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Willingness to Pay for a Refillable Packaging System

Investigating the Effect of the Consumers'
Perceived Ease of Use, Perceived Usefulness and
Pro-Environmental Attitude

Rute Gabriela Deveza Silva Moreira

Dissertation written under the supervision of Prof. Paulo Romeiro

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ABSTRACT

Title: “Willingness to Pay for a Refillable Packaging System: Investigating the Effect of the Consumers’ Perceived Ease of Use, Perceived Usefulness and Pro-Environmental Attitude”

Author: Rute Gabriela Deveza Silva Moreira

In a society where environmental concerns and demand for environmentally friendly products are increasing, businesses are adapting to meet their consumers’ expectations. Consumers believe that an efficient way to reduce companies’ environmental impact is by managing plastic waste. This dissertation focuses on a refillable packaging system in which the Refill on the Go solution is included.

The study intends to identify what determines the Willingness to Pay for a Refill on the Go solution and how the consumers’ environmental attitude impacts this relationship. Additionally, this research takes the Technology Acceptance Model as the initial point and examines how Perceived Ease of Use and Perceived Usefulness predict the Willingness to Pay.

An online survey was conducted where some respondents were exposed to a traditional Single-use shampoo package from an established brand within the industry and the other respondents to a Refill on the Go solution plus a refillable package from also an established brand within the industry.

The results show that with a higher consumers' Pro-Environmental Attitude, the Willingness to Pay for a Refill on the Go solution is also higher and with a lower Pro-Environmental Attitude, the Willingness to Pay for a Refill on the Go solution is also lower. Although, it was not possible to prove that Willingness to Pay can be explained by neither Perceived Ease of Use nor Perceived Usefulness. Nevertheless, it was possible to find that Willingness to Pay is explained by how useful consumers between 18 and 24 years old believe the packaging system is.

Keywords

Packaging, Perceived Ease of Use, Perceived Usefulness, Pro-Environmental Attitude, Refill, Willingness to Pay, Technology Acceptance Model

SUMÁRIO

Título: “Disponibilidade para Pagar Por um Sistema De Embalagem Reutilizável: Investigação do Efeito da Facilidade de Utilização Percebida, Utilidade Percebida e da Atitude Pró-Ambiental do Consumidor”

Autora: Rute Gabriela Deveza Silva Moreira

Numa sociedade onde as preocupações ambientais e a procura por produtos amigos do ambiente estão a aumentar, as empresas adaptam-se para atender às expectativas dos seus consumidores. Os consumidores acreditam que uma forma eficiente de reduzir o impacto ambiental das empresas está na gestão de plásticos. Esta dissertação foca-se num sistema de embalagem reutilizável em que a solução “*Refill on the Go*” se insere.

O estudo pretende identificar o que determina a Disposição de Pagar por uma solução “*Refill on the Go*” e como a Atitude Pró-Ambiental do consumidor impacta essa relação. Além disso, esta pesquisa toma o *Technology Acceptance Model* como ponto inicial e analisa como a Facilidade de Utilização Percebida e a Utilidade Percebida prevêm a Disposição para Pagar.

Foi realizado um questionário on-line em que alguns inquiridos foram expostos a um embalagem tradicional de champô de uma marca estabelecida no mercado e outros a uma solução “*Refill on the Go*” incluindo a embalagem reutilizável da mesma marca.

Os resultados mostram que uma maior Atitude Pró-Ambiental dos consumidores leva a uma maior Disposição para Pagar por uma solução “*Refill on the Go*” e que uma menor Atitude Pró-Ambiental leva a uma menor Disposição a Pagar pela mesma solução. No entanto, não foi possível provar que a Disposição para Pagar pode ser explicada nem pela Facilidade de Utilização Percebida nem pela Utilidade Percebida. Contudo, foi possível constatar que a Disposição para Pagar é explicada pela utilidade que os consumidores entre 18 e 24 anos acreditam que a embalagem tem.

Palavras-Chave

Embalagem, Disponibilidade para Pagar, Reutilizável, Facilidade de Utilização Percebida, Utilidade Percebida, Atitude Pró-Ambiental do Consumidor, Technology Acceptance Model

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GLOSSARY

HWTP Hypothetical Willingness to Pay

PEA Pro-Environmental Attitude

PEU Perceived Ease of Use

PU Perceived Usefulness

RWTP Real Willingness to Pay

TAM Technology Acceptance Model

TRA Theory of Reasoned Action

WTP Willingness to Pay

CHAPTER 1: INTRODUCTION

1.1 Background

With the increase of local and global environmental issues over the past half-century, environmental sustainability has gained importance among consumers (Choi & Ng, 2011). Not only do consumers now believe their behavior can make a difference and therefore are changing their consumption patterns accordingly (McDonagh & Prothero, 2014) but also, managers and directors understand that sustainability strategies will severely affect their competitive advantage and existence in the market (Lubin & Esty, 2010).

Since its commercial development between 1930 and 1940, plastic has taken a major place in the consumer marketplace (Jambeck et al., 2015). Nowadays, packaging is the largest end-use market with higher demand for plastic (Association of Plastics Manufacturers, 2020) that is, materials designed for immediate disposal. Population increase and economic growth resulted in a rise in plastics in public waste. Our current actions are not sufficient and require a paradigm shift (Jambeck et al., 2015).

Even though it is evident that consumers give increasing importance to ethical and environmental dimensions when it comes to product choices (Rokka & Uusitalo, 2008), literature also shows that convenience has a great influence on product choice, being potentialized by financial incentives. There are challenges regarding refillable packaging as, for example, consumers might have to clean the recipient and remember to take it on the next trip to the supermarket. This indicates that unless these types of packaging are easy to interact with and add value to the consumer, they will not be successful in the market. (Lofthouse & Bhamra, 2006b).

Considering the ideas presented and the challenges announced, this research aims to identify the impact of single-use vs. refillable packaging systems on willingness to pay, measuring how the consumers' environmental attitude, perceived ease of use and perceived usefulness impact that connection.

1.2 Problem Statement

This study aims to analyze the difference between customers' willingness to pay for a refillable packaging system and a single-use packaging. Furthermore, this research seeks to explain the impact of the consumers' pro-environmental attitude on their willingness to pay for a refillable packaging solution versus a single-use packaging.

Essentially, the problem statement is outlined as the following:

How do the consumers' pro-environmental attitude, perceived ease of use, and usefulness impact consumers' willingness to pay for refillable packaging vs. single-use packaging?

The following research questions explain this problem statement:

RQ1: What are the overall differences in Willingness to Pay between single-use and refill on the go?

RQ2: What explains the Willingness to Pay for a refill on the go solution?

1.3 Relevance

Introducing sustainable packages seems to be a logical company strategy, as consumers exhibit an increased concern about sustainability issues (Olsen et al., 2014), and start to demand products that meet their new scope of needs (Scott & Vigar-Ellis, 2014), where 96% of European citizens agree that companies should take more initiatives to limit plastic waste and extend recycling (European Commission, 2014). Hence, organizations are working on finding green solutions that help them become more sustainable and improve their corporate social responsibility. Reusable packaging arises as an attractive solution for companies to improve their current products' sustainable profile and attract the conscious segment (Dias, 2020).

However, to support this change from traditional single-use packaging to reusable, it is vital to study how the consumer reacts to the typical inconvenience associated with reusable packaging concluding on how suitable this solution is for the majority of consumers. This analysis can help the ongoing efforts from marketers of becoming more sustainable, primarily focused on reusable packaging, especially the Refill on the Go solution.

This research aims to explain the willingness to pay for a Refill on the Go package solution and provide the industry with enough insights to enhance the consumers' approval of these types of products. To provide adequate insights to the marketers, a customer profile needs to be drawn, by studying the moderator effect of the pro-environmental attitudes in the relationship between packaging systems and willingness to pay. Then, this analysis intends to establish a relationship between the consumer profile and the output outcome of willingness to pay for the proposed reusable packaging and refill mechanism through the mediation effect of perceived ease of use and perceived usefulness. The established relationships can then work as tangible information

to support organizations in providing the ideal strategies for these to be implemented in the market.

1.4 Research methods

The first step to tackle the proposed thesis and the research questions is to investigate relevant existing literature from established academic papers and books. This exercise allows us to define the problem clearer, identify the current solutions and attempts at solving the problem, and the foundations where these are sustained. For this thesis, these consist of Packaging and its sustainability nuances, consumer Pro-Environmental Attitude and Willingness to Pay, and the Technology Acceptance Model, Perceived Ease of Use, and Perceived Usefulness.

The last step focuses on data collection, through the method of a questionnaire that tested which solution the consumer was more willing to pay for, single-use or Refill on the Go reusable solution. This was executed by splitting the respondents into two halves exposing each to one of the two solutions – a common single-use container with shampoo and a reusable container with a refill system for the same shampoo product. The survey also retrieved data about every respondent's pro-environmental attitude rank. These results are then verified and statistically processed so conclusions can be drawn.

1.5 Dissertation outline

This dissertation has five different chapters. The first chapter is introductory, where the reader is introduced to the problem statement and research questions, and a summary of the dissertation. The second chapter is the state of the art, where the relevant existing literature is reviewed. This compilation consists of Packaging and its environmental impact, consumer Pro-Environmental Attitude and Willingness to Pay, and the Technology Acceptance Model, Perceived Ease of Use, and Perceived Usefulness. The methodology is depicted in chapter three, in this chapter is described the method for data collection and results processing to answer the stated problem. Chapter four covers the quality of the collected data and the introductory hypotheses are answered with support from the statistical results. For completion, the fifth chapter summarizes the study's most important findings, limitations and next steps for further research.

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

In this chapter a summary of the state of the art is presented, where relevant prior literature and research are discussed to better understand the background of the study purpose. It starts by reviewing packaging and its sustainable alternatives, followed by Willingness to Pay and Pro-Environmental Attitudes. Moreover, the Technology Acceptance Model (TAM) is as well presented and discussed. Finally, the conceptual framework and hypotheses are drawn based on the literature review.

2.1 Packaging

Literature differs over definitions for packaging when examining different angles. In general terms, research defines packaging as a container for a product that incorporates all aspects from physical appearance, such as the design, color, shape, labels, and materials (Agariya et al., 2012). From the marketing point of view, the packaging is treated as part of the product and the brand (Ampuero & Vila, 2006). Research even defines packaging as a brand element alongside brand name, URLs, logo, graphic symbol, personality, and slogan (Keller, 2013). According to Kotler and Keller (2016), packaging comprises all the activities in designing and producing the container for a certain product. More specifically, these researchers argue that there is a maximum of three layers of packaging. The primary package is the package in direct contact with the product itself. A secondary package that contains one or more primary packages and means to protect them. Finally, the shipping package contains a set of the two previous ones and has the function of the distribution. Above all, packaging represents the immediate identification of a brand or company. It is even argued that packaging is the fifth P of the marketing mix, along with Price, Product, Place, and Promotion (Kotler & Keller, 2016).

As lightly mentioned in the different packaging definitions, it is relevant to note that numerous trends in the marketing field indicate the increasing importance of packaging as a brand communication tool (Underwood et al., 2001). Each year it is estimated that approximately 20,000 new products are introduced in retailers offering consumers an extraordinary product choice. Adding to this, managers understand now better than ever that it is crucial to redirect communication efforts according to the changes occurring in consumer behavior (Underwood, 2003). In this sense, companies must take advantage of the packaging as an opportunity for innovation, making products further convenient and easier to use and profit from a premium price charged (Kotler & Keller, 2016).

