Master's Thesis Royal Philips Floor Care

"New or Refurbished?
A Choice-Based Conjoint Analysis into the Drivers of Consumers'
Acceptance of Refurbished Vacuum Cleaners''

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Management summary

A lack of consumer acceptance of refurbished products is one of the main barriers in the transition towards the circular economy. When consumers come across the term refurbishment, 'second hand' or 'inferior' is most likely the closest activated association in consumers' mind, which generates feelings of risk. Yet, as refurbishment of the Performer vacuum cleaner proved to be a profitable business case for Philips Floor Care, research into the drivers of consumers' choice for refurbished products is essential. The question that is central in this master's thesis is: *"What attributes make up the ideal refurbished vacuum cleaner for consumers, in order to enhance consumer's choice probability for a refurbished vacuum cleaner?"*

A choice-based conjoint analysis was used, where respondents were asked to make a trade-off between two *refurbished* vacuum cleaners and one constant *new* alternative. After an extended literature review and qualitative study, 'price', 'energy efficiency class', 'warranty period', 'type of information provided', 'point of purchase' and 'cosmetic condition' were selected as the final selection of attributes. After conducting the questionnaire and executing the analysis, 'energy efficiency class', 'price' and 'cosmetic condition' were shown to be most important in explaining consumers' choice probability for the refurbished alternative.

The latent class analysis revealed a clear heterogeneity in preferences; of the five segments that were created, two segments expressed a strong preference for the *new* vacuum cleaner. These 'newness-seekers' account for 50% of the sampled population. The three remaining segments expressed a positive purchase intention for the refurbished alternative, of which the 'appearance-oriented' and 'price-oriented' segment offer the greatest potential. To comply with their preferences, the *ideal* refurbished vacuum cleaner should be offered at Philips' online store at a price level of €130,-, A-B rating on the energy efficiency class and a 'like-new' appearance.

As consumers' assessment of goods is often based upon more than evaluations of attributes, three moderators were included in the model: consumers' 'expertise', 'attitude towards purchasing green products' and 'price perception'. A CBC-Hierarchical Bayes analysis was conducted to explore the interrelationships between the six attributes and the consumer specific covariates, and to foster the understanding of consumers' susceptibility towards the refurbished alternative. The results revealed that consumers' propensity to opt for refurbished depends on gender, expertise, age, familiarity with refurbishment, price perception and attitude towards purchasing green.

Acknowledgements

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1. Introduction

§1.1 Company introduction

This Master's Thesis was conducted for Philips Floor Care and Philips Group Sustainability. By delivering technological and sustainable innovations, Philips aims to improve peoples' lives, and enable consumers to contribute to a healthier world by choosing green day-to-day products.

§1.2 Problem indication

As a part of Philips' commitment to sustainability, Philips decided in 2013 to fast-track the move from the *linear economy* towards a *circular economy*. In the linear 'take, make and dispose' economic model, companies rely on large quantities of new materials and energy, which is a model that is reaching its limits. The circular economy replaces the linear 'end-of-life' concept of products into a concept of 'recovery and reuse' of renewable resources (Ellen MacArthur Foundation, 2012). Figure A1.1 in appendix A1 shows the four *return loops* that characterize the circular economy. The loop that is central in this research is *refurbishment*, by which Philips aims to collect discarded Philips products, recover, replace or repair components, and to create repurposed products with a like-new condition. Subsequently, these products are sold to new customers for a second life cycle (Rathore, Kota and Chakrabarti, 2011).

The potential gains from a circular business model are significant; TNO estimated a total annual saving of 7.3 billion euros in the Dutch market, which can be achieved by a more efficient utilization of materials (TNO, 2013). Philips is one of the pioneering companies in the circular economy, and has delivered breakthrough circular innovations with the 'pay-per-lux' lease model, where companies can lease lighting, ensuring that lamps return to Philips after a first life-cycle and can be refurbished. Another example is Philips' healthcare refurbishing system. The rationale behind this system is threefold: it enables medical institutions with a restricted budget to purchase first-rate equipment. Moreover, it is a profitable business venture for Philips as the savings on new parts and energy can be translated into costs savings when compared to newly manufactured products (Giutini and Gaudette, 2003; Heese et al., 2005). Lastly, whilst the starting point of refurbishment is economic value creation, improvement of the ecological aspects form a positive derivate (Koninklijke Philips N.V., 2014).

These benefits can be translated to the consumer market as well, where the circular economy is gaining ground. Companies like Leapp, a so-called Independent Reuse Business Company

(IRBC[1]) that is specialized in refurbishment of Apple products, but also Original Equipment Manufacturers (OEMs[2]) like Nikon[3], Harman Kardon and Dyson anticipate on the growing consumer demand for refurbished products. Likewise, Philips Floor Care considers to implement refurbishment in their business strategy for the Performer line of vacuum cleaners. These vacuum cleaners have a high recovery value at the end of their first life cycle, which creates opportunities for refurbishment. A refurbishment trial in cooperation with Dutch recycling company Coolrec indicated that refurbishment of the Performer is feasible in terms of logistics and labor. Moreover, the financial viability study (appendix A2) which was conducted in a preliminary phase of this research indicates that refurbishment can be profitable; ±50% of the parts of the Performer can be recovered, which can be translated into cost savings in terms of parts and energy. As these potential savings per Performer proved not to exceed the costs of transport, warehousing and actual refurbishment, it can be concluded that refurbishment of the Performer line of vacuum cleaners is a feasible strategy from a financial perspective.

This economic prospect of refurbishment is important for Philips Floor Care. Yet, to completely understand the potential of refurbishment, research related to the marketing and consumer demand for a refurbished alternative of the Performer vacuum cleaners is needed (Debo, Tokay and van Wassenhove, 2005). In the end, consumer acceptance of refurbished products is essential to make refurbishment a viable strategy. Research into this topic is needed, as Philips Floor Care is confronted with several challenges that impede the transition towards the circular economy. One important challenge is consumers' unfamiliarity with the concept of refurbishment (van Weelden, Mugge and Bakker, 2015), because the term is fairly new and does not yet widely exist in the Dutch vocabulary. When consumers come across the term refurbishment, 'second hand', 'used' or 'inferior' is most likely the closest association that is activated in consumers' mind. This association generates feelings of risk, mistrust and lack of quality (van Weelden et al., 2015). As a consequence, consumers largely remain unreceptive towards the acceptance and consumption of refurbished goods. One of the core challenges is expressed by Aymen Mnif, Senior Manager Consumer Marketing at Floor Care:

''How can Philips make sure that the consumer has the confidence that (s)he will not buy an inferior product?''

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[1] An IRBC is an autonomous company that does not manufacture products, but purchases products, take these products through a recovery process, and reintroduces recovered products into the market.

[2] An OEM is a company that manufactures the original, new product, under an own name and branding.

[3] Digifotopro.nl, (2015). *Nikon Nederland verkoopt refurbished producten.* Retrieved 12 February 2016, from http://www.digifotopro.nl/content/nikon-nederland-verkoopt-refurbished-producten

The challenges that Philips Floor Care faces can be further divided into a threefold problem indication; it is unclear whether there is an initial demand for refurbished vacuum cleaners, and which attributes determine consumers' choice for the refurbished alternative. That is, what are the perceptions of consumers towards refurbished vacuum cleaners and what determines their propensity towards participating in this closed-loop transaction? Moreover, the scarce current academic literature that focuses on the consumer perspective of refurbishment only provides *abstract* guidelines on how to market refurbished products. For instance, to comply with consumers' low willingness-to-pay, refurbished products should be offered for a *lower* price to generate consumer acceptance, or should be backed by a *comprehensive* warranty to reduce the perceived risk (Ovchinnikov, 2011). As a result, Philips Floor Care has no concrete guidance on how to design the attribute composition of the refurbished Performer vacuum cleaner. Moreover, Philips Floor Care wants to know whether there is preference heterogeneity between consumer segments, as this gives rise to differentiated and tailored product offerings (Allenby and Rossi, 1999). This research will provide a comprehensive understanding on these challenges, by expanding the current state of knowledge on consumer acceptance of refurbished vacuum cleaners.

§1.3 Problem statement

Paragraph 1.2 gives sufficient information to formulate the following problem statement:

"What attributes make up the ideal refurbished vacuum cleaner for consumers, in order to enhance consumer's choice probability for a refurbished vacuum cleaner?"

§1.4 Research questions

The following exploratory and empirical research questions were formulated in order to find an answer to the problem statement:

1.4.1 Exploratory research

Q1. How does the purchase decision process for a (refurbished) vacuum cleaner look like?

Q2. What attributes determine consumers' propensity to choose for a refurbished product?

Q3. What consumer variables are important in explaining consumers' propensity to choose for a refurbished product according to academic literature?

1.4.2. Empirical research

Q4. Is there consumer demand for a refurbished vacuum cleaner?

Q5. What is the relative importance of the attributes of a refurbished vacuum cleaner in

consumers' purchase decision process?

Q6. What attribute level composition leads to the highest value proposition for a refurbished vacuum cleaner?

Q7. To what extent is there heterogeneity in consumers' demand and preferences?

Q8. What are the practical implications of this research for Philips Floor Care?

§1.5 Research method

To answer the research questions, a qualitative and quantitative approach was used. In-depth interviews were conducted in order to determine the key factors that drive consumers' propensity to opt for a refurbished vacuum cleaner, and to make a final selection of the attributes that were found in academic literature. Subsequently, a choice-based conjoint analysis was performed using an online questionnaire, where respondents were asked to make a choice between *two refurbished* and *one new* vacuum cleaner. This research method was chosen, as it is suitable to guide on decisions for product design adjustments and to predict consumer choice behavior (Lazari and Anderson, 1994), which serves the purpose of this research.

§1.6 Managerial relevance

Product refurbishment is considered as the hardest loop to close on the path to a circular economy (Ellen MacArthur Foundation, 2012). A lack of market and consumer understanding poses barriers to the viability of Philips' Floor Care's circular model (Guide and van Wassenhove, 2009). This research contributes to the circular strategy of Philips Floor Care by providing a comprehensive understanding on the drivers of consumers' choice for a refurbished vacuum cleaner, and thus enhances the probability of success in the consumer market (Wang and Hazen, 2015). Moreover, a conjoint analysis indicates whether there is consumer preference heterogeneity (Green and Krieger, 1991), which enables Philips Floor Care to target the segment that is most likely to opt for the refurbished alternative.

The financial viability study in appendix A2 shows that refurbishment can be a profitable business venture for Philips Floor Care. Yet, consumers' demand is not taken into account in this calculation. The insights in consumer preferences and trade-offs will be used to quantify the profitability of the *ideal* refurbished Performer vacuum cleaner. That is, all levels of the attributes that will be included in the choice-based conjoint analysis are related to a certain level of costs; for instance, the costs of an engine that meets the energy label A class are higher than an engine with a C class. If the sum of the attribute costs of the *ideal* refurbished vacuum cleaner

exceeds the potential additional profit, refurbishment would be infeasible. By linking the overall utility for a refurbished vacuum cleaner to the costs, an overview will be provided whether the most preferred attribute composition indeed makes a financially viable business case for Philips Floor Care. Lastly, the findings of this study can be generalized to other, functionally oriented (Guide and Li, 2010), product categories of Philips.

§1.7 Academic relevance

Current knowledge on refurbishment mainly focuses on the strategic, design and manufacturing perspective of circular strategies. However, current academic literature barely takes into account the aspects related to the subsequent marketing (Atasu, Guide and van Wassenhove, 2010) and consumer demand of these products (Jiménez-Parra, Rubio and Vicente-Molina, 2014). This leaves the consumer perspective on refurbished products largely unexplored.

Whilst consumers use multiple extrinsic or intrinsic cues in the purchase decision process, the sparse literature on the consumer perspective has mainly focused on price. It is broadly covered that consumers have a low willingness-to-pay for refurbished products (Hamzaoui Essoussi & Linton, 2010; Guide & Li, 2010; Hazen, Overstreet and Jones-Farmer 2012; Michaud & Llerena, 2011). Although academic literature provides some insights into the relationships between a refurbished product's attributes and consumers' acceptance, an investigation on how these attributes operate in *conjunction* is only provided by Ovchinnikov (2011). Yet, whilst the author included 'warranty', 'cosmetic condition' and 'discount' in the choice-based conjoint model, there was a strong focus on the latter, as it was used as input for a subsequent pricing study. Though, in the study of Ovchinnikov, a clear heterogeneity in consumers' assigned attribute importance scores and part-worth utilities was uncovered. The inclusion of multiple covariates in this research builds upon the suggestions of Hamzaoui Essoussi and Linton (2010) and van Weelden et al. (2015) to expand the knowledge on the interrelationships between psycho-social variables and consumers' acceptance and judgments on refurbished products. This makes this research one of the first studies that expands the knowledge on consumer preference heterogeneity for refurbished products.

2. Theoretic framework

§2.1 Research scope

The selection of the attributes and corresponding levels is a crucial step in the design of a choice-based conjoint analysis, as it needs to cover the salient attributes involved in the choice of the majority of the target audience (Rao, 2014). In addition, the attributes should be relevant for Philips Floor Care and according to the academic literature (Bridges et al., 2011). Whilst this results in an extensive list of potential attributes to be included in the final design of the conjoint model, a choice-based conjoint analysis ideally includes six or less attributes (Hair et al., 2010). Hence, a channel approach was used in this chapter; first, after elaborating on the dependent variable, an overview of the attributes that were found in academic literature will be provided. Subsequently, there will be elaborated on the selection method of the final six key attributes. Lastly, the relationships between the six attributes and consumers' choice probability for a refurbished vacuum cleaner will be clarified.

§2.2 Elaboration on dependent variable

The question that is central in this master's thesis is which combination of a refurbished vacuum cleaner's attributes enhances the probability that a consumer will opt for the refurbished alternative instead of the new one. That is, consumers' choice is the variable to be explained, which resembles the final stage of the purchase decision process as composed by Engel, Blackwell and Kollat (1968), and is preceded by the stages of 1) problem recognition, 2) information search and 3) evaluation of alternatives. To fully grasp consumers' choice probability for a refurbished vacuum cleaner, there will be elaborated on all four stages; a refurbished product should survive all stages and their related obstacles to be chosen in the final stage. This is done in coherence with the product category vacuum cleaners, as consumers' purchase decision process depends on the product category (Laurent and Kapferer, 1985).

2.2.1 The purchase decision process

According to Laurent and Kapferer (1985), consumers' involvement with vacuum cleaners mainly stems from the perceived risk that is associated with this product category. That is, the perceived importance of negative consequences in case of a poor choice and the probability of a bad bargain are high for a vacuum cleaner compared to other product categories. Vacuum cleaners are primarily seen as utilitarian products (Dhar and Wertenbroch, 2000); a necessity to obtain a clean house. In contrast, a vacuum cleaner minimally relates to consumers' self-

concept and hedonic pleasure, as the majority of consumers do not express an enduring interest in the product. Therefore, *situational involvement* is prevalent for vacuum cleaners; once consumers recognize the need for a new or better performing vacuum cleaner, they exhibit a *short-term* involvement (Richins, Bloch and McQuarrie, 1992; Richins and Bloch, 1986).

At the moment of need recognition, an initial consideration set is composed out of memory, constructed with previous purchase and usage experiences. As refurbishment has not gained much awareness for domestic appliances, it is assumed that the refurbished alternative is not included in consumers' initial consideration set. Therefore, the phase of information search is crucial for the marketing of refurbished products, because new –refurbished- alternatives can be discovered. It is assumed that the majority of consumers enter the orientation phase with a moderate level or prior knowledge and experience. That is, a vacuum cleaner is present in more than 95% of Dutch households (Keegan and Schlegelmilch, 2001) and is a frequently used appliance. However, as a vacuum cleaner is on average purchased only once a seven years and the unaided brand recall of replacement buyers is low, it is expected that consumers will not enter the purchase decision process with well-defined preferences and heuristics. Instead, most preferences are expected to be constructed during the purchase process (Bettman, Luce and Payne, 1998), which enhances consumers' susceptibility towards the refurbished alternative.

Van Weelden et al. (2015) identified four barriers which prevent refurbished products to enter the final consideration set, of which a 'lack of awareness', 'misconception of the refurbishment concept' and 'lack of availability' are the most relevant in this research. The association with second-hand products results is a major reduction of the perceived value. As a result of the lack of availability of refurbished products in conventional and online channels, consumers do not easily encounter these products. Moreover, for a sustainable product to be included in the final consideration set, the product must meet a satisfactory performance level and not suffer from functional deterioration resulting from prior usage (Luchs, Brower and Chitturi, 2012). As the Performer is still a popular model and returned vacuum cleaners will go through a professional refurbishment and cleaning process, these requirements will be met. An additional barrier that is particularly relevant for vacuum cleaners is proposed by Abbey et al. (2015), who indicate that feelings of disgust have a detrimental impact on the attractiveness of refurbished products.

If these barriers did not restrain consumers from including the refurbished vacuum cleaner in the final consideration set, consumers consider the utility and risk of each alternative in more detail. The vacuum cleaner that entails the greatest perceived value and lowest risk is the preferred alternative (Zeithaml, 1988; Puto, 1987). As mentioned before, the perceived risk

when purchasing a vacuum cleaner is high compared to other product categories (Laurent and Kapferer, 1985). Yet, it is acknowledged by many studies that this overall perceived risk is even greater for refurbished products (e.g. Wang and Hazen, 2015). Performance and financial risk are prevalent for refurbished products, which is caused by consumers' ambiguity regarding the products, its use history and the unknown process of refurbishment. According to the ambiguity aversion theory, consumers prefer a known risk to an ambiguous risk (Ellsberg, 1961), which negatively affects the probability that consumers will opt for the refurbished vacuum cleaner (Wang and Hazen, 2015; Cox and Rich, 1964; Roselius, 1971). Therefore, to facilitate the adoption of a refurbished vacuum cleaner, the product must contain extrinsic and intrinsic attributes that are capable of reducing this ambiguous risk (Bearden and Shimp, 1982; van der Poel and Leunis, 1999) and enhancing the perceived value (Zeithaml, 1988).

Multiple attributes that are capable of either reducing risk or enhancing perceived value were identified by academic literature. The attributes that were found are in italics in this paragraph. *Financial benefits* are demonstrated to be the main determinant of the attractiveness of a refurbished product (Abbey, Meloy, Guide and Atalay, 2014), as it enables consumers to purchase premium brands for 20-50% of the original price. The *warranty* and *service* provided by a company relieves both financial and performance risk (Ovchinnikov, 2011; Subramanian and Subramanyam, 2012). The probability of choosing for the refurbished alternative increases when it is backed by an equal or extended warranty. Equivalently the *brand* and/or *seller image* serves as a form of warranty; a good reputation acts as a proxy of quality, especially when consumers perceive high risk in product purchase (Gürhan-Canli and Batra, 2004). 57% of the consumers state that the tendency to opt for refurbished increases when these products are offered by a well-known brand (Liquidity Services, 2014).

Michaud and Llerena (2011) and Wang and Hazen (2015) argue that *information provision* fosters consumers' acceptance, as this reduces the ambiguity regarding refurbishment. This information may cover facts on the use history, process of refurbishment and condition of the product, or focus on the benefits of refurbishment for consumers in terms of costs, environment and quality. The credibility of this provided information is supported by means *of (im)personal testimonials* or *quality certifications* (van Weelden et al., 2015). *Product appearance* was identified as an indicator of a product's quality and performance. The presence of 'wear and tear' on refurbished products has a negative influence on consumers' purchase intention (De Jong, 2015). Moreover, providing *accurate information on the technical and cosmetic condition* builds trust (Liquidity Services, 2014). Lastly, for every specific product category, certain

product-related attributes come into play. Building on the findings of Luchs et al. (2012), consumers first need to be convinced that, for instance, the minimum functional threshold in terms of power in watt or energy efficiency class is met.

§2.3 Selection of the attributes

As stated in paragraph 2.1, a choice-based conjoint analysis ideally includes up to six attributes (Hair et al., 2010). Therefore, a semi-structured qualitative study among 10 people was conducted in order to *verify* if the attributes that were found in academic literature are relevant in consumers' choice for a refurbished vacuum cleaner, *identify* new attributes and their corresponding levels and to *select* the final six key decision criteria.

The structure and minutes of the qualitative study are included in appendix A3. In the unaided part of the interviews, respondents cited financial benefits as the main determinant of their purchase intention for a refurbished vacuum cleaner. A substantial price difference compared to the new alternative is required. Environmental benefits were cited as a positive derivate from purchasing refurbished products. Yet, this is seldom the driving purchase argument. Moreover, half of the respondents expressed a desire for information on the refurbishment process. Whilst the prevailing initial response towards purchasing a refurbished vacuum cleaner is positive, there is always a 'but' in the answers of respondents. This is due to the perceived performance risk; respondents fear that the refurbished vacuum cleaner will have a shorter lifetime or inferior functionality compared to a new alternative. In specific, a lower price, equal or higher warranty or information provision on the concept of refurbishment were reported as persuasive cues in making a refurbished vacuum cleaner an equivalent alternative.

In the second part of the qualitative study, an aided question was asked, using a constant sum scale format. With respect to their preferences, respondents were asked to indicate the importance of 14 motives to choose for a refurbished vacuum cleaner by allocating 100 points. These 14 reasons were derived from the qualitative study of van Weelden et al. (2015). Figure A3.1.2 in appendix A3 indicates that 'financial benefits', 'warranty', 'brand image', 'environmental benefits', 'a certificate of quality' and 'personal recommendations' are the six most important aspects in respondents' choices for a refurbished vacuum cleaner. In the final selection of the six attributes, these qualitative outcomes were taken into account. Yet, not all six attributes were included in the model. Although 'brand image' was acknowledged as a trust-builder for refurbished products by academic literature, it was expected that the criterion of having a good brand image was satisfied since Philips was awarded as the Dutch most reputable

company (Reputation Institute, 2014). Moreover, 'personal recommendations' were excluded, as this is not an attribute Philips Floor Care can control. Additionally, the financial feasibility study in appendix A2 revealed several attributes that are relevant from the perspective of Philips Floor Care. 'Point of purchase', 'energy efficiency class' and 'cosmetic condition' are important in determining the financial viability of refurbishment. For instance, sales through retailers yields significantly less margin than sales through Philips' online store. Insights on the desired 'cosmetic condition' are essential, as plastics account for approximately 25% of the total costs. Moreover, it provides insights in the required degree of refurbishment in terms of labor and parts, and offers strategic opportunities. Lastly, consumers' desire for information on refurbishment was included in the model in accordance with the 'communicated benefits' that were introduced by Wang and Hazen (2015). By this means, both 'environmental benefits' and 'certificate of quality' were included in the model.

