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SUSTAINABLE PACKAGING: FACTORS  
INFLUENCING CONSUMERS PURCHASE  
INTENTION

Dissertation in the scope of the Master in Industrial Engineering and Management oriented by Professor Luís Miguel D. F. Ferreira, Ph.D and presented to the Mechanical Engineering Department of the Science and Technology Faculty of the University of Coimbra.

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# **Sustainable Packaging: Factors Influencing Consumers Purchase Intention**

Dissertation submitted for the degree of Master of Science in Industrial  
Engineering and Management

## **Embalagem Sustentável: Fatores que Influenciam a Intenção de Compra dos Consumidores**

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Each dream you leave behind is a part of your future that will no longer exist.

Steve Jobs



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## Resumo

O objetivo deste trabalho é explorar conceitos relacionados com a temática das embalagens sustentáveis, mas também o influencia a intenção dos consumidores na compra dos produtos que por sua vez tem embalagens sustentáveis. Assim para o desenvolvimento deste estudo foi importante a análise da Teoria do Comportamento Planeado, de modo a analisar as intenções dos consumidores relativamente à compra de produtos com embalagens sustentáveis. Este estudo identifica algumas variáveis consideradas importantes e que poderiam influenciar positivamente a intenção de compra de produtos com embalagens sustentáveis. Sendo entre elas a preocupação ambiental, atitude, conhecimento, normas subjetivas, controlo do comportamento percebido e disposição a pagar, e que se consideram que influenciam positivamente a intenção de compra. Com recurso a um questionário foi possível a recolha de respostas de consumidores. O tratamento de dados foi realizado recorrendo aos softwares pelo IBM SPSS em conjunto com o AMOS para a realização de análises fatoriais exploratórias (AFE), análises fatoriais confirmatórias (AFC), análises de fiabilidade e teste das hipóteses. Assim deparou-se com uma correlação elevada das variáveis preocupação ambiental (EC) e a atitude (At). Foi conclusivo que a norma subjetiva seria a variáveis com um peso maior na intenção de compra dos consumidores.

**Palavras-chave:** Embalagem sustentável, Teoria do Comportamento Planeado, Intenção de compra, Análise fatorial exploratória



## Abstract

The concept of sustainability is becoming more recurrent and usual in daily conversations, just as many people are beginning to adopt a sustainable lifestyle.

The goal of this work is not only to gather concepts related to the definition of sustainable packaging but also to clarify the concept that it represents and exemplify some factors that influence the intention of consumers to buy products that have sustainable packaging. Thus, for the study of the model, it is essential to go through theories such as the Theory of Planned Behavior to study the type of intentions that consumers of the Portuguese population have when purchasing products with sustainable packaging. This study goes through the organization of some variables considered essential, which could positively influence the intention to purchase products with sustainable packaging. Among them are an environmental concern, attitude, knowledge, subjective norm, perceived behavioral control, and willingness to pay, combined with hypotheses regarding these and purchase intention, which is considered positive, i.e., these variables positively influence purchase intention. With the use of a questionnaire, it is possible to collect answers from consumers, and it is done exclusively on online platforms, specifically in social networks. IBM SPSS performed the data processing in conjunction with AMOS to perform exploratory factor analysis (EFA), confirmatory factor analysis (CFA), reliability analysis, and analysis of covariances. Thus, the variables were faced with a high correlation between environmental concern (EC) and attitude (TA). It was conclusive that the subjective norm would be the variables with a greater weight in the purchase intention of consumers.

**Keywords** Sustainable packaging, Theory of Planned Behavior, Purchase intention, Exploratory factor analysis



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## SYMBOLS AND ACRONYMS

### List of Symbols

$\alpha$  - Cronbach alpha

### Abbreviations

CFA - Confirmatory Factor Analysis

EC - Environmental Concern

ECR-The European Organization for Packaging and the Environment

EFA - Exploratory Factor Analysis

EUROPEN - The European Organization for Packaging and the Environment

KPI - Key Performance Indicators

LCA - Life Cycle Assessment

PBC - Perceived Behavior Control

RMSEA - Root Mean Square Error of Approximation

SN - Subjective Norm

SPA - Packaging Alliance

SPC - Sustainable Packaging Coalition

TPB - Theory of Planned Behavior

WP - Willingness to Pay



## 1. INTRODUCTION

According to Bill Gates, there are two numbers to understand when it comes to climate change. The first one is 51 billion. The other is the number zero. The amount of greenhouse gases that the globe regularly emits into the atmosphere each year is 51 billion tons. Although the number fluctuates from year to year, it is generally on the rise. This is where we are now. We must strive for a score of zero. Humans must stop contributing greenhouse gases to the atmosphere to stop warming and avert the worst effects of climate change, which will be disastrous (Gates, 2021)

Sustainability is a subject where many events provide a compelling case to study the idea of sustainability as a new global attractor (Mol, 2010). However, it is a complex concept that is open to interpretation. Although we are affected almost every day by environmental damage caused by human activities, including climate change, land degradation, and declining availability and quality of water resources, uncertainty is still the best way to deal with individuals, companies, and governments (Lewis et al., 2007). It may seem a bit commonplace nowadays as sustainability applies to practically every kind of product or area. However, it is a fundamental concept since the impact on people's way of life influences the planet.

Sustainability is one of the most discussed subjects in the packaging area (Nordin & Selke, 2010). However, for many product manufacturing companies, the incorporation of sustainability principles into their business practice can be viewed mainly through others (society) through packaging (Nordin & Selke, 2010). For decades, the packaging industry has faced tremendous pressure to reduce waste and excess packaging and improve recyclability. However, some people worry that the complex role of packaging and the system to which the supply chain belongs is not considered in achieving these goals. Therefore, it is often unclear whether isolated decisions will lead to an overall net improvement in environmental performance. While this attention has been growing exponentially, the consumer, for the most part, has shown more interest in sustainable packaging, mainly because of the positive impact it can have on the environment. At the

same time, social pressures require that environmental goals do not compromise economic growth, jobs and standards of living (Lewis et al., 2007).

For this study, a survey was developed to analyze the variables/factors which influence consumers' intention to purchase products with sustainable packaging. It was structured and based on the Theory of Planned Behavior (TPB) model originally presented by Ajzen (1991). Human behavior is very complex and also frightening (Ajzen, 1991). Personality and social psychologists tend to focus their analysis on fully functional individuals whose processing of available information regulates the influence of biological and environmental factors on behavior. However, concepts related to behavioral tendencies, such as social attitudes and personality traits, have played an essential role in predicting and explaining human behavior.

So, this study aims not only to understand consumers' purchasing attitudes towards products with sustainable packaging but also seeks to give readers some insights into:

1. How sustainable packaging is defined.
2. Which are the consumer purchasing attitudes towards products with sustainable packaging.

## **2. LITERATURE REVIEW**

### **2.1. The Packaging**

The pressure on companies to make packages that are more desirable is not a new phenomenon, but it has increased significantly in recent years. The main issue is that the media and consumers generally view packaging as a stand-alone product. Furthermore, that overlooks its primary function, which is to protect, distribute and display goods. If unpackaged food rots, the fragile product will break, and distribution will become dangerous (ECR Europe, 2009).

#### **2.1.1. Functions of packaging**

Packaging development is subject to many different demands and influences from its environment (Hellström & Saghir, 2007). These arise from consumer demands for more, better convenience functions, more solutions, increased product safety, and the development of technology and materials, logistics, and marketing requirements (Rundh, 2009).

Packaging has many functions, the most basic function being the delivery of products to consumers in perfect conditions. Good packaging uses only the correct materials necessary to accomplish this task. Therefore, the packaging size is reduced, and the scope of the scenario where product loss occurs diminishes to the point where the increase in product loss exceeds the savings from using fewer packaging materials. Any reduction in packaging beyond this point is a false economy, as it increases the total amount of waste in the system (ECR Europe, 2009).

Many researchers state the functions of packaging in different contexts. Some functions are mentioned by most authors in a similar way, while others differ. For example, Lindh et al. (2016) categorized the different contexts of packaging in order to show that

several authors mention "protection" with different definitions. However, to facilitate and simplify the understanding of packaging functionality, we'll show the Table 1 summarized by ECR Europe and EUROPEN (2009), to better understand the functionalities.