Additionally, packaging can differentiate a brand from its competitors by reaching more consumers than advertising itself (Agariya et al., 2012). A great package appeals to and encourages the consumer to purchase the product, affecting the user experience when opened and every time that it is used (Kotler & Keller, 2016).

In the end, the packaging is a key factor in the decision-making process since it is the buyer's first confrontation with the product, and for that reason, packaging has to perform some sales tasks such as entice interest and illustrate products' features (Kotler & Keller, 2016; Silayoi & Speece, 2007).

2.1.1 Environmental Impact of Packaging

Businesses are increasingly recognizing that environmental concerns are important for success. Consumers are more aware of their impact on the environment and started to consider these factors in their shopping behavior by purchasing more ecologically compatible products, willing to pay more for these products (Laroche et al., 2001; Schwepker & Cornwell, 1991).

It has been established that though packaging is an essential component for almost all product systems, packaging made of plastic represents a serious waste problem. After a brief life cycle, packaging plastics are thrown in landfills, burned, or reused (Keoleian & Spitzley, 1999; Luijsterburg & Goossens, 2013). Analysis of refillable packaging shows environmental benefits and a potential solution for the increased packaging waste (Lofthouse et al., 2009; Simon et al., 2016).

2.1.2 Refillable Packaging Systems

According to Lofthouse, Bhamra, and Trimmingham (2009), there are several forms of refillable packaging systems, depending on the delivery mechanism and consumer level of interaction. A relevant packaging system is the "self-dispense" where the "customer takes reusable container back to the store where they refill it with the same product. Applications include dry goods, personal care products, and fabric conditioner" (Lofthouse et al., 2009). This type of reusable package has been responsible for decreasing packaging waste and increasing resource utilization (Lindh et al., 2016).

Regarding general refillable packaging systems, research shows that are several benefits not only for the environment but also for the consumer. Some of the attributes leading to a positive experience were good value, less waste, ease to use, clean and hygienic, less pantry space, no mess, quick to use, and quick to refill (Lofthouse, 2007). Specifically, for the "self-dispense"

refillable packaging system, there is evidence that only a few consumers have used this technology. Although, from these few users' perspectives, it was a good or very good experience due to its ease of use, price, and mess-free (Lofthouse & Bhamra, 2006a).

When it comes to attributes leading to a negative experience, findings show that consumers consider this technology expensive, inconvenient, and difficult to maintain (Lofthouse, 2007).

Although there are several benefits to refillable packaging systems, there is some perceived inconvenience to be addressed. The refill of the primary packaging should be perceived as easy to enhance the convenience and be pleasant to the consumer. Additionally, the same study performed by Lofthouse and Bhamra argues that technological issues concerning packaging durability, components' selections, health and safety, cleaning process, communication, and refill system mechanism should be addressed in the design process of the refillable packaging system because it will affect the consumers' decision-making process (Lofthouse & Bhamra, 2006b).

This dissertation will focus on a specific type of refillable packaging system called refill on the go. This requires a physical dispensing machine available to the consumer best suited to traditional retails in urban areas (Ellen MacArthur Foundation, 2019).

Although reusable packaging systems have been responsible for decreasing packaging waste, there is low evidence of case studies for Refill on the Go solutions, specifically in the hair care category. Procter & Gamble (P&G), for example, launched a refillable aluminum bottle system in Europe for its four haircare brands, allegedly reducing 60% of plastic with recyclable pouches refills (Reuters, 2020). Beiersdorf, in Germany, launched a packaging system in a drugstore chain where consumers take their empty plastic bottle and refill it with a NIVEA shower gel product. After three uses, Beiersdorf asks the consumer to replace the container with a new one for free (Beiersdorf, 2020). Meanwhile, Unilever is testing in the United Kingdom refill on the go with hair and home care products, where consumers can buy and refill reusable stainless steel bottles using refill machines in the store. There is also the return on the go pilot test in which the consumers can pick up a pre-filled stainless steel bottle placed in the aisle, integrated with single-use packages to increase uptake. Then it can be returned in-store, where it is cleaned and refilled again (Unilever, 2021). Other examples of refill on the go can be found all over the world but mainly for perishables (Coelho et al., 2020)

2.2 Willingness to Pay (WTP)

Researchers in the literature acknowledge that WTP represents the highest price a buyer agrees to pay for a certain quantity of a product or a service. When encountered with several choices, the consumer will purchase an item when the WTP surpasses the price the most (Cameron & James, 1987; Varian & Varian, 1992; Wertenbroch & Skiera, 2002). To assign a monetary value to WTP, individuals are required to consider the costs, benefits, and inconveniences of the product or service (Ajzen & Driver, 1992). There is evidence that consumers are willing to pay more for convenience, aesthetics, and reliability (Kotler & Keller, 2016).

Literature differs regarding methods for measuring WTP, depending on if it provides incentives to participants to reveal the actual WTP or if it is replicated in the actual point-of-purchase environment (Wertenbroch & Skiera, 2002). This topic it is explored four common methods for measuring WTP (Miller et al., 2011; Schmidt & Bijmolt, 2020):

Context	Measurement	
	Direct	Indirect
Hypothetical WTP	Open-ended question format	Choice-based conjoint analysis
Actual WTP	Becker, DeGroot, and Marschak's incentive-compatible mechanism	Incentive-aligned choice-based conjoint analysis

Table 1: Methods for Consumers' WTP measurement (Miller et al., 2011)

Hypothetical Willingness to Pay (HWTP), as the name suggests, is a hypothetical measure of WTP, so the participant does not have to incur any financial charges. In this method, the participant only has to state how much he would pay for a good, oppositely to the Real Willingness to Pay (RWTP), where the participant would have to actually pay the indicated WTP for the product in a real context (Schmidt & Bijmolt, 2020).

Regarding measuring HWTP, some researchers prefer a direct approach where it is asked to participants to directly state their WTP for a good through open-ended questions so participants can attribute a monetary value corresponding to the estimated worth (Abrams, 1964; Ajzen & Driver, 1992). Others prefer an indirect approach such as choice-based conjoint analysis, which is designed to define WTP based on a choice between several products alternatives and its features, including price (Green & Srinivasan, 1978; Louviere & Woodworth, 1983). These methods are used for measuring hypothetical WTP rather than actual WTP, thus generating hypothetical bias provoked by a hypothetical scenario (Harrison & Rutström, 2008).

In measuring RWTP, a direct approach commonly used is the Becker, DeGroot, and Marschak (Becker et al., 1964) method, in which the participant is required to purchase a product if the price drawn from a lottery is lower or equal to the stated WTP (Wertenbroch & Skiera, 2002). And finally, the indirect method for measuring RWTP is the Incentive-aligned Choice-Based Conjoint (ICBC) analysis (Ding, 2007), in which applicants are also required to purchase a product based on WTP deduced from their disclosed preference, applying the BDM method (Miller et al., 2011).

In conclusion, results show that though hypothetical measurements can create mean WTP estimation, an incentive-aligned approach could be a better method, especially when a sample is available and the product is cheap (Miller et al., 2011; Wertenbroch & Skiera, 2002). Under the hypothetical methodology, applicants seemed genuinely interested in buying the product, but their behavior was different when they were facing a real purchase decision for the incentive-aligned method. Even though hypothetical approaches such as open-ended questions can lead to hypothetical bias, they can still characterize the correct demand curve and proper pricing (Miller et al., 2011).

From this, a direct relation between packaging systems and WTP should be studied and therefore the first hypothesis of the study arises:

H1: Refill on the Go solution has a higher impact on WTP than single-use packaging.

2.3 Pro-Environmental Attitude

Although there are several definitions of attitude, most social psychologists seem to agree that an attitude is an individual's tendency to respond positively or negatively to any aspect of the person's context (Ajzen, 1989). More specifically, according to the Theory of Planned Behavior, attitudes are one of the factors that influence behavioral intention. A person's general assessment of performing the behavior is reflected by attitudes towards the behavior. This means that attitudes are constructed on the belief expectation regarding the probability that behavior would result in certain consequences, and on the assessment of the desirability of these consequences (Ajzen, 1991).

In the environmental context, a pro-environmental attitude is defined as a concern or care for the environment and its environmental issues (Gifford & Sussman, 2012). Even though beliefs, knowledge, or emotion are drivers of attitudes, it is not enough to have concern for the

environment. One must be part of a social network to have the opportunity and resources to be environmentally concerned (Heberlein, 2012).

In terms of how this influences the amount of money consumers are willing to pay, research argues that environmentally friend behavior increases consumers' willingness to pay for an environmentally friendly product (de Pelsmacker et al., 2005; Laroche et al., 2001; Roe et al., 2000). With this being said, this dissertation will be studied the moderator effect of a pro-environmental attitude on a behavioral intention – willingness to pay:

H2: Pro-environmental attitude moderates the relationship between packaging systems and WTP

2.4 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) was first inspired by the Theory of Reasoned Action (TRA) by Fishbein and Ajzen, which thesis is that individuals are generally rational and tend to consider the implications of their actions before deciding to perform a specific behavior (Fishbein & Ajzen, 1975). It has been widely used as a model for the prediction of behavioral intentions and/or behavior, lying on the foundation that relevant information or beliefs on the cause-effect relationship of performing a particular behavior leading to a specific outcome are variables of a function that quantifies behavioral intentions, the genesis to behavior. Fishbein and Ajzen (1975) break down the theory into two distinct sections: behavioral and normative. Davis eliminated the subjective norm from his model development, leaving the attitude towards the technology only to be considered (Madden et al., 1992).

Fred D. Davis first introduced TAM in 1985 to provide a theoretical methodology for a design or system before its implementation. This requires showing prototypes to potential users and measuring their interest to use alternative products prior to the deployment phase (Davis, 1985). This model has been broadly applied to predict user acceptance based on perceived ease of use (PEOU) and usefulness (PU) (Venkatesh & Davis, 1996). The purpose is to properly evaluate the attitude of a user towards a system.

As described in Figure 1, the design features influence the Perceived Usefulness (PU) and the Perceived Ease of Use (PEU) which are the main promoters of adopting new technology. These impact the Attitude Towards Use, hence, developing the outcome of the model, the Actual System Use (ASU).

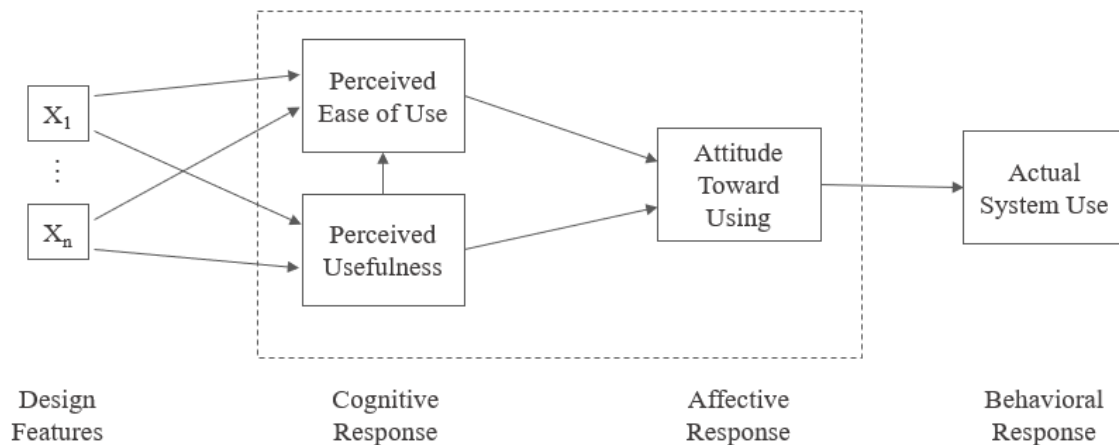


Figure 1: Technology Acceptance Model (Davis, 1985)

This study integrates the processes of the TAM and WTP to establish an integrated model that can explain the factors that determine consumers' payment intention.