§2.4 Conceptual framework

The conceptual framework visualizes the relationships between the six key attributes and the dependent variable. The dashed variables in the conceptual framework are the three moderator variables that were added to the model, which are explained in paragraph 2.4. These variables are expected to exert an amplifying or weakening influence on the relationships between specific attributes and the dependent variable, and provide insights in for which consumers the pre-established relationships are particularly evident.
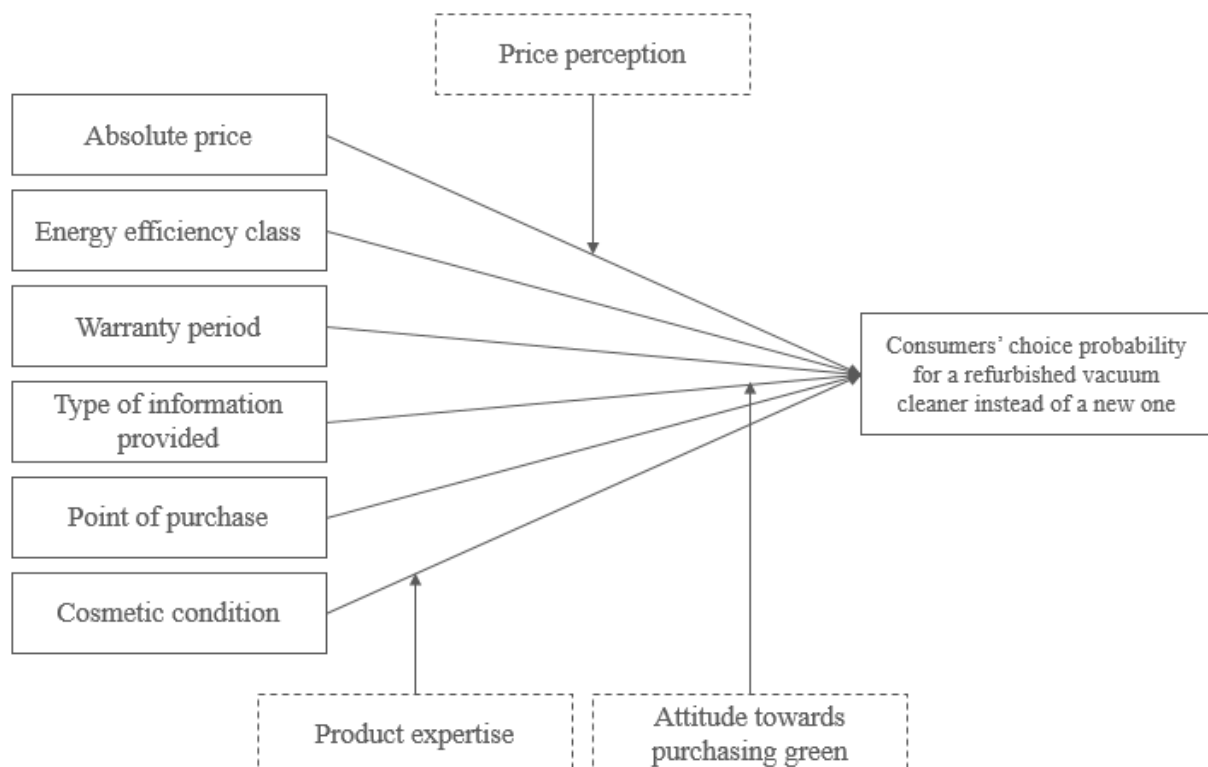
Figure 1.1: Conceptual framework

§2.5 Elaboration on the explanatory variables

2.5.1 Absolute price

Financial benefits have been identified as the main driver in consumers' choice for refurbished products (Agrawal, Atasu and van Ittersum, 2012; Jiménez-Parra et al., 2014). That is, offering refurbished products at a lower price compared to the new alternative, has a consistently positive, linear effect on the attractiveness of refurbished products (Abbey et al., 2014). For price-sensitive consumers who do not have the willingness-to-pay for a new product, the generally lower-priced refurbished alternative forms an opportunity to purchase a premium brand without paying the premium price (Atasu et al., 2010).

Nonetheless, other studies show that the price should not be set too low. A low price level may give a negative signal about the popularity or quality of the refurbished vacuum cleaner, and consequently lead to an even higher level of perceived risk (Ovchinnikov, 2011; van Weelden et al., 2015). Thus, consumers' acceptance has an inverted U-shape relationship with price; finding the right price is essential for eliciting consumers' acceptance.

2.5.2 Energy efficiency class

The European energy label, which is characterized by the A-G colored rating for energy efficiency, is a compulsory label for vacuum cleaners sold within the European Union. After price, the energy efficiency class exerts the highest influence on consumers' purchase decision for a vacuum cleaner (Metrix Lab, 2015), as it enhances consumers' ability to compare the alternatives from the consideration set and concentrate their limited efforts (Young et al., 2010).

A study which was conducted for Philips Floor Care shows that consumers use the energy efficiency rating as a heuristic to assess the quality of the vacuum cleaner (Metrix Lab, 2015). A vacuum cleaner with a higher rating on the energy efficiency class is inferred to be of better quality, which, in turn, is an important extrinsic cue in reducing the performance risk and enhancing consumers' choice probability.

2.5.3 Warranty period

The general role of warranties is one of enhancing product attractiveness by reducing perceived risk (Bearden and Shimp, 1980) and assuring product quality (Bearden and Shimp, 1982), which is expected to be of explicit importance for refurbished products. This is confirmed by the study of Subramanian and Subramanyam (2012), who found that consumers' uncertainty about a refurbished product's quality is a driver for the demanded warranty strength.

Moreover, the warranty that is offered with the refurbished product forms an indicator of a manufacturer's confidence in the quality of the product being sold. That is, for 68% of consumers, a warranty separates the high-quality refurbished products from the low-quality refurbished products (Liquidity Services, 2014). Therefore is striking to see that competitors Dyson and Hoover market their refurbished vacuum cleaners with a lower warranty than new products. In contrast, it is expected that a more comprehensive warranty period is needed in order to enhance the choice probability for refurbished products.

2.5.4 Type of information provided

The way product information is labeled has an important influence on consumers' judgments and decisions about products (Buda and Zhang, 2000) and increases the likelihood that the message reaches the intended audience. Equivalently, information provided on a product's use history, refurbishment process or the benefits of refurbishment can serve to *reframe* consumers' prospects, and thus affect decision-making. That is, consumers are more likely to accept the perceived risk and imperfections of refurbished products if they are informed about refurbishment and its benefits (Michaud and Llerena, 2011; van Weelden et al., 2015)

In this research it was chosen to focus on the type of product message in terms of benefits of refurbishment. Wang and Hazen (2015) and Stevels, Agema and Hoedemaker (2001) indicate that information on the equivalent quality of refurbished products is most influential on consumers' choice, followed by information on the financial and environmental benefits. By informing consumers about the equivalence of *quality* between a new and refurbished vacuum cleaner, and the *cost*-saving benefits of a refurbished vacuum cleaner, the perceived value will increase and the perceived risk will decrease. Lastly, Michaud and Llerena (2011) state that consumers assess refurbished products as inferior to new products, unless information on the *environmental* benefits of refurbishment is provided. Information provided on this matter enables consumers to engage in 'green', and thus increases consumers' choice probability.

2.5.5 Point of purchase

Refurbished products are sold by original equipment manufacturers (OEMs), Independent Reuse Business Companies (IRBCs), conventional stores or second-hand stores. Jiménez-Parra et al. (2014) state that if refurbished and new products are sold through the same conventional and Internet channel, consumers are inclined to choose for the new product. This implies that sales through an IRBC is preferable. However, as refurbishment of domestic appliances is a relatively new concept, it is expected that consumers will not actively and in particular search

for a *refurbished* vacuum cleaner. Instead, for a refurbished alternative to be included in the consideration set, it should be offered in conventional channels. This is consistent with the circular strategy of Dyson, which offers refurbished vacuum cleaners via the company webshop and online retailers, and refurbished jeans manufacturer Mud Jeans, which sells via the company webshop and offline retailers.

According to Van Weelden et al. (2015), a physical store is seen as a means to decrease the perceived risk associated with refurbished products, because it forms a 'safe point' of return in case of malfunction. Moreover, the large price comparison value of physical stores (Noble, Griffith and Weinberger, 2005) enhances the probability that consumers are seduced by the lower-priced refurbished alternative. In contrast, a survey of Liquidity Services (2014) among 1.400 consumers shows that 82% of consumers is more likely to purchase online than in-store, which might be explained by the fact that online channels provide greater information attainment (Noble et al., 2005). This enables consumers to obtain information on refurbishment and thus enhances consumers' choice probability (Wang and Hazen, 2015; Michaud and Llerena, 2011). The contradicting knowledge on the preferred channel to sell refurbished products highlights that research into the commercialization is necessary.

2.5.6 Cosmetic condition

Accurate information on the condition of a refurbished product is one of the key drivers in consumers' choice (Liquidity Services, 2014). As the *technical* condition affects the performance of the refurbished vacuum cleaner, and thus consumers' satisfaction (Swan, Jones Combs, 1976), this should be restored to an equivalent condition as that of the new vacuum cleaner. Thus, condition is narrowed to the *cosmetic* condition or *appearance* of the vacuum cleaner.

Product appearance proved to be relevant in consumers' choice; vision is the most essential modality at the moment of buying (Fenko, Schifferstein and Hekkert, 2010). This is believed to be of explicit importance for refurbished products, as the condition of these products ranges from clearly visible scratch and dent damage to a 'like-new' condition. As consumers use this appearance to make inferences about the functional quality of the refurbished products (Dawar and Parker, 1994; Creusen and Schoormans, 2005), it is expected that the presence of cosmetic blemishes negatively affects consumers' choice probability for the refurbished alternative (De Jong, 2015).

§2.6 Elaboration on the moderating variables

The primary focus of a conjoint analysis is measuring consumer preferences, part-worths, for each attribute level. Yet, consumers' assessment of goods is often based upon more than evaluations of attributes (Garbarino and Edell, 1997). Therefore, three consumer variables of interest were included in this research. Research into these variables was expected to contribute to a better understanding of consumers' choice, as it provides insights in preference heterogeneity between segments (Green and Krieger, 1991).

2.6.1 Consumer expertise

Literature on the role of appearance in consumers' product evaluations reveals that whether and what inferences are formed on the basis of a product's cosmetic condition will differ in terms of consumers' product expertise (Creusen and Schoormans, 2005). The degree of product expertise affects the likelihood to use novelty in a product's appearance as a cue for a product's usability (Schoormans and Mugge, 2012). Building on these findings, it is expected that experts are able to realize that there is no difference in quality between refurbished vacuum cleaners with an either 'like-new' condition or slightly/clearly visible user traces, as these consumers are able to understand the technical information that is provided. In contrast, due to novices' inability to understand technical information, judgments about the quality, and thus overall utility, is more likely to be influenced by the cosmetic condition of the refurbished alternative (Alba and Hutchinson, 1987). As a result, the negative effect of cosmetic blemishes is expected to be more detrimental on the choice probability of novices. Thus, it is hypothesized that:

H1: The presence of clearly and slightly visible traces of use negatively affects the choice probability for a refurbished vacuum cleaner. This effect is *more (less)* prevalent for consumers with a *low (high)* expertise on vacuum cleaners.

2.6.2 Attitude towards purchasing green products

Refurbished products can be seen as the 'green' version of the new alternative. The provision of information on the environmental benefits of refurbishment is an important means to give consumers the confidence that the refurbished product is not an inferior option (Michaud and Llerena, 2011). It is reasonable to assume that consumers with a positive attitude towards purchasing green products are more susceptible to opt for a refurbished vacuum cleaner that is marketed with a product message that focuses on the environmental benefits.

This is consistent with the findings of Harms and Linton (2015) and Abbey et al. (2015); consumers with proenvironmental attitudes found refurbished products more attractive. In

contrast, a large stream of literature showed that there is an *attitude-behavior gap* for green products (e.g. Vermeir and Verbeke, 2006). Also in practice, Philips Floor Care found that a *green* product message is often not effective. This contradiction highlights the importance to provide a better understanding of proenvironmental attitudes on the choice behavior for refurbished products. Thus, the following hypothesis is formulated:

H2. A product message that focuses on the environmental benefits of refurbishment positively affects consumers' choice probability for a refurbished vacuum cleaner. This effect is *more (less)* prevalent for consumers with a *positive (negative)* attitude towards purchasing green products.

2.6.3 Price perception

Many studies acknowledged that consumers express a low willingness-to-pay for refurbished products (e.g.), which is, to date, primarily explained by the high degree of perceived risk. It is assumed that the rationale behind this low willingness-to-pay can be further explained by the dual role of price. That is, consumers are heterogeneous in terms of their attention to price, and how price is used to evaluate a product (Dickson and Sawyer, 1990). Consumers can either use price to infer quality (i.e. price=quality oriented consumers) or use it as an indicator of monetary sacrifice (i.e. price-conscious consumers). It is hypothesized that consumers' perception of price moderates the effect of absolute price of the refurbished vacuum cleaner on consumers' choice probability for the refurbished alternative. For price-conscious consumers which focus on finding low prices, a higher susceptibility towards the refurbished alternative is expected, whilst an opposite effect is expected for price=quality oriented consumers. Although this relationship seems rather obvious, it enables the researcher to explain the choice-behavior in the conjoint tasks and to provide practical implications for Philips Floor Care.

H3. Price positively affects consumers' choice probability for a refurbished vacuum cleaner. This effect is *more (less)* prevalent for consumers that see price as an indicator of *monetary sacrifice (quality)* when purchasing a vacuum cleaner.

1. Research methodology

§3.1 Choice-based conjoint analysis

A conjoint analysis was chosen, as this research method is frequently used in new product development and to gain insights in the drivers of consumers' acceptance and preferences (Hair et al., 2010), which matches the goal of this study. Moreover, a conjoint analysis reduces the problem of socially-desirable answers (Orme, 2010), which is a commonly identified threat for 'green' products. In specific, a *choice-based* conjoint is deemed as most suitable, as it has the highest usability for a design with up to six attributes (Sawtooth Software, 2016). Based on consumers' trade-off judgments between two hypothetical *refurbished* profiles and one *new* profile of the Performer vacuum cleaner, the relative attribute importance, attribute level preferences, and expected consumer demand can be revealed (Hair et al., 2010). Subsequently, it can be determined what combination of attribute levels is most influential on consumers' choice, in order to improve the success rate of the refurbished alternative (Vriens, 1995).

§3.2 Stimuli

3.2.1 Specification of the attribute levels

The stimuli that were presented to respondents are the hypothetical profiles of vacuum cleaners, which were constituted by the selected attributes from chapter two. After selecting the attributes, it was decided how many levels should be defined per attribute, and how much variation should exist within the attributes (Vriens, 1995). Five attributes have three intermediate levels, whereas for 'point of purchase' four intermediate levels were identified. Thus, caution should be taken in the data analysis, as the 'number of levels effect' might apply (Hair et al., 2010). That is, respondents evaluate attributes with more levels as more important, which might lead to distorted results (Wittink, Krishnamurthi and Reibstein, 1990).

The levels for 'absolute price' were set consistently with the findings from academic literature and the prices of competitors Dyson and Hoover. Refurbished products are typically sold for 20-50% below original price (Dowlatshahi, 2000; Wang et al., 2013; Ovchinnikov, 2011). Thus, a 20, 35 and 50 percent discount relative to the *new* vacuum cleaner of €260,- was used. 'Energy efficiency class' is composed of three levels, where the A-F ratings were clustered by two. As the input power in watt is the main lever for a good energy efficiency rating[4], the A-F rating and power were combined in the attribute levels. The levels for warranty period were set at one

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[4] Bosch, ''EU Energy Label'', http://www.bosch-home.com.hk/eu-energy-label.html. Retrieved at: 22 March 2016.

year, the minimum legally allowed warranty period on second-hand goods (European Parliament, 1999), the standard two year warranty, and an extended warranty of two years plus five years motor warranty. The levels for 'type of information provided' were retrieved from Wang and Hazen (2015). For 'point of purchase', the physical store, Philips online store, specialized refurbishment company (IRBC) were used. Additionally, second-hand store was added as a fourth point of purchase, as many refurbished products from both IRBCs and OEMs are offered via this channel. Lastly, the gradation for 'cosmetic condition' was retrieved from IRBC Greenmobile.nl and ranged from like-new to clearly visible user traces like scratch and dent damage. The complete description of the levels is provided in appendix A4.

3.2.2 Presentation method

The overriding objective is to present the stimuli in the most realistic manner as possible (Hair et al., 2010). Thus, a similar choice-based conjoint approach as in the study of Ovchinnikov (2011) was used, where *two* refurbished vacuum cleaners and one *new* alternative were presented per choice task. An example of a choice task is shown in figure 1.4. The new product that was used, the Performer FC9177 which is the latest Performer model in the market, served as a reference point and replaced the traditional no-choice option that is frequently used in a choice-based conjoint analysis. The attribute levels of the new vacuum cleaner were kept constant. The addition of the *new* alternative added more realism to the decision task and yielded a better estimation of the potential market penetration of the refurbished alternative (Haaijer, Kamakura and Wedel, 2001).
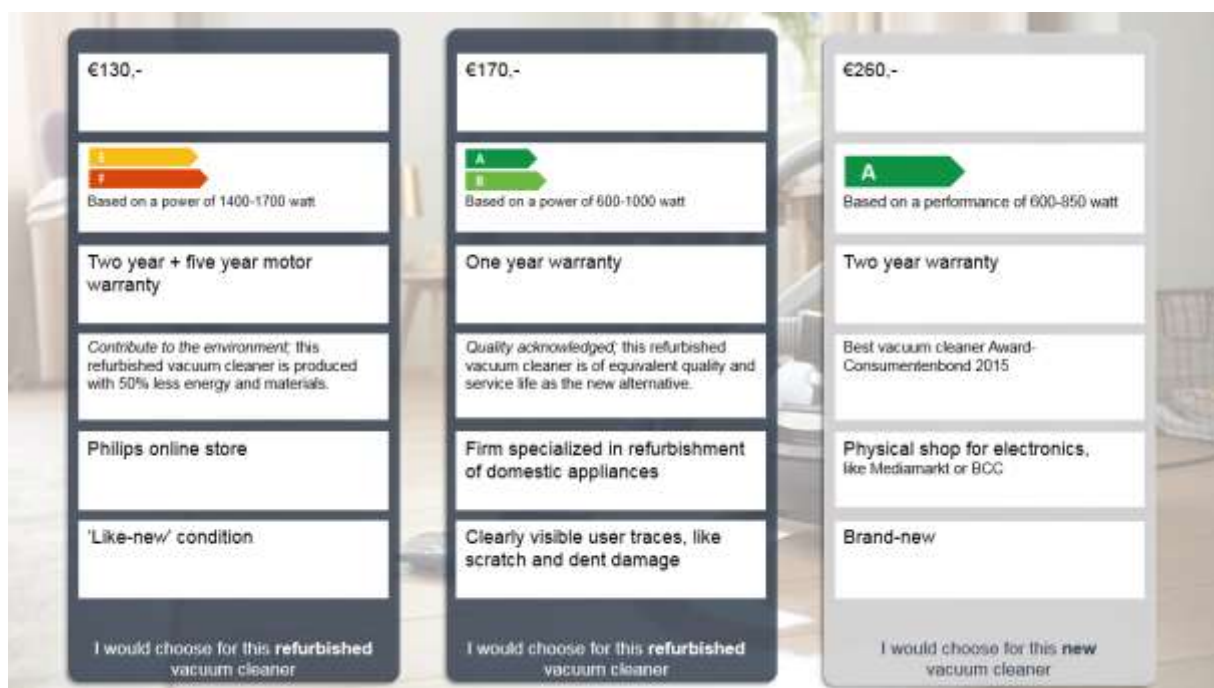
Figure 1.4: Presentation method of the choice tasks

§3.3 Design of the questionnaire

3.3.1 Choice design criteria

SAS software was used to create the actual design of the choice tasks that were presented to respondents, and enables to comply with the following four criteria of an optimal choice design (Huber and Zwerina, 1996):

- Level balance: the levels of the attributes should appear with equal frequency.
- Orthogonality: the levels of any two attributes must occur independently.
- Minimal level overlap: the two alternatives in a choice set may not share the same level.
- Utility balance: create difficult choices with an equal attractiveness. Choices may not be predictable.

As utility balance is a difficult criterion to satisfy, beta values were included in the design of the model. These betas are assumed part-worths, and indicate the assumed degree of influence an attribute level has on consumers' trade-offs. By integrating the assumed betas in SAS, the efficiency of the design of the questionnaire was increased by 10-50% (Huber and Zwerina, 1996). The beta values are included in the blue boxes in table 1.5. An assumed beta of *(minus)* one or two indicates that it was expected that a certain level was *(less)* more attractive than the base level, and exerted a *(lesser)* greater influence on the choice probability for a refurbished product.

Attributes	Level 1	Assumed beta - β	Level 2	Assumed beta - β	Level 3	Assumed beta - β	Level 4	Assumed beta - β
Absolute price	€130,-	2	€170,-	1	€210,-	0		
Energy efficiency class	A-B 600-1000 Watt	2	C-D 1000-1400 Watt	1	E-F 1400-1700 Watt	0		
Warranty period	1 year	-2	2 years	-1	2 years + 5 years motor-warranty	0		
Type of information provided	Environmental benefits	-2	Financial benefits	-1	Equivalent quality	0		
Point of purchase	Physical store	3	Philips online webshop	2	Company specialized in refurbishment	1	Second-hand store	0
Cosmetic condition	Clearly visible usage traces 'scratch & dent'	-2	Small, visible usage traces	-1	Like new condition	0		

Table 1.5: Attribute levels and betas

A full description of the queries that were used to create the choice tasks in SAS is included in appendix A5. The SAS output indicated that for six attributes, of which five with three levels and one with four, 972 hypothetical profiles could be created. As this was not feasible in

practice, a *fractional* factorial design method was used to define a subset of profiles for evaluation. 36 stimuli were needed to estimate the parameters, and to comply with the criteria of level balance and orthogonality. 18 choice tasks were sufficient, as in each choice task two alternatives were shown to the respondents. As respondents can complete up to 20 tasks without a decrease in response quality (Johnson and Orme, 1996), 18 was a suitable number of choice tasks. The D-efficiency was 100, indicating that the design was balanced, orthogonal and that parameters could be estimated with optimal precision.

§3.4 Covariates

As part-worths are measured at the individual level, preference heterogeneity can be measured (Green and Krieger, 1991). Literature differentiates between *a priori* and *post-hoc* segmentation. For a priori segmentation purposes, the conjoint questionnaire was supplemented by multiple covariates. These covariates are the moderating variables from the conceptual framework and multiple demographic, psychographic and behavioral variables. This paragraph elaborates on how the moderators were operationalized into measurable constructs.

3.4.1 Construct operationalization

The constructs that were used to measure the moderators can be seen in part two of the questionnaire in appendix A6. Appendix A7 indicates how the original scales were adjusted for this research. The construct to measure 'product expertise' was adapted from Mishra, Umesh and Stern (1993). A measure of *subjective* product expertise was chosen, as this is easier to measure than *objective* knowledge, where generally multiple-choice questions are used to test consumers' factual knowledge of a product category (Brucks, 1985). The four-item construct was measured by the original seven-point semantic differential scale. The items were adjusted by incorporating the product category vacuum cleaners in the statements.

'Attitude towards purchasing green products' was used as a measure for consumers' proenvironmental attitude. Recent studies show that measures that are closely related to actual purchase behavior are a better predictor of actual purchase behavior than 'attitude towards green products' (Chan, 2001; van 't Erve, 2013; De Pelsmacker, Driesen and Rayp, 2005). Four of the five items that were used to measure this construct were retrieved from Liñán and Chen (2009), who apply the personal attitude construct of the Theory of Planned Behavior to measure entrepreneurial intentions. The scale was adjusted to the attitude towards *purchasing green products*. An additional question (C6) was added for face validity reasons.

Two constructs of Lichtenstein, Ridgway and Netemeyer (1993) were used to measure consumers' price perception. The original seven-point Likert scale was applied. For both constructs three questions were derived from the original scale to avoid that the questionnaire became too extensive. Thus, three items of the original scale were not included in the construct.

The demographic and behavioral variables that were included in the questionnaire to examine their relationship with consumers' choice probability for a refurbished vacuum cleaner were 'age', 'gender', 'household composition', 'current occupation' and ' time spent on cleaning- and vacuum'. These variables were included in the study, as these are also frequently used in the current segmentation of Philips Floor Care. 'Familiarity with refurbishment' was added to the questionnaire, as a previous qualitative study of van Weelden et al. (2015) indicated that the degree of familiarity with refurbishment is a major determinant of consumer acceptance.