**Table 1.** Packaging functions (ECR Europe, 2009)

<b>Function</b>	<b>Feature</b>
<b>Protection</b>	<ul style="list-style-type: none"> <li>• Prevent breakage (mechanical protection)</li> <li>• Prevent spoilage (barrier to moisture, gases, light, flavors and aromas)</li> <li>• Prevent contamination, tampering and theft</li> <li>• Increase shelf life</li> </ul>
<b>Promotion</b>	<ul style="list-style-type: none"> <li>• Description of product</li> <li>• List of ingredients</li> <li>• Product features &amp; benefits</li> <li>• Promotional messages and branding</li> </ul>
<b>Information</b>	<ul style="list-style-type: none"> <li>• Product identification, preparation and usage</li> <li>• Nutritional and storage data</li> <li>• Safety warnings</li> <li>• Contact information</li> <li>• Opening instructions</li> <li>• End of life management</li> </ul>
<b>Convenience</b>	<ul style="list-style-type: none"> <li>• Product preparation and serving</li> <li>• Product storage</li> <li>• Portioning</li> </ul>
<b>Unitization</b>	<ul style="list-style-type: none"> <li>• Provision of consumer units</li> <li>• Provision of retail and transport units</li> </ul>
<b>Handling</b>	<ul style="list-style-type: none"> <li>• Transport from producer to retailer</li> <li>• Point of sale display</li> </ul>
<b>Waste reduction and recycling and reuse by-products</b>	<ul style="list-style-type: none"> <li>• Enables centralized processing and re-use of by-products</li> <li>• Facilitates portioning and storage</li> <li>• Increases shelf life</li> <li>• Reduces transport energy</li> </ul>



## 2.2. Packaging and sustainability

The deployment of measures in the three pillars of economic, environmental, and social sustainability should be linked (Azzi et al., 2012). From a business standpoint, choosing the "best packaging" is generally linked to concerns such as increased sales and lower expenses (García-Arca et al., 2017). On the one hand, packaging should be viewed as a silent or unseen "salesperson" with concrete and intangible product qualities, encouraging distinction and eventual sales (Rundh, 2016). On the other hand, packaging also impacts a product's "green" image (Seo et al., 2016). Packaging efficiency should also be evaluated from an environmental standpoint (García-Arca et al., 2017). The following complimentary lines might be used to help reduce the environmental effect of package design:

- Packaging waste reduction and raw material usage reduction (Azzi et al., 2012);
- Promotion of returnable packaging, recycling, and packaging waste recovery (Williams et al., 2008);
- Strengthening product protection in order to prevent losses (Williams et al., 2008).

In terms of packaging, the social pillar is perhaps the least developed of the three. Providing clear, honest, comprehensible, and genuine information, adjusting use and product dosages to the demands of different consumers, or ensuring safe consumption are some of the societal needs identified by certain writers (Azzi et al., 2012).

The contribution of packaging to economic, environmental, and social sustainability can be illustrated as the particular reason why inadequate packaging in distribution causes food to deteriorate before it reaches the consumer (World Health Organizations cited in ECR Europe, 2009). Thus, packaging presents potential losses and gains concerning the pillars of sustainability that can be categorized on the three components of sustainability (See Table 2).

**Table 2.** The impacts/costs and gains of packaging in relation to the three components of sustainability (Wever & Tempelman, 2009)

Sustainability component	(Potential) impact /costs	(Potential) gains
Economic (Profit)	<ul style="list-style-type: none"> <li>• Purchasing of materials, energy.</li> <li>• Cost of processing, converting, printing, transportation, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Improving market potential through:</li> <li>• Extended shelf life</li> <li>• Inducing sales through marketing</li> <li>• Convenience</li> </ul>
Environmental (Planet)	<ul style="list-style-type: none"> <li>• Impact of materials</li> <li>• Impact of processing, converting, printing, transportation, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Reducing wastage of food</li> <li>• Reducing damage to products</li> </ul>
Social (People)	<p><i>“Fosters unsustainable consumption habits, such as not valuing materials and a ‘throw-away mentality’.”</i> (Lewis, 2005)</p>	<ul style="list-style-type: none"> <li>• Enabling food availability in developing regions</li> <li>• Providing employment (Lewis, 2005)</li> <li>• Enabling life styles (e.g. single household portions)</li> <li>• Protecting children from harmful substances</li> <li>• Inducing proper wasting behavior</li> </ul>

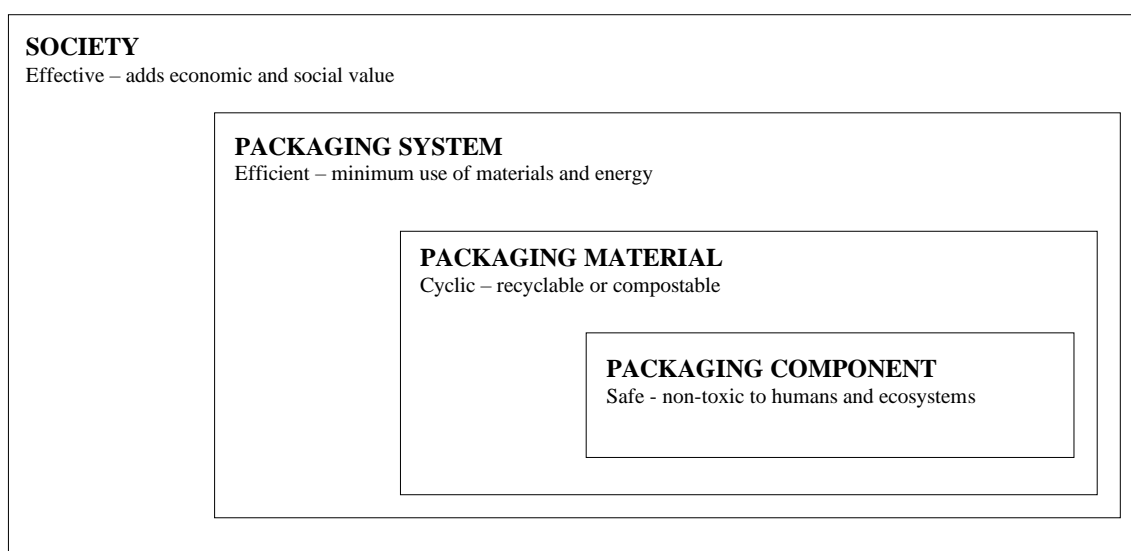
### 2.3. Definition of Sustainable Packaging

The studies referring to this type of concept refer to different nomenclatures. Firstly, it is important to point out the prominent names that usually are mostly used to research this subject. Thus, we have "green packaging", "eco-friendly packaging", "sustainable packaging", "biodegradable pack", "compostable pack", "recyclable pack", "bio-pack", or "environmentally pack" (Wandosell et al., 2021) as the nomenclature for sustainable packaging. A few organizations devote their time to increase their portfolio, gathering as many companies as possible to join and increase their knowledge on this sustainability journey, such as the Sustainable Packaging Alliance (SPA), Sustainable

Packaging Coalition (SPC), and EUROPEN - The European Organization for Packaging and the Environment.

### 2.3.1. SPA's Sustainable Packaging Definition

According to their website, SPA hopes that more companies are eager to provide more sustainable product customization and more sustainable operations. The packaging is a high-profile issue that must be considered in a company's sustainability strategy.



**Figure 1.** The four levels and principles of the definition of SPA sustainable packaging, (Sonneveld et al., 2005)

James, Fitzpatrick, Lewis, and Sonneveld (2005) definition considers the role that packaging plays in various areas to achieve environmental objectives (Figure 1). It aims to differentiate between the macro levels of society associated with prosperity and well-being, the efficiency and effectiveness of the packaging product/system, the environmental performance level of materials (impact and waste prevention), to the micro-level of humans ecotoxicological soundness of packaging components.

There are also proposed key performance indicators (KPI) (Table 3) (as cited in to Sonneveld et al., 2005). These are expressed with “reduce product waste” and “improve function” to highlight that sustainability is a continuous improvement process and do not have a predetermined end (Lewis et al., 2007).

**Table 3.** Principles and indicators of sustainable packaging, (Lewis et al., 2007 and Sonneveld et al., 2005)

Sustainable packaging principle	Sustainable packaging indicator	
<b>1. Effective</b> The packaging system adds real value to society by effectively containing and protecting products as they move through the supply chain and by supporting informed and responsible consumption.	1.1	Reduces product waste
	1.2	Improves functionality
	1.3	Prevents over-packaging
	1.4	Reduces business costs
	1.5	Achieves satisfactory return on investment
<b>2. Efficient</b> The packaging system is designed to use materials and energy as efficiently as possible throughout the product life cycle. This should include material and energy efficiency in interactions with associated support systems such as storage, transport, and handling.	2.1	Improves product / packaging ratio
	2.2	Improves efficiency of logistics
	2.3	Improves energy efficiency
	2.4	Improves materials efficiency (total amount of material used)
	2.5	Improves water efficiency
	2.6	Increases recycled content
	2.7	Reduces waste to landfill
<b>3. Cyclic</b> Packaging materials used in the system are cycled continuously through natural or industrial systems, minimizing material degradation.	3.1	Returnable
	3.2	Reusable (alternative purpose)
	3.3	Recyclable (technically recyclable and system exists for collection and reprocessing)
	3.4	Biodegradable
<b>4. Clean</b> Packaging components used in the system, including materials, finishes, inks, pigments, and other additives do not pose any risks to humans or ecosystems. When in doubt the precautionary principle applies.	4.1	Reduces airborne emissions
	4.2	Reduces waterborne emissions
	4.3	Reduces greenhouse gas emissions
	4.4	Reduces toxicity
	4.5	Reduces litter impacts

### 2.3.2. Sustainable Packaging Coalition (SPC)

The sustainable packaging guidelines combine general sustainability and industrial ecology goals with commercial considerations and strategies to address environmental issues related to the packaging life cycle. These criteria relate to the

packaging value chain, areas related to transformation, innovation, and optimization. Along this line, packaging can reach a stage where the system becomes economically robust and beneficial throughout its life cycle. Therefore, sustainable packaging should: be beneficial, safe, and healthy for individuals and communities throughout its life cycle; meet market criteria for performance and cost; be sourced, manufactured, transported, and recycled using renewable energy; optimize the use of materials from renewable or recycled sources; be manufactured using clean production technologies and best practices; be made from healthy materials throughout the entire life cycle; be physically designed to optimize materials and energy; be recovered and used in closed-loop biological and industrial cycles (Sustainable Packaging Coalition, 2011).