2.4.1 Perceived Ease of Use (PEU)

Perceived Ease of Use is commonly defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Drawing on the theory of reasoned action, in the TAM perceived ease of use is considered one of the essential predictors of user behavior intentions. Not only predict but also significantly and positively affect users' intentions in accepting the system (Alalwan et al., 2016; Berger & Corbin, 1992; Davis et al., 1989). And, as expected, when recycling turns out to be a perceived inconvenience it negatively affects recycling behaviors. It is crucial to change this inconvenience perception and facilitate the purchase process of these products to increase the consumption of environmentally friendly products (Bhate & Lawler, 1997; McCarty & Shrum, 1994; Osterhus, 1997)

2.4.2 Perceived Usefulness (PU)

Literature defines PU as "the degree to which a person believes that using a particular system would enhance his or her job performance". As Perceived Ease of Use, Perceived Usefulness is also presented on the TRA as one of the fundamental determinants of user behavior in the TAM (Davis, 1989; Davis et al., 1989). Studies argue that these two variables are positively associated with a behavioral intention which determines payment intention and, finally, influences the WTP value (Averdung & Wagenfuehrer, 2011; Sun & Zhang, 2021).

Based on the empirical findings from prior research, this dissertation also seeks to revalidate similar relationships in the context of willingness to pay for a refillable technology. Hence, the following hypothesis is proposed:

After careful research concerning the variables above, the following hypotheses have risen:

Hence, the following hypotheses are proposed:

H3a: Perceived Ease of Use mediates the relationship between packaging systems and willingness to pay.

H3b: Single-use packaging has higher PEU than the refill on the go solution.

H4a: Perceived Usefulness mediates the relationship between packaging systems and willingness to pay.

H4b: Single-use packaging has higher PU than the refill on the go solution.

A conclusion from the studies performed by Davis in 1989 was that PU linkage to usage is significantly stronger than PEU. This can be explained by the fact that users are usually more willing to deal with difficulties if the system is considered useful (Davis, 1989).

With this in mind, for the purpose of this dissertation, an adapted hypothesis was designed:

H5: Perceived Usefulness has a stronger impact on Willingness to Pay than Perceived Ease of Use.

After careful research, for the purpose of this dissertation, WTP was treated as a behavioral intention, and the TAM was adapted to explore HWTP:

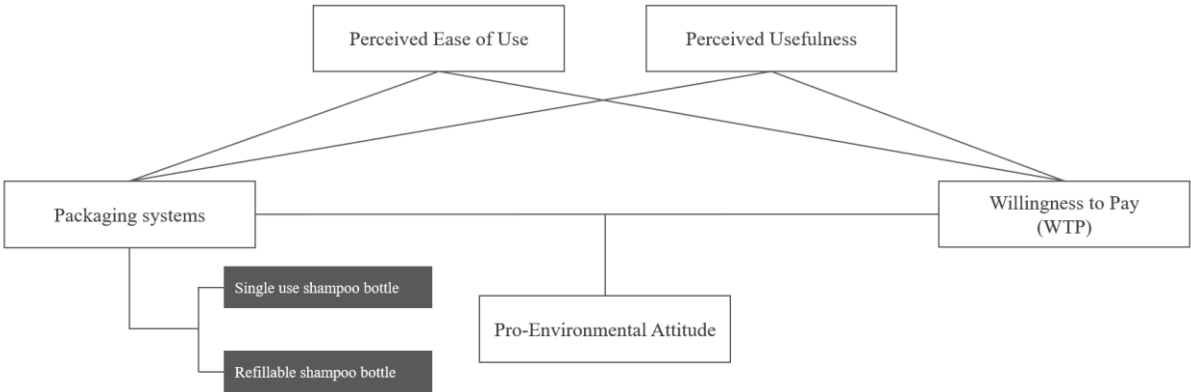


Figure 2: Modified TAM for refillable packaging WTP

2.4.3 TAM Limitation and Extensions

TAM has been broadly cited by numerous researchers mainly due to its simplicity and ease of theoretical use, often failing in its practical application within these researches. Hence, TAM has been broadly criticized, despite how it is frequently used (Malatji et al., 2020), becoming relevant to address the model usage, limitations, and extensions.

Some of the most relevant extensions of the model lay in the behavioral and social variables considerations (Venkatesh & Davis, 2000) and analysis of online technologies like e-banking (Pikkarainen et al., 2004). Despite these applications and numerous others published over decades, there are still unexplored areas of potential application where the model is still valid (Marangunić & Granić, 2015) and some others where it is incomplete (Ajibade, 2018).

The interconnection of technology and its actual adoption and use have been intensively expressed, which culminates in a model weakness to explain user's behavior (Hai et al., 2015). It is also argued that the model cannot predict the acceptance of information communication technology, raising the need for another model to address this (Hojjati & Khodakarami, 2016). Furthermore, with the rising of technology relevance for entertainment purposes and not problem-solving, TAM's cognitive response of the user's perceived usefulness is not affected. Hence, inadequate to address the behavior intention of passing the time and relaxing (Hsu & Lu, 2004).

The exposed most relevant weaknesses of the model can be ceased in, depending on the application and the inadequacy of some variables which can change the meaning of the relationship of the variables (Agarwal & Karahanna, 2000). On a more general approach, TAM is mostly used by academics. Although this is an advantage in terms of the easiness of obtaining data, the trade-off appears with the deterioration of the findings' generalization (Y. Lee et al., 2003).

2.5 Previous research

As important, a previous dissertation written by Joana Dias which investigated the "intention to use a reusable packaging", serves as an inspiration for this dissertation. This previous research also adapts the TAM, but to identify what can explain the intention to use a reusable product.

Even though the packaging system and the type of products studied are different, the author states that purchase intention should also be researched to further explore the findings and here

is where this research comes to life (Dias, 2020). As a starting point on what already exists in the previous literature and research, this dissertation will bring new insights into the Willingness to Pay for a more specific refillable packaging system – the Refill on the Go.

CHAPTER 3: METHODOLOGY

In this chapter, it will be presented a comprehensive methodology used to draw conclusions on the hypothesis formulated in chapter two and consequently answer the research questions. First, a research approach is defined and the primary data is described. Then, a detailed explanation of the primary data collection method is provided.

3.1 Research Approach

This dissertation's purpose is to obtain valuable insights into the drivers of the WTP for a refillable packaging solution. For this, a literature review was conducted on relevant subjects such as packaging and its environmental effect, pro-environmental attitude, perceived ease of use, perceived usefulness and willingness to pay, which allowed for the development of the conceptual framework.

To assess the validity of the stated hypotheses and therefore answer the research questions, three research methods are considered: exploratory, descriptive, and explanatory (Dias, 2020). In this dissertation, a combination of exploratory and explanatory methods was used. The exploratory method focused on searching the existing literature to gather the information that could help define the appropriate variables and hypothesize their interactions (Saunders et al., 2009). It will be studied the reasoning behind the relationships between “Refill on the Go” vs. Single-use packaging and its WTP.

3.2 Primary Data

In order to collect primary data, an online survey was conducted. Although this method has great advantages, such as low cost, high response speed, and low bias, there are also disadvantages to take into consideration. There is evidence of a low response rate, no opportunity for further clarification regarding the questions asked and it also could not give a reasonable representation of the population (Malhotra & Birks, 2007).

To guarantee the efficiency and understanding of the questionnaire, it was launched a pilot study with 35 responses on the comprehension of the stimuli, leading feedback into adjustments. After feedback incorporation, a focus group with 7 people was conducted to make sure the stimuli were clear and approve the feedback incorporation from the pilot study.

3.2.1 Main Study - Online Questionnaire

3.2.1.1 Data Collection

The key objective of this research was to gather and analyze data concerning customers' willingness to pay for refillable packaging system, more specifically, the Refill on the Go technology versus single-use packaging.

As mentioned in Literature Review, plastic packaging is in the spotlight of waste problems, and companies are trying to reduce its utilization and shift to more sustainable production. And even though there are only a few case studies on refillable packaging systems that drastically decrease the amount of plastic packaging used, it is increasing the number of pilot tests on refill on the go around the world.

For the purpose of this study, the hair care category was chosen, inspired by the Unilever pilot test with a Refill on the Go technology and stainless steel bottles (*Reuse. Refill. Rethink. Our Progress on Refill and Reuse Continues* | Unilever, n.d.). Regarding the brand for the stimuli, Pantene was chosen based on its notoriety in Europe and specifically in Portugal (Lopes, 2017). This technology has become more common around the world (Ellen MacArthur Foundation, 2019) and in Europe with, for instance, Biersdorf pilot test in a drugstore chain for NIVEA shower gels refill station, launched in 2020 in Germany (Refill Instead of Throwing Away – the Vision of the Perfect Circular Economy | Beiersdorf, n.d.). Since this technology is mostly available outside of Portugal, Portuguese consumers are typically not confronted with these kinds of refillable products, making results unbiased to provide a clear result of the Willingness to Pay.

As a consequence of this, the target population of the study was people who currently live in Portugal and bought at least one shampoo in the last half-year. Furthermore, a manipulation question was made in the questionnaire to ensure the full understanding of the study and to get valid results. Respondents noncomplying with these control and manipulation questions would be automatically excluded. The online survey was available in both Portuguese and English languages (Appendix 1).

Data collection occurred between the 20th of November 2021 and the 3rd of December 2021 through an online survey distributed across a social media platform (WhatsApp) and a platform that specifically recruits participants for online research (Prolific). Data was collected over a non-probability convenience sampling technique which means it is a non-random convenient sample. Although this is the cheapest and least time-consuming sampling technique, it has some

limitations. There are several potential sources of bias selection (Malhotra & Birks, 2007). To reduce this bias, a survey distribution platform was used to get respondents unknown to the researcher.

The online survey was closed with a total of 178 answers of which 103 were distributed through WhatsApp and 75 through Prolific. Of these, 53 responses were considered invalid for not complying with the prerequisites, failing an attention-check question resulting in a total of 125 valid answers. The assigned stimuli were evenly distributed, resulting in 59 valid answers to stimulus 1 (Single-use) and 65 to stimulus 2 (Refill on the Go).

3.2.1.2 Research Design

The survey model had a 2 (Single-use, Refill on the Go) by 1 (established brand) design as shown in the figure below.

2x1 design	Established brand
Single-use	Stimuli 1
Refill on the Go	Stimuli 2

Table 2: Design Matrix

The presented main study is composed of 7 blocks. The first block of the survey contained control questions that would be used to refine the research sample by excluding people currently not living in Portugal and those who haven't bought shampoo in the last 6 months. In the second block, respondents were presented with one of the two stimuli (figures 3 and 4) with written descriptions.