3.4.2 Construct reliability and validity

Since adjustments were made to the original wording of the items, and the items were translated into Dutch, a pilot study (n=24) was conducted to ascertain the intelligibility of the choice tasks and test for construct reliability and validity. Because the purpose of the pilot study was survey and scale development, a sample of 24 was sufficient (Johanson and Brooks, 2010). The internal consistency measurement Cronbach's Alpha was used to test for construct reliability. Appendix A8 shows the output of the analysis in SPSS. As the blue box in table 1.2 indicates, all constructs exceeded the minimum value of 0.7, as prescribed by Nunnaly (1978) and DeVellis (2003). Thus, the measures consistently represented the construct that was being measured.

Constructs	Original Cronbach's Alpha	Obtained Cronbach's Alpha
Product expertise	0.90	0.948
Attitude towards purchasing 'green'	0.897 **	0.855
Price consciousness	0.78	0.762
Price-quality scheme	0.78	0.858

** Construct to measure entrepreneurial intentions of Liñán and Chen (2009)
Table 1.6: Cronbach's Alpha values per construct

The validity of the constructs was examined by using a rotated Principal Component factor Analysis. According to the component correlation table A8.2.1 in appendix A8, there was no correlation between the constructs. Thus, an orthogonal Varimax rotation was used (Tabachnik and Fidell, 2007). The rotated component matrix in table A8.2.3 shows that the items of the questionnaire load high, that is above 0.5, on the expected constructs and low on other

constructs. Thus the constructs have convergent and discriminant validity[5]. As none of the respondents raised problems, and construct reliability and validity were demonstrated, no alterations were made for the main questionnaire.

Based on the study of Lichtenstein, Bloch and Black (1988), a negative relationship was expected between the price-conscious construct and the price=quality construct, making the constructs suitable to dichotomize consumers. Yet, the absence of this relationship disabled the researcher to solely classify consumers in one of the groups. Thus, it was decided to continue this research with two separate constructs.

3.5 Working method

3.5.1 Distribution

The main study was launched at Wednesday 17 February and closed on Monday 29 February. As the scope of this study was set to the entire Dutch consumer market, the target population included any Dutch person. A non-probability, cross-sectional sampling design was used, where the questionnaire was distributed in two stages. First, the questionnaire was posted on Social Media platforms, enabling anyone browsing to participate. Additionally, the questionnaire was distributed online via Philips' pre-recruited consumer panel on the 23th of February.

3.5.2 Sample size

The larger the sample size, the more accurate the predictions will be. However, academic literature only provides guidelines for determining a sufficient sample size. Orme (1998) and Hair et al. (2010) advise a minimum of 200 respondents per segment if the purpose of the research is to compare segments and detect significant differences. Based on the moderating variables, it was expected that there were two segments. Thus, a sample size of ≥ 400 was needed to estimate the parameters. This also complies with the findings of Vilikus (2012); increasing the sample size over 400 barely improves the results of a choice-based conjoint analysis. That is, with 18 choice tasks the mean absolute error, i.e. the measure of accuracy, keeps fairly constant with a sample larger than 400.

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[5] Convergent validity measures whether items correctly measure the same latent variable, and are, thus unidimensional (Henseler et al. 2009). Discriminant validity requires that "a test does not correlate too high with measures from which it is supposed to differ" (Campbell 1960, p. 548).

4. Findings

§4.1 Preparation of the data

This chapter presents the data that was uncovered through the choice-based conjoint analysis. A total of 477 responses were collected. Of the total of 501 respondents that started the questionnaire, 24 respondents abandoned the task before completion, which is equivalent to a dropout rate of 4.8%. These cases were excluded from the analysis due to incomplete responses. Subsequently, the data was verified on response consistency and accuracy. As the age and gender were already registered for every Philips' panel member, these questions were not asked. However, for eight respondents an age of three years or younger was found. As demographics were not the key properties in this study and the number of 'missing' cases concerned was small, *multiple explicit imputation* was applied (appendix A9.1). This technique imputes 'missing' values by a value that is predicted by a respondent's other, known characteristics (Donders et al., 2006). By this means, the valuable responses in the choice tasks were retained. For the covariates 'time spent on cleaning' and '-vacuum cleaning' two outliers were detected, as can be seen in the figures A9.2.2 and A9.2.3 in appendix A9. It is fair to assume that a time of 3600 minutes of cleaning a week is not realistic. However, although the second outliers with a reported time spent on vacuum cleaning of nearly seven hours a week can be seen as extreme, this might not be unrealistic. Thus, only the former outlier was deleted from the dataset. This resulted in a final sample of 476 respondents.

The continuous variables 'time spent on cleaning' and '-vacuum cleaning' were transformed into three categories. Lastly, to include the moderator variables as covariates in the Latent Gold Choice software and to foster the interpretability of the results, the constructs that originally have a seven-point Likert scale were rescaled into a dichotomous variable. The median of the constructs was used as a cut-off value to subdivide the respondents in either of the two groups based on the respondent-specific assigned scores per item. A value below the median assigned the respondent to the category 'low' (0), and a value above the median assigned the respondent to the category 'high' (1). Appendix A10 shows how the respondents were classified.

§4.2 Analysis of the moderators

The Cronbach's Alpha test for construct reliability and Principal Component factor Analysis for construct validity were repeated for the main study. The analysis is visualized in appendix A11.1 and A11.2. The results of both tests indicated that the criterion for reliability and

convergent and discriminant validity were satisfied for all constructs. Thus, no items were removed and no adjustments needed to be made.

§4.3 Description of the sample

A total description of the sample is provided in appendix A12. Of the total 476 respondents, 56% are male. Twenty-nine percent is in the age category below 25, 43.2% is in the age category between 36 and 55, and 27.7% is 56 years or older. The significant values for the Chi-Square Goodness-of-fit test in appendix A12.2 showed that the proportion of men, women and age categories was significantly different from the distribution in the Dutch population (CBS, 2016). Hence, caution should be taken when generalizing results. The majority of the sample (66.2%) lives in a two-person household without children, and has a full-time job (52.8%). Only for 9.7% of the respondents, the familiarity with refurbishment stems from a purchase experience of a refurbished product in the past, whereas 45.2% was familiar with the concept as they heard from it before and 45.1% was unfamiliar with refurbishment. Based on the median split categorization, 63.4% of respondents were classified as an 'expert' in the field of vacuum cleaners. Forty-nine percent was classified as having a proenvironmental attitude, which is consistent with the results of Liquidity Services (2014). Forty percent belongs to the price-conscious segment and 62% belongs to the price=quality oriented segment.

Respondent's purchase intention was measured by asking how likely it would be that respondents would opt for a refurbished vacuum cleaner in the next purchase occasion. Thirty-eight percent of respondents stated that it is unlikely that a refurbished alternative is chosen. 18.7% of respondents is indifferent. The largest group (29.2%) stated that this is somewhat likely, and for 14.5% this is very likely. Of the total 8568 choices that were made by the 476 respondents, the *new* vacuum cleaner was chosen in 47.4% of the cases. 18% of the respondents showed a consistent preference for the new alternative, and 46% chose for the new alternative in half of the choice tasks. 20% did not opt for the new alternative in any of the choice tasks.

§4.4 Analysis with Latent Gold

There are three different techniques to analyze the data that was collected by a choice-based conjoint analysis; an aggregate multinomial logit model, latent class analysis and CBC-HB. In this chapter, these three analyses were applied sequentially. The analysis of the aggregate logit model and latent class analysis were conducted using the software Latent Gold Choice 4.5. To estimate the models, Latent Gold Choice requires that the part-worth relationships are specified for all attributes (Hair et al., 2010). This relationship can be linear, quadratic or separate. The

primary support in defining this part-worth relationship should be from prior research or conceptual models. Only for 'price' a positive, linear effect was expected based on the findings of Abbey et al. (2014). Though, the absence of a linear effect when visually examining the part-worths, indicated that a separate part-worth relationship was more applicable. Thus, all six attributes were coded as nominal. Likewise, the covariates were coded as nominal, because these were categorical variables.

4.4.1 Aggregate multinomial logit model

The aggregate logit model, or one-class model, assigns all 476 respondents to one segment. Table 1.7 on the next page shows the part-worth estimates for the aggregate model. It can be concluded that five out of the six variables are highly significant in explaining consumers' choice for a refurbished vacuum cleaner, which is indicated by the p-values of 'price', 'energy efficiency class', 'warranty', 'point of purchase' and 'cosmetic condition', that are far below 0.05. Only the attribute 'type of information provided' is insignificant with a p-value of 0.15, indicating that that this attribute did not contribute to the overall utility of the refurbished Performer. Moreover, the *new* alternative is highly significant (p= 1.0×10^{-150}). The part-worth estimate of *new* of 0.6085 indicates that when all attributes of the refurbished alternative are above the average threshold, people do not see the *new* vacuum cleaner as an attractive option.

The relative importance of the 'energy efficiency class' was shown to be the highest (24.52%) in respondents' decision making, followed by 'price' (20.68%) and 'cosmetic condition' (18.28%). By combining the significance of the attributes with the relative importance, it can be concluded that these three variables have a major effect for the aggregate model, and that 'warranty' and 'point of purchase' have a more modest effect.

For the majority of the attribute levels, the magnitude and sign of the part-worth estimates were as expected, and showed, therefore, theoretical validity. Yet, the part-worth estimate of the €210,- price level deviates from prior expectations, as it was expected that all part-worth estimates for price would be positive (Abbey et al., 2014). For 'point of purchase', it was expected that the 'physical store' would have a larger impact on the utility compared to the 'Philips online store'. Moreover, although 'type of information provided' is insignificant, positive part-worth estimates were expected for all levels, and that information provided on 'the equivalent quality of refurbished products' would have the largest impact. Lastly, for both degrees of 'wear and tear', negative part-worth utilities were expected. However, a positive part-worth utility was found for the presence of slightly visible user traces.

Aggregate model				
Attribute	Influence	z-value	Relative importance	Rank
Absolute price (p= 1.5×10^{-72})				
€130	0.3329	13.479	20.68%	2
€170	0.1502	6.082		
€210	-0.4831	-17.553		
Energy efficiency class (p= 6.5×10^{-33})				
A-B	0.4694	19.077	24.54%	1
C-D	0.0299	1.279		
E-F	-0.4992	-18.580		
Warranty (p= 2.0×10^{-5})				
1 year	-0.1244	-4.817	7.05%	6
2 years	-0.0296	-1.230		
2 years + 5 year extension	0.1540	5.768		
Type of information provided (p= 0.41)				
Environmental benefits	-0.0327	-1.317	1.98%	7
Financial benefits	0.0456	1.860		
Equivalent quality	-0.0130	-0.492		
Point of purchase (p= 1.5×10^{-5})				
Physical store	0.0145	0.405	12.04%	5
Philips online store	0.2300	7.919		
Specialized refurbishment	0.0007	0.024		
firm	-0.2451	-7.333		
Second hand store				
Cosmetic condition (p= 2.8×10^{-10})				
Clearly visible traces	-0.4251	-16.374	18.28%	3
Slightly visible traces	0.1288	5.225		
Like-new	0.2964	11.327		
New (p= 2.3×10^{-17})				
	0.6085	26.149	15.42%	4

Table 1.7: Parameter estimations and importance scores of the aggregate model

4.4.2 Latent Class analysis

The aggregate logit model assumes that respondent's utility is equal to the aggregate utility, which is a restrictive assumption, as it does not consider heterogeneity in the sample (Borghi, 2009). For segmentation purposes, a latent class analysis was performed, which uses a clustering algorithm to find groups of consumers with similar preferences. Table 1.8 shows the information criteria that were used to determine the optimal number of segments for this particular research. These criteria assess the quality of each model based on a trade-off between the goodness-of-fit and complexity. A lower value indicates a better model (Vermunt and Magidson, 2005). AIC is not taken into account, as it tends to select a model with too many segments (Nylund, Asparouhov and Muthén, 2007) which is not desirable from a managerial perspective. The information criteria in table 1.8 yield different conclusions. According to Dias (2004), AIC3 outperforms BIC and CAIC; nevertheless, as this research is an initial research into refurbishment for Philips Floor Care, it was not preferred to have too many segments. Thus, the five-class model was chosen.

	LL	BIC(LL)	AIC3(LL)	CAIC(LL)	L^2	Npar	df	p-value	R^2
1-class model	-8592.7703	17271.8564	17227.5405	17285.8564	17124.5436	14	462	1.2×10^{-3259}	0.0522
2-class model	-6396.5821	13138.4276	12961.1642	13194.4276	12732.1672	56	420	3.7×10^{-2366}	0.3370
3-class model	-5902.0952	12408.4013	12098.1904	12506.4013	11743.1934	98	378	1.3×10^{-2189}	0.4090
4-class model	-5665.7566	12194.6717	11751.5132	12334.6717	11270.5163	140	336	7.5×10^{-2079}	0.4536
5-class model	-5488.4113	12098.9286	11522.8225	12280.9286	10915.8256	182	294	1.6×10^{-2079}	0.4718
6-class model	-5347.4411	12075.9357	11366.8821	12299.9357	10633.8852	224	252	2.1×10^{-2053}	0.4905

Table 1.8: Model goodness-of-fit

Looking at the prediction statistics of the five-class model, this model correctly predicts 74.7% of the responses, which is an improvement of 24.2% compared to the one-class model.

Table A13.4.1 in appendix A13.4 displays the part-worths per segment and the Wald and Wald(=) tests. The Wald test tests whether the six attributes are significant across all five segments, using the following hypothesis:

$$H_0: \ \beta_{1s=1} = \beta_{1s=2} = \beta_{1s=3} = \beta_{1s=4} = \beta_{1s=5} = 0$$

$B_{1s=1}$ refers to the part-worth estimate for the *first* attribute for the *first* segment. The significance of the p-values indicated that the null-hypothesis could be rejected for all six attributes, indicating that the attributes were important in consumers' choice for every segment. At this point, the model was further optimized by investigating the Wald(=) test. This is a formal test of equality, indicating whether attribute preferences are equal across segments, using the following hypothesis:

$$H_0: \ \beta_{1s=1} = \beta_{1s=2} = \beta_{1s=3} = \beta_{1s=4} = \beta_{1s=5}$$

The p-values for the Wald(=) test indicated that the null-hypothesis could be rejected for four of the six attributes and the new product; the preferences per segment were significantly different from each other. For 'warranty' and 'type of information provided' the null-hypotheses could not be rejected as the p-value was larger than 0.05. Thus, for these two attributes, all consumers appeared to have the same preferences. These restrictions were implemented in the model, by stating that the effects were *class independent*. Lastly, the z-statistics were observed, which indicate whether a part-worth is significant for a specific segment. A part-worth estimate between -1.96 and 1.96, indicates that a part-worth is insignificant for a specific segment. As table A13.4.2 in appendix A13.4 indicates, no restrictions had to be made based on the z-statistics. After imposing the restrictions according to the Wald(=) test, the re-estimated five-class model did produce a better fit according to the BIC, AIC and CAIC and hit-rate (appendix A11.6). Thus, the refined five-class model was used for further analysis.

4.4.3 Description of the segment preferences

Figure A13.5.4 in appendix A13.5 provides an estimation of the part-worth utilities per attribute level for each of the five segments. Alongside with the attribute importance, this information was used to describe and compare the preferences per segments. Segment one and two both account for ±25% of the market. Segment three, four and five account for 22%, 19% and 7% of the market respectively. As the insignificant Wald(=) values for 'warranty' and 'type of information provided' indicated that the preferences for these attributes were equal across the five segments, it is possible to market refurbished vacuum cleaners in all segments with the same warranty and product message. Offering the products with a minimum warranty of one year negatively affects the utility of the refurbished vacuum cleaner. Although the part-worth of a two year warranty, which is equivalent to the new alternative, had a negative effect on the utility, the magnitude of this effect was small (-0.064). The two year warranty with an extended five year motor warranty was preferred by all segments. For 'type of information provision', a product message that emphasizes the equivalent quality of refurbished products was preferred by all segments, whilst information on the environmental benefits had a negative effect on the overall utility. Information on the financial benefits of refurbishment did have a positive impact on the overall utility, but this effect was small (0.0669).

The first important aspect of information is the utility that was assigned to the *new* alternative by each segment, as this is an indicator of the susceptibility of a segment to the refurbished vacuum cleaner. For segment one and two, the part-worths of the *new* vacuum cleaner are positive, indicating that these segments were more inclined to opt for the new alternative. Especially for segment two, the part-worth estimate for *new* is of substantial magnitude (5.0838). This is confirmed by the profile table A13.5.6; in a given purchase situation, 85.01% of segment one and 99.09% of segment two would not prefer the refurbished alternative, but opt for the *new* alternative. In contrast, for segment three, four and five, the *new* alternative has a negative part-worth of -0.3315, -3.4588 and -2.9358 respectively. The profile table in appendix A12.5 indicates that 58.2% of segment three, 97% of segment four and 95% of segment five would prefer the refurbished alternative.

Segment one and two are referred to as the 'newness-seekers'. Consumers in these segments are picky; if the refurbished product does not have the lowest price level, like new condition and A-B energy efficiency class, these consumers prefer not to choose the refurbished alternative, but opt for the *new* one.

Segment three is referred to as the 'appearance-oriented' segment. Consumers in this segment assigned the greatest importance to 'cosmetic condition', with 24.1%, followed by 'energy efficiency class' with 19.6% and 'point of purchase' with 17.7%. The part-worth estimates in table A13.5.2 show that the ideal refurbished vacuum cleaner has a 'like-new' condition, A-B rating on the energy efficiency class, and is preferably purchased at Philips' online store. Nonetheless, this segment is also willing to accept slightly visible user traces and a C-D rating on the energy efficiency class; both levels have a positive impact on the overall utility of the refurbished vacuum cleaner, but to a lesser extent. Whilst a price level of €210, - clearly affects the overall utility of the refurbished vacuum cleaner in a negative way, the impact of the two lower prices is positive and fairly equal in terms of magnitude.

For consumers from segment four, the 'price-oriented' segment, 'price' is the most important attribute in the decision making process with 19.9%, followed by 'energy efficiency class' with 16.6% and 'cosmetic condition' with 9.0%. This segment shows a clear preference for the €130, - price level, an A-B rating on the energy efficiency class and a like-new condition. Yet, a price level of €170, - and a C-D rating on the energy efficiency class also significantly contribute to a higher utility of the refurbished alternative. Consumers in segment four prefer to purchase the refurbished vacuum cleaner in the Philips online store. For 'cosmetic condition', the part-worth estimate of slightly visible user traces is insignificant, which indicates that this segment is only willing to accept a refurbished vacuum cleaner with a fairly new appearance.

Segment five, the 'energy label-oriented' segment, assigns the greatest importance to the 'energy efficiency class' with 25.9%, followed by 'point of purchase' with 13.1% and 'cosmetic condition' with 9.4%. The role of price in the trade-off of respondents in segment five is noticeable; the attribute is of minor importance, and the €130, - and €170, - price levels are insignificant. Contrary to the other segments, the A-B energy efficiency class has a negative impact on the overall utility of the refurbished vacuum cleaner, whilst C-D and E-F have a positive impact. This segment also has contradictory preferences regarding 'cosmetic condition' and 'point of purchase'; this segment assigns a greater utility to the refurbished alternative when it has slight user traces instead of a like-new condition, and if it is sold through a specialized refurbishment company (IRBC).

§4.5 CBC-HB

The last method of analysis is CBC-HB, or 'choice-based conjoint – Hierarchical Bayes'. The mathematical specification is a Bayesian Hierarchical model, using a Monte Carlo Markov

Chain algorithm (Borghi, 2009). This method recovers the part-worths of every individual and for every attribute level by *borrowing* information from the choices made by other respondents in the corresponding conjoint questionnaire. It was chosen to expand the analysis with a CBC-HB analysis, as Latent Gold Choice only provided limited information on the covariates. Figure A13.5.4 in appendix A13.5 indicates that multiple covariates are significant, which indicates that these covariates can be used to explain heterogeneity between segments. Yet, Latent Gold Choice does not provide the opportunity to see for which specific *attribute levels* consumers differ in terms of covariates, and to test for the effect of the three moderators. CBC-HB does serve these purposes.

The individual part-worths were estimated by an iterative process, shown in appendix A14. The covariates of the 476 respondents were included in the CBC-HB model, as this improved the predictive ability of the part-worth estimates (Sawtooth Software, 2009). 10.000 preliminary iterations of betas were drawn, until the iterative process *converged* and optimal model fit was reached. The subsequent 10.000 draws were used to create part-worth estimates per attribute level. Table 1.9 shows the output that was obtained; an intercept part-worth estimate for each attribute level when each covariate is in its zero state, as well as the regression coefficient associated with each covariate. If 95% of the 10.000 draws is negative or positive, it suggests that a part-wort estimate is significantly different from zero (Sawtooth Software, 2009).

Looking at the intercepts in table 1.9, only for the intercepts '€130,-', 'clearly visible user traces', 'like-new condition' and the *new* alternative it can be stated that these are significant at the 95% confidence level. For the others attribute levels, this statement cannot be made with 95% confidence. The coefficients associated with *new* are of particular interest. If all covariates are in its zero state, the coefficient for *new* is negative. Yet, if a person is a man, expert and/or price=quality oriented, this negative utility becomes significantly less negative or even positive. It is very noticeable that this also applies for people with a positive attitude towards purchasing green products. The negative coefficient for *new* for price-conscious people and people who have purchased refurbished in the past, indicates that these people are significantly less likely to prefer the new alternative. The positive, significant coefficient for age indicates that for every year a person gets older (younger) than 45, the utility of *new* increases (decreases) with 0.041. Lastly, it is noticeable that there are no significant differences in the utilities for *new* in terms of (vacuum) cleaning intensity.