### **2.3.3. EUROPEAN ORGANIZATION**

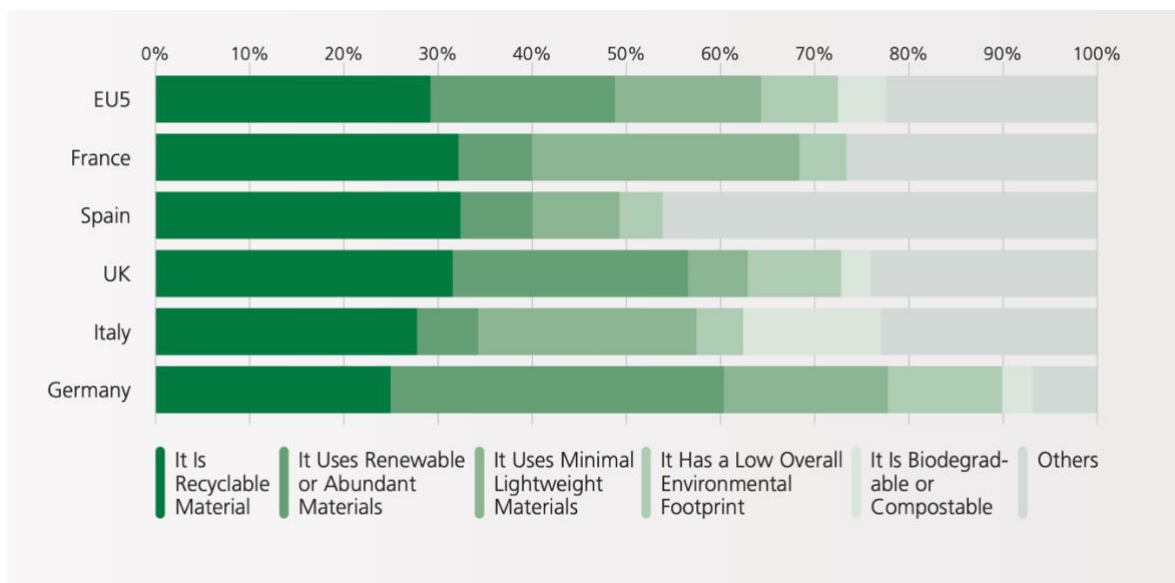
In its vision of packaging's contribution to sustainable development, in other words, to minimize sustainability impacts of packaging and maximize the benefits, it is stated that packaging needs to: be created along with the product to maximize overall environmental performance; be made from environmentally friendly materials; it must be created in such a way that it is both powerful and healthy over its entire life cycle; meet market criteria for performance and cost; satisfy consumer choice and expectations; be efficiently recycled after use. To close this topic on sustainable packaging, ECR Europe; The European Organization for Packaging and the Environment (2009) mentions the concept of sustainable packaging in a succinct and straightforward sentence: "The issue is not about 'sustainable packaging,' but about the role of packaging in sustainability. There is, in fact, no such thing as inherently 'sustainable' packaging. There can only ever be a more sustainable way of manufacturing a certain product". Despite everything, its function should be considered, starting with its protection, promotion, information, convenience, unitization, handling, and waste reduction, so that the product stays preserved and in perfect conditions to make a sale.

## 2.4. Requirements to be a Sustainable Packaging

A survey directed by Smithers Pira for PRO CARTON (2017) found that recyclable, renewable, and lightweight counts most when it comes to sustainable packaging. Respondents listed the five critical criteria to label the packaging as sustainable:

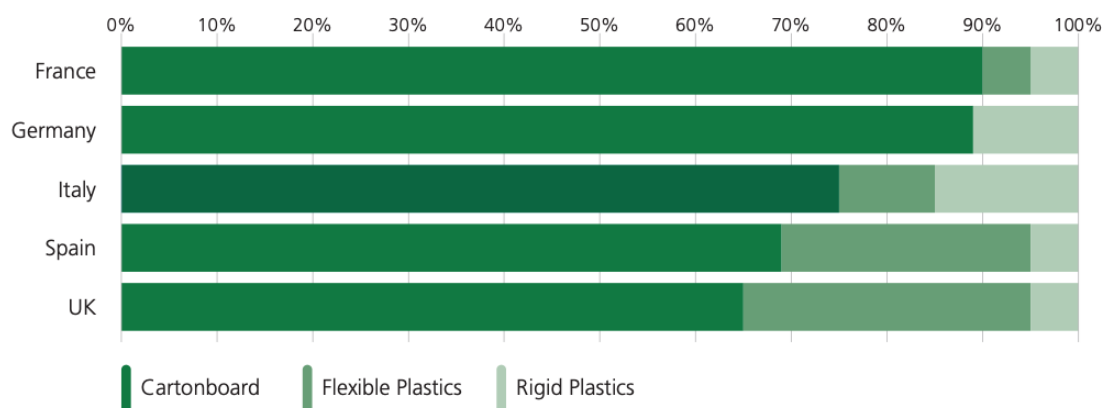
1. Recyclable materials (29.2%)
2. Use of renewable and rich materials (19.6%)
3. Use of minimal, lightweight materials (15.5%)
4. A low overall environmental footprint (8.2%)
5. Materials that are biodegradable or compostable (5.1%)

France, Italy, and Spain place far less importance in renewable and rich materials than Germany or the United Kingdom (Figure 2). Germany is the only country that ranks this criterion as the most critical standard, which shows that the lack of education is outstanding in other parts of Europe PRO CARTON (2017).



**Figure 2.** Five top criteria required to sustainable packaging (PRO CARTOON, 2017).

Following the study, 78% chose carton board over plastics as the most sustainable solution. For decades, the packaging industry has faced tremendous pressure to reduce waste and excess packaging and improve recyclability. However, some people worry that the complex role of packaging and the system to which the supply chain belongs is not considered in achieving these goals. Therefore, it is often unclear whether isolated decisions will lead to an overall net improvement in environmental performance PRO CARTON (2017).



**Figure 3.** Most sustainable packaging material, (PRO CARTOON, 2017).

## 2.5. Design

Companies could look for packaging alternatives by matching the four critical design decisions: selecting materials, dimensions, the structure of packaging systems (relationship between primary, secondary, and tertiary packaging), and the design of the packaging (text, colors, branding, image, shape.) This should create an atmosphere and culture of quantity and quality packaging changes, improvement, and innovation within the company, which will have a tangible impact on sustainability and overall competitiveness of the company and the supply chain (García-Arca et al., 2017). It means designing for resource minimization (material, energy, and water), hazard reduction (such as heavy metals), reuse, recycling, waste reduction, and composting for the packaging industry (Holdway et al., 2010).

According to Boesen (2019) , the packaging design should be created according to the Life Cycle Assessment (LCA) guidelines, by integrating environmental and social concerns into each stage of its life cycle, from design to end-of-life (as cited in Zeng et al., 2021).

Consumers' perceptions and habits must be considered when redesigning such packages; it is a basis for a better understanding of consumer perceptions regarding the social dimensions of packaging sustainability (Nordin & Selke, 2010). According to Williams et al. (2012), around 20-25% of household food waste could be related to its packaging. The households noted that packages too big and packages that are difficult to empty are causes for food waste. In addition, food waste due to 'best before date' was included in the packaging-related waste aspect.

As a result, through the deployment of various 'dimensions', appropriate package design should contribute favorably to developing the three axes of sustainability (Azzi et al., 2012). According to Dickner (2012), wasted or underutilized space in warehouses, transportation, points of sale, surplus resources, or product breakages are all examples of waste (García-Arca et al., 2017).

Packaging design impacts direct and indirect expenses (packaging procurement and trash management, packing, handling, storage, transport, and losses). It is precisely these indirect costs that make it difficult to grasp the full impact of some packaging design decisions (García-Arca & Carlos Prado Prado, 2008)

However, if not holistically considered, this cost-cutting strategy might be dangerous. Although "economic" packaging would be associated with a conventional format with suitable, tried-and-true logistic efficiency, being "different" and sustainable may need the sacrifice of some of its capabilities. In reality, this means that package design necessitates a supply chain study of the "trade-offs" between the various roles (Azzi et al., 2012).

## **2.6. Barriers to Sustainable Packaging**

Some of the barriers include achieving the fulfillment of all packaging requirements that EUROOPEN identifies as the main functions of packaging. For example,



increasing the sustainability of cheese packaging means facing the taste and flavor conservation of the many different products according to size, shape, and weight (Spreafico & Russo, 2021). According to James, Fitzpatrick, Lewis, and Sonneveld (2005), this is one of the most pressing challenges in the development of sustainable packaging, and there is a lack of clear understanding of what it is or what it represents. There are other barriers (Sonneveld et al., 2005), such as the inability to adopt the technologies for sustainable change, capital investment, maintenance, the complexity of marketing strategies. However, to James, Fitzpatrick, Lewis, and Sonneveld (2005), other driving factors such as consumer behavior, consumer trends, market segmentation, and distribution development often conflict with the principles of sustainable development, which poses a significant challenge for the sustainable development of the packaging industry (Nordin & Selke, 2010).

## **2.7. Theory of Planned Behavior**

According to Tonglet (2004), the Theory of Planned Behavior (TPB) assumes that consumers have a reasonable basis for behavior and considers the meaning of their intentions and behaviors. These intentions and behaviors are affected by: attitude, that is, personal evaluation preference behavior; subjective norms, that is, people's perception of social pressure to engage in (or not participate in) specific behaviors; and perceptual control, including the perception of behavior (Martinho et al., 2015).

