers?

Based on the conjoint analysis it can be concluded that consumers value ownership, level of support and product offers as most important attributes. Consumers believe it is important to have an independent authority creating and owning the app. This might mean that they find it important that the information that is provided to them is truthful and complete. To the respondents in the group of 20-30 years old an independent acting authority is the most reliable to them. In line with the findings of Simons et al (2013) the respondents valued the level of support as important. Receive professional coaching is very important to them in order to improve and maintain their healthy lifestyle which can be explained by the reciprocal responsibility effect.

Finally, also product offers are valued as important. Consumers seem to prefer product offers based on their diet in order to ensure themselves of best healthy buys. Where Lee (2010) used a game in order to motivate users and adopt the app into consumers lives, product offers might be a more practical solution to reach the same thing. As consumers need to buy groceries on at least a weekly base and also often intend to save money on these expenditures this system might be very effective.

Surprisingly respondents value counting of calories and their physical activity of lowest importance. Tracking how much one eats and what one eats seems to be vital in trying to find a balanced, healthy lifestyle. But respondents value this as least important. This could indicate that consumers do not like the idea of entering their consumptions on a daily base. So in future research it would be valuable to investigate how consumers can be engaged into increasing overall health.

The results of the two parts combined gives more insight into the choices the producer of the app has to make. For example, the people who have a positive attitude towards the app, who are on a diet or practice sports often have higher intentions to use the app. So the choice needs to be made whether these people are targeted as potential users, or that the producer focuses on the group that is less intended to use the app. Both groups require a different approach. And possibly between these groups different preferences towards the design of the app exist. And potentially, within these groups there might be other groups present that also require a different approach. Therefore the analysis should be taken

further. One could also look at different age groups and differences between users who have different diseases or allergies. So in future research a more in-depth analysis should be conducted in order to enhance the chance of making this app a success.

Future Research

As the points for future research are described already during the results and in the discussion, this section is limited to a summation of these points:

1. Search for other variables that predict the intention of using a food consultancy app
2. Preferences of different age groups
3. Preferences of intenders and non-intenders
4. How to engage consumers in tracking/entering their food consumption/physical activity
5. Due to the limitations of means (such as money and other resources) the scale of this research was quite small. It would be valuable to conduct this research on a larger scale to see if the effects still hold and search for other effects.
6. The exploratory part has provided some valuable insides but has been conducted on a small skill as well. So this research should be extended with other attributes too. Another interesting move would be to create a sample app based on the conclusions of this exploratory research. It would be valuable to see how customers experience the usage of the food consultancy in real life. Based on this sample app usage a true measure of Behavior can be created too, which enables us to analyze the full model of the theory of planned behavior.

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TABLE A – *Overview of hypotheses Linear Regression Models*

Model 1	Model 2:	Model 3:	Model 4	Model 5	Model 6	Model 7	Model 8
$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$	$h_0: A = 0$ $h_a: A \neq 0$
$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$	$h_0: SN = 0$ $h_a: SN \neq 0$
$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$	$h_0: PBC = 0$ $h_a: PBC \neq 0$
	$h_0: D = 0$ $h_a: D \neq 0$	$h_0: S = 0$ $h_a: S \neq 0$	$h_0: DE = 0$ $h_a: DE \neq 0$	$h_0: S = 0$ $h_a: S \neq 0$	$h_0: S = 0$ $h_a: S \neq 0$	$h_0: D = 0$ $h_a: D \neq 0$	$h_0: S = 0$ $h_a: S \neq 0$
				$h_0: D = 0$ $h_a: D \neq 0$	$h_0: DE = 0$ $h_a: DE \neq 0$	$h_0: DE = 0$ $h_a: DE \neq 0$	$h_0: D = 0$ $h_a: D \neq 0$
							$h_0: DE = 0$ $h_a: DE \neq 0$