Attribute levels	Intercept	Gender	Age	Heard of refurbishment	Bought refurbished	Cleaning time	Vacuum cleaning time	Product expertise	Attitude purchasing gree	Price-consciousness	Price=quality oriënted
		base level= female	mean= 45	base level= unfamiliar	base level= unfamiliar	mean= 147	mean= 32	base level= novice	base level= no positive attitude	base level= not price conscious	base level = not quality oriënted
e130	1,028*	0,451*	-0,0131	-0,081	-0,174	0,0004	-0,0026	-0,353	0,359*	0,633*	-0,086
e170	-0,115	-0,090	0,0177	0,036	0,001	-0,0004	0,0042*	0,088	0,038	-0,029	0,121
e210	-0,914	-0,361	-0,0046	0,046	0,174	0,0000	-0,0016	0,265	-0,398*	-0,604*	-0,035
A-B, 600-1000 watt	-0,609	0,708*	-0,0067	-0,074	-0,250	-0,0016	0,0081	0,512	2,371*	-0,290	0,153
C-D, 1000-1400 watt	0,766	-0,380*	-0,0132	0,258	0,663*	0,0014*	-0,0030	0,195	-0,002	-0,418*	0,182
E-F, 1400-1700 watt	-0,157	-0,327	0,0198	-0,184	-0,413	0,0002	-0,0051	-0,707*	-2,368*	0,708*	-0,334
1 year warranty	0,407	0,208	-0,017*	-0,111	-0,167	0,0008	-0,0030	0,192	0,400*	-0,013	-0,017
2 year warranty	-0,498	-0,178	0,0034	0,336*	0,186	-0,0004	0,0024	0,185	-0,152	-0,217	0,105
2 + 5 year motor warranty	0,091	-0,030	0,0138	-0,224	-0,019	-0,0004	0,0006	-0,377*	-0,249	0,230*	-0,089
Environmental benefits	-0,706	-0,021	-0,0060	-0,232	-0,483*	-0,0003	0,0005	-0,206	0,184	0,106	-0,191
Financial benefits	0,348	0,198	0,0011	-0,111	0,347	0,0009	-0,0049*	-0,057	0,237	0,092	-0,149
Equivalent quality	0,359	-0,178	0,0049	0,343*	0,136	-0,006	0,0043*	0,263	-0,421*	-0,198	0,340*
Physical store	0,471	-0,294	-0,0031	0,199	-0,260	-0,0001	0,0002	0,088	0,111	-0,283	0,479*
Philips online webshop	0,189	-0,211	0,0112	0,384*	0,612*	-0,0027*	0,0084*	0,172	-0,229	-0,842*	0,397*
Specialized refurbishment firm	0,344	0,055	0,017*	-0,185	-0,231	0,0009	-0,0024	-0,042	-0,291	0,066	-0,269
Second-hand store	-1,004	0,450	-0,025*	-0,398	-0,120	0,0018*	-0,0062*	-0,218	0,409	1,059*	-0,607*
Clearly visible user traces	-1,637*	-0,260	-0,0028	-0,032	0,183	0,0012	-0,0050	-0,301	0,328	-0,145	-0,302
Slightly visible user traces	0,140	-0,262	0,0034	-0,007	0,334	-0,0012*	0,0046*	0,146	-0,207	0,144	0,079
Like-new condition	1,500*	0,522*	-0,0006	0,039	-0,517	-0,0001	0,0004	0,154	-0,121	0,001	0,223
New	-3,422*	1,677*	0,041*	0,869	-2,584*	-0,0017	0,0110	2,223*	1,227*	-1,799*	2,182*

* Significant at the 95% confidence level
Table 1.9: Covariate specific part-worths

4.5.1 Profiles of the segments

This results of the CBC-HB analysis enabled the researcher to understand how the segments were composed by Latent Gold Choice, and were used to describe the profiles of the segments.

The first segment of 'newness-seekers' is the largest segment, with a majority of males (60.3%) and people in the age category of 26-55 years (68.3%). This segment can be characterized as full-time workers (70.2%), and is the largest proportion of two-person households with children. Based on table 1.9, the propensity of this segment to opt for *new* may be explained by the fact that it are mostly expert consumers (68.5%) who see price as an indicator of quality (64.7%), and who are self-identified 'green'. It is noticeable that whilst this segment has the second largest proportion of people that have purchased refurbished before, the purchase intention for a refurbish vacuum cleaner is extremely low.

The second segment of 'newness-seekers' is mainly characterized by men (67.4%) in the age category of 46 years and older with a two-person household without children (77.3%). Sixty percent of this segment has a full-time job. Moreover, this is the segment with the largest proportion of housewives/-men and retired respondents. The large share of experts (77.8%) and people who see price as an indicator of quality (72%) and low share of people who are familiar with the concept of refurbishment, may explain the propensity of this segment to opt for *new*.

Segment three is fairly equal in terms of gender, and primarily represented by people of 35 years or younger (38.8%). Of the entire sample, nearly 36% of the people with an age of ≤ 25 and 25% with an age of 26-35 belongs to segment three. The majority lives in a two-person household without children, and of the entire sample, segment three is the second-largest

segment with people who share a house with other students or workers (26.5%). In terms of occupation, 51.8% has a full-time job, and 17.8% is a student. Based on table 1.9, the propensity to opt for *refurbished* mainly stems from the fact that these are young people and are the largest proportion of people who have purchased a refurbished product in the past (34.2%).

Segment four is similar to segment three; the gender ratio is equal and the segment is mainly presented by people with an age below 35 (43.6%). Thirty-eight percent of the segment works full-time and 23.7% is a student, making this the segment with the largest share of students. Most people live in a two-person household, and segment four has the largest proportion of people who share a house with other students or workers (43.3%). The large share of young people, and the fact that this segment has the second-largest proportion of people who have purchased refurbished products in the past (26.3) might explain the propensity to opt for *refurbished.*

Segment five is mainly characterized by women (63.9%) in the age category of 46-65 years (43.9%). The largest share of segment five is unfamiliar with refurbishment (51.4%). The propensity to opt for *refurbished* can be explained by the large proportion of women and people who do not have a positive attitude towards purchasing green products (83.0%)

§4.6 Test of the hypotheses

The results of the analysis in CBC-HB provided the opportunity to test the three moderators. No support was found for hypothesis one. The negative effect on the choice probability of the presence of traces of use is not more prevalent for novice consumers than for expert consumers. Hypothesis two cannot be accepted, as the assigned utility of a product message that focuses on the environmental benefits of refurbishment is not statistically different for consumers with a positive attitude towards purchasing green products. In fact, a 'green' message negatively affects the choice probability for both groups.

Hypothesis three is partially supported; price-conscious consumers assign a significantly higher utility to the €130, - price level. For the €170, - price level no significant difference was found for both price-conscious consumers and price=quality oriented consumers. Contrary to what was hypothesized, the price level of €210, - had a negative effect on the overall utility of the refurbished vacuum cleaner. This effect is significantly more prevalent for price-conscious consumers. No significant differences in the part-worth utilities for price were found for price=quality oriented consumers. Although the coefficient for €130, - is in favor of the hypothesis, this is not statistically significant.

5. Conclusions, discussion and recommendations

§5.1 Conclusions

This research was set out to reveal the drivers of consumers' acceptance of the refurbished Performer vacuum cleaner. On an aggregate level, 'energy efficiency class', 'price' and 'cosmetic condition' proved to be most important in explaining consumers' propensity to opt for refurbished. Whilst 'warranty' and 'point of purchase' have a relatively lower importance, the 'type of information provided' had no effect on consumers' trade-off.

The latent class analysis revealed a clear heterogeneity in preferences; of the five segments that were created, two segments expressed a strong preference for the *new* vacuum cleaner, unless a superior refurbished alternative was offered. These segments account for 50% of the sampled population. The three remaining segments expressed a positive purchase intention for the refurbished alternative, which indicates that there is sufficient potential for Philips Floor Care to market these products. The 'appearance-oriented' and 'price-oriented' segment account for 22% and 19% of the market respectively, and are the segments Philips Floor Care should target. Both segments have fairly equal preferences in terms of attributes; the *ideal* refurbished vacuum cleaner is purchased at the Philips online store at a price level of €130,-, and has an A-B rating on the energy efficiency class. Nonetheless, a C-D rating and price level of €170, - also contribute to a positive overall utility. The only difference between both segments is that the 'price-oriented' segment clearly prefers a like-new appearance. As the preferences for 'warranty period' and 'type of information provided' were equal across segments, Philips should offer the refurbished Performer with an extended warranty and emphasize the equivalent quality in the marketing communications. A refinement of the financial viability study (appendix A2) based on consumers' preferences demonstrates that refurbishment of the Performer yields a profitable business case. As the 'energy label oriented' segment only accounts for 7% of the market, and shows a clear preference for purchasing refurbished products at an IRBC, Philips Floor Care should not focus on this segment.

The results showed that consumer specific covariates are valuable in explaining preference heterogeneity for refurbished products. Men, experts, self-identified 'green' consumers and price=quality oriented consumers are significantly more inclined to opt for *new*. In contrast, young consumers, consumers who have purchased refurbished products in the past and price-conscious consumers are significantly more inclined to prefer the refurbished vacuum cleaner.

§5.2 Discussion

In this paragraph, the findings of this research are related to the prior expectations based on current academic literature and the preliminary qualitative study. Moreover, the implications for current literature and practice are discussed.

Financial benefits have been identified as the main determinant in consumers' acceptance of refurbished products (Agrawal et al., 2012; Jiménez-Parra et al., 2014). Yet, the results from the choice-based conjoint analysis demonstrated that 'energy efficiency class' was more important in consumers' trade-off, confirming that the refurbished vacuum cleaner should meet a functional threshold first (Luchs et al., 2012). Moreover, contrary to study of Abbey et al. (2014), no consistently positive, linear effect was found for price; on both an aggregate and segment level a negative impact was found for the 20% lower priced alternative of €210, -. As the €170, - and €130, - price levels showed positive part-worth estimates, it can be inferred that a substantial price difference is needed to enhance consumers' choice probability.

Ovchinnikov (2011) and Subramanian and Subramanyam (2012) argue that the attractiveness of refurbished products increases when it is backed by a *large* warranty. To be more concrete, this research demonstrated that consumers demand an extended warranty compared to the generally offered two year warranty on the new alternative. Offering refurbished products with a one or two year warranty had a negative impact on consumers' choice probability, which infers that the six month warranty that competitors Hoover and Dyson offer is not advisable.

Consumers' clear preference to purchase refurbished products through conventional channels and the Philips online store contradicts the findings of Jiménez-Parra et al. (2014), who recommend to sell refurbished products through an IRBC. This can be explained by Subramanian and Subramanyam (2012); seller reputation and the image of the OEM mitigate consumers' uncertainty about the quality of the refurbished products. This implies that for IRBCs that plan to refurbish domestic appliances, it may be wise to partner up with an OEM.

This research identified a difference between consumers' *stated* and *observed* importance of the cosmetic condition in the purchase decision. Whilst it was not seen as a decisive cue in the preliminary qualitative study, the appearance was found to be important in consumers' trade-offs. Moreover, whereas De Jong (2015) argues that a refurbished product's 'wear and tear' negatively influences consumers' purchase intention, this research shows that this proposition can be relaxed. That is, for 70% of the respondents no significant effect of *slightly* visible user traces was found on the overall utility. For 30%, this effect was significant and positive,

indicating that the findings of De Jong only apply for products with clearly visible blemishes. Moreover, contrary to the expectations based on the study of Schoormans and Mugge (2012), no significant difference was found between experts and novices with regards to the evaluation of the cosmetic condition. It can be argued that a lack of knowledge, i.e. inability, on refurbishment results in the use of cosmetic condition as an inference of quality, even for consumers that are knowledgeable on a certain product category.

The minor importance that was assigned to 'type of information provided', indicates that the relative importance is small if presented with other attributes. Moreover, inconsistencies with the research of Wang and Hazen (2015) and Michaud and Llerena (2011) were observed, who state that a 'green' product message has a positive effect on the evaluation of a refurbished product. In contrast, a negative relationship was observed. Furthermore, the results confirmed the findings of De Pelsmacker et al. (2005); self-identified 'green' consumers do not always exhibit the corresponding 'green' behavior. That is, consumers with a positive attitude towards purchasing green, assigned a significantly lower utility to the refurbished vacuum cleaner.

§5.3 Recommendations

The research results in several managerial and academic implications. Philips Floor Care is advised to target the appearance-oriented and price-oriented segment. Compared to the current target group, which are females in their mid-age with a family, this implies that Philips Floor Care should target a new audience. This group can be characterized as young consumers who live in a two-person household with their partner or share a house with workers or students. Consistent with the current strategy, Philips Floor Care should focus on females, as women are more likely to opt for refurbished.

It is of critical importance that Philips Floor Care sets quality standards for the refurbished vacuum cleaner to ensure that the minimum threshold of *functional* performance is met (Luchs et al., 2012). Moreover, standards for the cleaning process of returned vacuum cleaners should be created to overcome the barrier of feelings of disgust (Abbey et al., 2015). Both quality standards should be clearly communicated to consumers.

To appeal to the appearance-oriented and price-oriented segment, the attribute composition should be designed in accordance with the preferences of both segments. In terms of attribute composition, both segments can be reached with the same product; yet, differences in the importance scores per segment demonstrate that Philips Floor Care should emphasize other attributes in the marketing communications. Moreover, as the appearance-oriented segment

preferred the *new* alternative in 42% of the choice tasks, this segment is somewhat inclined to opt for *new*. To foster the probability that the refurbished alternative is included in consumers' final consideration set, Philips Floor Care should comply with the preferences of this segment.

In accordance with consumers' preferences and consistent with the findings from the financial viability study, it is advised to initially market the refurbished Performers through the Philips online store. As price is the main barrier in the conversion from consideration into actual purchase of a Philips Floor Care product, Philips Floor Care should exploit the lower priced refurbished alternative as a valuable online asset to limit the drop-out rate and to appeal to the price-conscious segment.

Inconsistent with several previous studies (e.g. Michaud and Llerena, 2011), Philips Floor Care is not advised to focus on a 'green' product message, but should emphasize the equivalent quality of the refurbished vacuum cleaner. To overcome the barrier of unfamiliarity and anticipate on consumers' desire for transparency, Philips Floor Care should provide information about the refurbishment process. By means of, for instance, a 'how it is refurbished' clip, the purchase intention can be influenced in a positive way (De Jong, 2015). Moreover, given the importance of the cosmetic condition, transparent information on this matter should be provided. In the online store, this transparency can be offered by means of visuals or a detailed description of the condition (e.g. gradations). From a financial and strategic perspective, Philips should aim to collect discarded Performers where the chance on cosmetic blemishes is the lowest, with, for instance alliances with Coolrec or trade-in promotions with retailers.

The clear preference heterogeneity highlights the importance of including covariates in future academic research to better understand consumers' propensity to opt for new. This research solely provided an *initial indication* that, for instance, age and gender are valuable in explaining consumers' choice. Future research on the rationale behind these findings, for instance by linking age to risk aversion (Pålsson, 1996), is needed. Moreover, this research also demonstrated the usefulness and potential of expanding the latent class analysis with CBC-HB, as it is a convenient tool to reveal the interrelationships between covariates and attribute levels.

§5.4 Limitations and future research

As in any research, this study was subject to several limitations. First, as the presentation method that was used entailed a *constant* new option, the results from this research do not guarantee that consumers' trade-offs and susceptibility towards refurbished products are equivalent in a situation where, for instance, a lower priced new alternative is offered. This

limitation can be countered by using a paired comparison design with one *refurbished* and one *new* alternative with varying levels for both. This also provides the opportunity to research the possible threat of cannibalization. This approach was not used in this research as two attributes in this study were only relevant for the refurbished alternative, resulting in too many restrictions and a near-zero D-efficiency in SAS.

Contrary to the prior expectations, 'energy efficiency class' showed to be the most important attribute in consumers' trade-offs. For the levels of this attribute the original colored labels were used, whereas for the other attributes only a verbal description was used. The presence of a visual in the choice tasks forms an easy point of comparison, which, as a result, might lead to an over-estimated importance of this attribute. This can be avoided by choosing one method.

The use of Philips' panel to collect the data might limit the generalizability of the findings. The sample was selected based on the panel members' stated willingness to participate in general Philips surveys, or surveys in the specific field of floor care appliances. As these people might have a particular interest in Philips products or floor care appliances, this sample might not truly represent the Dutch target audience. Other sampling methods, for instance simple random sampling, foster the generalizability and representativeness of the results.

A fourth limitation is that a median split analysis was used, where respondents were divided into dichotomous groups. A drawback of dichotomizing is that it reduces the statistical power of a test and could potentially lead to misleading interpretations (Fitzsimons, 2008; Irwin and McClelland, 2003).

A general limitation in the design of a choice-based conjoint analysis, is that respondents only react to what is provided in terms of profiles, leaving a large field of attributes, particularly attributes of a more qualitative nature unexplored (Hair et al., 2010). Future research into the emotional responses or subjective feelings towards purchasing refurbished domestic appliances might be important and contribute to a better understanding of consumers' susceptibility towards these products. Thus, an additional research with a more qualitative nature is recommended.

Lastly, contrary to the findings of Lichtenstein et al. (1988), no negative relationship was found between the price-conscious and price=quality construct. This disabled the researcher to dichotomize consumers, and implied that consumers can belong to both groups. Future researchers are advised to test whether inclusion of the three items that were omitted in this study does yield a negative relationship. Yet, when a negative relationship is absent, consumers' price perception can better be measured using a semantic differential scale.

Appendices

A1. Clarification of the returning loops

Where does this company sit within the circular economy?
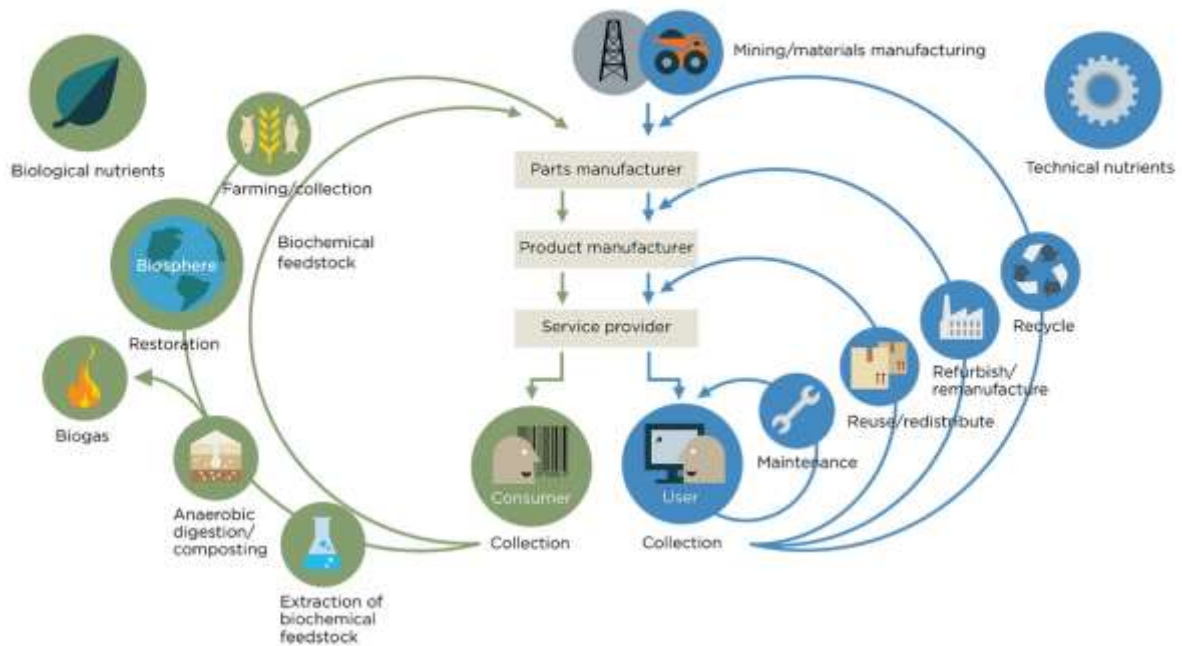
Figure A1.1: The four returning loops of the circular economy

A2. Financial viability study

A3. Qualitative preliminary study – structure and minutes

A3.1 Structure of the study

The qualitative interview started with general questions, in order to identify the respondent's personal characteristics. That is, respondent's name, age, household composition and current occupation.

Subsequently, multiple questions regarding the product category vacuum cleaners were asked.

1. Did you ever purchase a vacuum cleaner?
2. If yes, how did the purchase decision process look like?
3. Assume, your current vacuum cleaner breaks down today. Within how many days to you ultimately want to have a new one?

Subsequently, it is determined whether respondents have experience with purchasing refurbished products, or knowledge on the concept of refurbishment.

4. Did you ever purchase a refurbished product?
5. Were you familiar with the term refurbishment?

Two **unaided questions** are asked, in order to determine the attributes that are of relevance in respondent's choice for either the new or refurbished alternative.

6. Assume that you are in the need for a new vacuum cleaner. You are in front of the shelf where a new and refurbished vacuum cleaner are offered.
   - What would be the reason for you to choose for the <u>new</u> vacuum cleaner?
   - What would be the reason for you to choose for the <u>refurbished</u> vacuum cleaner?

A3.2 Minutes of the study

Name: Pieter Kerkhof **Age:** 26 **Occupation:** Junior quantitative risk analysist at ABN AMRO **Household composition:** Appartment shared with workers/ friends	'What would be the reason for you to choose for the **new** vacuum cleaner?' If I can see or expect a quality difference or defects. I would think that a refurbished vacuum cleaner will break down quicker than the new one. I associate a refurbished vacuum cleaner with a higher degree of risk. What you often see is that these products are sold with a lower warranty, so if the refurbished product is not offered with a large warranty, I would opt for the new one. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' A lower price or a discount. New is my benchmark, and if the price difference is only €5,-, I would choose for the new one. The difference should be substantial to make people choose for the refurbished option. I also would

	like to know what parts are actually refurbished. For example, a 'how it's made' clip in the store can be a trigger for me. I would purchase a refurbished vacuum cleaner, as you don't have to deal with software or hardware updates etc. A laptop gets obsolete if you don't use it, while this is not de case for a vacuum cleaner.
	You don't want people to see refurbishment as second hand, but as an upgrade.
	I am familiar with the concept refurbishment, but I actually see it as a concept for the professional market; tanks from the American army are all refurbished, trains of NS, and a refurbished car engine gave people the insurance that it would not break down.
Name: Esmee van Binsbergen **Age:** 25 **Occupation:** Student at Tilburg University **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' To minimize the risk of the purchase. To be sure that the product does not suffer from previous ownership or usage of the product. As a vacuum cleaner is used to clean a house, hygiene is also a factor. I think that I would be worried that dust of other households is in the vacuum cleaner, and that is gross. Yet, this is not decisive. The appearance of the product is more important; if it looks hygienic I might not take the hygiene factor into account anymore. With appearance I mean scratches. This is an indication that the product is old. These user marks increase my perceived risk. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' Because I get the feeling that I will contribute to the environment. Refurbished products produce less waste and less energy is needed to make it. I might also believe that it is cheaper and that I save money with purchasing a refurbished product. I think this is also psychological. Refurbishment arouses the idea that it is cheaper. Another aspect in my consideration is that it enables me to stay myself, and not always demand the newest things. It gives me a bad feeling to always want and purchase the newest products. By purchasing a refurbished product, I get the feeling that I am less requiring. This feeling would be strong for a vacuum cleaner.
Name: Max Sonneveld **Age:** 24 **Occupation:** Student at Tilburg University **Household composition:** Student home	'What would be the reason for you to choose for the **new** vacuum cleaner?' The risk that the refurbished one does not perform well or for the same period as the new product. If the warranty of the refurbished product is limited or not sufficient, I would choose the new one. The absence of a warranty would give me the feeling that the refurbished product would break down easily.

	'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' A lower price. Of course the environmental benefits are important, but this is less relevant in my decision. Environmental considerations account for 10%, and price for 90%. If the refurbished product is backed by the warranty that it is as good as new, I would be more likely to buy it. I have purchased a refurbished iPhone. My old one broke down, and the guarantee arrangement of Apple enabled me to get a refurbished iPhone for €250,-. Though, I did not immediately choose for this offer, as it was still quite expensive. When I saw that refurbished was the lowest-priced option, I decided to go for the refurbished iPhone.
Name: Jan Mennens **Age:** 64 **Occupation:** Retired **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' I think I am from a generation that always purchases a new product if the old one breaks down. The environmental thought is not truly present in my decision making process for products. I want reliable products, and I don't know whether a refurbished product meets this requirement. For the environmental consciousness, I think that people of my generation need to be educated to think in another 'environmental' way. I think companies should use marketing, or that people should be informed on refurbishment via television. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' The price. Although it is not very likely that I would actually purchase this product for myself. Maybe I would consider it to be a good alternative for a person that is in a retirement home, where the vacuum cleaner is only used occasionally. I also think that getting information on refurbishment is interesting, like the refurbishment process and what has been replaced etcetera. What I also would like to know is what happens to the €5, - 'verwijderingsbijdrage' that is paid for a product if you purchase a refurbished product.
Name: Jolien Lempers **Age:** 28 **Occupation:** Teacher at Arcus College **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' For the refurbished product you will think that it is a second-hand product. I would not be sure if this product still functions properly. We are used to stores like the Mediamarkt, where everything is new. This would be the reason for me to go for the new one. Maybe this is also just an assumption that is not grounded. Therefore, I think that this term should grow among consumers, and that people must be educated.