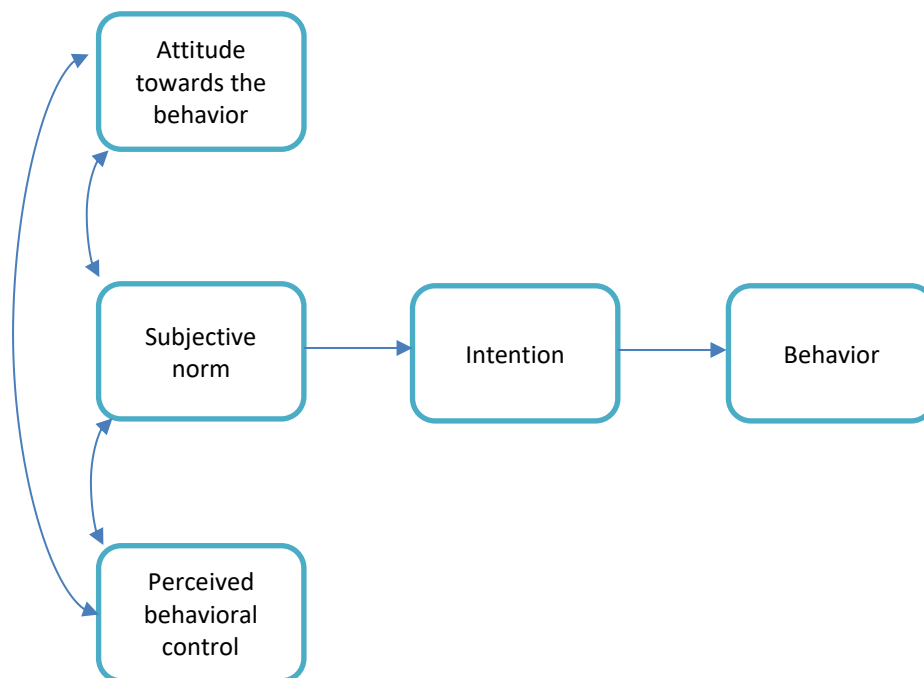
Prakash and Pathak (2017) attempted to explain the purchase intention toward more sustainable packaging by working with the Theory of Reasoned Action (TRA). Hence, this research was created to explain the purchase intention to sustainable packaging among young consumers, utilizing the Theory of Planned Behavior (TPB) and expand it by adding more variables (such as environmental concern and willingness to pay) (as cited in Aria Auliandri et al., 2018).

The TPB assumes that the direct determinant of behavior is the individual's intention whether to perform it or not. In turn, the intention is influenced by three factors:

1. Attitude, an individual's assessment of the advantages or disadvantages of performing the behavior.

2. Subjective norms, an individual's perception of the social pressure to perform or not perform the behavior.
3. Perceptual control, an individual's perception of his or her ability to perform the behavior. People recognize factors outside the model, such as personality, previous experiences.

Demographic and its characteristics can also affect behavior, but some people believe that this is an indirect effect, regulated by components of the model (Ajzen, 1991).



**Figure 4.** Theory of Planned Behavior, (Ajzen, 1991).

### 3. RESEARCH MODEL

The TPB allows the inclusion of additional variables, as long as they significantly contribute to the interpretation of the behavior (Ajzen, 1991). Thus, several that are considered essential to the study were added to the base model.

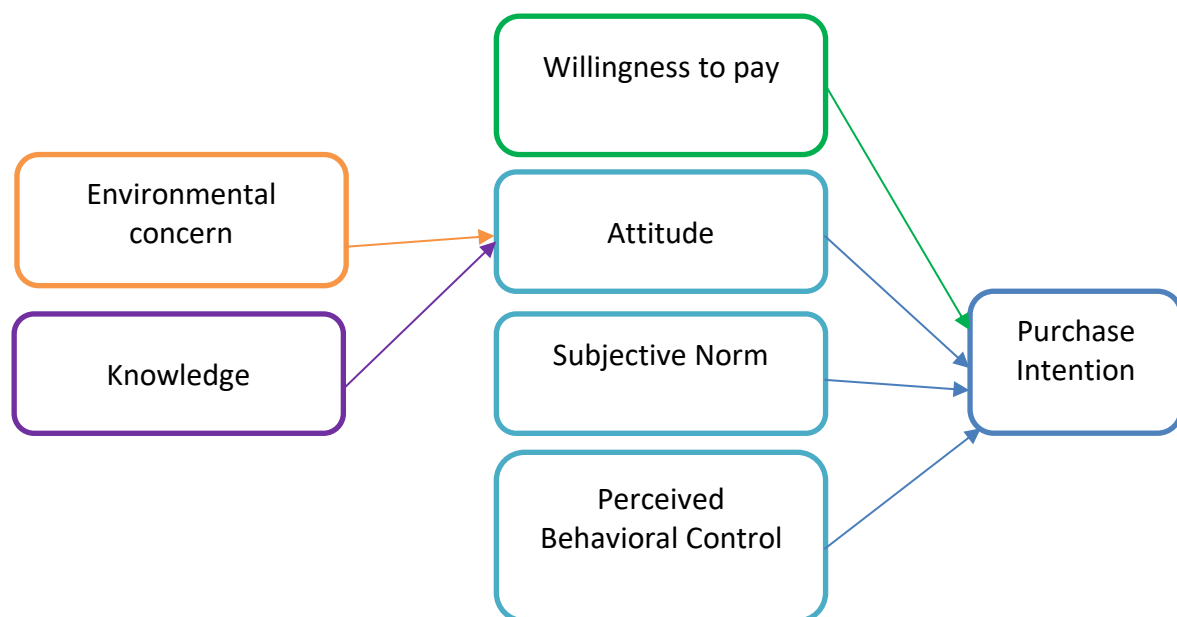


Figure 5. Research Model.

Therefore, it was structured as exemplified in Figure 5, followed by describing the variables in question. As Ajzen's model represents, there is a construct that is represented by attitude, in this specific case, as it is a very recent topic and there are not many offers of products with types of sustainable packaging.

#### 3.1.1. Attitude

To Kaiser and Scheuthle (2003), determining intent begins with attitudes to specific behaviors. This variable represents a positive or negative evaluation of behavior in a specific situation (Ahmmadi et al., 2021). For example, the more positive a person's attitude toward self-confidence is, the more willing they will be. A meta-analysis study

directed by Riebl et al. (2015) exhibits that attitudes positively correlated with adolescents' behavioral willingness (Aria Auliandri et al., 2018). Therefore, we can state hypothesis 1:

**H1 - There is a positive relationship between attitude and purchase intention.**

### **3.1.2. Subjective Norm (SN)**

Ajzen (1991) and Kim & Chung (2011) allege that subjective norm measures how social perception boosts someone to do a particular behavior (Aria Auliandri et al., 2018). For Ajzen (1991) and De Bruijn (2010), the consumers' intentions are mainly affected by the second most relevant variable, subjective norms, which highlight how people's intention to perform a particular behavior has influenced the approval or disapproval of significant others (Ahmmadi et al., 2021). Therefore, if the social environment gives a positive appreciation toward green products' purchase intention, the purchase intention will also be high (Aria Auliandri et al., 2018).

**H2 - There is a positive relationship between subjective norm and purchase intention.**

### **3.1.3. Perceived Behavior Control (PBC)**

To Ajzen (1991), PBC refers to people's perception of performing a specific behavior (Aria Auliandri et al., 2018). In addition, Savari and Gharechae (2020) assume that PBC emphasizes a person's perception of peripety to perform a particular behavior (Ahmmadi et al., 2021). Paul et al. (2016) argued that PBC is an essential variable of human behavior out of three predictors of behavioral intention in the TPB model (Aria Auliandri et al., 2018). Ajzen (1991) and Schultz and Fielding (2014) consider TPB as the third factor predicting intentions in perceived behavioral control, which is defined as the perception of the comfort or trouble in performing a behavior that can prevent or facilitate a behavior (Ahmmadi et al., 2021). Various empirical resources showed positive influences of PBC on purchase intention in the context of green packaging consumption (Aria Auliandri et al., 2018). Goh et al. (2017) wrote that people might not fully control factors such as

opportunities, resources, time, knowledge, and skills, but these factors affect their intentions to perform the behavior (as cited in Ahmmadi et al., 2021).

**H3 - There is a positive relationship between perceived behavioral control and purchase intention**

**3.1.4. Knowledge**

Knowledge plays a crucial role in making purchasing decisions (Laroche et al., 2001). Research by Hill and Lynchehaun (2002) shows that even if customers know the main factors of organic products, they do not have sufficient knowledge of the agricultural processes involved in organic production (Padel & Foster, 2005). According to research by Werner and Alvensleben (2011), knowledge positively affects people's viewing habits when buying and using food (as cited in Saleki & Seyedsaleki, 2012).