Figure 3: Stimuli 1 - Single Use Packaging



Figure 4: Stimuli 2 - Refill on the Go solution

Following the stimulus, respondents were asked about their pro-environmental attitudes (block 3), perceived usefulness (block 4), perceived ease of use (block 5) and willingness to pay for the stimuli (block 6). Between the latter block and the last one, another control question is asked to ensure the understanding of the stimuli. Finally, the 7th and last block concerned demographic questions about gender, age, occupation, marital status, education and income.

3.2.2 Measurement and Operational Model

From the pretest and focus group two stimuli were identified for the main study – a single-use shampoo packaging and a Refill on the Go technology, both for an established brand in the market. Each respondent had to investigate the product presented before stating their pro-environmental attitude, perceived usefulness and willingness to pay. PU, PEU and PEA are presented on a 7-point Likert scale (from “Strongly Disagree” to “Strongly Agree”).

In this study, it is used the New Environmental Paradigm developed by Dunlap et al. (2000) to measure the pro-environmental attitude of the user. It is commonly used to evaluate the respondents’ understanding of environmental arguments on a 7-point Likert scale. These 15 items of the New Environmental Paradigm are of both positive and negative nature and for that reason, provide a thoughtful and legitimate image of the respondent’s attitude.

On the other hand, literature presents numerous frameworks to measure the consumers’ willingness to pay. In this study, a direct approach will be used in which it will be asked directly to shampoo users to indicate an adequate price for a shampoo packaging system. (Breidert et al., 2006; Cameron & James, 1987; de Pelsmacker et al., 2005; Krishna, 1991; van Doorn & Verhoef, 2011). Even though this approach has been criticized by many since the users do not have to actually buy the product (Wertenbroch & Skiera, 2002), literature also shows that, for inexpensive, frequently bought and non-durable products, this approach leads to reasonable results (Miller et al., 2011). Since the category of this dissertation fits within the description, the direct approach proposed by Van Doorn and Verhoef (2011) is considered appropriate. For single-use packaging, only one question is asked but in the Refill on Go case, two questions are asked: the willingness to pay for the reusable packaging and another for each refill.

In the table below it is possible to find the summary of the operational model.

OPERATIONAL MODEL			
Construct	Scale	Items	Literature
Perceived Usefulness	7-point Likert Scale	6	(Davis, 1989)
Perceived Ease of Use	7-point Likert Scale	6	(Davis, 1989)
Pro-Environmental Attitude	7-point Likert Scale	15	(Dunlap & Van Liere, 1978; Dunlap et al., 2000)
Willingness to Pay	Direct Approach	1/2	(van Doorn & Verhoef, 2011)

Table 3: Operational Model

3.2.3 Data Analysis

The quantitative data collected from the main study was analyzed through IBM's software SPSS. The main goal is to validate and test the hypotheses proposed. The first step is to remove any outliers utilizing Mahalanobis Distance, then the reliability test of each construct is performed by calculating Cronbach's alpha. Lastly, it is checked if the data is parametric or non-parametric through Kolmogorov–Smirnov test to assess normality of the distribution and Levene's test to assess the homogeneity of variances. In the case of parametric data and to compare the difference between means, a T-test can be used. Although, if the data resurfaces as non-parametric, the Kruskal-Wallis test or Mann-Whitney U test is the correct statistical test to use.

As it is not possible to run a non-parametric regression analysis on SPSS, even if the data is nonparametric, it will be used Linear Regressions to test hypotheses based on mediators and moderators. Depending on the hypotheses being tested, models 1 (one moderator), 4 (one mediator), 6 (two mediators) and 86 (overview of the complete effect of the model) of the Process Macro by Hayes (2018) are used.

CHAPTER 4: RESULTS AND DISCUSSION

In this chapter, it will be presented the main results from the analysis of quantitative data. Firstly, it will be presented and characterized the sample research, followed by the main and alternative hypotheses testing and their results.

4.1 Sample Description

The online survey gathered a total of 168 answers in which 43 respondents could not be taken into consideration for failing to answer the control questions or for standing as outliers. The remaining 125 respondents are represented in the following table by the stimuli presented to them. Additionally, the Qualtrics randomization tool was used so the respondents were approximately evenly distributed between the different stimuli.

		Refill on the Go		Single-Use		Total	
Gender	Female	38	30.6%	34	27.4%	72	58.1%
	Male	27	21.8%	25	20.2%	52	41.9%
Age	18-24 years old	37	29.8%	35	28.2%	72	58.1%
	25-34 years old	20	16.1%	18	14.5%	38	30.6%
	35-44 years old	6	4.8%	3	2.4%	9	7.3%
	45-54 years old	0	0.0%	2	1.6%	2	1.6%
	55-64 years old	2	1.6%	1	0.8%	3	2.4%
Occupation	Student	28	22.6%	22	17.7%	50	40.3%
	Working full-time	28	22.6%	31	25.0%	59	47.6%
	Working part-time	8	6.5%	3	2.4%	11	8.9%
	Unemployed and looking for work	1	0.8%	1	0.8%	2	1.6%
	A homemaker or stay-at-home parent	0	0.0%	2	1.6%	2	1.6%
Marital Status	Never been married	51	41.1%	48	38.7%	99	79.8%
	Living with a partner	8	6.5%	3	2.4%	11	8.9%
	Married	4	3.2%	6	4.8%	10	8.1%
	Divorced/Separated	2	1.6%	2	1.6%	4	3.2%
Education	High school graduate	23	18.5%	18	14.5%	41	33.1%
	Bachelor's degree	24	19.4%	21	16.9%	45	36.3%
	Master's degree	17	13.7%	17	13.7%	34	27.4%
	Doctoral degree	0	0.0%	1	0.8%	1	0.8%
	Other	1	0.8%	2	1.6%	3	2.4%
Income	Less than €10,000	33	26.6%	29	23.4%	62	50.0%
	€10,000 to €19,999	20	16.1%	19	15.3%	39	31.5%
	€20,000 to €29,999	5	4.0%	8	6.5%	13	10.5%
	€30,000 to €39,999	5	4.0%	1	0.8%	6	4.8%
	€40,000 to €49,999	1	0.8%	1	0.8%	2	1.6%
	€50,000 to €59,999	1	0.8%	0	0.0%	1	0.8%
	€60,000 to €69,999	0	0.0%	1	0.8%	1	0.8%

Table 4: Characteristics of Respondents

As mentioned previously, the study aims to be tested for the Portuguese market, therefore all respondents are currently living in Portugal. From the sample characterization table, it is possible to state that most of the sample are women, between 18 and 24 years old, working full time, never been married with at least a high school degree and low income (less than €10,000 a year).

4.2 Measure Reliability

Before measuring the reliability of the constructs, it was necessary to recode pro-environmental attitudes due to positive and negative variables in the construct. 7 out of 15 items were

negatively framed, meaning that a disagreement with the statement implied a pro-environmental attitude. Therefore, these 7 items were recoded so all items could be compared.

In order to check the reliability of the variables used in the research, it was conducted a Cronbach's alpha test to ensure the viability of the data. The Cronbach's alpha test was run for pro-environmental attitude, perceived ease of use and perceived usefulness for each stimulus.

All of the constructs had Cronbach's alpha higher than 0.7, indicating that the constructs are reliable enough to predict the variables and, therefore, it is possible to proceed with the data analysis.

Construct	Number of Items	Cronbach's alpha
Pro-Environmental Attitude	15	0.8
Stimulus 1 : Single-use		
Perceived Usefulness	6	0.9
Perceived Ease of Use	6	0.9
Stimulus 2 : Refill on the Go		
Perceived Usefulness	6	0.9
Perceived Ease of Use	6	0.9

Table 5: Cronbach's Alpha of Constructs

4.3 Parametric validation test

In order to validate if the data is parametric, two tests were performed. First, a Kolmogorov-Smirnov test to assess normality of the distribution and then a Levene's test to assess the homogeneity of variances. PU, PEU, WTP and PEA were used in both tests.

In the output of the Kolmogorov-Smirnov test (Appendix 2), the variables tested present a $p < .05$. The null hypothesis of the normal distribution is rejected and therefore it is not possible to say that the data follows a normal distribution. Regarding Levene's test (Appendix 3), for PU, PEU and WTP the null hypothesis of equal population variances is rejected ($p < .05$). Although, PEA is the only variable which the null hypothesis of equal variances is not rejected ($p > .05$). Hence, the three first variables mentioned violate the homogeneity of variance assumption needed for an ANOVA.

In conclusion, even though the data is nonparametric and Process by Hayes (2018) in SPSS assumes that the models are parametric, for the sake of this dissertation, it will still be used Process Macro by Hayes (2018) in SPSS to test the moderation and mediator effects.

4.4 Results from the Hypotheses Testing

4.4.1 Hypothesis 1

H1: Refill on the Go solution has a higher impact on Willingness to Pay than Single-use packaging

In order to test if the Refill on the Go packaging system has a stronger effect on WTP than single-use, a Kruskal-Wallis test was conducted to analyze if the means of the two packaging systems are significantly different from each other.

The Kruskal-Wallis test showed that there is a statistically significant difference in WTP for the different packaging systems, with a mean rank score of 36.34 for single-use and 86.25 for Refill on the Go. The Monte Carlo estimates an exact p-value of .000 guaranteed that lies within the range (.000, .000) with 99% confidence. Furthermore, the asymptotic inference also returns a $p < .001$ indicating it was able to estimate the true p-value with this degree of accuracy. For this, the means of the two packaging systems are significantly different and the mean rank shows that Refill on the Go has a higher impact on WTP, therefore, H1 is significant and valid (Appendix 4).

4.4.2 Hypothesis 2

H2: Pro-Environmental Attitude moderates the relationship between packaging system and Willingness to Pay

Consequently, to evaluate the effect of the moderator between the predictor and the outcome, model 1 from Process Macro by Hayes (2018) was run for a single moderation testing (Appendix 5). This analysis aims to identify how the consumers' pro-environmental attitude affects the strength of the relationship between packaging systems and willingness to pay.

In general terms, the model summary shows that the model is significant ($p < .001$) and it explains 43% of the variance. Regarding the effect of the packaging systems, one can state that there is a negative effect of -5.6109 on the WTP (path b_1). Even though neither pro-environmental attitude nor packaging systems have a significant effect on WTP, the interaction that determines if there is a moderation effect is significant ($p < .05$). The results show that the consumers' pro-environmental attitude has a positive effect of 1.6383 when interacting with a Refill on the Go packaging (path b_3).

Regarding the conditional effects of pro-environmental attitude on willingness to pay specifically, one can state that the average value of the consumers' pro-environmental attitude

is 5.8516 with a lower (difference between the mean and one standard deviation) and higher (sum of the mean and one standard deviation) level of 5.3048 and 6.3974, respectively. These levels are significant since none of them include a zero in the bootstrapping interval. This means that a lower level of PEA interacting with a Refill on the Go solution results in a positive effect of 3.0820 in comparison to a single-use packaging system, that the mean PEA value interacting with a Refill on the Go solution results in a higher positive effect of 3.9761 and, lastly, that the high PEA interacting with a Refill on the Go solution will account for the highest effect of 4.8703.

Additionally, the Johnson-Neyman test offers further detail on the level at which PEA becomes significant. From the Johnson-Neyman significance region, 96.8% is significant and only 3.2% is not significant. The turning point occurs when the p-value reaches the value of 0.05 which is at a 4.6687 level of pro-environmental attitude. For higher levels of PEA than this, the relationship between PEA and packaging systems is statistically significant and increasingly stronger. The following graph shows how the different levels of PEA affect the WTP for the different packaging systems.