TABLE B- Correlations

Correlations

		Age	Income	BI	Attitude	SN	PBC	Female	EducationHigh	YesDiet	SportsHigh
Age	Pearson Correlation	1	,322**	-,058	-,003	-,079	,197*	,101	-,066	,168	-,048
	Sig. (2-tailed)		,000	,513	,968	,368	,024	,251	,452	,056	,587
	N	131	131	131	131	131	131	131	131	131	131
Income	Pearson Correlation	,322**	1	-,177*	,030	-,111	,235**	-,189*	-,075	-,081	-,189*
	Sig. (2-tailed)	,000		,043	,735	,208	,007	,031	,394	,355	,031
	N	131	131	131	131	131	131	131	131	131	131
BI	Pearson Correlation	-,058	-,177*	1	,572**	,285**	,231**	,217*	,018	,342**	,208*
	Sig. (2-tailed)	,513	,043		,000	,001	,008	,013	,841	,000	,017
	N	131	131	131	131	131	131	131	131	131	131
Attitude	Pearson Correlation	-,003	,030	,572**	1	,364**	,379**	,241**	-,111	,290**	,087
	Sig. (2-tailed)	,968	,735	,000		,000	,000	,006	,205	,001	,321
	N	131	131	131	131	131	131	131	131	131	131
SN	Pearson Correlation	-,079	-,111	,285**	,364**	1	,140	-,007	-,084	,261**	,161
	Sig. (2-tailed)	,368	,208	,001	,000		,112	,934	,343	,003	,066
	N	131	131	131	131	131	131	131	131	131	131
PBC	Pearson Correlation	,197*	,235**	,231**	,379**	,140	1	,070	-,015	,143	-,012
	Sig. (2-tailed)	,024	,007	,008	,000	,112		,428	,861	,104	,892
	N	131	131	131	131	131	131	131	131	131	131
Female	Pearson Correlation	,101	-,189*	,217*	,241**	-,007	,070	1	-,176*	,023	-,147
	Sig. (2-tailed)	,251	,031	,013	,006	,934	,428		,045	,796	,095
	N	131	131	131	131	131	131	131	131	131	131
EducationHigh	Pearson Correlation	-,066	-,075	,018	-,111	-,084	-,015	-,176*	1	-,061	,156
	Sig. (2-tailed)	,452	,394	,841	,205	,343	,861	,045		,486	,074
	N	131	131	131	131	131	131	131	131	131	131
YesDiet	Pearson Correlation	,168	-,081	,342**	,290**	,261**	,143	,023	-,061	1	,101
	Sig. (2-tailed)	,056	,355	,000	,001	,003	,104	,796	,486		,250
	N	131	131	131	131	131	131	131	131	131	131
SportsHigh	Pearson Correlation	-,048	-,189*	,208*	,087	,161	-,012	-,147	,156	,101	1
	Sig. (2-tailed)	,587	,031	,017	,321	,066	,892	,095	,074	,250	
	N	131	131	131	131	131	131	131	131	131	131

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Questionnaire Master Thesis

Fijn dat je de tijd neemt om deze vragenlijst in te vullen. De antwoorden zullen, volledig anoniem, worden verwerkt in het onderzoek dat ik uitvoer voor het afronden van mijn opleiding. Het doel is enerzijds om te achterhalen of consumenten behoefte hebben aan een app die hen voorziet van informatie met betrekking tot de voedingsproducten die zij kopen en anderzijds om verkennend onderzoek te doen naar hoe zo´n app er dan uit moet komen te zien. Het invullen zal maximaal 5 minuten in beslag nemen en bij de open vragen mag je gewoon in het Nederlands antwoorden. Mocht je verder vragen hebben dan hoor ik het graag.

Thank you for taking the time to complete this questionnaire. The answers will, fully anonymous, be processed in order to conduct my research which enables me to complete my master thesis. The purpose of this thesis is twofold. First the goal is to find out whether consumers have a need for an app that provides them with information concerning the food products they buy. Second the research attempts to explore what such an app should look like. Completing this questionnaire will take 5 minutes at most. In case you might have any further questions I'll be happy to answer them.

*Vereist

PART 1

1. Age: *

Jouw antwoord

2. Gender: *

- o Male
- o Female

3. What is your gross yearly income (bruto) in Euro's, approximately? *

4. What is the highest level of education you have successfully completed? *

- o Preparatory Secondary Vocational Education (Vmbo)

- o Higher General Secondary Education (Havo)
- o Pre- University Education (Vwo)
- o Intermediate Vocation Education (Mbo)
- o University of Professional Education (Hbo)
- o University (Wo)
- o Anders:

[   ]

5. If you are living according to a diet please select the reason that applies to you, otherwise select 'no diet' *

- o No diet
- o Food allergies/intolerances
- o Cardio/Vascular diseases
- o Losing/Gaining weight
- o Pregnancy
- o Anders:

[   ]

6. How often do you work out/practice sports? *

- o Never
- o 1 or 2 times a week
- o 3 or 4 times a week
- o 5 times a week or more

PART 2:

Dit deel bestaat uit een aantal stellingen. Geef op een schaal van 1 tot 7 aan in welke mate de stelling op jou van toepassing is.

This part consists of several statements. Please indicate each time on a scale from 1 to 7 to what extend the statement applies to you.