**H4 - There is a positive relationship between knowledge and attitude**

**3.1.5. Willingness to Pay (WP)**

According to Padel and Foster (2005), green product consumption is typically correlated to consumer perception of their prices and benefits (Aria Auliandri et al., 2018), which is clear because most green products are more expensive than conventional products (Aria Auliandri et al., 2018). Rana and Paul (2017) argued that consumers of green products are willing to buy the products at a higher price than conventional products. Prakash and Pathak (2017) illustrated that the willingness to pay for premium products positively influences young consumers' purchase intention toward green packaging (as cited in Aria Auliandri et al., 2018)

**H5 - There is a positive relationship between willingness to pay and purchase intention**

### **3.1.6. Environmental Concern (EC)**

Chen and Tung (2014) explained that concern for the environment is related to one's attitude towards environmental protection, encouraging one to be environmentally friendly. Specifically, Prakash and Pathak (2017) refer that, for young consumers, environmental concerns have positively impacted the attitude of green packaging (Aria Auliandri et al., 2018).

**H6 - There is a positive relationship between environmental concern and attitude.**

## 4. METHODOLOGY

When starting this study, to learn the factors that influence consumers' purchase intention for products with sustainable packaging, it was necessary to emerge from the central theme, which was to study the concept of sustainable packaging in general and the concepts and subjects that were closest to this central theme. Thus, the research methodology has its starting point with the delineation of the main philosophy, choosing approaches, methods, and strategies, and defining time horizons, which altogether take the research logic to the research design – main techniques and procedures of data collection and analysis.

One of the ways of research methodology construction is based on the theoretical concept of "research onion" (Figure 6). The research onion, proposed by Saunders et al. (2016), helps organize the research and develop research design, by following its layers step by step (as cited in Melnikovas, 2018).

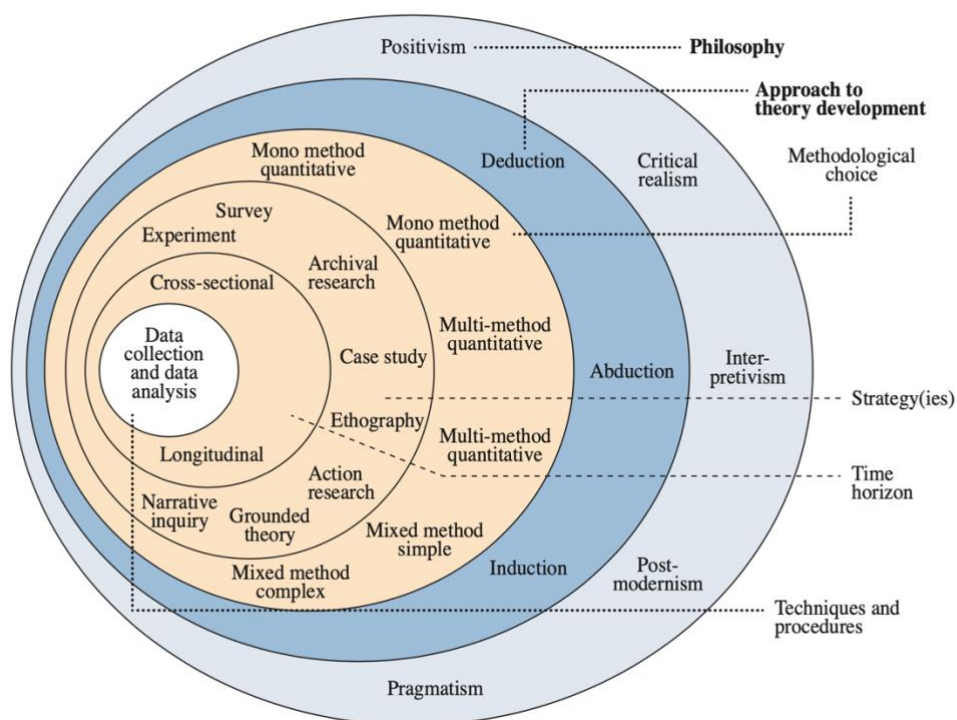


Figure 6. Research onion.

Through this methodology, it was possible to investigate the generality of sustainable packaging and embroider certain concepts related to the theory. Thus, several collections of information and means of directing the intended study were considered. After that, it was necessary to stipulate which direction the study would be taken and assumed it would be developed. Thus, with resource of the TPB model, it was possible to study consumers' purchases.

The TPB model is the most widely used model for this type of study on perceptions, allowing for adaptation depending on the objective of the study. The model was tested by conducting questionnaires to obtain honest answers regarding specific issues, aiming to understand what factors influence consumers to buy products with this type of packaging. That being said, the structuring of the study model begins with the correlated items considered necessary for the research. In addition, and to complement the study, a questionnaire with characteristic questions was carried out for each variable using a Likert scale (1 to 5). A scale of 1 to 5 helps the person who is answering to be more decisive in the answer. The structure of the main questionnaire was based on studies by Aria Auliandri et al. (2018) and Martinho et al. (2015).

A questionnaire was built, using Google Forms, with a short presentation written in the Portuguese language (APPENDIX A) because the target audience would be Portuguese. This introduction intended to introduce the subject in question or inform those who do not know what it is about so that later answers would be as authentic as possible. Thus, the following tables represent the structure and questions asked and the hypotheses regarding the research model, which positively influence purchase intention.



**Table 4.** Attitude questions.

Attitude		Source
At_1	I will choose to buy green packaging	(Aria Auliandri et al., 2018)
At_2	I am willing to buy a product with recyclable packaging	
At_3	I will buy a product of a non-popular company, if its products are environmentally friendly	
At_4	The current environmental problems are secondary regarding the other problems that our society is facing.	(Martinho et al., 2015)

**Table 5.** Environmental concern questions.

Environmental concern		Source
EC_1	I care about environment	(Aria Auliandri et al., 2018)
EC_2	I try to buy a recycled product	
EC_3	I switch to green product for environmental sustainability	
EC_4	When I have to choose one out of two products, I much prefer the green packaging	
EC_5	I feel that I am contributing to make a better environment every time I place packaging for recycling (in the recycling bin).	(Martinho et al., 2015)

**Table 6.** Subjective norm questions.

Subjective Norm		Source
SN_1	I feel obligated to preserve environment	(Aria Auliandri et al., 2018)
SN_2	I must do whatever I can to preserve environment	
SN_3	I feel obligated to use the green packaging	
SN_4	My friends appreciate my decision to choose the green packaging	
SN_5	My family appreciates my decision to choose the green packaging	
SN_6	Choosing the green packaging is important in my community	

**Table 7.** Knowledge questions.

Knowledge	
Kn_1	I know what sustainable packaging is
Kn_2	I know the advantages of sustainable packaging
Kn_3	I have heard about the advantages of sustainable packaging at school or university
Kn_4	I've read about the advantages of sustainable packaging on social media and/or digital platforms

**Table 8.** Perceived behavioral control questions.

Perceived Behavioral Control		Source
PBC_1	When I buy the green packaging, I feel like I have done something positive for environment	(Aria Auliandri et al., 2018)
PBC_2	I believe that the decision to choose the green packaging directly influences the environment as a whole	
PBC_3	My choice to buy the green packaging directly influences the environment	
PBC_4	Choosing to buy products that are contained/wrapped in sustainable packaging does not help in solving environmental problems.	(Martinho et al., 2015)

**Table 9.** Willingness to pay questions.

Willingness to pay		Source
WP_1	I am willing to pay more for the green packaging	(Aria Auliandri et al., 2018)
WP_2	I am proud to use the green packaging, even though it is more expensive than the conventional packaging	
WP_3	I am willing to pay a higher price for a more environmentally friendly product	
WP_4	Whether the packaging is sustainable or not is irrelevant in the decision to purchase a product, the most important feature is price	
WP_5	All packaging should be environmentally friendly, even if that requires a small charge in its price.	(Martinho et al., 2015)

**Table 10.** Purchase intention questions.

Purchase Intention		Source
PI_1	I will buy the green packaging in the near time	(Aria Auliandri et al., 2018)au
PI_2	I plan to buy the green packaging regularly	
PI_3	I plan to buy the green packaging because it positively affects the environment	
PI_4	I pay attention to the environmentally friendly aspect on the packaging of products I buy	
PI_5	I avoid buying products the packaging of which negatively affects the environment	

After structuring the model, we proceeded to data collection through the filling in of the anonymous questionnaire. The data collection was conducted online. Social networks such as Facebook, Instagram, WhatsApp, and LinkedIn were used to disseminate the survey. However, after approximately one month of data collection, the model was validated by performing reliability, validity, and correlational tests to check and verify the validity of the items that are part of the structural model. Exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and descriptive analysis were performed to make the study more complete and the presentation of data more concise and reliable.



## 5. RESULTS

After enough sample data is drawn to expect or analyze variables that may be regressing the values, the data analysis is complete. The analyses were only carried out after the questionnaire was closed and available on digital platforms for approximately one month. The number of responses was closely monitored until the desired size of the sample was reached.

The software, IBM SPSS, was used to ensure the validation and to analyze the results obtained and the AMOS software. SPSS is a data analysis program that allows manipulating, converting, and creating tables and graphs that summarize the information gathered. These two programs combined simplify the analysis by highlighting variables or issues that may affect the reliability of the model in question and correlations between variables and inconsistent responses.

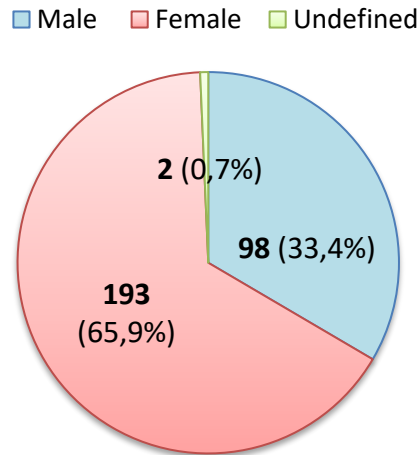
Firstly, it concerns the measurement model that studies the model's reliability. Secondly, the structural models, from which the conclusions of the model can be evaluated.