	'What would be the reason for you to choose for the **refurbished** vacuum cleaner?'
	There has to be a good story behind it. If I am told where the product comes from, how it is refurbished, and that it is beneficial for the environment, I am willing to purchase a refurbished product. I think environmental friendly products should be sold with a good story, in order for the majority of people to be willing or convinced to contribute to the environment.
	Another reason is of course price. I think that refurbished products should be considerably cheaper, and not just €20, - cheaper. I would expect a €100, - price difference.
	Lastly, although this is not very important for a vacuum cleaner, I believe that the design and appearance is important. The product should still look decent.
Name: Jeanne Goffin **Age:** 57 **Occupation:** Housewife **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' Because I associate refurbishment with second-hand products, I infer that the product will not function properly for many years. I also don't have much experience with second-hand products. Only a car, but I think that is different. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' Then the environmental aspect would be the primary reason. I think there are less sources needed to make it, and that it leads to less waste. I would expect/ require that this product is cheaper than the new product. I would consider a refurbished vacuum cleaner for a second vacuum cleaner for the upper floor. I think that for the older generation or housewives refurbishment will not be very attractive. A vacuum cleaner is a more important appliance for households with children, and especially for housewives. For these people, the vacuum cleaner might have another purpose. The terms refurbishment and second-hand products only got more awareness in the last five or ten years, so the fact that older consumers are not really familiar with it might also be a reason not to accept it.
Name: Leon Bogman **Age:** 60 **Occupation:** Engineer at Cofely **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' I would be skeptical towards the refurbished product, as it is not a concept I am very familiar with. Maybe I would have the confidence if I would hear friends or family about it. The insecurity I experience would be my main reason to go for the new vacuum cleaner. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?'

	If the refurbished vacuum cleaner is cheaper, I might go for this option. I would demand the same warranty for this product though. I would like to know to what degree this refurbished product is actually recycled or refurbished. I also don't want a vacuum cleaner with scratches, so the exterior should look neat. If there is a refurbished motor in the vacuum cleaner, this would be of less importance to me, since this is not something I can see. The visible components should be like new. This depends on the price; if a scratch results in a lower price, I might consider it.
Name: Rachelle Lemmens **Age:** 25 **Occupation:** Ergotherapist **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' Because of the risk. I think I can avoid the risk of buying an inferior product by purchasing the new one. Although I know that these products will be checked, I would still be worried that there is something that has not been repaired or replaced well. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' A lower price, and for example something that proves that it is checked properly. I would like to know what has been refurbished, and what components are replaced. However, this is not very realistic for Philips. I would like to have the same warranty as I get on a new vacuum cleaner. Only if it would save me a lot of money and I get the same warranty, I would choose for the refurbished product. I think that in the beginning, Philips will not sell a lot of these products, but if consumers get familiar with it or quality marks are introduced for these products it might have potential. You need to have a party that is responsible for the components that are replaced. Another aspect is the environment. If you keep buying new products, the old ones are thrown on the growing pile of waste.
Name: Mike van der Veen **Age:** 25 **Occupation:** Account manager at Brunel **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' To be sure that the product will work properly during its whole lifetime. With a refurbished product, I would not take this for granted. I know that Leapp refurbishes Apple products. I am no proponent or opponent for refurbishment, but I think you still pay a lot for these products and you get extra risk compared to the new one. If it breaks down and you have to purchase another one after all, the total sum of expenses is way higher. Personally, I prefer to pay a little bit more, as I am suspicious. This does depend on the product category; for a vacuum cleaner the likelihood of purchasing the refurbished one is greater. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?'

	Price and warranty. I assume that these products will be sold for a lower price. I also expect that these products will be sold with the same warranty as a new one. Those are aspects that reduce the perceived risk. If Philips, or another company, cannot offer that to its customers, no one will buy the product. You can also think about aspects like corporate social responsibility. However, this is not something that is truly relevant in my decisions and not decisive. That is just a nice bonus to me.
Name: Marjo Kerkhof **Age:** 55 **Occupation:** Teacher at De Rooij Pannen **Household composition:** Two person household	'What would be the reason for you to choose for the **new** vacuum cleaner?' Because I think the new vacuum cleaner would be of a higher quality. I believe that this new product is better. 'What would be the reason for you to choose for the **refurbished** vacuum cleaner?' Not the price, as this probably is one of the main reasons for many people, but the environmental benefits. We already have a large pile of waste in this world. Yet, as price is not a very important factor in my decision, I would be more likely to go for the new one.

Finally, one question to address the **aided awareness** is asked. Respondents were asked to identify which aspect is most persuasive in respondent's choice for a refurbished product. Using a constant sum scale, respondents were asked to divide 100 points over 14 aspects.

7. Assume that you are in the need for a new vacuum cleaner. You are in front of the shelf in a store or in an online webshop where a new and refurbished vacuum cleaner are offered. Of the aspects below, what would be the most important reason to choose for the refurbished vacuum cleaner instead of the new one? You can divide 100 points over the following aspects. Attribute more points to the aspect that is most persuasive in your choice.

After collecting the data, the attributed scores were summed, which led to the following ranking:

Aspects	Score	Rank
A lower price compared to the new alternative	187	**1**
The environmental benefits of refurbishment	95	**4**
An equal or higher warranty compared to the new alternative	157	**2**
A lower energy consumption (i.e. a higher rating on the energy efficiency rate)	45	10
The image/ reputation of the brand	98	**3**
The image/ reputation of the seller	31	12
The advice of a sales representative	40	11
A certificate/ quality label that acknowledges the quality of the refurbished product	79	**5**
Information provided on the concept of refurbishment	57	7
Information provided on the usage history of the product	52	8
If the product is offered by an external company that is specialized in refurbishing of electronics	0	13
Recommendations of friends, family and acquaintances	59	6
Independent testimonials, such as online reviews and reviews of the Consumentenbond	50	9
An 'as-new' appearance of the product	50	9
	1000	

Table A3.1.2: Scores and rankings of aided qualitative study

A4. Determination of attribute levels

Attribute		Complete level description
Price	1	€130,-
	2	€170,-
	3	€210,-
Energy efficiency class	1	A-B based on a power of 600-1000 watt
	2	C-D based on a power of 1000-1400 watt
	3	E-F based on a power of 1400-1700 watt
Warranty	1	1 year warranty
	2	2 years warranty
	3	2 years warranty plus 5 years motor warranty
Type of information provided	1	**Contribute to the environment:** this refurbished vacuum cleaner is produced with 50% less energy and materials.
	2	**Save on your expenses:** this refurbished vacuum cleaner is cheaper than the new alternative.
	3	**Quality acknowledged:** this refurbished vacuum cleaner is of equivalent quality and service life as the new alternative.
Point of purchase	1	Physical store Like Mediamarkt or BCC
	2	Philips online store
	3	Company specialized in refurbishment of domestic appliances
	4	Second-hand store Like Marktplaats
Cosmetic condition	1	Clearly visible user traces, like scratch and dent damage
	2	Slightly visible user traces
	3	Like-new condition

A5. Development of the questionnaire in SAS

SAS software was used to compose the alternatives to include in the questionnaire. SAS is based on a statistical method, which ensures that the choice sets are constructed by taking the four criteria of an optimal research design into account.

A5.1 Determine the number of choice sets

The following query was used to determine the number of stimuli needed to estimate the parameters:

```
%Mktruns(3 3 3 3 4 3)
```

This yields the following output:


```
                        Design Summary

                     Number of
                      Levels        Frequency

                        3              5
                        4              1


        Saturated     = 14
        Full Factorial = 972

        Some Reasonable                    Cannot Be
          Design Sizes      Violations     Divided By

              36 *              0
              72 *              0
              18                6          4 12
              27                6          4 12
              45                6          4 12
              54                6          4 12
              63                6          4 12
              24               10          9
              48               10          9
              60               10          9
              14 S             21          3  4  9 12

     * - 100% Efficient design can be made with the MktEx macro.
     S - Saturated Design - The smallest design that can be made.
         Note that the saturated design is not one of the
         recommended designs for this problem.  It is shown
         to provide some context for the recommended sizes.
```

Figure A5.1.1: Mktruns output

The output indicates that 36 stimuli are needed to estimate the parameters. This design does not lead to any violations. Thus, it can be concluded that 18 choice tasks, each represented by two stimuli, are sufficient for the research design.

A5.2 Create the candidate set

A full-factorial design is used to create the candidate set, as this gives SAS more freedom in the choice set stage. As figure A5.1.1 indicates, full-factorial design is 972, which resembles the maximum number of stimuli one can come up with. The following query is used:

```
%Mktex(3 3 3 3 4 3,n=972,seed=17)
```

This yields the following output:

Design Number	D-Efficiency	A-Efficiency	G-Efficiency	Average Prediction Standard Error
1	100.0000	100.0000	100.0000	0.1200

Figure A5.1.2: Mktex output

A5.3 Define structure of the choice sets

Two alternatives are shown per choice task, including the *new* vacuum cleaner, which serves as a reference point. The following query is used to determine the number of alternatives per task:

```
%mktlab(data=design,int=f1-f2)
```

A5.4 Create choice design

The following query is used to create the choice design, taking into account the assumed betas that are defined in paragraph 3.3.1, figure 1.5. SAS treats the last attribute as a benchmark, indicated by a value of 0, which does not need to be entered in the query.

```
%choiceff(data=final,model=class(x1-x6),nsets=18,flags=f1-f2,beta= 2 1 2 1
           -2 -1 -2 -1 3 2 1 -2 -1,seed=17,maxiter=20)
```

This yields the following output:

n	Variable Name	Label	Variance	Assumed Beta	DF	Standard Error	Wald	Prob > Squared Wald
1	x11	x1 1	3.15977	2	1	1.77757	1.12513	0.2605
2	x12	x1 2	1.25300	1	1	1.11938	0.89335	0.3717
3	x21	x2 1	2.86226	2	1	1.69182	1.18216	0.2371
4	x22	x2 2	1.13211	1	1	1.06401	0.93984	0.3473
5	x31	x3 1	3.38607	-2	1	1.84013	-1.08688	0.2771
6	x32	x3 2	1.27239	-1	1	1.12800	-0.88652	0.3753
7	x41	x4 1	3.18219	-2	1	1.78387	-1.12116	0.2622
8	x42	x4 2	1.29606	-1	1	1.13845	-0.87839	0.3797
9	x51	x5 1	6.63361	3	1	2.57558	1.16479	0.2441
10	x52	x5 2	3.48994	2	1	1.86814	1.07058	0.2844
11	x53	x5 3	1.39751	1	1	1.18216	0.84591	0.3976
12	x61	x6 1	3.06510	-2	1	1.75074	-1.14237	0.2533
13	x62	x6 2	1.10182	-1	1	1.04968	-0.95267	0.3408
					13			

Figure A5.1.3: Mktex output

Figure A5.1.3 indicates the variances, which refer to the reliability of the part-worths. A low variance indicates a higher reliability. The following query is used to create the actual choice design:

```
proc print; id set; by set; run;
```

This yields the following output:

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
1	1	1.72830	0.500	1	3	3	1	4	3
	2	1.72830	0.500	2	1	1	3	3	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
2	1	1.72830	0.500	3	3	3	2	4	3
	2	1.72830	0.500	2	2	2	1	2	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
3	1	1.72830	0.26894	3	2	2	2	1	3
	2	1.72830	0.73106	1	1	3	3	4	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
4	1	1.72830	0.73106	2	2	3	2	3	3
	2	1.72830	0.26894	3	3	2	3	1	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
5	1	1.72830	0.73106	3	1	1	2	1	1
	2	1.72830	0.26894	2	2	2	1	3	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6

6	1	1.72830	0.500	3	1	2	3	4	1
	2	1.72830	0.500	2	3	1	1	1	2
Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
7	1	1.72830	0.73106	1	2	1	1	1	1
	2	1.72830	0.26894	2	3	2	2	3	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
8	1	1.72830	0.73106	3	2	2	3	3	2
	2	1.72830	0.26894	2	1	1	1	2	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
9	1	1.72830	0.500	2	2	3	2	1	1
	2	1.72830	0.500	1	3	1	3	2	3

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
10	1	1.72830	0.500	1	1	1	2	2	2
	2	1.72830	0.500	2	3	3	3	1	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
11	1	1.72830	0.500	1	2	2	1	4	3
	2	1.72830	0.500	3	3	3	2	2	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
12	1	1.72830	0.500	1	3	2	1	3	1
	2	1.72830	0.500	2	2	1	2	4	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
13	1	1.72830	0.500	2	1	1	3	3	3
	2	1.72830	0.500	1	2	3	2	2	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
14	1	1.72830	0.500	3	2	1	1	3	2
	2	1.72830	0.500	2	3	2	2	4	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
15	1	1.72830	0.500	3	1	2	1	4	2
	2	1.72830	0.500	1	3	1	2	3	1

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
16	1	1.72830	0.26894	3	2	3	3	2	3
	2	1.72830	0.73106	1	1	2	2	1	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
17	1	1.72830	0.73106	3	1	2	1	2	3
	2	1.72830	0.26894	1	2	1	3	4	2

Set	Alternative	Efficiency	Probability	x1	x2	x3	x4	x5	x6
18	1	1.72830	0.26894	1	1	3	1	3	1
	2	1.72830	0.73106	2	3	2	3	2	3

A6. Final design of the questionnaire

Beste,

Hartelijk dank dat u deel wilt nemen aan mijn onderzoek. Uw input is van grote toegevoegde waarde voor mijn afstuderen. Voor mijn master thesis voor Philips doe ik onderzoek naar de acceptatie van refurbished producten onder Nederlandse consumenten. *Refurbished producten zijn producten die eigendom zijn geweest van een eerdere gebruiker en na hun eerste levenstermijn geretourneerd zijn naar Philips. Nadat de producten volledig zijn schoongemaakt, componenten gerepareerd of vervangen zijn en het product is getest, worden deze producten voor een tweede levenscyclus op de markt gezet.*

Voor het invullen van deze enquête vraag ik circa 10 minuten van uw tijd. Wanneer u deze enquête invult maakt u kans op een stofzuiger.

Met vriendelijke groet,

Manon Bogman
M.e.m.bogman@tilburguniversity.edu

Stelt u zich voor dat u van plan bent om een nieuwe stofzuiger te kopen.

U zult achtereenvolgend 18 keuzesituaties van stofzuigers te zien krijgen. Per keuzesituatie worden twee refurbished stofzuigers en één geheel nieuwe stofzuiger getoond. De onderstaande afbeelding geeft kenmerken van de **NIEUWE** stofzuiger weer, welke per keuzesituatie hetzelfde blijven. Geef per keuzesituatie aan naar welke stofzuiger uw voorkeur uitgaat. Wanneer de twee refurbished stofzuigers niet aan uw eisen voldoen, kunt u dit aangeven door voor de nieuwe stofzuiger te kiezen.

Iedere stofzuiger kenmerkt zich door de volgende aspecten, waar u uw keuze op dient te baseren. Leest u deze informatie alstublieft nauwkeurig door:

Prijs:	De verkoopprijs van de stofzuiger.
Energie efficiëntieklasse:	Kenmerkt zich door de beoordeling van A t/m F, waarbij A (groen) een hoge energie efficiëntie betekent, en F (oranje) een lage energie efficiëntie. Deze score wordt in grote mate bepaald door het vermogen in watt. Hoe hoger het vermogen, hoe lager de energie efficiëntieklasse.
Garantie:	De door Philips verschafte garantietermijn
De product boodschap:	De marketing boodschap waarmee de stofzuiger in de markt wordt gezet, en zich onderscheidt.
Het punt van aankoop:	De winkel waar de stofzuiger verkocht wordt.
Conditie van de behuizing:	De staat van de zichtbare onderdelen van de stofzuiger.

Prijs:

€260,-

Energie efficiëntieklasse:

A

Gebaseerd op een vermogen van 600-850 watt

Garantie:

Twee jaar garantie

Product boodschap:
Beste uit de Test Award-Consumentenbond 2015

Punt van aankoop:

Fysieke elektronica winkel, zoals Mediamarkt of BCC

Conditie van de behuizing:

Gloednieuw

€130,-

E
F

Gebaseerd op een vermogen van 1400-1700 watt

Twee jaar garantie + 5 jaar motorgarantie

Draag bij aan het milieu; deze refurbished stofzuiger is geproduceerd met 50% minder energie en materialen.

Tweedehands winkel of webshop, zoals Marktplaats

'Als nieuw' conditie

Ik zou voor deze refurbished kiezen

€170,-

A
B

Gebaseerd op een vermogen van 600-1000 watt

Een jaar garantie

Kwaliteit erkend: deze refurbished stofzuiger heeft een gelijke kwaliteit en levensduur als het nieuwe alternatief.

Bedrijf gespecialiseerd in refurbishment van huishoudelijke apparaten

Duidelijk zichtbare gebruikssporen, zoals kras en/of stootschade

Ik zou voor deze refurbished kiezen

---

19. Stel dat u in een situatie bent waarin u een stofzuiger wilt kopen. Geef aan hoe u zichzelf op de volgende aspecten beoordeelt:

| Ik heb zeer weinig kennis over stofzuigers | ○ ○ ○ ○ ○ ○ ○ | Ik heb zeer veel kennis over stofzuigers |
| Ik ben onervaren met het kopen van stofzuigers | ○ ○ ○ ○ ○ ○ ○ | Ik ben ervaren met het kopen van stofzuigers |

| Ik ben ongeïnformeerd over stofzuigers | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Ik ben geïnformeerd over stofzuigers |
| Ik ben een leek op het gebied van stofzuigers | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Ik ben een expert op het gebied van stofzuigers |

20. De volgende vragen hebben betrekking op uw perceptie van **de prijs van een stofzuiger.** Geef per stelling aan wat het meest voor u van toepassing is.

	1.Zeer mee oneens	2.Mee oneens	3.Een beetje mee oneens	4.Neutraal	5.Een beetje mee eens	6.Mee eens	7.Zeer mee eens
Ik ben bereid om extra inspanning te leveren om de laagste prijs te vinden.	○	○	○	○	○	○	○
Het geld wat men bespaart met het vinden van een lagere prijs is de tijd en moeite waard.	○	○	○	○	○	○	○
De tijd die nodig is om een lagere prijs te vinden is meestal de moeite waard.	○	○	○	○	○	○	○
Over het algemeen geldt, hoe hoger de prijs van een product, hoe hoger de kwaliteit.	○	○	○	○	○	○	○
Het gezegde ''je krijgt waar je voor betaald'', is over het algemeen waar.	○	○	○	○	○	○	○
De prijs van een product vormt een indicator van de kwaliteit van het product.	○	○	○	○	○	○	○

21. De volgende vragen hebben betrekking op uw houding ten opzichte van het kopen van milieuvriendelijke, ofwel 'groene' producten. Geef per stelling aan wat het meest voor u van toepassing is.

	1.Zeer mee oneens	2.Mee oneens	3.Een beetje mee oneens	4.Neutraal	5.Een beetje mee eens	6.Mee eens	7.Zeer mee eens
Ik zie het kopen van 'groene' producten als aantrekkelijk.	○	○	○	○	○	○	○
Of een product 'groen' is, is een belangrijk aspect in mijn aankoopbeslissing.	○	○	○	○	○	○	○
Wanneer ik de mogelijkheid en de middelen zou hebben, zou ik voor het 'groene' product kiezen.	○	○	○	○	○	○	○
Het kopen van 'groene' producten brengt mij voldoening.	○	○	○	○	○	○	○
Wanneer ik de keuze heb uit een 'groen' product en een normaal product, gaat mijn voorkeur uit naar het groene product.	○	○	○	○	○	○	○

23. Wat is uw leeftijd in jaren?

24. Wat is uw geslacht?

- ◯ Man
- ◯ Vrouw

25. Wat is de huidige samenstelling van uw huishouden?

- ◯ Alleenwonend
- ◯ Ik deel een huis met meerdere studenten/ werkenden
- ◯ Tweepersoonshuishouden zonder kinderen
- ◯ Tweepersoonshuishouden met uitwonend(e) kind(eren)
- ◯ Tweepersoonshuishouden met thuiswonend(e) kind(eren)
- ◯ Eénpersoonshuishouden met thuiswonend(e) kind(eren)
- ◯ Anders, namelijk:

26. Wat is uw huidige maatschappelijke positie? Meerdere antwoorden zijn mogelijk.

- ◯ Ik ben scholier/student
- ◯ Ik ben werkzaam, 1-20 uur per week
- ◯ Ik ben werkzaam, 21 uur of meer per week
- ◯ Ik ben huisvrouw/ -man
- ◯ Ik ben werkloos/ arbeidsongeschikt
- ◯ Ik ben gepensioneerd/ vervroegd uitgetreden
- ◯ Anders, namelijk:

27. Hoeveel tijd besteed u gemiddeld per week aan:

Geef aan in minuten per week

Het **totale** dagelijks huishoudelijk werk, zoals schoonmaken, stofzuigen en opruimen.

Stofzuigen

28. Was u voor uw deelname aan deze vragenlijst bekend met het concept refurbishment?

- ○ Ja, omdat ik er eerder van heb gehoord.

- ○ Ja, omdat ik zelf in het verleden een refurbished product heb gekocht.

- ○ Nee

29. Vul hier uw e-mailadres in wanneer u kans wilt maken op de onder de deelnemers te verloten Philips Power Pro Compact stofzuiger ter waarde van €119,-. Uw e-mailadres zal enkel gebruikt worden om contact met u op te nemen wanneer u gewonnen heeft.

A7. Questionnaire constructs

Product expertise construct (Retrieved from Mishra, Umesh and Stem, 1993)	
O1	Know very little about -1- -2- -3- -4- -5- -6- -7- Know very much about
C1	Ik heb zeer weinig kennis over stofzuigers -1- -2- -3- -4- -5- -6- -7- Ik heb zeer veel kennis over stofzuigers
O2	Inexperienced -1- -2- -3- -4- -5- -6- -7- Experienced
C2	Ik ben onervaren met het kopen van stofzuigers -1- -2- -3- -4- -5- -6- -7- Ik ben ervaren met het kopen van stofzuigers
O3	Uninformed -1- -2- -3- -4- -5- -6- -7- Informed
C3	Ik ben ongeïnformeerd over stofzuigers -1- -2- -3- -4- -5- -6- -7- Ik ben geïnformeerd over stofzuigers
O4	Novice buyer -1- -2- -3- -4- -5- -6- -7- Expert buyer
C4	Ik ben een leek op het gebied van stofzuigers -1- -2- -3- -4- -5- -6- -7- Ik ben een expert op het gebied van stofzuigers

O= Original question

C= Converted question

Price perception (Retrieved from Lichtenstein, Ridgway and Netemeyer, 1993)	
Price consciousness	
O1	I am not willing to go to extra effort to find lower prices.
C1	Ik ben bereid om extra inspanning te leveren om de laagste prijs te vinden.
O2	I will grocery shop at more than one store to take advantage of low prices.
C2	-
O3	The money saved by finding low prices is usually not worth the time and effort.
C3	Het geld wat men bespaart met het vinden van een lagere prijs is meestal de tijd en moeite waard.
O4	I would never shop at more than one store to find low prices
C4	-
O5	The time it takes to find low prices is usually not worth the effort
C5	De tijd die nodig is om een lagere prijs te vinden is meestal de moeite waard.
Price-quality schema	
O6	Generally speaking, the higher the price of a product, the higher the quality.
C6	Over het algemeen geldt, hoe hoger de prijs van een product, hoe hoger de kwaliteit.
O7	The old saying ''you get what you pay for'' is generally true.
C7	Het oude gezegde ''je krijgt waar je voor betaald'' is over het algemeen waar.
O8	The price of a product is a good indicator of its quality.
C8	De prijs van een product vormt een indicator van de kwaliteit van het product.
O9	You always have to pay a bit more for the best.
C9	-

O= Original question

C= Converted question

Attitude towards purchasing green products (Retrieved from Liñán and Chen, 2009)	
O1	A career as an entrepreneur is totally unattractive to me.
C1	Ik zie het kopen van 'groene' producten als aantrekkelijk.
O2	If I had the opportunity and the resources, I would love to starts a business.
C2	Wanneer ik de mogelijkheid en de middelen zou hebben, zou ik voor het 'groene' product kiezen.
O3	Amongst various options, I would rather be anything but an entrepreneur.
C3	Wanneer ik de keuze heb uit een 'groen' product en een normaal product, gaat mijn voorkeur uit naar het groene product.
O4	Being an entrepreneur would give me great satisfaction.
C4	Het kopen van 'groene' producten brengt mij voldoening.
O5	Being an entrepreneur implies more advantages than disadvantages to me.
C5	-
Additional question included for face validity reasons	
O6	Environmental protection is important to me when making purchases.
C6	Of een product 'groen' is, is een belangrijk aspect in mijn aankoopbeslissing.