1. I think it is important to eat healthy *

Not important at all   1 2 3 4 5 6 7   Very important

2. I enjoy eating healthy *

Not at all   1 2 3 4 5 6 7   A lot

3. I think it is important to have knowledge of the nutrients (= voedingsstoffen) of a product *

Not important at all   1 2 3 4 5 6 7   Very important

4. I think it is interesting to inform myself about the nutrients (= voedingsstoffen) of a product *

Not interesting at all   1 2 3 4 5 6 7   Very interesting

The following three statements concern the 'Ik kies bewust logo'. To avoid any misconception, the pictures below of the 'Ik kies bewust' logo are presented to you

5. I am familiar with the 'ik kies bewust' logo? *

- o   Yes
- o   No

6. I make use of the ´Ik kies bewust´ logo in my decision to buy a product *

Never   1 2 3 4 5 6 7   All the time

7. The ´Ik kies bewust´ logo is a good way of informing people about the nutrients of a product *

Very bad   1 2 3 4 5 6 7   Excellent

8. I believe using an app on my phone to inform myself about the nutrients of a product is convenient *

Not convenient at all   1 2 3 4 5 6 7   Very convenient

9. I like to use an app on my phone to inform myself about the nutrients of a product *

Not at all   1 2 3 4 5 6 7   Very much

10. My referents (= vrienden, familie, collega's etc.) believe it is important for me to eat healthy *

Not important at all   1 2 3 4 5 6 7   Very important

11. I eat healthy because my referents think I should *

Not at all   1 2 3 4 5 6 7   Totally

12. My referents believe it is important to be well informed about the nutrients of a product before buying it *

Not at all   1 2 3 4 5 6 7   Very important

13. I inform myself thoroughly about the nutrients of a product before I actually buy it because my referents think I should *

Never   1 2 3 4 5 6 7   Always

14. I always shop for groceries by myself *

Never   1 2 3 4 5 6 7   Always

15. I believe there is a sufficient amount of healthy products available in-store *

Insufficient   1 2 3 4 5 6 7   Sufficient

16. I use apps on electronic devices *

Never   1 2 3 4 5 6 7   All the time

17. I believe it is hard to use apps on electronic devices *

Very hard   1 2 3 4 5 6 7   Very easy

18. Mentally, I believe it is hard to maintain a healthy diet *

Very hard   1 2 3 4 5 6 7   Very easy

19. I know how to cook with healthy products *

Not at all   1 2 3 4 5 6 7   Totally

20. If an app that recommends the most healthy products to you (based on your diet and preferences) and provides you with nutritional information of the products you intend to buy would exist, I would use it if I go shopping for groceries *
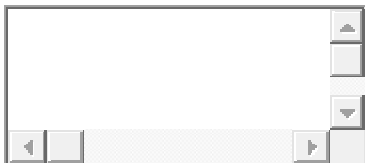
Never   1 2 3 4 5 6 7   Always

PART 3:

1. With which one of the four parties listed below do you feel most confident if they would create and own the app? *

- o   Government
- o   A company active as a producer in the food industry
- o   A company active in wholesale (=groothandel) or as a supermarket
- o   Independent acting authority (for example, the NVD: Nederlandse Vereniging voor Dietisten/Professional Associaton of Dieticians)

2. Please motivate your answer to the previous question:

Jouw antwoord

3. Two possible scenarios of how the app could function will be briefly explained below, please select the most convenient one: *

- o   Product scanner: the app enables you to scan products in-store and tells you whether this product classifies as healthy, all right or unhealthy. It also tells you whether this products fits within your specific diet and provides you with additional, relevant nutritional information
- o   Grocery list: before you buy shopping for groceries, you make a list of items you intend to buy. The app will automatically suggest the products

that are the most healthy or the ones that fit within your diet (in case you live according to a diet)

4. Please select the three components from the list below that would increase your intention of using the app the most: *

- o Recipes
- o Dietary information
- o Calorie counter/Weight log
- o Success stories of people who achieved a healthier lifestyle by using the app
- o New product notifications (if new products are introduced to the market that could potentially be interesting for you based on your preferences and diet you will receive a notification)
- o Sporting schedules or exercises
- o Step counter
- o Chat/Forum or other contact possibilities with equals or like-minded people
- o Contact/advice from professionals or coaches

5. Can you think of other components that would enhance the chance that you would use the app?

Jouw antwoord

6. Please select the two food categories that you would most likely want to receive advice or extra information about: *

- o Fat & Oil
- o Fruit & Vegetables
- o Dairy (zuivel), Protein, Egg & Meat substitutes
- o Drinks
- o Bread, Pasta, Legumes & Potatoes

7. Please indicate how much you would be willing to pay on a monthly base for an app that advices suitable products to you (based on your specific diet & preferences) and provides you with extra nutritional information. Your answer

may vary from 0 - 5 euro, so if you are not willing to pay for such an app your answer will be 0. *

Bedankt dat je de tijd wilde nemen om deze vragenlijst in te vullen!

Thank you very much for taking the time to fill out this questionnaire!