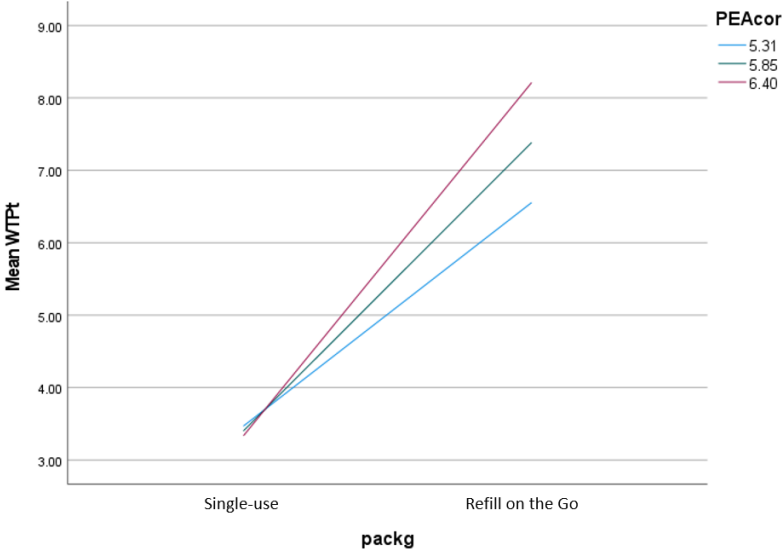


Figure 5: Interaction Effect of PEA * PP on WTP

Model 1 shows a statistically significant interaction and consequently validates the hypothesis test that states that consumers’ pro-environmental attitude moderates the relationship between packaging systems and willingness to pay.

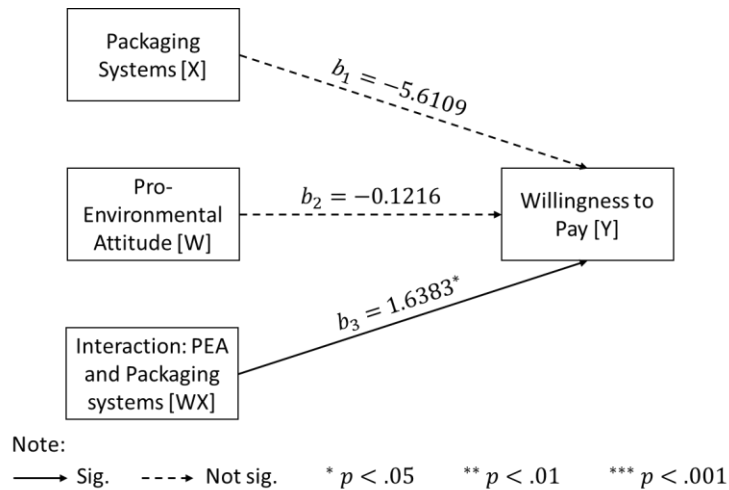


Figure 6: Statistical Model (H2)

4.4.3 Hypothesis 3

H3a: Perceived Ease of Use mediates the relationship between packaging systems and Willingness to Pay.

To evaluate the effect that explains the relationship between the independent and the dependent variable through a third variable, model 4 from Process Macro by Hayes (2018) was used (Appendix 6).

The model is statistically significant and it explains 40.8% of the variance. Examining the effect of the packaging system on the PEU, the model shows it is statistically significant ($p < .01$) with a positive effect of 0.6336 (path a1). Regarding WTP, the model is significant ($p < .001$), but it is possible to see that PEU does not have a significant impact on WTP (path b_1) as the bootstrapping confidence interval includes zero. This means that most of the effect comes from the direct effect from packaging systems to WTP without going through PEU (path c'). The indirect effect demonstrates how packaging systems influence the WTP through a sequence in which packaging systems influence the mediator PEU that also influences WTP. In return, the total effect is the sum of the direct and indirect effects (Hayes, 2018). Thus, the total effect equals the sum of 3.7608 (path c') and 0.1639, which results in a total effect of 3.9247.

To summarize, most of the effect comes from the direct effect and this hypothesis is not validated. Perceived ease of use does not mediate the relation between packaging systems and WTP. Other alternatives to this hypothesis are presented in chapter 4.5.

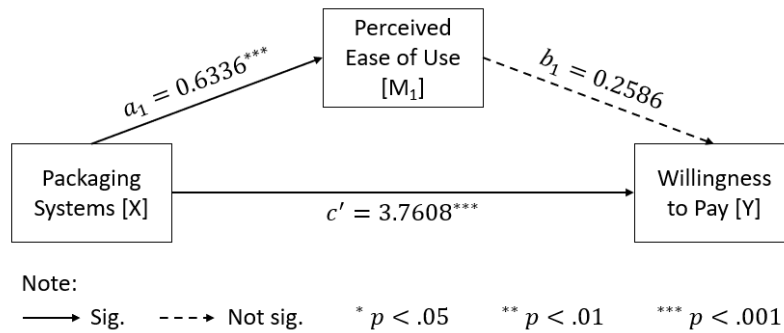


Figure 7. Statistical Model (H3a)

H3b: Single-use packaging has a higher impact on Perceived Ease of Use than Refill on the Go solution

In order to test if the Single-use packaging system has a higher impact on PEU than Refill on the Go solution, a Kruskal-Wallis test was conducted to analyze if the means of the two packaging systems are significantly different from each other.

The Kruskal-Wallis test showed that there is a statistically significant difference in PEU for the different packaging systems, with a mean rank score of 52.64 for single-use and 71.45 for Refill on the Go. The Monte Carlo estimates an exact p-value of .003 guaranteed that lies within the range (.002, .005) with 99% confidence. Furthermore, the asymptotic inference also returns a $p < .01$ indicating it was able to estimate the true p-value with this degree of accuracy. Thus, the means of the two groups are significantly different from each other.

Although, the mean rank shows that Refill on the Go has a higher impact on PEU than Single-use packaging, invalidating H3b (Appendix 7).

4.4.4 Hypothesis 4

H4a: Perceived Usefulness mediates the relationship between packaging systems and Willingness to Pay.

To evaluate the effect that explains the relationship between the independent and the dependent variable through a third variable, model 4 from Process Macro by Hayes (2018) was used (Appendix 8).

The model is statistically significant and it explains 41.7% of the variance. Examining the effect of the packaging system on the PU, it is significant ($p < .001$) and shows a positive effect of

1.2042 (path a_1). Regarding WTP, the model is significant ($p < .001$), but it is possible to see that PU does not have a significant impact on WTP (path b_1) as the bootstrapping confidence interval includes zero. This means that most of the effect comes from the direct effect (path c'). The indirect effect demonstrates how packaging systems influence the WTP through a sequence in which packaging systems influence the mediator PU that also influences WTP. In return, the total effect is the sum of the direct and indirect effects (Hayes, 2018). Thus, the total effect equals the sum of 3.5656 (path c') and 0.2982, which results in a total effect of 3.8638.

To summarize, most of the effect comes from the direct effect and this hypothesis is not validated. Perceived Usefulness does not mediate the relation between packaging systems and WTP. Other alternatives to this hypothesis are presented in chapter 4.5.

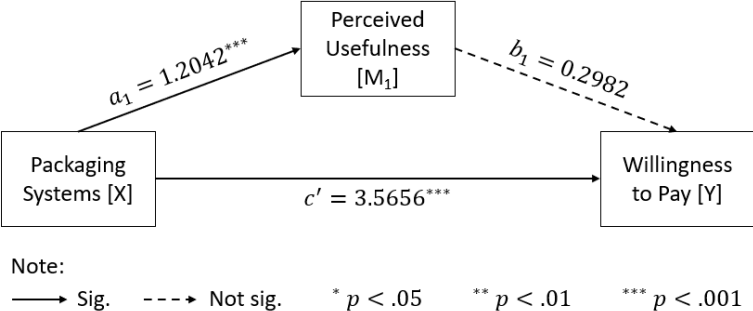


Figure 8: Statistical Model (H4a)

H4b: Single-use packaging has a higher impact on Perceived Usefulness than the Refill on the Go solution.

In order to test if the Single-use packaging system has a higher impact on PU than Refill on the Go solution, a Kruskal-Wallis test was conducted to analyze if the means of the two packaging systems are significantly different from each other.

The Kruskal-Wallis test showed that there is a statistically significant difference in PU for the different packaging systems, with a mean rank score of 47.58 for Single-use and 76.04 for Refill on the Go. The Monte Carlo estimates an exact p-value of .000 guaranteed that lies within the range (.000, .000) with 99% confidence. Furthermore, the asymptotic inference also returns a $p < .001$ indicating it was able to estimate the true p-value with this degree of accuracy. Thus, the means of the two groups are significantly different from each other.

Although, the mean rank shows that Refill on the Go has a higher impact on PU than Single-use packaging, invalidating H3b (Appendix 9).

4.4.5 Hypothesis 5

H5: Perceived Usefulness has a stronger impact on Willingness to Pay than Perceived Ease of Use

To evaluate the together effect of the mediators that explains the relationship between the independent and the dependent variable, model 6 from Process Macro by Hayes (2018) was used (Appendix 10). This model accounts for a double mediator analysis which allows explaining their interactions working in a serial model.

Starting with the effect of packaging systems on PEU, this is statistically significant ($p < .001$) with a positive effect of 0.6336 (path a_1). For the effects on PU, packaging systems also have a significant ($p < .001$) positive effect of 0.9924 (path a_2). Moreover, the model provides information regarding the relationship between PEU and PU. This effect is significant ($p < .01$) and PEU has a positive effect of 0.3343 on PU (path d_1).

Concerning the results on WTP, the total effect model is statistically significant, and it explains 40% of the variance. Examining the direct effect, one can assume that the independent variable packaging systems predict the dependent variable WTP with a statistically significant ($p < .001$) effect of 3.4981. On the other hand, looking at the indirect effects Ind1 (packaging systems \rightarrow PEU \rightarrow WTP), Ind2 (packaging systems \rightarrow PU \rightarrow WTP) and Ind3 (packaging systems \rightarrow PEU \rightarrow PU \rightarrow WTP), neither has a significant effect as all of them include a zero in the bootstrap confidence intervals. Additionally, and as stated in Hypotheses H3a and H4a, neither PEU (path b_1) nor PU (path b_2) has a significant effect on WTP, as the bootstrapping confidence interval includes zero.

This means that most of the effect comes from the direct effect (path c'). The indirect effect demonstrates how packaging systems influence the WTP through a sequence in which packaging systems influence the mediators PEU and PU and those also influence WTP. In return, the total effect is the sum of the direct and indirect effects (Hayes, 2018). Thus, the total effect equals the sum of 3.4981 (path c') and 0.4266, which results in a total effect of 3.9247.

To summarize, most of the effect comes from the direct effect and this hypothesis is not validated. Thus, it is not viable to say that a mediator has a stronger effect than the other as

neither PEU nor PU has a significant effect on WTP. Other alternatives to this hypothesis are presented in chapter 4.5.