O= Original question
C= Converted question

A8. Analysis of results pilot study

A8.1 Test for reliability of the constructs

The test for reliability indicates how free a construct is from random error. Test-retest reliability and internal consistency are two frequently used indicators. As this concerns a pilot study, only internal consistency is taken into account, which represents the degree to which the items that make up a scale are all measuring the same underlying construct.

Reliability Statistics

Cronbach's Alpha	N of Items
,948	4

Table A8.1.1: Cronbach's Alpha for product expertise construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Expertise_1	8,92	23,471	,886	,932
Expertise_2	9,29	20,650	,863	,939
Expertise_3	8,75	21,761	,908	,922
Expertise_4	8,67	22,145	,862	,936

Table A8.1.2: Item-Total Statistics for product expertise construct

Reliability Statistics

Cronbach's Alpha	N of Items
,855	3

Table A8.1.3: Cronbach's Alpha for price consciousness construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Price_consciousness1	10,17	6,319	,559	,959
Price_consciousness2	9,71	5,607	,789	,737
Price_consciousness3	9,71	5,607	,862	,675

Table A8.1.4: Item-Total Statistics for price consciousness construct

Reliability Statistics

Cronbach's Alpha	N of Items
,762	3

Table A8.1.5: Cronbach's Alpha for quality consciousness construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Quality_consiousness1	9,25	3,326	,586	,732
Quality_consciousness2	9,21	3,737	,695	,558
Quality_consciousness3	8,46	5,389	,584	,734

Table A8.1.6: Item-Total Statistics for quality consciousness construct

Reliability Statistics

Cronbach's Alpha	N of Items
,858	5

Table A8.1.7: Cronbach's Alpha for attitude towards purchasing green products construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Attitude_green1	18,42	20,428	,698	,822
Attitude_green2	18,92	18,167	,679	,832
Attitude_green3	17,79	22,172	,693	,829
Attitude_green4	18,54	20,781	,619	,842
Attitude_green5	18,17	19,449	,724	,814

Table A8.1.8: Cronbach's Alpha for attitude towards purchasing green products construct

The Cronbach's Alpha value provides an indication of the average correlation among all of the items that make up a scale. It can be concluded that the minimum level of 0.7 is satisfied Nunnaly (1978) and DeVellis (2003). Thus the constructs have internal consistency.

A8.2 Test for validity of the constructs

The test for validity indicates the degree to which a construct measures what it is supposed to measure. As there is no straightforward indicator of a scale's validity, convergent and discriminant validity are studied using a Principal Component Factor Analysis.

To decide between orthogonal and oblique rotation, an oblique rotation with the desired number of factors is requested. This yields the following output:

Component Correlation Matrix

Component	1	2	3	4
1	1,000	,259	-,128	-,126
2	,259	1,000	,216	-,232
3	-,128	,216	1,000	-,001
4	-,126	-,232	-,001	1,000

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

Table A8.2.1: Oblique rotation correlation matrix

As no factor correlation exceeds 0.32, the correlations are not driven by the data. Thus, the orthogonal rotation technique should be used (Tabachnik and Fidell, 2007).

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,573
Bartlett's Test of Sphericity	Approx. Chi-Square	262,539
	df	105
	Sig.	,000

Table A8.2.2: KMO and Bartlett's test

Additionally, the Kaiser-Meyer-Olkin measure of Sampling Adequacy is above 0.5 (KMO= 0.573), indicating that the patterns of correlations are relatively compact and analysis should yield distinct and reliable factors. Lastly, as required, Bartlett's Test of Sphericity is significant (P= 0.000), which indicates that the correlation matrix resembles an identity matrix.

		Component			
	Pattern Matrix[a]	1	2	3	4
Product expertise	Ik ben een leek op het gebied van stofzuigers/ Ik ben een expert op het gebied van stofzuigers	0.935	0.058	0.013	0.031
	Ik ben onervaren op het gebied van stofzuigers/ Ik ben ervaren op het gebied van stofzuigers	0.904	0.158	-0.051	-0.036
	Ik heb zeer weinig kennis over stofzuigers/ Ik heb zeer veel kennis over stofzuigers	0.898	0.267	-0.039	-0.136
	Ik ben ongeïnformeerd over stofzuigers/ Ik ben geïnformeerd over stofzuigers	0.948	0.007	-0.083	0.009
Attitude tow. purchasing green	Het kopen van 'groene' producten brengt mij voldoening	0.055	0.787	-0.072	-0.038
	Wanneer ik de keuze heb uit een 'groen' product en een normaal product, gaat mijn voorkeur uit naar het groene product.	0.024	0.741	0.469	-0.202
	Ik zie het kopen van 'groene' producten als aantrekkelijk.	0.131	0.818	0.021	0.037
	Of een product 'groen' is, is een belangrijk aspect in mijn aankoopbeslissing.	0.356	0.731	-0.007	-0.231
	Wanneer ik de mogelijkheid en de middelen zou hebben, zou ik voor het 'groene' product kiezen.	0.034	0.835	0.151	-0.008
Price consc.	De tijd die nodig is om een lagere prijs te vinden is meestal de moeite waard.	-0.038	0.071	0.943	0.072
	Het geld wat men bespaart met het vinden van een lagere prijs is de tijd en moeite waard.	-0.035	0.105	0.925	0.177
	Ik ben bereid om extra inspanning te leveren om de laagste prijs te vinden.	-0.059	0.037	0.750	-0.273
Quality consc.	Het gezegde ''Je krijgt waar je voor betaalt'', is over het algemeen waar.	-0.074	-0.013	-0.091	0.875
	De prijs van een product vormt een indicator van de kwaliteit van het product.	-0.180	-0.068	0.330	0.786
	Over het algemeen geldt, hoe hoger de prijs van een product, hoe hoger de kwaliteit.	0.121	-0.146	-0.154	0.818

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Table A8.2.3: PCA rotated pattern matrix

A9. Data preparation

A9.1 Multiple imputation

Multiple imputation is used to handle the unrealistic values for age that were administered for eight respondents. As for eight cases the age was below three, these cases were treated as 'missing values'. By means of multiple imputation, the entirety of observed data could be used, and the valuable choice task information could be retained for all respondents.

Variable Summary[a,b]

	Missing		Valid N	Mean	Std. Deviation
	N	Percent			
age	8	2,1%	373	47,34	12,759

a. Maximum number of variables shown: 25

b. Minimum percentage of missing values for variable to be included: 1,0%

Table A9.1.1: Missing values for age

Table 9.1.1 reports that eight values were missing for age for the total 381 respondents that were acquired by the Philips panel. SPSS was used for the multiple imputation procedure. First, the missing values in the dataset were replaced with values that preserve the relationship expressed by the observed data. That is, based on respondents other, known, covariates, the missing values for age were inferred. Five datasets were created, where the missing values for age were estimated. This yielded the following classification (table A9.1.2). The age category in which a respondent is most frequently classified was used for further analysis.

	#1		#2		#3		#4		#5		
resp12	34	2	35	2	41	3	31	2	64	5	2
resp44	45	3	51	4	58	5	35	2	63	5	5
resp63	50	4	27	2	41	3	44	3	46	4	4
resp77	45	3	48	4	58	5	52	4	48	4	4
resp83	57	5	46	4	46	4	52	4	47	4	4
resp120	54	4	48	4	48	4	43	3	46	4	4
resp188	38	3	39	3	25	1	47	4	39	3	3
resp210	53	4	56	5	47	4	52	4	61	5	4

Table A9.1.2: Classification of age by SPSS for multiple imputation

A9.2 Outliers
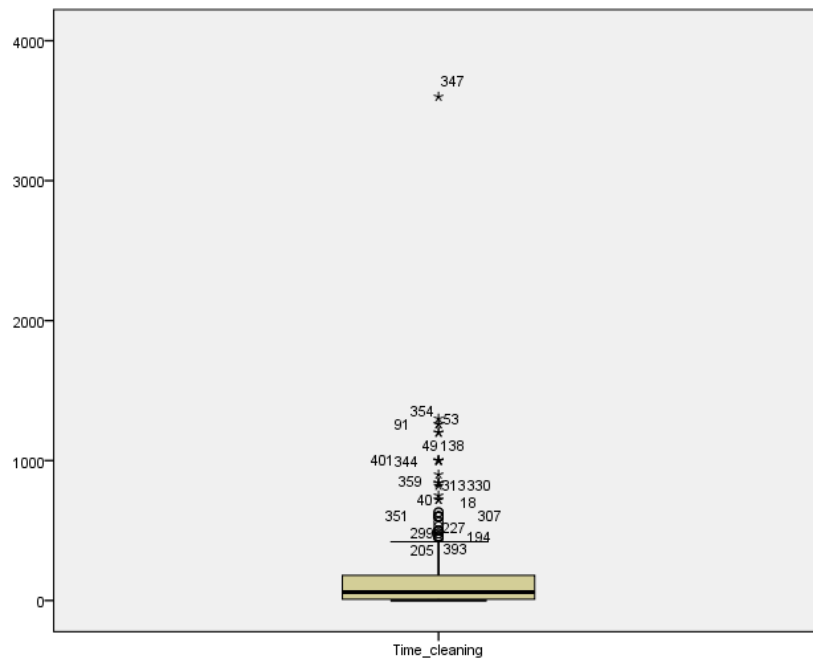
Figure A9.2.1: Outlier for 'time spent on cleaning' variable
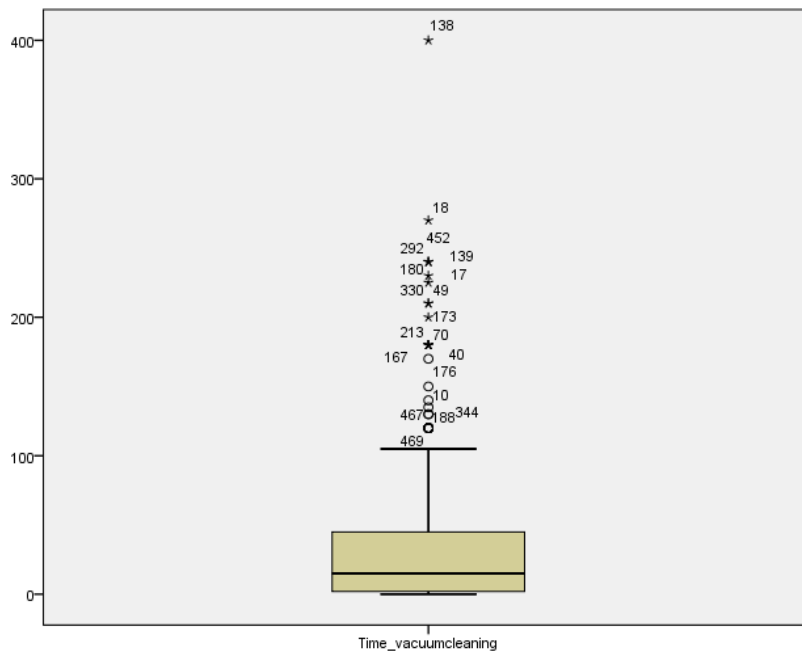
Figure A9.2.2: Outlier for 'time spent on vacuum cleaning' variable

A10. Median split classification

Total N=476	Product expertise	Price consciousness	Quality consciousness	Attitude towards purchasing green
Median of construct	4	6	4	5
N below median	174	286	181	242
N above median	302	190	295	234

Table A10.1.2: Median split classification of respondents

A11. Analysis of results main study

A11.1 Test for reliability of the constructs

Reliability Statistics

Cronbach's Alpha	N of Items
.906	4

Table A11.1.1: Cronbach's Alpha for product expertise construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Expertise_1	12.15	15.102	.788	.879
Expertise_2	12.17	14.084	.757	.890
Expertise_3	12.03	13.699	.812	.869
Expertise_4	12.25	14.824	.803	.873

Table A11.1.2: Item-Total Statistics for product expertise construct

Reliability Statistics

Cronbach's Alpha	N of Items
.878	3

Table A11.1.3: Cronbach's Alpha for price consciousness construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Priceconsciousness_1	10.39	6.255	.750	.840
Priceconsciousness_2	10.43	5.939	.801	.794
Priceconsciousness_3	10.48	6.443	.743	.846

Table A11.1.4: Item-Total Statistics for price consciousness construct

Reliability Statistics

Cronbach's Alpha	N of Items
.804	3

Table A11.1.5: Cronbach's Alpha for quality consciousness construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Qualityconsciousness_1	8.57	5.724	.657	.726
Qualityconsiousness_2	8.04	6.399	.655	.729
Qualityconsciousness_3	8.22	6.119	.642	.739

Table A11.1.6: Item-Total Statistics for quality consciousness construct

Reliability Statistics

Cronbach's Alpha	N of Items
.930	5

Table A11.1.7: Cronbach's Alpha for 'attitude towards purchasing green products' construct

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Attitudegreen_1	18.72	25.828	.802	.916
Attitudegreen_2	19.10	24.307	.827	.911
Attitudegreen_3	18.48	24.263	.842	.908
Attitudegreen_4	19.06	23.935	.830	.911
Attitudegreen_5	18.52	25.658	.774	.921

Table A11.1.8: Item-Total Statistics for 'attitude towards purchasing green products' construct

A test for reliability and validity was conducted for the constructs that were used to measure the moderators. The reliability of the constructs is measured using the Cronbach Alpha test for internal consistency. The *obtained* Cronbach Alpha values in table A11.1.9 indicate that the internal consistency values differ from the original values and the values obtained from the pilot study, but that the minimum required value of 0.7 (Nunnaly, 1978; DeVellis, 2003) is satisfied.

Constructs	Original Cronbach's Alpha	Cronbach's Alpha in pilot study	Obtained Cronbach's Alpha
Product expertise	0.900	0.958	0.906
Attitude towards purchasing 'green'	0.897 **	0.868	0,930
Price consciousness	0.780	0.864	0.804
Price-quality schema	0.780	0.766	0.878

** Construct to measure entrepreneurial intentions of Liñán and Chen (2009)
Table A11.1.9: Cronbach's Alpha values per construct

A11.2 Test for validity of the constructs

To decide between orthogonal and oblique rotation, an oblique rotation with the desired number of factors is requested. This yields the following output:

Component Correlation Matrix

Component	1	2	3	4
1	1.000	.001	.104	.141
2	.001	1.000	.057	.047
3	.104	.057	1.000	.088
4	.141	.047	.088	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

Table A11.2.1: Oblique rotation correlation matrix

As no factor correlation exceeds 0.32, the correlations are not driven by the data. Thus, the orthogonal rotation technique should be used (Tabachnik and Fidell, 2007).

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.828
Bartlett's Test of Sphericity	Approx. Chi-Square	4448.648
	df	105
	Sig.	.000

Table A11.2.2: KMO and Bartlett's test

Table A11.2.2 shows the KMO measure and Bartlett's Test of Sphericity. The Kaiser-Meyer-Olkin measure of sampling adequacy tests whether the partial correlation among variables are small. Bartlett's test of Sphericity tests if the correlation matrix is an identity matrix, which indicates that a factor model is inappropriate. The KMO value of 0.828 is greater than the threshold of 0.5, indicating that the results are suitable for a factor analysis. The observed significance of 0.000 for Bartlett's Test of Sphericity indicates that the strength of the relationship among variables is strong. Thus, it is a good idea to proceed a factor analysis for the data.

Pattern Matrix[a]		Component			
		1	2	3	4
Product expertise	Ik ben een leek op het gebied van stofzuigers/ Ik ben een expert op het gebied van stofzuigers	-0.005	0.891	0.023	0.026
	Ik ben onervaren met het kopen van stofzuigers/ Ik ben ervaren met het kopen van stofzuigers	0.045	0.866	-0.008	-0.038
	Ik heb zeer weinig kennis over stofzuigers/ Ik heb zeer veel kennis over stofzuigers	-0.010	0.881	0.024	0.047
	Ik ben ongeïnformeerd over stofzuigers/ Ik ben geïnformeerd over stofzuigers	-0.025	0.896	0.067	0.038
Attitude tow. purchasing green	Het kopen van 'groene' producten brengt mij voldoening	0.891	-0.005	0.039	0.071
	Wanneer ik de keuze heb uit een 'groen' product en een normaal product, gaat mijn voorkeur uit naar het groene product.	0.850	-0.030	0.008	0.077
	Ik zie het kopen van 'groene' producten als aantrekkelijk.	0.871	0.072	0.053	0.073
	Of een product 'groen' is, is een belangrijk aspect in mijn aankoopbeslissing.	0.894	0.069	0.014	0.029
	Wanneer ik de mogelijkheid en de middelen zou hebben, zou ik voor het 'groene' product kiezen.	0.899	-0.101	0.085	0.027
Price consc.	De tijd die nodig is om een lagere prijs te vinden is meestal de moeite waard.	0.054	0.036	0.882	0.041
	Het geld wat men bespaart met het vinden van een lagere prijs is de tijd en moeite waard.	0.060	0.014	0.914	0.022
	Ik ben bereid om extra inspanning te leveren om de laagste prijs te vinden.	0.035	0.042	0.885	0.046
Quality consc.	Het gezegde ''Je krijgt waar je voor betaalt'', is over het algemeen waar.	0.042	0.079	-0.019	0.850
	De prijs van een product vormt een indicator van de kwaliteit van het product.	0.049	0.023	0.062	0.840
	Over het algemeen geldt, hoe hoger de prijs van een product, hoe hoger de kwaliteit.	0.117	-0.042	0.064	0.842

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Table A11.2.3: PCA Varimax rotated matrix

The Principal Component Analysis with a Varimax rotation shows that the items load high (>0.5) on the expected constructs.

A12. Description of the sample

A12.1 Descriptives statistics

Gender		
	Men	56.3%
	Women	43.7%
Age		
	≤ 25	14.1%
	26-35	14.9%
	36-45	17.4%
	46-55	25.8%
	56-65	22.5%
	≥ 66	5.2%
Household composition		
	Single person	8.6%
	Shared house with students/ workers	6.5%
	Two person household	66.2%
	Two person household with child(ren)	36.8%
	Single person household with child(ren)	4.6%
Occupation		
	Student	12.3%
	Work ≤ 20 hours a week	12.5%
	Work >21 hours a week	52.8%
	Housewife/-man	8.8%
	Unemployed	5.3%
	Retired	8.2%
Familiarity with refurbishment		
	Yes, because I have heard from it before	45.2%
	Yes, because I have bought a refurbished product in the past	9.7%
	No, I am unfamiliar with refurbishment	45.1%
Time spent on cleaning		
	0-30 minutes	38.9%
	31-210 minutes	38.8%
	>210 minutes	22.3%
Time spent on vacuum cleaning		
	0-5 minutes	34.9%
	5-60 minutes	53.3%
	>60 minutes	11.8%

Table A12.1.1: Descriptive statistics

A12.2 Chi-square Goodness-of-fit test

Gender

	Observed N	Expected N	Residual
Male	268	235,6	32,4
Female	208	240,4	-32,4
Total	476		

Table A12.2.1: Goodness-of-fit test for gender

Test Statistics

	Gender
Chi-Square	8,812[a]
df	1
Asymp. Sig.	,003

a. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 235,6.

Age_six_categories

	Observed N	Expected N	Residual
1,00	67	72,9	-5,9
2,00	71	79,8	-8,8
3,00	83	75,4	7,6
4,00	123	98,2	24,8
5,00	107	75,9	31,1
6,00	25	73,9	-48,9
Total	476		

Test Statistics

	Age_six_cate gories
Chi-Square	53,611[a]
df	5
Asymp. Sig.	,000

a. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 72,9.

Table A12.2.2: Goodness-of-fit test for age

Estimations are retrieved from Centraal Bureau voor de Statistiek. It was expected that 49.5% of the sample would be male and 50.5% would be female. For age the following distribution was expected:

Age category	17-25	26-35	36-45	46-55	56-65	66-77
Distribution	15.31%	16.77%	15.84%	20.62%	15.94%	15.52%

Table A12.2.3: Expected distribution for age

A13. Latent Gold Choice output

A13.1 Assessment of model quality

File name:	M:\Thesis\Latent Gold Choice files\Excel and SPSS files\cbcRESP_dicho_age.sav
File size:	455038 bytes
File date:	2016-Apr-05 12:57:46 PM

		LL	BIC(LL)	AIC(LL)	AIC3(LL)	CAIC(LL)	Npar	L²	df	p-value	Class.Err.	R²(0)	R²
Model1	1-Class Choice	-8592.7703	17271.8564	17213.5405	17227.5405	17285.8564	14	17124.5436	462	1.2e-3259	0.0000	0.0949	0.0522
Model2	2-Class Choice	-6396.5821	13138.4276	12905.1642	12961.1642	13194.4276	56	12732.1672	420	3.7e-2366	0.0054	0.3668	0.3370
Model3	3-Class Choice	-5902.0952	12408.4013	12000.1904	12098.1904	12506.4013	98	11743.1934	378	1.3e-2189	0.0166	0.4356	0.4090
Model4	4-Class Choice	-5665.7566	12194.6717	11611.5132	11751.5132	12334.6717	140	11270.5163	336	7.5e-2122	0.0266	0.4782	0.4536
Model5	5-Class Choice	-5488.4113	12098.9286	11340.8225	11522.8225	12280.9286	182	10915.8256	294	1.6e-2079	0.0275	0.4956	0.4718
Model6	6-Class Choice	-5347.4411	12075.9357	11142.8821	11366.8821	12299.9357	224	10633.8852	252	2.1e-2053	0.0273	0.5134	0.4905
Model7	5-Class Choice	-5504.3956	12032.2505	11340.7911	11506.7911	12198.2505	166	10947.7942	310	8.6e-2074	0.0300	0.4957	0.4719
Model8	5-Class Choice												

Table A13.1.1: Model quality

The 5-class choice model is the best model according to the BIC, AIC and AIC3. As a formal assessment of whether the R2 obtained from the 5-class model provides a significant increase over the 4-class model, a Conditional Bootstrap is used where the p-value for the improvement is given.