From 320 responses, two were removed in the first analysis because the respondents missed some answers. Latter, 25 responses were removed because they compromised the normality of data (Mahalanobis distance). As a result, the questionnaire was downsized to 293 valid responses.

### 5.1. Sample profile

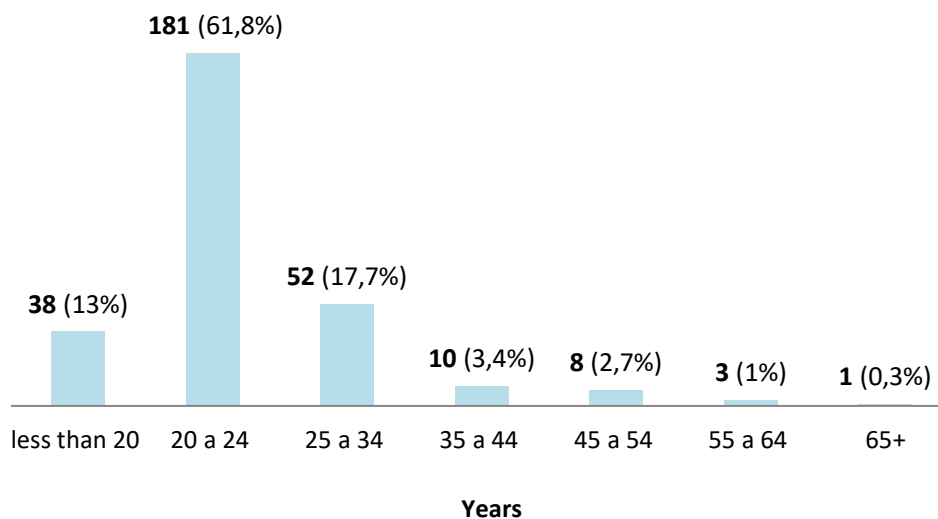
The sample of 293 resulted from the removal of specific answers for the reasons mentioned above, where 193 are female (65,9%), 98 (33,4%) are male, and two (0,7%) correspondents answered as undifferentiated, i.e., neither male nor female. Despite the necessary reduction of the sample, the initial percentage values, and the new sample regarding the gender of the respondents, with the percentage of undifferentiated was maintained and the variation in male and female gender was around the 1% to 2% range,

which is very insignificant. In order to express what is presented in values and for better understanding, the following images condense the values in a more intuitive way regarding the respondents' gender (Figure 7), age (Figure 8), and education (Figure 9).



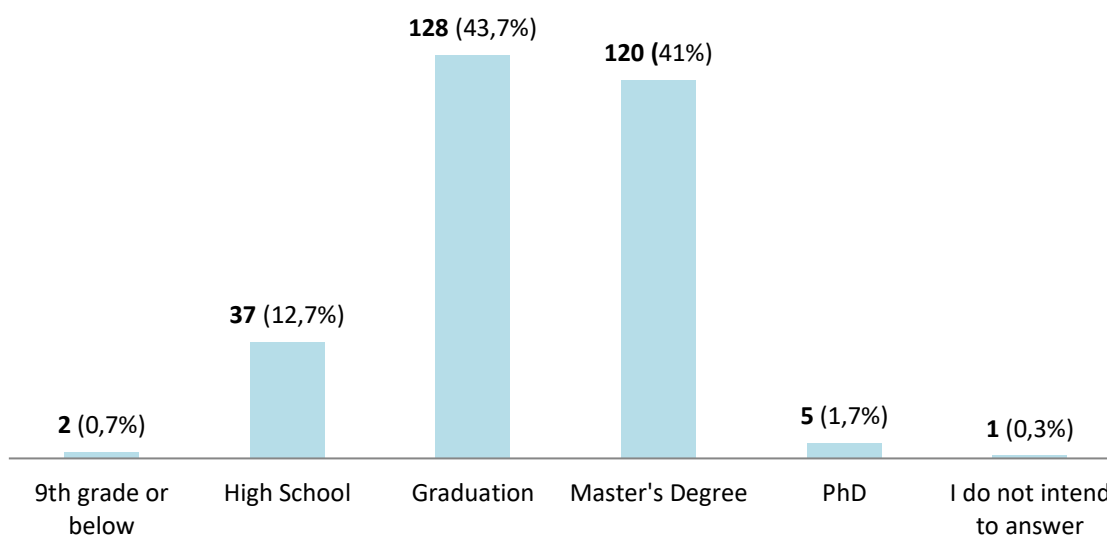
**Figure 7.** Sample gender.

Regarding the age ranges, the affluence of responses persists in the 20 to 24 age range, so, people with less than 20 years are represented by 38 respondents (13%), the 20 and 24 years range is represented by 181 (61.8%), the 25 to 34 years range have 52 respondents of the sample (17.7%), people between 35 and 44 years are 10 (3.4%), slightly different, the 45 to 54 years range is composed by eight (2.7%), between 55 and 64 years, there are only three (1%) and finally in the range of 65 years or more, there is only one respondent (0.3%).



**Figure 8.** Sample age range.

To conclude the categorization of the resulting sample of 293 people, only two (0.7%) respondents had less than a 9th-grade education (Portugal), while 37 of the sample (12.7%) have finished high school. Therefore, the Bachelor's degree presents the highest value, in which 128 (43.7%) are represented, followed by the Master's degree with 120 (41%) respondents. Still, five (1.7%) Ph.D. students answered, and only one (0.3%) did not want to mention their schooling for the study.



**Figure 9.** Sample education.

## 5.2. Analyses

First of all, it is necessary to check the model's validation and reliability. Validity is the degree to which a scale or set of measures accurately represents the concept of interest (Campbell & Fiske, 1959). Reliability is an assessment of the degree of consistency among multiple measures of a variable. The goal is to ensure that responses do not vary too much over periods so that a measure taken at any instant is reliable (Churchill, 1979). The evaluation of the reliability of a factorial structure was verified using the internal consistency coefficient called Cronbach's Alpha ( $\alpha$ ) (Cronbach, 1951), which assesses the degree to which the items of a data matrix are correlated with each other. The items that make up a scale should present a high alpha value, and as this coefficient ranges from 0 to 1, the closer to 1, the greater the reliability of the scales (Hair Jr., J. F.; William, B.; Babin, B.; Anderson, 2009). A reliability test and an exploratory factor analysis were performed using SPSS.

**Table 11.** Reliability test

Item	Average scale if item is deleted	Scale variance if item is deleted	Corrected total item correlation	Cronbach's alpha if item is deleted	Cronbach alpha
At_1	10,59	2,817	0,370	0,004	0,331
At_2	9,63	3,727	0,310	0,163	
At_3	12,13	4,403	-0,156	0,705	
At_4	10,06	3,106	0,390	0,025	
EC_1	15,97	8,677	0,715	0,838	0,866
EC_2	16,52	7,490	0,778	0,815	
EC_3	16,29	7,385	0,797	0,810	
EC_4	16,51	7,586	0,641	0,855	
EC_5	16,02	8,661	0,556	0,869	
Kn_1	11,46	5,578	0,537	0,585	0,671



Kn_2	11,52	5,504	0,527	0,584	
Kn_3	12,52	4,059	0,379	0,709	
Kn_4	11,99	4,373	0,517	0,558	
SN_1	18,24	12,773	0,518	0,803	0,819
SN_2	17,78	14,580	0,399	0,824	
SN_3	19,16	11,786	0,565	0,795	
SN_4	18,95	11,744	0,639	0,777	
SN_5	18,92	11,241	0,690	0,765	
SN_6	18,74	11,006	0,694	0,764	
PBC_1	10,71	4,850	0,473	0,424	0,572
PBC_2	10,92	4,391	0,568	0,341	
PBC_3	10,99	4,431	0,606	0,325	
PBC_4	12,28	5,310	0,026	0,847	
WP_1	13,76	6,141	0,676	0,417	0,634
WP_2	13,40	6,885	0,662	0,454	
WP_3	13,53	6,236	0,711	0,406	
WP_4	14,06	11,958	-0,297	0,882	
WP_5	12,98	6,938	0,573	0,488	
PI_1	15,50	8,812	0,806	0,867	0,899
PI_2	15,46	8,578	0,835	0,860	
PI_3	15,41	8,742	0,800	0,867	
PI_4	15,62	8,291	0,745	0,879	
PI_5	15,81	8,660	0,614	0,912	

From the previous table, it is possible to see that some items cause some constraints to the model derived from their influence on Cronbach's alpha. Even though the  $\alpha$  value of several items is considered good, some can be eliminated to make the model even

more reliable for analysis. Therefore, to arrive to the optimal model, with SPSS in association with AMOS, these same items will be selected and eliminated so that the model is as viable as possible for analysis.