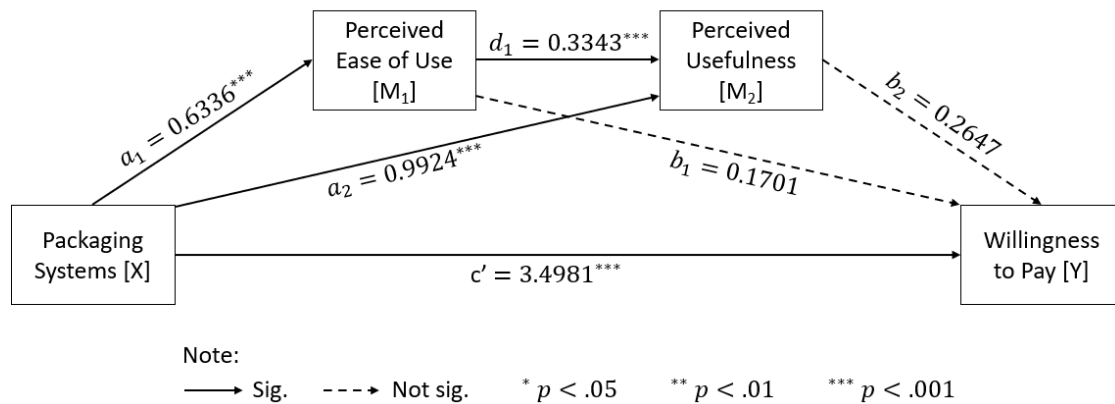


Figure 9: Statistical Model (H5)

4.5 Alternative mediators' tests

As seen in the 4.4 chapter, none of the mediators tested have a significant impact on Willingness to Pay. For that reason, demographic filters were applied to the original data to test if Perceived Ease of Use or Perceived Usefulness has a significant impact on Willingness to Pay. As in the survey there are 6 demographic questions, alternative hypotheses were tested in concordance with those questions, taking into account the number of people in each demographic group.

Note that Process by Hayes (2018) in SPSS assumes that the models are parametric. Even though the data is nonparametric, for the sake of this dissertation, it will still be used Process Macro by Hayes (2018) in SPSS to run these hypotheses.

Below it is possible to find the summary table of alternatives hypothesis tested:

Hypotheses	Valid	Significant
H6a: PU mediates the relationship between packaging systems and WTP when the respondent is a woman	No	No
H6b: PEU mediates the relationship between packaging systems and WTP when the respondent is a woman	No	No
H7a: PU mediates the relationship between packaging systems and WTP when a respondent is a person between 18 and 24 years old	Yes	Yes
H7b: PEU mediates the relationship between packaging systems and WTP when a respondent is a person between 18 and 24 years old.	No	No
H8a: PU mediates the relationship between packaging systems and WTP when the respondent is working at full time	No	No
H8b: PEU mediates the relationship between packaging systems and WTP when the respondent is working at a full time	No	No
H9a: PU mediates the relationship between packaging systems and WTP when the respondent has never been married	No	No
H9b: PEU mediates the relationship between packaging systems and WTP when the respondent has never been married	No	No
H10a: PU mediates the relationship between packaging systems and WTP when the respondent has a bachelor's degree	No	No
H10b: PEU mediates the relationship between packaging systems and WTP when the respondent has a bachelor's degree	No	No
H11a: PU mediates the relationship between packaging systems and WTP when the respondent has an income higher than 10.000€ a year	No	No
H11b: PEU mediates the relationship between packaging systems and WTP when the respondent has an income higher than 10.000€ a year	No	No

Table 6: Alternative mediators hypotheses

The only significant and valid hypothesis tested on SPSS was H7a:

PU mediates the relationship between packaging systems and WTP when a respondent is a person between 18 and 24 years old.

To evaluate the effect that explains the relationship between the package system and WTP when a respondent is a person between 18 and 24 years old, model 4 from Process Macro by Hayes (2018) was used (Appendix 11).

The model is statistically significant and it explains 48.7% of the variance. Examining the effect of the packaging system on the PU, it is significant ($p < .001$) and displays a positive effect of 1.3582 (path a_1). Regarding WTP, the model is significant ($p < .01$) and it is possible to see that PU has a significant positive impact on WTP of 0.5935 (path b_1). The indirect effect demonstrates how packaging systems influence the WTP when a respondent is a person between 18 and 24 years old through a sequence in which packaging systems influence the mediator PU, which also influences WTP. In return, the total effect is the sum of the direct and indirect effects (Hayes, 2018). Thus, the total effect equals the sum of 3.4259 (path c') and 0.8061, which results in a total effect of 4.2320.

To summarize, this hypothesis is significant and validated meaning that Perceived Usefulness mediates the relation between packaging systems and WTP for people between 18 and 24 years old.

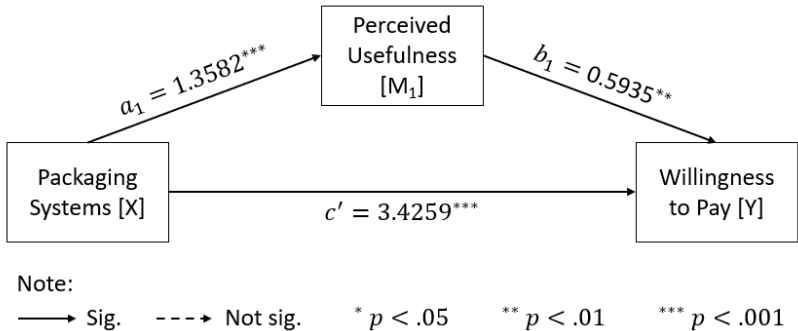


Figure 10: Statistical Model (H7a)

None of the hypotheses tested showed that Perceived Ease of Use is a mediator of the relationship between packaging systems and Willingness to Pay. In this study is not possible to assume that PEU is not a mediator of that relationship, but further studies should be conducted on that matter.

CHAPTER 5: CONCLUSIONS AND LIMITATIONS

The last chapter of the dissertation serves as a summary and conclusion of the main findings. Academic and managerial implications are identified, and finally, a record of limitations and proposals for further research are described.

5.1 Main Findings & Conclusions

RQ1: What are the overall differences in Willingness to Pay between Single-use and Refill on the Go?

Overall, it was proved that the mean ranks are significantly different from each other more specifically that the Refill on the Go solution has a higher impact on WTP than Single-use packaging. This means that consumers are willing to pay more for the Refill on the Go package plus a first shampoo refill than for a traditional Single-use shampoo packaging.

RQ2: What explains the Willingness to Pay for a Refill on the Go solution?

In this dissertation, it has been studied the moderator effect of consumers' Pro-Environmental Attitude on Willingness to Pay. This study suggests that a higher PEA leads to a higher WTP for a Refill on the Go solution and that a lower PEA leads to a lower WTP for a Refill on the Go solution. In fact, these results are similar to the previous literature findings.

Although, in this dissertation, it was not possible to prove that WTP can be explained by neither Perceived Ease of Use nor Perceived Usefulness. Regarding PEU, the objective was to understand if the Refill on the Go solution is simple to interact with and to understand how to use it, customers would likely be willing to pay more for it. A similar rationale was applied to PU as the goal was to understand if consumers were willing to pay more for a Refill on the Go solution if the technology was useful in their daily life.

Opposing to what is explained in the original Technology Acceptance Model, where PU and PEU are mediators of the relationship between external variables and behavioral intention to use, in this case, PU and PEU are not mediators of the relationship between packaging systems and WTP. In fact, other hypotheses were tested to find if, for different demographic groups, PU or PEU would be significant mediators of the relationship between packaging systems and WTP. Of the 12 total additional hypotheses tested, it was possible to find that PU mediates the relationship between packaging systems and WTP when a respondent is a person between 18 and 24 years old. Although, none of the demographic filters tested could show PEU as a significant mediator for the relationship.

In conclusion, a higher PEA leads to a higher WTP for a Refill on the Go solution. Additionally, WTP is explained by how useful consumers between 18 and 24 years old believe the packaging system is.

5.2 Managerial Implications

This research is relevant to any marketers and product developers in the hair care category at a retail level looking for reusable packaging solutions. Even though there is no significant effect of the mediators used for the general population, the insights gathered are still relevant for companies that aim to reduce their environmental impact through, particularly, plastic reduction.

In fact, this research starts by showing that Pro-Environmental Attitude moderates the relationship between packaging and Willingness to Pay. In this sense, it is recommended that companies target customers with high Pro-Environmental Attitudes as this group of people is willing to pay more for a Refill on the Go shampoo solution.

Moreover, since Willingness to Pay is explained by how useful consumers between 18 and 24 years old believe the packaging system to be, businesses should state a clear message that the usefulness between the two packaging systems is identical.

5.3 Academic Implications

Even though a lot of research has been conducted on sustainability and specifically on plastic waste, there is still little information on the success of the Refill on the Go solution in the countries where this solution already exists. Furthermore, not a lot of information exists specifically on the long-term benefits for the environment by changing to a Refill on the Go solution. This dissertation fills a research gap in the Portuguese market where this solution is not available at a supermarket level for shampoos, serving as a starting point for future research on the matter.

Additionally, the TAM is frequently applied for digital and software purposes and should be adapted to different technologies like the one presented in this dissertation.

5.4 Limitations and Further Research

Despite the fact that this dissertation serves as a starting point for environmental impact discussion on retail businesses and provides insights regarding the Willingness to Pay for a Refill on the Go solution, numerous limitations ought to be considered.

As this research is part of a master's degree, there are money and time restrictions therefore, the chosen method for data collection was an online questionnaire. This is the less intrusive offered option but, people may respond in concordance to their idyllic intention and not necessarily to their actual actions. This is even more important for this study as it is analyzed the consumers' pro-environmental attitudes, which literature shows may lead to a feeling of obligation to satisfy the society standards and answer accordingly (Fisher, 1993).

Regarding the sampling technique, data was collected over a non-probability convenience sampling technique which means it is a non-random convenient sample. Although this is the cheapest and least time-consuming sampling technique, it has some limitations. There are several potential sources of bias selection (Malhotra & Birks, 2007). Even though it was used a survey distribution platform to get respondents unknown to the researcher, it is recommended to replicate the research with a random and representative sample of the population for more reliable findings. Besides that, another limitation of this study was the nonparametric data. However, the Process Macro by Hayes (2018) was used in SPSS to test the moderation and mediator effects even though it assumes that the models are parametric. This might have led to non-optimal results.

Another point worth mentioning is that even though this may apply to the Portuguese market, the findings may not be appropriate to other geographies as they cannot be universalized (Bodur & Sarigöllü, 2005; Trivedi et al., 2015). Additionally, it is hard to predict consumers' reactions to environmentally friendly products, as there is almost no market information available (K. Lee, 2009; Trivedi et al., 2015), especially in the shampoo industry. Likewise, the research assumes a hypothetical willingness to pay as the respondent was not obligated to buy the final product which may lead to an overestimation of the real willingness to pay (Schmidt & Bijmolt, 2020).

Furthermore, additional research should be conducted to find other mediators that can explain the relationship between packaging systems and the willingness to pay as none of the tested had a significant impact. In addition to a willingness to pay, this study should also take into consideration the purchase intention and the brand effect. The results from the research may be affected by the fact that the brand chosen was Pantene. It is possible that consumers with a high pro-environmental attitude may or may not recognize a Pantene line product to be similar to the parent brand and consequently, not up to their environmental principles (Hill & Lee, 2015).