			Bootstrap	
Log-likelihood Statistics		-2LL Diff	p-value	s.e.
Log-likelihood (LL)	-5488.4113	354.6907	0.0000	0.0000
Log-prior	-4.2505			
Log-posterior	-5492.6618			
BIC (based on LL)	12098.9286			
AIC (based on LL)	11340.8225			
AIC3 (based on LL)	11522.8225			
CAIC (based on LL)	12280.9286			

Since the estimated p-value is smaller than 0.05 (p=0.000 with an estimated standard error of 0.000 reported in the above figure), the improvement by going to a 5-class model is statistically significant.

A13.2 Assessment of the hit rates

Prediction Statistics
choice

Error Type	Baseline(0)	Baseline	Model	R²(0)	R²
Squared Error	0.6667	0.6367	0.6034	0.0949	0.0522
Minus Log-likelihood	1.0986	1.0559	1.0029	0.0871	0.0502
Absolute Error	1.3333	1.2732	1.2069	0.0948	0.0521
Prediction Error	0.6667	0.5256	0.4945	0.2582	0.0591

Prediction Table	Estimated			
Observed	1	2	3	Total
1	659.0	189.0	1476.0	2324.0
2	235.0	452.0	1492.0	2179.0
3	534.0	311.0	3220.0	4065.0
Total	1428.0	952.0	6188.0	8568.0

Table A13.2.1: Hit-rate of aggregate model

Prediction Statistics
choice

Error Type	Baseline(0)	Baseline	Model	R²(0)	R²
Squared Error	0.6667	0.6367	0.3479	0.4782	0.4536
Minus Log-likelihood	1.0986	1.0559	0.5901	0.4629	0.4412
Absolute Error	1.3333	1.2732	0.7105	0.4671	0.4420
Prediction Error	0.6667	0.5256	0.2543	0.6185	0.5161

Prediction Table	Estimated			
Observed	1	2	3	Total
1	1366.0	546.0	412.0	2324.0
2	437.0	1464.0	278.0	2179.0
3	269.0	237.0	3559.0	4065.0
Total	2072.0	2247.0	4249.0	8568.0

Table A13.2.2: Hit-rate of 4-class model

Prediction Statistics
choice

Error Type	Baseline(0)	Baseline	Model	R²(0)	R²
Squared Error	0.6667	0.6367	0.3363	0.4956	0.4718
Minus Log-likelihood	1.0986	1.0559	0.5626	0.4879	0.4671
Absolute Error	1.3333	1.2732	0.6843	0.4868	0.4625
Prediction Error	0.6667	0.5255	0.2532	0.6203	0.5183

Prediction Table	Estimated			
Observed	1	2	3	Total
1	1399.0	554.0	371.0	2324.0
2	463.0	1439.0	277.0	2179.0
3	249.0	255.0	3561.0	4065.0
Total	2111.0	2248.0	4209.0	8568.0

Table A13.2.3: Hit-rate of 5-class model

A13.3 Assessment of parameters, importance and profile aggregate model

Model for Choices						
	Class1	Overall				
R²	0.0522	0.0522				
R²(0)	0.0949	0.0949				
Attributes	Class1	Wald	p-value	Mean	Std.Dev.	z-value
price						
130e	0.3329	327.9325	6.2e-72	0.3329	0.0000	13.4796
170e	0.1502			0.1502	0.0000	6.0826
210e	-0.4831			-0.4831	0.0000	-17.5532
eec						
A-B	0.4694	445.8183	1.6e-97	0.4694	0.0000	19.0771
C-D	0.0299			0.0299	0.0000	1.2791
E-F	-0.4992			-0.4992	0.0000	-18.5798
warranty						
1 year	-0.1244	36.5152	1.2e-8	-0.1244	0.0000	-4.8171
2 year	-0.0296			-0.0296	0.0000	-1.2302
2 year + 5 year motorwarranty	0.1540			0.1540	0.0000	5.7679
comb						
Green	-0.0327	3.7865	0.15	-0.0327	0.0000	-1.3169
Costs	0.0456			0.0456	0.0000	1.8597
Quality	-0.0130			-0.0130	0.0000	-0.4921
pop						
Physical store	0.0145	88.9752	3.6e-19	0.0145	0.0000	0.4048
Philips online webshop	0.2300			0.2300	0.0000	7.9187
Independent refurbishment company	0.0007			0.0007	0.0000	0.0239
Second hand store	-0.2451			-0.2451	0.0000	-7.3330
condition						
Clearly visible user traces	-0.4251	275.5432	1.5e-60	-0.4251	0.0000	-16.3743
Slight, visible user traces	0.1288			0.1288	0.0000	5.2253
Like-new	0.2964			0.2964	0.0000	11.3266
none						
	0.6085	683.7806	1.0e-150	0.6085	0.0000	26.1492

Table A13.3.1: Part-worth estimates and p-value on an aggregate level

	Class1
Maximum	
price	0.8160
eec	0.9686
warranty	0.2784
comb	0.0783
pop	0.4751
condition	0.7215
none	0.6085
Relative	
price	0.2068
eec	0.2454
warranty	0.0705
comb	0.0198
pop	0.1204
condition	0.1828
none	0.1542

Table A13.3.2: Relative importance per attribute of aggregate model

	Class1
Class Size	1.0000
Attributes	
price	
130e	0.4395
170e	0.3661
210e	0.1944
eec	
A-B	0.4941
C-D	0.3184
E-F	0.1876
warranty	
1 year	0.2924
2 year	0.3214
2 year + 5 year motorwarranty	0.3862
comb	
Green	0.3224
Costs	0.3487
Quality	0.3289
pop	
Physical store	0.2501
Philips online webshop	0.3103
Independent refurbishment company	0.2467
Second hand store	0.1929
condition	
Clearly visible user traces	0.2084
Slight, visible user traces	0.3627
Like-new	0.4289
none	
0	0.3524
1	0.6476
Mean	0.6476
Covariates	
sex	
Male	0.5630
Female	0.4370
age	
25 years or younger	0.1429
26-35 years	0.1471
36-45 years	0.1807
46-55 years	0.2542
56-65 years	0.2206
66 years or older	0.0546
occup	
Student	0.1239
Working <21 hours a week	0.0987
Working 21 hours or more per week	0.5567
Housewife	0.0819
Unemployed	0.0525
Retired	0.0861
familiar	
Yes, I have heard from it before	0.4517
Yes, I have bought a refurbished product in the past	0.0966
No	0.4517

Household_recoded	
One person household	0.0861
Shared house with workers or students	0.0630
Two person household	0.6618
Two person household with child(ren) living at home	0.1429
One person household with child(ren) living at home	0.0462
productexpertise_cat	
0	0.3655
1	0.6345
priceconsciousness_cat	
0	0.6008
1	0.3992
qualityconsciousness_cat	
0	0.3803
1	0.6197
attitudegreen_cat	
0	0.5084
1	0.4916
Time_cleaning_class_3	
1	0.3887
2	0.3887
3	0.2227
Time_vacuumcleaning_class3	
1	0.3487
2	0.5336
3	0.1176

Table A13.3.3: Profile aggregate model

A13.4 Assessment of 5-class model

Model for Choices											
	Class1	Class2	Class3	Class4	Class5	Overall					
R²	0.3176	0.0265	0.0976	0.2183	0.4138	0.4718					
R²(0)	0.4452	0.9259	0.1008	0.3903	0.5629	0.4956					
Attributes	Class1	Class2	Class3	Class4	Class5	Wald	p-value	Wald(=)	p-value	Mean	Std.Dev.
price											
130e	0.6296	0.7186	0.3328	0.8270	0.2456	324.5440	9.9e-64	30.1293	0.00020	0.5948	0.1972
170e	0.0077	-0.3379	0.2543	0.2310	0.1213					0.0282	0.2308
210e	-0.6374	-0.3807	-0.5871	-1.0580	-0.3668					-0.6229	0.2370
eec											
A-B	2.1510	1.5672	0.4195	0.7470	-1.2055	730.5725	1.7e-150	374.3515	5.7e-76	1.0996	0.9328
C-D	0.0125	-1.1379	0.1907	0.1430	0.5283					-0.1695	0.5706
E-F	-2.1635	-0.4293	-0.6102	-0.8901	0.6772					-0.9300	0.8238
warranty											
1 year	-0.1139	-0.2462	-0.2962	-0.3630	-0.4278	74.2556	6.6e-12	12.9217	0.11	-0.2587	0.1005
2 year	0.0021	-0.1031	-0.0147	-0.1767	0.0464					-0.0587	0.0734
2 year + 5 year motorwarranty	0.1118	0.3493	0.3109	0.5397	0.3814					0.3174	0.1454
comb											
Green	-0.2666	0.1499	-0.2060	-0.1907	-0.3794	48.0411	6.1e-7	9.2379	0.32	-0.1437	0.1755
Costs	0.0548	-1.0465	0.1020	0.0564	0.0891					-0.2051	0.4837
Quality	0.2117	0.8966	0.1040	0.1343	0.2903					0.3488	0.3191
pop											
Physical store	0.2981	0.9006	0.1692	0.1939	0.0460	206.6320	9.5e-36	33.5506	0.00079	0.3800	0.3064
Philips online webshop	0.5952	0.2687	0.4248	0.2517	0.2756					0.3864	0.1401
Independent refurbishment company	-0.3492	-0.2434	-0.0493	-0.1108	0.4537					-0.1502	0.2062
Second hand store	-0.5441	-0.9258	-0.5447	-0.3349	-0.7753					-0.6161	0.2083
condition											
Clearly visible user traces	-0.9164	-0.6190	-0.7379	-0.5206	-0.5215	418.8769	9.0e-84	28.6604	0.00036	-0.6973	0.1510
Slight, visible user traces	0.0388	0.0265	0.1362	0.0925	0.3818					0.0935	0.0925
Like-new	0.8776	0.5925	0.6016	0.4281	0.1397					0.6038	0.2045
none											
	1.7781	5.1114	-0.2658	-3.4345	-2.9776	749.9612	7.7e-160	669.5798	1.3e-143	0.7929	3.1033

Table A13.4.1: Part-worth estimates and p-value five-class model

Model for Choices													
	Class1		Class2		Class3		Class4		Class5		Overall		
R²	0.3176		0.0265		0.0976		0.2183		0.4138		0.4718		
R²(0)	0.4452		0.9259		0.1008		0.3903		0.5629		0.4956		
Attributes	Class1	z-value	Class2	z-value	Class3	z-value	Class4	z-value	Class5	z-value	Mean	Std.Dev.
price												
130e	0.6296	7.8767	0.7186	2.5232	0.3328	6.1697	0.8270	8.1977	0.2456	1.5878	0.5948	0.1972
170e	0.0077	0.0918	-0.3379	-1.0845	0.2543	5.1824	0.2310	4.4092	0.1213	1.1239	0.0282	0.2308
210e	-0.6374	-7.8306	-0.3807	-1.1893	-0.5871	-9.8592	-1.0580	-8.6445	-0.3668	-2.3602	-0.6229	0.2370
eec												
A-B	2.1510	18.9530	1.5672	4.0267	0.4195	6.4060	0.7470	6.9355	-1.2055	-6.5429	1.0996	0.9328
C-D	0.0125	0.1189	-1.1379	-2.3319	0.1907	4.0854	0.1430	2.7982	0.5283	4.3239	-0.1695	0.5706
E-F	-2.1635	-12.0493	-0.4293	-1.2239	-0.6102	-9.1101	-0.8901	-7.7012	0.6772	4.0088	-0.9300	0.8238
warranty												
1 year	-0.1139	-1.2942	-0.2462	-0.8896	-0.2962	-5.0991	-0.3630	-3.5921	-0.4278	-2.5476	-0.2587	0.1005
2 year	0.0021	0.0256	-0.1031	-0.3264	-0.0147	-0.3126	-0.1767	-3.2496	0.0464	0.4442	-0.0587	0.0734
2 year + 5 year motorwarranty	0.1118	1.2498	0.3493	1.2011	0.3109	5.2436	0.5397	4.3276	0.3814	2.5520	0.3174	0.1454
comb												
Green	-0.2666	-3.3765	0.1499	0.5196	-0.2060	-3.9135	-0.1907	-1.9211	-0.3794	-1.9676	-0.1437	0.1755
Costs	0.0548	0.5661	-1.0465	-2.4059	0.1020	2.1180	0.0564	1.0263	0.0891	0.9860	-0.2051	0.4837
Quality	0.2117	2.4082	0.8966	2.8748	0.1040	1.9364	0.1343	1.3416	0.2903	1.5893	0.3488	0.3191
pop												
Physical store	0.2981	2.1614	0.9006	2.0679	0.1692	2.2460	0.1939	1.5601	0.0460	0.1870	0.3800	0.3064
Philips online webshop	0.5952	6.4820	0.2687	0.8204	0.4248	7.1206	0.2517	3.1680	0.2756	1.9554	0.3864	0.1401
Independent refurbishment company	-0.3492	-3.3883	-0.2434	-0.6166	-0.0493	-0.7846	-0.1108	-1.5288	0.4537	2.7400	-0.1502	0.2062
Second hand store	-0.5441	-4.5818	-0.9258	-2.2485	-0.5447	-7.2588	-0.3349	-2.6039	-0.7753	-3.2947	-0.6161	0.2083
condition												
Clearly visible user traces	-0.9164	-10.6577	-0.6190	-2.1439	-0.7379	-12.5117	-0.5206	-4.9558	-0.5215	-2.8974	-0.6973	0.1510
Slight, visible user traces	0.0388	0.4557	0.0265	0.0825	0.1362	2.7110	0.0925	1.6711	0.3818	3.4912	0.0935	0.0925
Like-new	0.8776	10.7395	0.5925	2.0792	0.6016	10.7206	0.4281	3.9295	0.1397	0.8811	0.6038	0.2045
none												
	1.7781	18.4700	5.1114	11.8588	-0.2658	-3.3546	-3.4345	-11.4179	-2.9776	-8.9404	0.7929	3.1033

Table A13.4.2: Z-values five-class model

A13.5 Re-estimated (final) 5-class model

Prediction Statistics

choice

Error Type	Baseline(0)	Baseline	Model	R²(0)	R²
Squared Error	0.6667	0.6367	0.3362	0.4957	0.4719
Minus Log-likelihood	1.0986	1.0559	0.5640	0.4866	0.4658
Absolute Error	1.3333	1.2732	0.6853	0.4860	0.4618
Prediction Error	0.6667	0.5255	0.2514	0.6229	0.5216

Prediction Table	Estimated			
Observed	1	2	3	Total
1	1396.0	556.0	372.0	2324.0
2	460.0	1438.0	281.0	2179.0
3	240.0	245.0	3580.0	4065.0
Total	2096.0	2239.0	4233.0	8568.0

Table A13.5.1: Hit-rate of re-estimated five-class model

Model for Choices

	Class1	Class2	Class3	Class4	Class5	Overall
R²	0.3142	0.0174	0.0983	0.2127	0.4229	0.4719
R²(0)	0.4442	0.9168	0.1034	0.3887	0.5697	0.4957

Attributes	Class1	Class2	Class3	Class4	Class5	Wald	p-value	Wald(=)	p-value	Mean	Std.Dev.
price											
130e	0.5583	0.5396	0.3306	0.7936	0.1397	401.5122	4.5e-80	53.3660	9.2e-9	0.5164	0.1825
170e	0.0806	0.0271	0.2568	0.1875	0.1394					0.1313	0.0868
210e	-0.6389	-0.5667	-0.5874	-0.9811	-0.2791					-0.6476	0.1831
eec											
A-B	2.1518	1.3608	0.4488	0.6595	-1.3188	891.7117	3.9e-185	387.3516	9.5e-79	1.0328	0.9286
C-D	-0.1021	-1.2482	0.1952	0.1618	0.4878					-0.2306	0.6106
E-F	-2.0498	-0.1126	-0.6441	-0.8213	0.8310					-0.8022	0.8526
warranty											
1 year	-0.2737	-0.2737	-0.2737	-0.2737	-0.2737	90.1473	2.7e-20	0.0000	.	-0.2737	0.0000
2 year	-0.0614	-0.0614	-0.0614	-0.0614	-0.0614					-0.0614	0.0000
2 year + 5 year motorwarranty	0.3351	0.3351	0.3351	0.3351	0.3351					0.3351	0.0000
comb											
Green	-0.1906	-0.1906	-0.1906	-0.1906	-0.1906	31.0134	1.8e-7	0.0000	.	-0.1906	0.0000
Costs	0.0669	0.0669	0.0669	0.0669	0.0669					0.0669	0.0000
Quality	0.1237	0.1237	0.1237	0.1237	0.1237					0.1237	0.0000
pop											
Physical store	0.3716	0.2794	0.1946	0.1646	-0.0986	211.4585	9.9e-37	44.0855	1.5e-5	0.2349	0.1218
Philips online webshop	0.5835	0.1115	0.4182	0.2203	0.2454					0.3339	0.1826
Independent refurbishment company	-0.3944	-0.1057	-0.0616	-0.1096	0.4681					-0.1297	0.2139
Second hand store	-0.5608	-0.2852	-0.5512	-0.2752	-0.6149					-0.4391	0.1414
condition											
Clearly visible user traces	-0.9603	-0.4743	-0.7456	-0.4486	-0.4121	482.1136	2.9e-97	57.8547	1.2e-9	-0.6525	0.2163
Slight, visible user traces	0.0530	-0.2589	0.1439	0.0935	0.3702					0.0258	0.1825
Like-new	0.9073	0.7332	0.6017	0.3551	0.0419					0.6266	0.2502
none											
	1.7351	4.6854	-0.3315	-3.4588	-2.9358	793.3321	3.2e-169	762.6574	9.4e-164	0.6865	2.9608

Table A13.5.2: Part-worth estimates and p-value re-estimated five-class model

Model for Choices	Class1		Class2		Class3		Class4		Class5		Overall	
R²	0.3142		0.0174		0.0983		0.2127		0.4229		0.4719	
R²(0)	0.4442		0.9168		0.1034		0.3887		0.5697		0.4957	
Attributes	Class1	z-value	Class2	z-value	Class3	z-value	Class4	z-value	Class5	z-value	Mean	Std.Dev.
price												
130e	0.5583	7.6587	0.5396	2.3820	0.3396	6.4973	0.7936	11.4755	0.1397	1.2964	0.5164	0.1825
170e	0.0806	1.0001	0.0271	0.1099	0.2568	5.4542	0.1875	4.1036	0.1394	1.2354	0.1313	0.0868
210e	-0.6389	-7.9591	-0.5667	-1.9536	-0.5874	-10.6483	-0.9811	-13.6020	-0.2791	-2.0476	-0.6476	0.1831
eec												
A-B	2.1518	19.7609	1.3608	4.3464	0.4488	6.9965	0.6595	9.3792	-1.3188	-5.0633	1.0328	0.9286
C-D	-0.1021	-1.0822	-1.2482	-2.7823	0.1952	4.1886	0.1618	3.2406	0.4878	3.4096	-0.2306	0.6106
E-F	-2.0498	-12.6226	-0.1126	-0.3890	-0.6441	-10.1077	-0.8213	-10.2962	0.8310	4.9658	-0.8022	0.8526
warranty												
1 year	-0.2737	-7.9531	-0.2737	-7.9531	-0.2737	-7.9531	-0.2737	-7.9531	-0.2737	-7.9531	-0.2737	0.0000
2 year	-0.0614	-2.1576	-0.0614	-2.1576	-0.0614	-2.1576	-0.0614	-2.1576	-0.0614	-2.1576	-0.0614	0.0000
2 year + 5 year motorwarranty	0.3351	9.2057	0.3351	9.2057	0.3351	9.2057	0.3351	9.2057	0.3351	9.2057	0.3351	0.0000
comb												
Green	-0.1906	-5.5684	-0.1906	-5.5684	-0.1906	-5.5684	-0.1906	-5.5684	-0.1906	-5.5684	-0.1906	0.0000
Costs	0.0669	2.1985	0.0669	2.1985	0.0669	2.1985	0.0669	2.1985	0.0669	2.1985	0.0669	0.0000
Quality	0.1237	3.5012	0.1237	3.5012	0.1237	3.5012	0.1237	3.5012	0.1237	3.5012	0.1237	0.0000
pop												
Physical store	0.3716	3.6828	0.2794	1.0049	0.1946	2.7308	0.1646	2.0079	-0.0986	-0.5028	0.2349	0.1218
Philips online webshop	0.5835	6.7436	0.1115	0.4675	0.4182	7.1368	0.2203	3.2395	0.2454	1.7944	0.3339	0.1826
Independent refurbishment company	-0.3944	-4.0517	-0.1057	-0.3312	-0.0816	-0.9825	-0.1096	-1.7038	0.4681	2.9371	-0.1297	0.2139
Second hand store	-0.5608	-5.3547	-0.2852	-0.9903	-0.5512	-7.6776	-0.2752	-3.6466	-0.6149	-3.9339	-0.4391	0.1414
condition												
Clearly visible user traces	-0.9603	-12.3654	-0.4743	-1.8985	-0.7456	-13.3292	-0.4486	-7.2714	-0.4121	-2.8424	-0.6525	0.2163
Slight, visible user traces	0.0530	0.6381	-0.2589	-0.9463	0.1439	2.9073	0.0935	1.6927	0.3702	3.2868	0.0258	0.1825
Like-new	0.9073	11.3826	0.7332	3.1104	0.6017	11.0206	0.3551	4.8223	0.0419	0.3163	0.6266	0.2502
none												
	1.7351	17.7513	4.6854	14.6643	-0.3315	-4.1834	-3.4588	-13.6560	-2.9358	-8.0140	0.8865	2.9688

Table A13.5.3: Z-values re-estimated five-class model

Attributes	Segment one		Segment two		Segment three		Segment four		Segment five	
Price	Part-worth	Importance	Part-worth	Importance	Part-worth	Importance	Part-worth	Importance	Part-worth	Importance
€130,-	0.5583	10.82%	0.5396	9.97%	0.3306	16.44%	0.7936	19.86%	0.1397	5.05%
€170,-	0.0806		0.0271		0.2568		0.1875		0.1394	
€210,-	-0.6389		-0.5667		-0.5874		-0.9811		-0.2791	
EEC										
A-B	2.1518	37.96%	1.3608	23.51%	0.4488	19.58%	0.6595	16.57%	-1.3188	25.92%
C-D	-0.1021		-1.2482		0.1952		0.1618		0.4878	
E-F	-2.0498		-0.1126		-0.6441		-0.8213		0.8310	
Warranty										
1 year	-0.2737	5.50%	-0.2737	5.49%	-0.2737	10.91%	-0.2737	6.81%	-0.2737	7.34%
2 years	-0.0614		-0.0614		-0.0614		-0.0614		-0.0614	
2+5 year motor warranty	0.3351		0.3351		0.3351		0.3351		0.3351	
Type of information provided										
Environmental benefits	-0.1906	2.84%	-0.1906	2.83%	-0.1906	5.63%%	-0.1906	3.52%	-0.1906	3.79%
Financial benefits	0.0669		0.0669		0.0669		0.0669		0.0669	
Equivalent quality	0.1237		0.1237		0.1237		0.1237		0.1237	
Point of purchase										
Physical store	0.3716	10.34%	0.2794	5.09%	0.1946	17.37%	0.1646	5.54%	-0.5028	13.06%
Philips online webshop	0.5835		0.1115		0.4182		0.2203		0.2454	
Specialized refurbishment firm	-0.3944		-0.1057		-0.0616		0.1096		0.4681	
Second-hand store	-0.5608		-0.2851		-0.5512		-0.2752		-0.6149	
Cosmetic condition										
Clearly visible traces	-0.9603	16.87%	-0.4743	10.88%	-0.7456	24.13%	-0.4486	8.99%	-0.4121	9.42%
Slightly visible traces	0.0530		-0.2589		0.1439		0.0935		0.3702	
Like-new condition	0.9073		0.7332		0.6017		0.3551		0.0419	
New	1.7351	15.68%	4.6854	42.23%	-0.3315	5.94%	-3.4588	38.70%%	-2.9358	35.40%