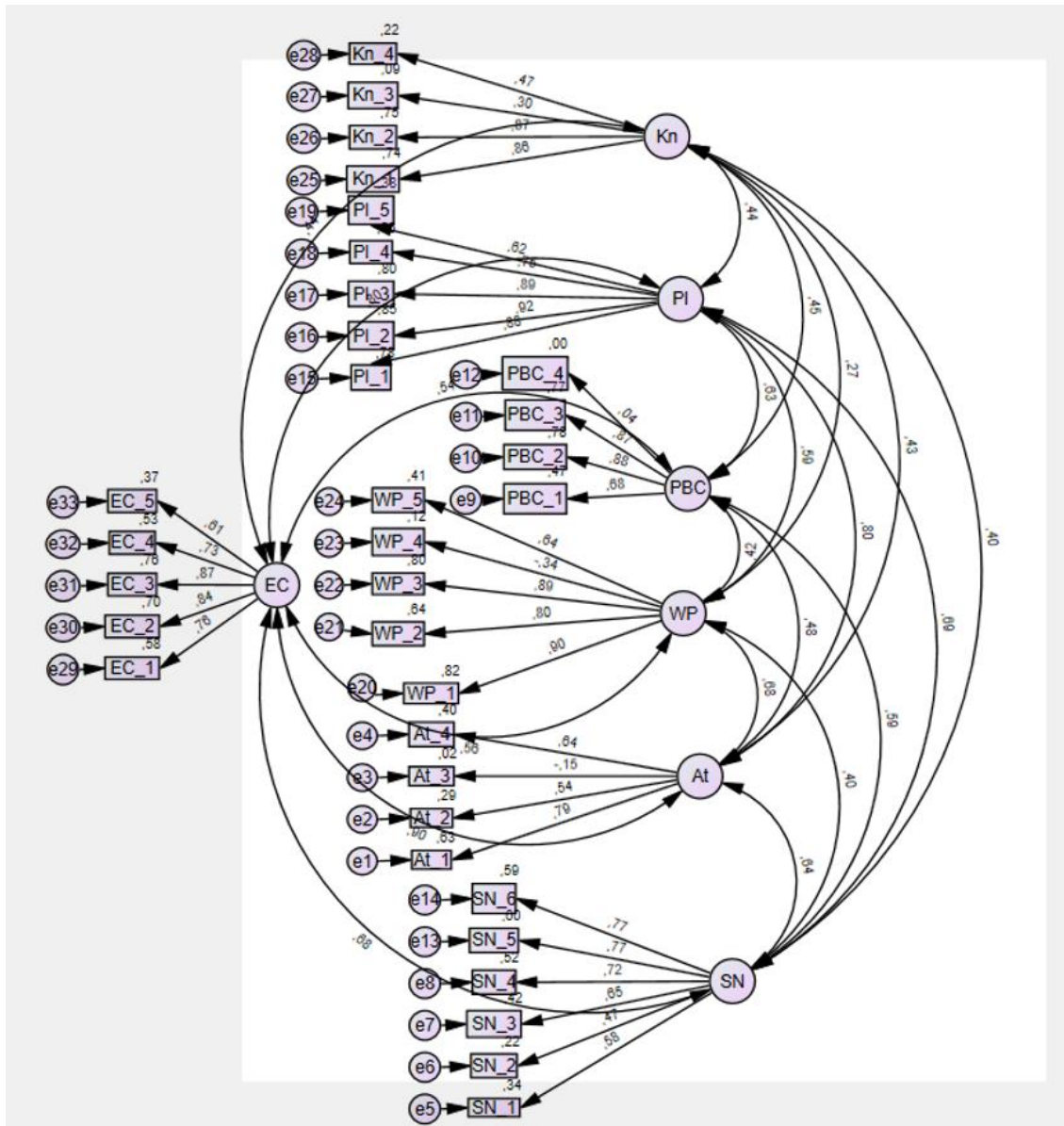


Figure 10. Initial model with covariances

Figure 10 represents the initial model with the representation of the conventions of the items. These are directly correlated with the model's reliability and, as expected, some values will be considered inadequate for the final goal, and thus the item will be eliminated.

Table 12. Reliability test without inadequate items

Item	Average scale if item is deleted	Scale variance if item is deleted	Corrected total item correlation	Cronbach's alpha if item is deleted	Cronbach alpha
At_1	8,59	1,976	0,490	0,681	0,705
At_2	7,62	2,674	0,515	0,643	
At_4	8,05	2,086	0,599	0,516	
EC_1	15,97	8,677	0,715	0,838	0,866
EC_2	16,52	7,490	0,778	0,815	
EC_3	16,29	7,385	0,797	0,810	
EC_4	16,51	7,586	0,641	0,855	
EC_5	16,02	8,661	0,556	0,869	
Kn_1	8,15	2,256	0,636	0,528	0,709
Kn_2	8,20	2,184	0,632	0,519	
Kn_4	8,68	1,760	0,411	0,860	
SN_3	10,46	6,976	0,514	0,842	0,825
SN_4	10,26	6,527	0,694	0,761	
SN_5	10,23	6,163	0,742	0,737	
SN_6	10,05	6,306	0,665	0,773	
PBC_1	8,02	2,808	0,612	0,880	0,847
PBC_2	8,23	2,307	0,788	0,713	
PBC_3	8,30	2,507	0,752	0,751	
WP_1	10,89	6,378	0,810	0,822	0,882
WP_2	10,53	7,387	0,745	0,850	
WP_3	10,66	6,574	0,825	0,816	
WP_5	10,11	7,625	0,609	0,898	
PI_1	15,50	8,812	0,806	0,867	0,899

PI_2	15,46	8,578	0,835	0,860	
PI_3	15,41	8,742	0,800	0,867	
PI_4	15,62	8,291	0,745	0,879	
PI_5	15,81	8,660	0,614	0,912	

Thus, Table 12 represents the alpha values for each variable concerning the final models with the already eliminated items that were considered due to their inflection on alpha, not only in the tests performed in SPSS but also in AMOS. The Figure 11 represents the structure of this same model with the representation of the conventions of the items.

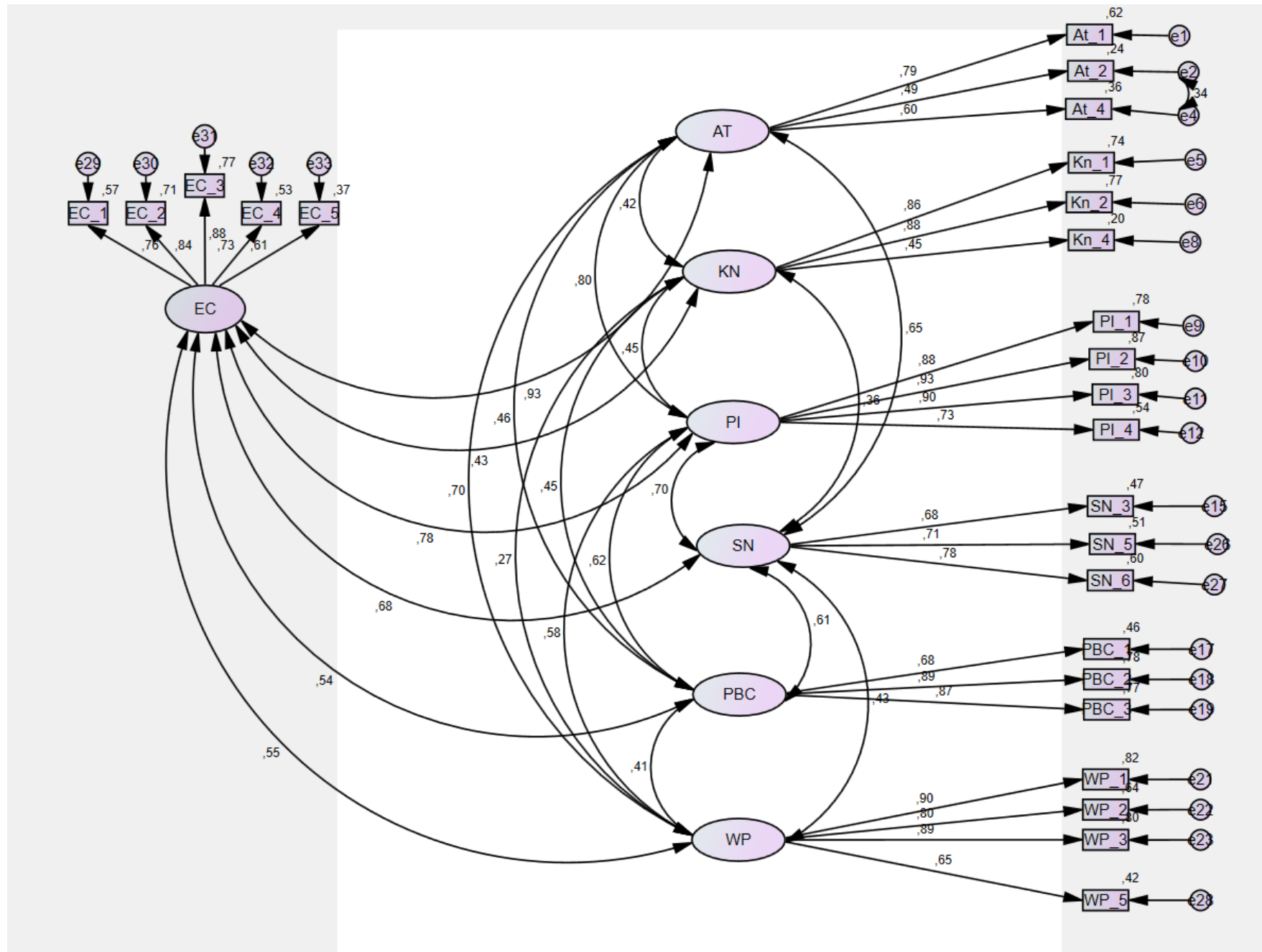


Figure 11. Covariances model

With the model considered valid, we proceeded to the exploratory factor analysis to verify the item compositions and their loadings. Exploratory factor analysis (EFA) is a statistical technique that studies correlations between a large number of variables by grouping them into factors. This technique allows the reduction of data, identifying the most representative variables, or creating a new group of variables much smaller than the original (Hair Jr., J. F.; William, B.; Babin, B.; Anderson, 2009). One of the factor reduction EFA outputs is the result of a Kaiser-Meyer-Olkin mean test of sampling adequacy, which requires that the resulting value is more significant than 0.8 to be considered reasonable. The Bartlett's test of sphericity shows the significance value for the model and this is intended to be as close to zero or even zero so that the values are reliable.