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APPENDICES

Appendix 1: Questionnaire – English version

Survey Flow

Standard: Introduction (1 Question) Standard: Block 1: Control Questions (2 Questions)
BlockRandomizer: 1 - Evenly Present Elements
Standard: Block 2: Stimuli 1 - Single-use (1 Question) Standard: Block 2: Stimuli 2 - Refill on the go (1 Question)
Standard: Block 3: Pro-Environmental Attitudes (1 Question) Standard: Block 4: Perceived Usefulness (2 Questions) Standard: Block 5: Perceived Ease of Use (2 Questions) Standard: Block 6: Willingness to Pay (2 Questions) Standard: Block 1.1: Control Question (1 Question) Block: Block 7: Demographics (6 Questions)

Start of Block: Introduction

Q1 | Intro

Dear participant,

This survey aims to assess your willingness to pay for refillable packaging in the Portuguese market. Bear in mind that there is no wrong or right answers so I kindly ask you to answer the questions truthfully and intuitively. Your participation is anonymous – nothing asked can be used to identify you. Data is fully confidential – it is compiled into a report and then deleted. If you have any questions, please send an e-mail to: s-rgdmoreira@ucp.pt

Proceed with the survey if you agree to participate.

Thank you and kind regards,
Gabriela Moreira

End of Block: Introduction

Start of Block: Block 1: Control Questions

Q2 In which country do you currently reside?

▼ Afghanistan (1) ... Zimbabwe (195)

Skip To: End of Survey If Q2 != Portugal

Q3 | Buying freq How often have you bought a shampoo, in the last half-year?

- Every week
- Every month
- Every 3 months
- Once
- Never

Skip To: End of Survey If Q3 | Buying freq = Never

End of Block: Block 1: Control Questions

Start of Block: Block 2: Stimuli 1 - Single use

Q5 | S1

Imagine that you are in a supermarket looking for a shampoo. While browsing the shelves, you come across the product below and take a closer look at it.

The product is an established shampoo brand in a regular packaging and is thrown away once it's finished.

Please answer the following questions with this product in mind.



End of Block: Block 2: Stimuli 1 - Single use

Start of Block: Block 2: Stimuli 2 - Refill on the go

Q6 | S2

Imagine that you are in a supermarket looking for a shampoo. While browsing the shelves, you come across the "Refill on the Go" technology (figure A) and take a closer look at it. This technology, as shown below, allows you to refill your shampoo container (figure B) if you already have one, or you can buy a container and fill it up for the first time. You would scan the container, fill it up and a barcode label would be printed to be scanned at the checkout.

Please answer the next questions with this in mind.



A



B

End of Block: Block 2: Stimuli 2 - Refill on the go

Start of Block: Block 3: Pro-Environmental Attitudes

Q4 | PEA

Please indicate your level of agreement for the following statement

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
"We are approaching the limit of the number of people the earth can support"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Humans have the right to modify the natural environment to suit their needs"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"When humans interfere with nature it often produces disastrous consequences"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Human ingenuity will insure that we do NOT make the earth unlivable"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Humans are harshly abusing the environment"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The earth has plenty of natural resources if we just learn how to develop them"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Plants and animals have as much right as humans to exist"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The balance of nature is strong enough to cope with the impacts of modern industrial nations"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Despite our special abilities, humans are still subject to the laws of nature"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Please select strongly agree"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The so-called 'ecological crisis' faced by humankind has been greatly exaggerated"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The earth is like a spaceship with very limited room and resources"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Humans were meant to rule over the rest of nature"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

“The balance of nature is very delicate and easily upset”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
“Humans will eventually learn enough about how nature works to be able to control it”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
“If things continue on their present course, we will soon experience a major ecological catastrophe”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:
If Q5 | S1 Is Displayed

Q7 - PU S1

Please indicate your level of agreement for the following statements

	Strongly disagree	Disagree	Somewh at disagree	Neither agree nor disagree	Somewh at agree	Agree	Strongly agree
Using this packaging would enable me to accomplish my shopping tasks more quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using this packaging would improve my job performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using this packaging would increase my productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using this packaging would enhance my effectiveness in my shopping tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using this packaging would make it easier to shop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find this packaging useful in my shopping tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Block 3: Pro-Environmental Attitudes

Start of Block: Block 4: Perceived Usefulness

Display This Question:
If Q6 | S2 Is Displayed

Q8 - PU S2

Please indicate your level of agreement for the following statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Using "Refill on the Go" technology would enable me to accomplish my shopping tasks more quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using "Refill on the Go" technology would improve my job performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using "Refill on the Go" technology would increase my productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using "Refill on the Go" technology would enhance my effectiveness in my shopping tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using "Refill on the Go" technology would make it easier to go shopping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find "Refill on the Go" technology useful in my shopping tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Block 4: Perceived Usefulness

Start of Block: Block 5: Perceived Ease of Use

Display This Question:
If Q5 | S1 Is Displayed

Q9 | PEU S1

Please indicate your level of agreement for the following statements

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
Learning how to use this packaging would be easy for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find it easy to get this packaging to do what I want it to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My interaction with this packaging would be clear and understandable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find this packaging to be flexible to interact with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It would be easy for me to become skillful at using this packaging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find this packaging easy to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Learning how to use "Refill on the Go" would be easy for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find it easy to get "Refill on the Go" to do what I want it to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My interaction with "Refill on the Go" would be clear and understandable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find "Refill on the Go" to be flexible to interact with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It would be easy for me to become skillful at using "Refill on the Go"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I would find "Refill on the Go" easy to use

○ ○ ○ ○ ○ ○ ○

If Q6 | S2 Is Displayed

Q10 | PEU S2

Please indicate your level of agreement for the following statements

End of Block: Block 5: Perceived Ease of Use

Start of Block: Block 6: Willingness to Pay

Display This Question:


If Q5 | S1 Is Displayed

Q11 | WTP S1

What would be your maximum willingness to pay for the solution presented before?

0 2 3 5 6 8 9 11 12 14 15

In euros



Display This Question:


If Q6 | S2 Is Displayed

Q12 | WTP S2


What would be your maximum willingness to pay (in euros) for the solution presented?

0 2 3 5 6 8 9 11 12 14 15

Refillable container



Each refill



End of Block: Block 6: Willingness to Pay

Start of Block: Block 2.1: Control Question

Q21

What was the type of packaging presented to you just now?

- Refill/reusable packaging
- Single-use packaging
- None

End of Block: Block 2.1: Control Question

Start of Block: Block 7: Demographics

End of Block: Block 2.1: Control Question

Start of Block: Block 7: Demographics

Q13 | Gender

How do you describe yourself?

- Male
- Female
- Non-binary / third gender
- Prefer to self-describe _____
- Prefer not to say

How old are you?

- Under 18
- 18-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65+ years old

Q15 | Job

What best describes your employment status over the last year?

- Working full-time
- Working part-time
- Unemployed and looking for work

- A homemaker or stay-at-home parent
- Student
- Retired
- Other

Q16 | Marital

What is your current marital status?

- Married
- Living with a partner
- Widowed
- Divorced/Separated
- Never been married

Q17 | Academic

What is the highest level of school you have completed or the highest degree you have received?

- Less than high school degree
- High school graduate
- Bachelor's degree
- Master's degree
- Doctoral degree
- Other

Q18 | Income What is your approximate net yearly income, in euros?

- Less than €10,000
- €10,000 to €19,999
- €20,000 to €29,999
- €30,000 to €39,999
- €40,000 to €49,999
- €50,000 to €59,999
- €60,000 to €69,999
- €70,000 to €79,999
- €80,000 to €89,999

- €90,000 to €99,999
- €100,000 to €149,999
- €150,000 or more

End of Block: Block 7: Demographics

Appendix 2: Kolmogorov-Smirnov test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PEAcor	.094	124	.010	.977	124	.035
PU	.090	124	.014	.971	124	.009
PEU	.144	124	.000	.891	124	.000
WTPt	.131	124	.000	.927	124	.000

a. Lilliefors Significance Correction

Appendix 3: Levene test

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
PU	Based on Mean	6.287	1	122	.013
	Based on Median	5.820	1	122	.017
	Based on Median and with adjusted df	5.820	1	121.225	.017
	Based on trimmed mean	6.387	1	122	.013
PEU	Based on Mean	8.407	1	122	.004
	Based on Median	6.890	1	122	.010
	Based on Median and with adjusted df	6.890	1	114.660	.010
	Based on trimmed mean	7.859	1	122	.006
WTPt	Based on Mean	17.464	1	122	.000
	Based on Median	16.625	1	122	.000
	Based on Median and with adjusted df	16.625	1	93.637	.000
	Based on trimmed mean	17.181	1	122	.000
PEAcor	Based on Mean	1.943	1	122	.166
	Based on Median	1.596	1	122	.209

Based on Median and with adjusted df	1.596	1	114.313	.209
Based on trimmed mean	1.797	1	122	.183

Appendix 4: Hypothesis 1

Refill on the Go solution has a higher impact on Willingness to Pay than single-use packaging

Kruskal-Wallis Test

Ranks

	packg	N	Mean Rank
WTPt	Single-use	59	36.34
	Refill on the Go	65	86.25
	Total	124	

Test Statistics^{a,b}

		WTPt	
Kruskal-Wallis H		59.762	
df		1	
Asymp. Sig.		.000	
Monte Carlo Sig.	Sig.	.000 ^c	
	99% Confidence Interval	Lower Bound	.000
		Upper Bound	.000

a. Kruskal Wallis Test

b. Grouping Variable: packg

c. Based on 10000 sampled tables with starting seed 926214481.

Appendix 5: Hypothesis 2

Pro-Environmental Attitude moderates the relationship between packaging system and Willingness to Pay

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Version 4.0 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

Model : 1
Y : WTPt
X : packg
W : PEAcOR

Sample
Size: 124

OUTCOME VARIABLE:

WTPt

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.6568	.4314	5.6327	30.3485	3.0000	120.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	4.1164	3.0872	1.3334	.1849	-1.9961	10.2288
packg	-5.6109	4.6617	-1.2036	.2311	-14.8406	3.6189
PEAcor	-.1216	.5213	-.2332	.8160	-1.1537	.9105
Int_1	1.6383	.7938	2.0640	.0412	.0668	3.2099

Product terms key:

Int_1 : packg x PEAcor

Test(s) of highest order unconditional interaction(s):

	R2-chng	F	df1	df2	p
X*W	.0202	4.2603	1.0000	120.0000	.0412

Focal predict: packg (X)
Mod var: PEAcor (W)

Conditional effects of the focal predictor at values of the moderator(s):

PEAcor	Effect	se	t	p	LLCI	ULCI
5.3058	3.0820	.6069	5.0780	.0000	1.8803	4.2836
5.8516	3.9761	.4279	9.2926	.0000	3.1290	4.8233
6.3974	4.8703	.6109	7.9728	.0000	3.6608	6.0798

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
4.6687	3.2258	96.7742

Conditional effect of focal predictor at values of the moderator:

PEAcor	Effect	se	t	p	LLCI	ULCI
4.3333	1.4887	1.2762	1.1664	.2457	-1.0382	4.0155
4.4600	1.6962	1.1820	1.4350	.1539	-.6441	4.0365
4.5867	1.9037	1.0889	1.7483	.0830	-.2522	4.0596
4.6687	2.0380	1.0294	1.9799	.0500	.0000	4.0761
4.7133	2.1112	.9972	2.1171	.0363	.1368	4.0856
4.8400	2.3188	.9074	2.5553	.0119	.5221	4.1154
4.9667	2.5263	.8201	3.0804	.0026	.9025	4.1501
5.0933	2.7338	.7362	3.7133	.0003	1.2761	4.1915
5.2200	2.9413	.6570	4.4769	.0000	1.6405	4.2422
5.3467	3.1489	.5844	5.3883	.0000	1.9918	4.3059
5.4733	3.3564	.5211	6.4406	.0000	2.3246	4.3882
5.6000	3.5639	.4710	7.5663	.0000	2.6313	4.4965
5.7267	3.7714	.4386	8.5988	.0000	2.9030	4.6398
5.8533	3.9790	.4279	9.2989	.0000	3.1318	4.8261
5.9800	4.1865	.4405	9.5041	.0000	3.3143	5.0586
6.1067	4.3940	.4745	9.2595	.0000	3.4544	5.3336
6.2333	4.6015	.5259	8.7499	.0000	3.5603	5.6428
6.3600	4.8090	.5900	8.1503	.0000	3.6408	5.9773
6.4867	5.0166	.6633	7.5630	.0000	3.7033	6.3299
6.6133	5.2241	.7430	7.0314	.0000	3.7531	6.6951
6.7400	5.4316	.8272	6.5664	.0000	3.7938	7.0694
6.8667	5.6391	.9147	6.1649	.0000	3.8281	7.4502

Data for visualizing the conditional effect of the focal predictor:

Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/

```

packg      PEAcor      WTPt      .
BEGIN DATA.
.0000      5.3058      3.4713

```

```

1.0000    5.3058    6.5533
.0000     5.8516    3.4050
1.0000    5.8516    7.3811
.0000     6.3974    3.3386
1.0000    6.3974    8.2089
END DATA.
GRAPH/SCATTERPLOT=
  PEAcor  WITH      WTPt      BY      packg      .

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
  95.0000

W values in conditional tables are the mean and +/- SD from the mean.

----- END MATRIX -----

```

Appendix 6: Hypothesis 3a

Perceived Ease of Use mediates the relationship between packaging systems and willingness to pay.

Run MATRIX procedure:

```

***** PROCESS Procedure for SPSS Version 4.0 *****

      Written by Andrew F. Hayes, Ph.D.      www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

*****

Model   : 4
  Y     : WTPt
  X     : packg
  M     : PEU

Sample
Size: 124

*****
OUTCOME VARIABLE:
  PEU

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .2953    .0872    1.0648    11.6587    1.0000    122.0000    .0009

Model
      coeff      se      t      p      LLCI      ULCI
constant    5.5254    .1343    41.1304    .0000    5.2595    5.7914
packg       .6336     .1855     3.4145    .0009     .2662    1.0009

*****
OUTCOME VARIABLE:
  WTPt

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .6388    .4080    5.8158    41.7012    2.0000    121.0000    .0000

Model
      coeff      se      t      p      LLCI      ULCI
constant    1.9710    1.2105    1.6282    .1061    -.4256    4.3676
packg       3.7608     .4539     8.2856    .0000     2.8622    4.6594

```

```

PEU          .2586      .2116      1.2223      .2240      -.1603      .6775

***** TOTAL EFFECT MODEL *****
OUTCOME VARIABLE:
  WTPt

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .6330      .4007      5.8393      81.5781      1.0000      122.0000      .0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      3.4000      .3146      10.8074      .0000      2.7772      4.0228
packg          3.9246      .4345      9.0321      .0000      3.0644      4.7848

***** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *****

Total effect of X on Y
      Effect      se      t      p      LLCI      ULCI
      3.9246      .4345      9.0321      .0000      3.0644      4.7848

Direct effect of X on Y
      Effect      se      t      p      LLCI      ULCI
      3.7608      .4539      8.2856      .0000      2.8622      4.6594

Indirect effect(s) of X on Y:
      Effect      BootSE      BootLLCI      BootULCI
PEU          .1639      .1159      -.0311      .4252

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

----- END MATRIX -----

```

Appendix 7: Hypothesis 3b

Single-use packaging has a higher impact on Perceived Ease of Use than Refill on the Go solution

Kruskal-Wallis Test

		Ranks	
	packg	N	Mean Rank
PEU	Single-use	59	52.64
	Refill on the Go	65	71.45
	Total	124	

Test Statistics^{a,b}

	PEU
Kruskal-Wallis H	8.587
df	1
Asymp. Sig.	.003

Monte Carlo Sig.	Sig.		.003 ^c
	99% Confidence Interval	Lower Bound	.002
		Upper Bound	.005

a. Kruskal Wallis Test

b. Grouping Variable: packg

c. Based on 10000 sampled tables with starting seed 2000000.

Appendix 8: Hypothesis 4a

Perceived usefulness mediates the relationship between packaging systems and willingness to pay

Run MATRIX procedure:

```
***** PROCESS Procedure for SPSS Version 4.0 *****
Written by Andrew F. Hayes, Ph.D.      www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3
*****
Model : 4
  Y : WTPt
  X : packg
  M : PU

Sample
Size: 124

*****
OUTCOME VARIABLE:
  PU

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .4109      .1688      1.8100      24.7784      1.0000      122.0000      .0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      3.0932      .1752      17.6603      .0000      2.7465      3.4400
packg          1.2042      .2419      4.9778      .0000      .7253      1.6831

*****
OUTCOME VARIABLE:
  WTPt

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      .6459      .4172      5.7254      43.3155      2.0000      121.0000      .0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      2.4777      .5875      4.2176      .0000      1.3147      3.6408
packg          3.5656      .4719      7.5552      .0000      2.6312      4.4999
PU             .2982      .1610      1.8517      .0665      -.0206      .6169

***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****

Direct effect of X on Y
      Effect      se      t      p      LLCI      ULCI
      3.5656      .4719      7.5552      .0000      2.6312      4.4999
```

```

Indirect effect(s) of X on Y:
      Effect    BootSE    BootLLCI    BootULCI
PU      .3591      .2334      -.0565      .8778

```

***** ANALYSIS NOTES AND ERRORS *****

```

Level of confidence for all confidence intervals in output:
  95.0000

```

```

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

```

```

----- END MATRIX -----

```

Appendix 9: Hypothesis 4b

Single-use packaging has a higher impact on Perceived Usefulness than the Refill on the Go solution.

Kruskal-Wallis Test

Ranks			
	packg	N	Mean Rank
PU	Single-use	59	47.58
	Refill on the Go	65	76.04
	Total	124	

Test Statistics^{a,b}

		PU
Kruskal-Wallis H		19.436
df		1
Asymp. Sig.		.000
Monte Carlo Sig.	Sig.	.000 ^c
99% Confidence Interval		
		Lower Bound
		Upper Bound

a. Kruskal Wallis Test

b. Grouping Variable: packg

c. Based on 10000 sampled tables with starting seed 299883525.

Appendix 10: Hypothesis 5

Perceived Usefulness has a stronger impact on Willingness to Pay than Perceived Ease of Use.

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Version 4.0 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
 Documentation available in Hayes (2022). www.guilford.com/p/hayes3

Model : 6
 Y : WTPt
 X : packg
 M1 : PEU
 M2 : PU

Sample
 Size: 124

OUTCOME VARIABLE:
 PEU

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.2953	.0872	1.0648	11.6587	1.0000	122.0000	.0009

Model

	coeff	se	t	p	LLCI	ULCI
constant	5.5254	.1343	41.1304	.0000	5.2595	5.7914
packg	.6336	.1855	3.4145	.0009	.2662	1.0009

OUTCOME VARIABLE:
 PU

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.4727	.2235	1.7050	17.4095	2.0000	121.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.2461	.6554	1.9012	.0597	-.0515	2.5437
packg	.9924	.2458	4.0382	.0001	.5059	1.4790
PEU	.3343	.1146	2.9179	.0042	.1075	.5611

OUTCOME VARIABLE:
 WTPt

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.6482	.4202	5.7438	28.9882	3.0000	120.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.6412	1.2209	1.3442	.1814	-.7761	4.0584
packg	3.4981	.4805	7.2799	.0000	2.5467	4.4494
PEU	.1701	.2175	.7820	.4357	-.2606	.6009
PU	.2647	.1669	1.5864	.1153	-.0657	.5951

***** TOTAL EFFECT MODEL *****

OUTCOME VARIABLE:
 WTPt

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.6330	.4007	5.8393	81.5781	1.0000	122.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
--	-------	----	---	---	------	------

constant	3.4000	.3146	10.8074	.0000	2.7772	4.0228
packg	3.9246	.4345	9.0321	.0000	3.0644	4.7848

***** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *****

Total effect of X on Y						
Effect	se	t	p	LLCI	ULCI	
3.9246	.4345	9.0321	.0000	3.0644	4.7848	

Direct effect of X on Y						
Effect	se	t	p	LLCI	ULCI	
3.4981	.4805	7.2799	.0000	2.5467	4.4494	

Indirect effect(s) of X on Y:				
	Effect	BootSE	BootLLCI	BootULCI
TOTAL	.4266	.2531	-.0197	.9713
Ind1	.1078	.1095	-.0959	.3376
Ind2	.2627	.2043	-.0825	.7203
Ind3	.0561	.0568	-.0165	.1996

Indirect effect key:

Ind1 packg	->	PEU	->	WTPT		
Ind2 packg	->	PU	->	WTPT		
Ind3 packg	->	PEU	->	PU	->	WTPT

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
5000

----- END MATRIX -----

Appendix 11: Hypothesis 7a

PU mediates the relationship between packaging systems and WTP when a respondent is a person between 18 and 24 years old.

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Version 4.0 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

Model : 4
Y : WTPT
X : packg
M : PU

Sample
Size: 72

OUTCOME VARIABLE:
PU

Model Summary						
R	R-sq	MSE	F	df1	df2	p
.4539	.2060	1.8263	18.1667	1.0000	70.0000	.0001

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.9571	.2284	12.9456	.0000	2.5016	3.4127
packg	1.3582	.3187	4.2622	.0001	.7226	1.9937

OUTCOME VARIABLE:

WTpt

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.6979	.4870	5.6050	32.7523	2.0000	69.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.7535	.7373	2.3784	.0202	.2827	3.2243
packg	3.4259	.6265	5.4683	.0000	2.1760	4.6757
PU	.5935	.2094	2.8344	.0060	.1758	1.0112

***** TOTAL EFFECT MODEL *****

OUTCOME VARIABLE:

WTpt

Model Summary

	R	R-sq	MSE	F	df1	df2	p
	.6537	.4273	6.1682	52.2229	1.0000	70.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	3.5086	.4198	8.3576	.0000	2.6713	4.3458
packg	4.2320	.5856	7.2265	.0000	3.0640	5.3999

***** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *****

Total effect of X on Y

Effect	se	t	p	LLCI	ULCI
4.2320	.5856	7.2265	.0000	3.0640	5.3999

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI
3.4259	.6265	5.4683	.0000	2.1760	4.6757

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
PU	.8061	.4152	.1654	1.7818

***** BOOTSTRAP RESULTS FOR REGRESSION MODEL PARAMETERS *****

OUTCOME VARIABLE:

PU

	Coeff	BootMean	BootSE	BootLLCI	BootULCI
constant	2.9571	2.9552	.2555	2.4524	3.4537
packg	1.3582	1.3614	.3209	.7354	1.9932

OUTCOME VARIABLE:

WTpt

	Coeff	BootMean	BootSE	BootLLCI	BootULCI
constant	1.7535	1.7502	.7619	.2287	3.1831
packg	3.4259	3.4047	.6040	2.2120	4.5722
PU	.5935	.5958	.2423	.1426	1.0955

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:

95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
5000

----- END MATRIX -----