The underlined part-worths are insignificant at the 95% confidence level

A13.5.4: Segment part-wort estimates

Model for Classes							
Intercept	Class1	Class2	Class3	Class4	Class5	Wald	p-value
	0.0333	-0.1009	0.6263	-0.0776	-0.4811	2.5588	0.63
Covariates	Class1	Class2	Class3	Class4	Class5	Wald	p-value
sex							
Male	0.0933	0.2821	-0.0697	0.0344	-0.3402	6.4897	0.17
Female	-0.0933	-0.2821	0.0697	-0.0344	0.3402		
age							
25 years or younger	0.4406	-0.9118	0.8932	0.7192	-1.1412	30.9166	0.056
26-35 years	-0.1779	-0.6823	0.2976	0.4189	0.1436		
36-45 years	-0.2241	0.4380	-0.1061	-0.6962	0.5885		
46-55 years	-0.4448	0.0132	-0.1918	-0.3438	0.9673		
56-65 years	-0.7927	0.4444	0.1256	-0.0891	0.3118		
66 years or older	1.1989	0.6985	-1.0185	-0.0090	-0.8699		
occup							
Student	-0.6569	0.3923	-0.1996	0.1360	0.3282	24.2111	0.23
Working <21 hours a week	0.6177	-0.2483	0.1953	-0.0490	-0.5157		
Working 21 hours or more per week	0.9208	-0.0947	-0.0078	-0.3272	-0.4911		
Housewife	0.0443	0.0364	0.1664	-0.4267	0.1796		
Unemployed	0.2514	0.1365	-0.1858	-0.2355	0.0333		
Retired	-1.1774	-0.2221	0.0316	0.9024	0.4655		
familiar							
Yes, I have heard from it before	-0.1117	0.5365	-0.0752	-0.3892	0.0397	14.3837	0.072
Yes, I have bought a refurbished product in the past	-0.0066	-0.9550	0.4486	0.2335	0.2795		
No	0.1183	0.4186	-0.3734	0.1557	-0.3192		
Household_recoded							
One person household	0.3064	-0.0551	-0.2944	-0.2144	0.2575	25.6420	0.059
Shared house with workers or students	-0.0614	0.1769	-0.5146	0.6080	-0.2089		
Two person household	-0.2012	0.3685	0.0461	0.3224	-0.5357		
Two person household with child(ren) living at home	0.6056	-0.2237	-0.2598	-0.2477	0.1256		
One person household with child(ren) living at home	-0.6494	-0.2665	1.0226	-0.4683	0.3615		
productexpertise_cat							
0	-0.1682	-0.2801	0.1941	0.2679	-0.0138	11.9187	0.018
1	0.1682	0.2801	-0.1941	-0.2679	0.0138		
priceconsciousness_cat							
0	-0.0024	0.0730	0.2208	-0.4284	0.1370	14.3227	0.0063
1	0.0024	-0.0730	-0.2208	0.4284	-0.1370		
qualityconsciousness_cat							
0	-0.0057	-0.3484	0.1363	0.2342	-0.0165	12.8222	0.012
1	0.0057	0.3484	-0.1363	-0.2342	0.0165		
attitudegreen_cat							
0	-0.6321	-0.0539	0.2358	-0.2906	0.7408	34.6241	5.5e-7
1	0.6321	0.0539	-0.2358	0.2906	-0.7408		
Time_cleaning_class_3							
1	0.5180	0.1103	-0.4319	-0.0746	-0.1218	9.7390	0.28
2	0.0325	-0.1650	0.2722	0.1209	-0.2606		
3	-0.5505	0.0547	0.1597	-0.0463	0.3824		
Time_vacuumcleaning_class3							
1	-0.5910	-0.0238	0.2087	0.0890	0.3171	7.4055	0.49
2	-0.1256	-0.0395	0.1695	-0.1586	0.1542		
3	0.7166	0.0633	-0.3782	0.0696	-0.4713		

Table A13.5.5: Part-worth estimates and p-values covariates

	Class1	Class2	Class3	Class4	Class5
Maximum					
price	1.1972	1.1063	0.9179	1.7746	0.4188
eec	4.2016	2.6090	1.0929	1.4809	2.1498
warranty	0.6088	0.6088	0.6088	0.6088	0.6088
comb	0.3143	0.3143	0.3143	0.3143	0.3143
pop	1.1443	0.5645	0.9694	0.4955	1.0830
condition	1.8676	1.2074	1.3472	0.8037	0.7824
none	1.7351	4.6854	0.3315	3.4588	2.9358
Relative					
price	0.1082	0.0997	0.1644	0.1986	0.0505
eec	0.3796	0.2351	0.1958	0.1657	0.2592
warranty	0.0550	0.0549	0.1091	0.0681	0.0734
comb	0.0284	0.0283	0.0563	0.0352	0.0379
pop	0.1034	0.0509	0.1737	0.0554	0.1306
condition	0.1687	0.1088	0.2413	0.0899	0.0943
none	0.1568	0.4223	0.0594	0.3870	0.3540

Table A13.5.6: Importance of attributes for re-estimated five-class model

	Class1	Class2	Class3	Class4	Class5
Class Size	0.2608	0.2518	0.2245	0.1896	0.0734
Attributes					
price					
130e	0.5202	0.5182	0.4295	0.5831	0.3763
170e	0.3227	0.3104	0.3990	0.3181	0.3762
210e	0.1571	0.1714	0.1715	0.0989	0.2475
eec					
A-B	0.8929	0.7676	0.4737	0.5448	0.0638
C-D	0.0937	0.0565	0.3676	0.3312	0.3886
E-F	0.0134	0.1759	0.1588	0.1239	0.5476
warranty					
1 year	0.2454	0.2454	0.2454	0.2454	0.2454
2 year	0.3035	0.3035	0.3035	0.3035	0.3035
2 year + 5 year motorwarranty	0.4511	0.4511	0.4511	0.4511	0.4511
comb					
Green	0.2730	0.2730	0.2730	0.2730	0.2730
Costs	0.3532	0.3532	0.3532	0.3532	0.3532
Quality	0.3738	0.3738	0.3738	0.3738	0.3738
pop					
Physical store	0.3231	0.3232	0.2858	0.2889	0.2096
Philips online webshop	0.3994	0.2732	0.3574	0.3054	0.2957
Independent refurbishment company	0.1502	0.2199	0.2212	0.2196	0.3695
Second hand store	0.1272	0.1838	0.1356	0.1861	0.1251
condition					
Clearly visible user traces	0.0978	0.1790	0.1374	0.2019	0.2100
Slight, visible user traces	0.2694	0.2221	0.3343	0.3472	0.4593
Like-new	0.6329	0.5989	0.5284	0.4509	0.3307
none					
0	0.1499	0.0091	0.5821	0.9695	0.9496
1	0.8501	0.9909	0.4179	0.0305	0.0504
Mean	0.8501	0.9909	0.4179	0.0305	0.0504
Covariates					
sex					
Male	0.6028	0.6738	0.4937	0.5213	0.3606
Female	0.3972	0.3262	0.5063	0.4787	0.6394
age					
25 years or younger	0.1189	0.0496	0.2275	0.2356	0.0493
26-35 years	0.1832	0.0752	0.1601	0.2000	0.0883
36-45 years	0.2046	0.2412	0.1691	0.0757	0.1945
46-55 years	0.2952	0.2593	0.2113	0.1852	0.4012
56-65 years	0.1587	0.3079	0.2123	0.1929	0.2381
66 years or older	0.0396	0.0667	0.0197	0.1106	0.0287
occup					
Student	0.0713	0.0583	0.1783	0.2371	0.0779
Working <21 hours a week	0.0957	0.0755	0.1147	0.0982	0.1421
Working 21 hours or more per week	0.7017	0.6001	0.5175	0.3835	0.4597
Housewife	0.0524	0.1086	0.0913	0.0512	0.1465
Unemployed	0.0391	0.0575	0.0493	0.0546	0.0880
Retired	0.0399	0.1001	0.0489	0.1755	0.0857
familiar					
Yes, I have heard from it before	0.4601	0.5236	0.4634	0.3585	0.3795
Yes, I have bought a refurbished product in the past	0.0919	0.0259	0.1471	0.1338	0.1061
No	0.4481	0.4505	0.3895	0.5076	0.5144

Household_recoded					
One person household	0.0899	0.0659	0.0855	0.0876	0.1405
Shared house with workers or students	0.0327	0.0333	0.0745	0.1439	0.0288
Two person household	0.6467	0.7733	0.6103	0.6474	0.5266
Two person household with child(ren) living at home	0.2079	0.1025	0.1310	0.0997	0.1983
One person household with child(ren) living at home	0.0229	0.0250	0.0986	0.0214	0.1058
productexpertise_cat					
0	0.3150	0.2225	0.4714	0.5138	0.3289
1	0.6850	0.7775	0.5286	0.4862	0.6711
priceconsciousness_cat					
0	0.6076	0.6228	0.6861	0.4562	0.6146
1	0.3924	0.3772	0.3139	0.5438	0.3854
qualityconsciousness_cat					
0	0.3527	0.2815	0.4422	0.4590	0.4246
1	0.6473	0.7185	0.5578	0.5410	0.5754
attitudegreen_cat					
0	0.3118	0.5287	0.6553	0.4542	0.8296
1	0.6882	0.4713	0.3447	0.5458	0.1704
Time_cleaning_class_3					
1	0.4349	0.4548	0.2735	0.3728	0.3904
2	0.3923	0.2964	0.4995	0.4122	0.2918
3	0.1728	0.2488	0.2270	0.2150	0.3178
Time_vacuumcleaning_class3					
1	0.3785	0.3984	0.2538	0.3523	0.3542
2	0.4947	0.4606	0.6589	0.5403	0.5219
3	0.1269	0.1410	0.0873	0.1074	0.1239

Table A13.5.7: Profile re-estimated five-class model

	Class1	Class2	Class3	Class4	Class5
Overall	0.2608	0.2518	0.2245	0.1896	0.0734
Attributes					
price					
130e	0.2709	0.2606	0.1926	0.2208	0.0551
170e	0.2476	0.2300	0.2636	0.1775	0.0812
210e	0.2568	0.2705	0.2413	0.1175	0.1138
eec					
A-B	0.3636	0.3018	0.1660	0.1613	0.0073
C-D	0.1150	0.0669	0.3883	0.2956	0.1342
E-F	0.0237	0.3011	0.2423	0.1597	0.2732
warranty					
1 year	0.2608	0.2518	0.2245	0.1896	0.0734
2 year	0.2608	0.2518	0.2245	0.1896	0.0734
2 year + 5 year motorwarranty	0.2608	0.2518	0.2245	0.1896	0.0734
comb					
Green	0.2608	0.2518	0.2245	0.1896	0.0734
Costs	0.2608	0.2518	0.2245	0.1896	0.0734
Quality	0.2608	0.2518	0.2245	0.1896	0.0734
pop					
Physical store	0.2809	0.2713	0.2139	0.1826	0.0513
Philips online webshop	0.3130	0.2067	0.2411	0.1740	0.0652
Independent refurbishment company	0.1840	0.2600	0.2332	0.1955	0.1273
Second hand store	0.2149	0.2998	0.1972	0.2286	0.0595
condition					
Clearly visible user traces	0.1644	0.2907	0.1988	0.2468	0.0994
Slight, visible user traces	0.2336	0.1859	0.2495	0.2189	0.1120
Like-new	0.3032	0.2771	0.2179	0.1571	0.0446
none					
0	0.0919	0.0054	0.3071	0.4320	0.1637
1	0.3859	0.4343	0.1633	0.0101	0.0064
Covariates					
sex					
Male	0.2792	0.3014	0.1969	0.1756	0.0470
Female	0.2370	0.1879	0.2601	0.2077	0.1073
age					
25 years or younger	0.2170	0.0875	0.3575	0.3127	0.0253
26-35 years	0.3248	0.1288	0.2444	0.2580	0.0441
36-45 years	0.2953	0.3362	0.2101	0.0794	0.0790
46-55 years	0.3028	0.2568	0.1866	0.1381	0.1158
56-65 years	0.1875	0.3514	0.2160	0.1658	0.0792
66 years or older	0.1889	0.3075	0.0810	0.3841	0.0385
occup					
Student	0.1499	0.1184	0.3229	0.3626	0.0461
Working <21 hours a week	0.2527	0.1924	0.2608	0.1885	0.1056
Working 21 hours or more per week	0.3287	0.2714	0.2087	0.1306	0.0606
Housewife	0.1668	0.3336	0.2501	0.1184	0.1312
Unemployed	0.1939	0.2755	0.2108	0.1969	0.1229
Retired	0.1207	0.2925	0.1273	0.3864	0.0730
familiar					
Yes, I have heard from it before	0.2656	0.2919	0.2303	0.1505	0.0616
Yes, I have bought a refurbished product in the past	0.2478	0.0675	0.3416	0.2625	0.0806
No	0.2587	0.2511	0.1936	0.2131	0.0836

Household_recoded					
One person household	0.2720	0.1927	0.2228	0.1929	0.1197
Shared house with workers or students	0.1353	0.1329	0.2654	0.4328	0.0336
Two person household	0.2548	0.2942	0.2070	0.1855	0.0584
Two person household with child(ren) living at home	0.3794	0.1806	0.2059	0.1323	0.1018
One person household with child(ren) living at home	0.1290	0.1364	0.4789	0.0877	0.1679
productexpertise_cat					
0	0.2247	0.1533	0.2895	0.2665	0.0660
1	0.2815	0.3086	0.1870	0.1453	0.0776
priceconsciousness_cat					
0	0.2637	0.2610	0.2563	0.1440	0.0750
1	0.2563	0.2380	0.1765	0.2583	0.0708
qualityconsciousness_cat					
0	0.2418	0.1864	0.2610	0.2288	0.0819
1	0.2724	0.2919	0.2020	0.1655	0.0681
attitudegreen_cat					
0	0.1599	0.2618	0.2893	0.1694	0.1197
1	0.3651	0.2415	0.1574	0.2105	0.0254
Time_cleaning_class_3					
1	0.2918	0.2946	0.1580	0.1819	0.0737
2	0.2632	0.1920	0.2885	0.2011	0.0551
3	0.2023	0.2813	0.2287	0.1830	0.1047
Time_vacuumcleaning_class3					
1	0.2830	0.2876	0.1634	0.1915	0.0745
2	0.2417	0.2173	0.2772	0.1920	0.0718
3	0.2812	0.3019	0.1666	0.1731	0.0773

Table A13.5.8: Probmeans re-estimated five-class model

A13.6 Assessment of quality of the model

File name:	M:\Thesis\Latent Gold Choice files\Excel and SPSS files\cbcRESP_dicho_age.sav											
File size:	455038 bytes											
File date:	2016-Apr-05 12:57:46 PM											
		LL	BIC(LL)	AIC(LL)	AIC3(LL)	CAIC(LL)	Npar	L²	BIC(L²)	df	p-value	Class.Err.	R²(0)	R²
Model1	1-Class Choice	-8592.7703	17271.8564	17213.5405	17227.5405	17285.8564	14	17124.5436	14276.1205	462	1.2e-3259	0.0000	0.0949	0.0522
Model2	2-Class Choice	-6396.5821	13138.4276	12905.1642	12961.1642	13194.4276	56	12732.1672	10142.6917	420	3.7e-2366	0.0054	0.3668	0.3370
Model3	3-Class Choice	-5902.0952	12408.4013	12000.1904	12096.1904	12506.4013	98	11743.1934	9412.6655	378	1.3e-2189	0.0166	0.4356	0.4090
Model4	4-Class Choice	-5665.7566	12194.6717	11611.5132	11751.5132	12334.6717	140	11270.5163	9196.9359	336	7.5e-2122	0.0266	0.4782	0.4536
Model5	5-Class Choice	-5488.4113	12096.9286	11340.8225	11522.8225	12280.9286	182	10915.8256	9103.1927	294	1.6e-2079	0.0275	0.4956	0.4718
Model6	6-Class Choice	-5347.4411	12075.9357	11142.8821	11366.8821	12299.9357	224	10633.8852	9660.1999	252	2.1e-2053	0.0273	0.5134	0.4905
Final five class model	5-Class Choice	-5504.3958	12032.2505	11340.7911	11506.7911	12198.2505	166	10947.7942	9636.5147	310	8.6e-2074	0.0300	0.4957	0.4719
Model4Boot	4-Class Choice	-5665.7566	12194.6717	11611.5132	11751.5132	12334.6717	140	11270.5163	9196.9359	336	7.5e-2122	0.0266	0.4782	0.4536
Model5Boot	5-Class Choice	-5488.4113	12096.9286	11340.8225	11522.8225	12280.9286	182	10915.8256	9103.1927	294	1.6e-2079	0.0275	0.4956	0.4718

Table A13.6.1: Model quality

14. Analysis in CBC-HB

A14.1 Working method CBC-HB

CBC-HB requires that two files are created; one with respondents' demographics and one with the choices that respondents made (figure A14.1.1).

CASEID	Task.	Concept.	Att1	Att2	Att3	Att4	Att5	Att6	Response
1	1	1	1	3	3	1	4	3	1
1	1	2	2	1	1	3	3	1	0
1	1	3	0	0	0	0	0	0	0
1	2	1	3	3	3	2	4	3	1
1	2	2	2	2	2	1	2	1	0
1	2	3	0	0	0	0	0	0	0
1	3	1	3	2	2	2	1	3	1
1	3	2	1	1	3	3	4	2	0
476	16	1	3	2	3	3	2	3	0
476	16	2	1	1	2	2	1	2	1
476	16	3	0	0	0	0	0	0	0
476	17	1	3	1	2	1	2	3	1
476	17	2	1	2	1	3	4	2	0
476	17	3	0	0	0	0	0	0	0
476	18	1	1	1	3	1	3	1	1
476	18	2	2	3	2	3	2	3	0
476	18	3	0	0	0	0	0	0	0

Figure A14.1.1: Data file for CBC-HB analysis

```
Build Report

CBC/HB Build Process (12-4-2016 21:00:16)
====================================================
Data File: C:\Users\Manon\Dropbox\Master Tilburg University\Latent Gold and SPSS\Sawtooth CBC-HB\Compleet
\Final_CBC_476.csv

Attribute              Coding          Levels
----------------------------------------------------
Price                  Part Worth      3
Energy efficiency cl   Part Worth      3
Warranty               Part Worth      3
Information provided   Part Worth      3
Point of purchase      Part Worth      4
Cosmetic condition     Part Worth      3

The number of parameters to be estimated (including 'None') is 14.

All tasks are included in estimation.

Build includes 476 respondents.


Total number of choices in each response category:
Concept     Number  Percent
----------------------------------------------------
      1     2325,0   27,14%
      2     2178,0   25,42%
   NONE     4065,0   47,44%

There are 8568 expanded tasks in total, or an average of 18,0 tasks per respondent.

The build file 'C:\Users\Manon\AppData\Local\Temp\tmp1601.tmp' was built successfully.
```

[Continue with estimation] [Do not estimate now]
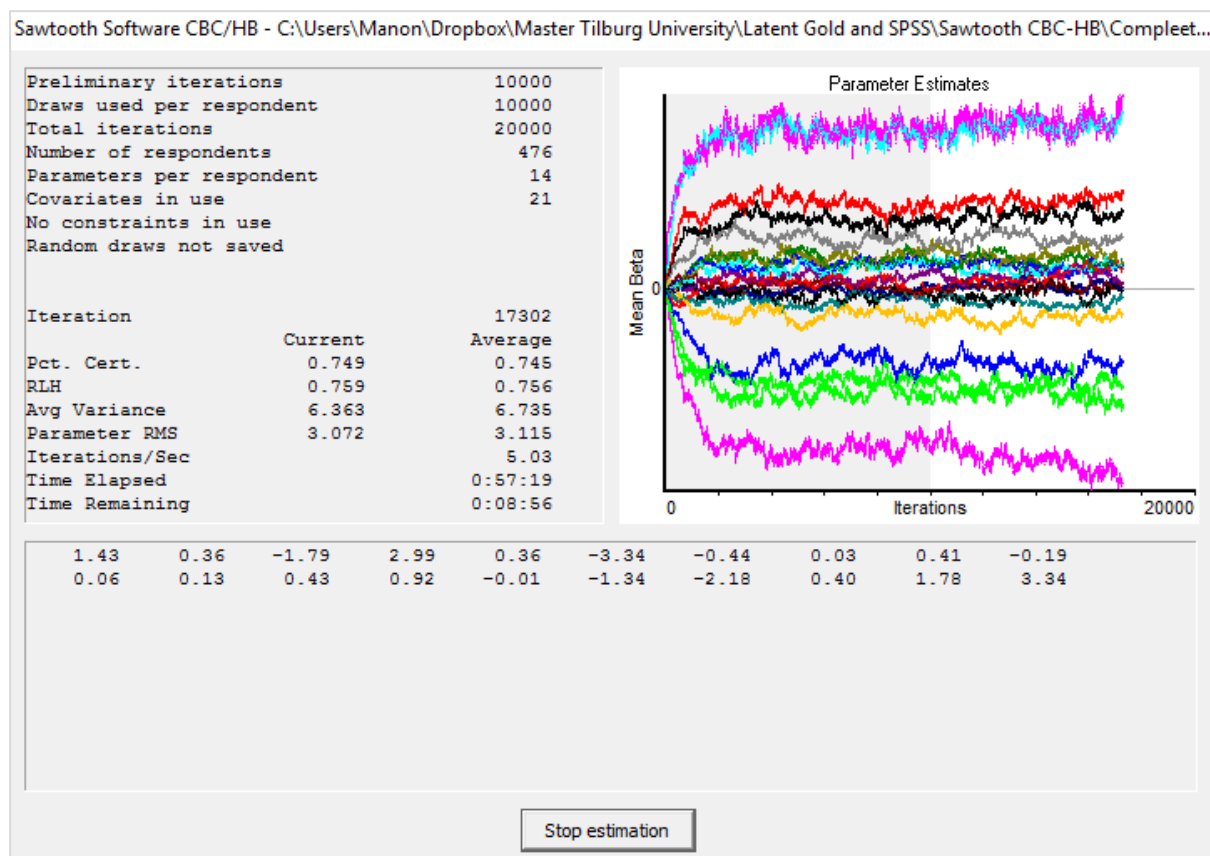
Figure A14.1.2: Report CBC-HB analysis

```
Sawtooth Software CBC/HB - C:\Users\Manon\Dropbox\Master Tilburg University\Latent Gold and SPSS\Sawtooth CBC-HB\Compleet...

Preliminary iterations              10000
Draws used per respondent           10000
Total iterations                    20000
Number of respondents                 476
Parameters per respondent              14
Covariates in use                      21
No constraints in use
Random draws not saved


Iteration                           17302
                    Current       Average
Pct. Cert.          0.749          0.745
RLH                 0.759          0.756
Avg Variance        6.363          6.735
Parameter RMS       3.072          3.115
Iterations/Sec                      5.03
Time Elapsed                      0:57:19
Time Remaining                    0:08:56

    1.43     0.36    -1.79     2.99     0.36    -3.34    -0.44     0.03     0.41    -0.19
    0.06     0.13     0.43     0.92    -0.01    -1.34    -2.18     0.40     1.78     3.34

                              Stop estimation
```

Figure A14.1.3: Process CBC-HB analysis

Figure A14.1.3 shows the process of parameter estimating. At this point, CBC-HB was at its 17302nd iteration.

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