**Table 13.** KMO and Bartlett's test

<b>KMO and Bartlett's test</b>		
<b>Kaiser-Meyer-Olkin measure of sampling adequacy.</b>	0,922	
<b>Bartlett's test of sphericity</b>	Approx. Chi-square	5108,049
	df	325
	Sig.	0

In the continuation of the EFA, the following table represents the component rotation matrix, with the extraction method being Principal Component Analysis, Varimax Rotation Method with Kaiser Normalization, and the convergent rotation was performed in seven iterations. The result aims to optimize the grouping of the constructs because the more grouped the constructs are in the same component, in relation to its group, the more reliable the construct for the model.

**Table 14.** Rotating component matrix

Rotating component matrix					
	Component				
	1	2	3	4	5
<b>At_1</b>	0,677				
<b>At_2</b>	0,521				
<b>At_4</b>	0,574				
<b>EC_1</b>	0,733				
<b>EC_2</b>	0,766				
<b>EC_3</b>	0,767				
<b>EC_4</b>	0,672				
<b>EC_5</b>	0,594				
<b>Kn_1</b>					0,834
<b>Kn_2</b>					0,832
<b>Kn_4</b>					0,643
<b>SN_3</b>				0,535	
<b>SN_4</b>				0,819	
<b>SN_5</b>				0,821	
<b>SN_6</b>				0,713	
<b>PBC_1</b>			0,593		
<b>PBC_2</b>			0,817		
<b>PBC_3</b>			0,789		
<b>WP_1</b>		0,868			
<b>WP_2</b>		0,764			
<b>WP_3</b>		0,87			
<b>WP_5</b>		0,648			
<b>PI_1</b>	0,615				
<b>PI_2</b>	0,642				
<b>PI_3</b>	0,588				
<b>PI_4</b>	0,603				

Analyzing the model's correlations, it is relevant to highlight a high correlation between the constructs EC and At. Thus, the correlational model is represented by the following figure.

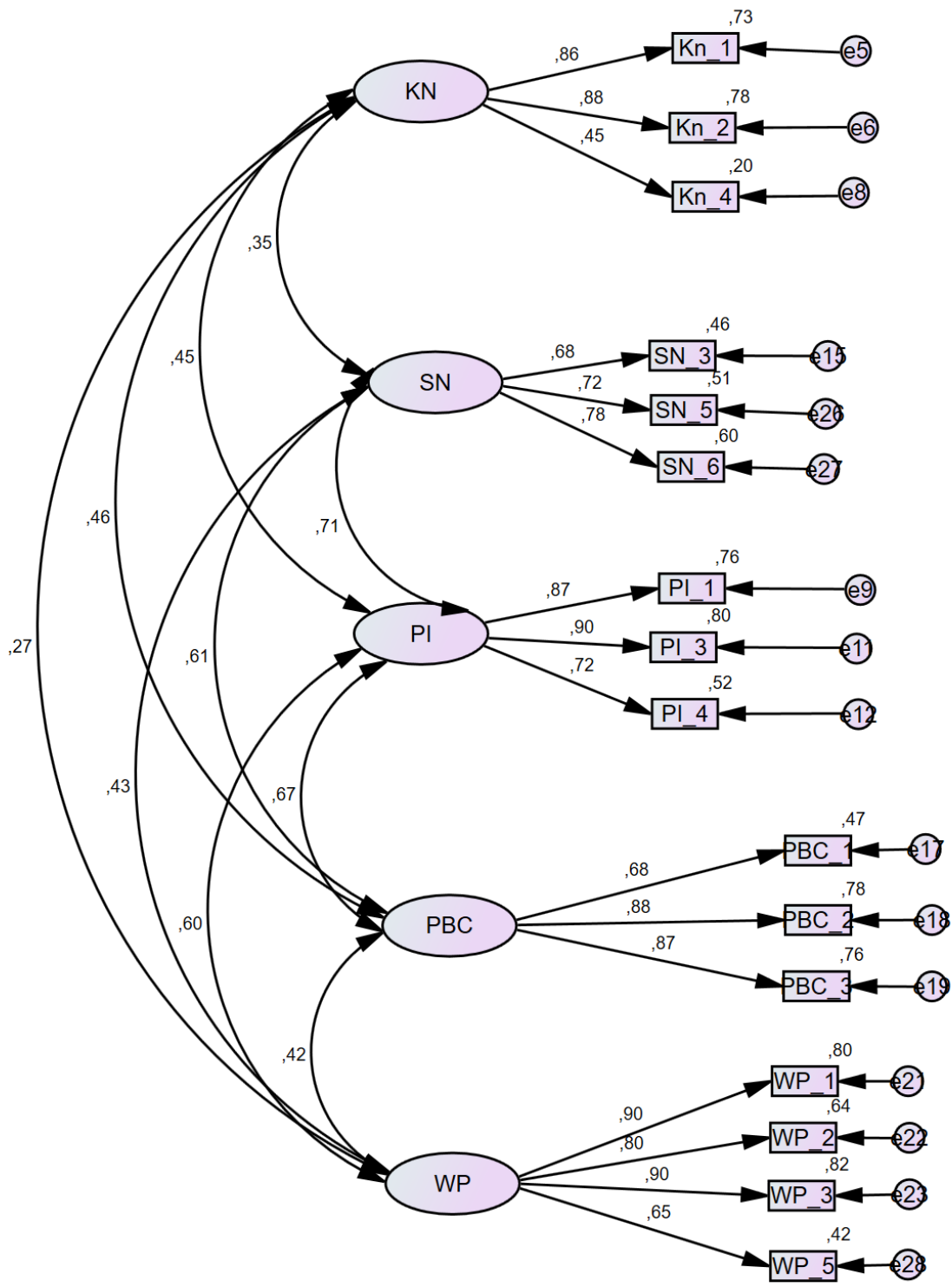


Figure 12. Final covariances model



Therefore, the following table is representative of the correlations and the standardized regression weights corresponding to the structure shown in the previous figure, followed by the tables of model fit, which represents the baseline comparisons and the Root Mean Square Error of Approximation (RMSEA).

**Table 15.** Correlations and the standardized regression weights.

Correlations			Standardized Regression Weights				
			Estimate				Estimate
WP	<-->	PBC	0,417	Kn_1	<---	KN	0,856
SN	<-->	PBC	0,605	Kn_2	<---	KN	0,881
KN	<-->	SN	0,354	Kn_4	<---	KN	0,446
WP	<-->	SN	0,427	PI_1	<---	PI	0,87
WP	<-->	KN	0,272	PI_3	<---	PI	0,896
KN	<-->	PBC	0,455	PI_4	<---	PI	0,723
KN	<-->	PI	0,446	SN_3	<---	SN	0,681
PI	<-->	SN	0,706	PBC_1	<---	PBC	0,683
PI	<-->	PBC	0,673	PBC_2	<---	PBC	0,884
WP	<-->	PI	0,605	PBC_3	<---	PBC	0,875
				WP_1	<---	WP	0,895
				WP_2	<---	WP	0,798
				WP_3	<---	WP	0,903
				SN_5	<---	SN	0,715
				SN_6	<---	SN	0,776
				WP_5	<---	WP	0,649

**Table 16.** Baseline Comparisons

Baseline Comparisons					
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0,91	0,885	0,941	0,924	0,941

**Table 17.** RMSEA

RMSEA				
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0,076	0,065	0,087	0

**Table 18.** Confirmatory factor analysis

	CR	AVE	MSV	MaxR(H)	WP	KN	PI	SN	PBC
<b>WP</b>	0,888	0,669	0,366	0,916	<b>0,818</b>				
<b>KN</b>	0,787	0,569	0,207	0,866	0,272	<b>0,755</b>			
<b>PI</b>	0,871	0,694	0,498	0,892	0,605	0,446	<b>0,833</b>		
<b>SN</b>	0,768	0,526	0,498	0,774	0,427	0,354	0,706	<b>0,725</b>	
<b>PBC</b>	0,858	0,671	0,453	0,885	0,417	0,455	0,673	0,605	<b>0,819</b>

To finalize the results, it is essential to perform a Confirmatory Factor Analysis (CFA) (Table 18). Thus, the analysis confirmed that the construct EC and At did not correspond to the minimum values of discriminant validity, reliability, and convergent validity. Thus, it is necessary to eliminate it, resulting in a structure represented by the

Figure 13. It is notorious that SN and WP are the constructs with the highest loadings in relation to those with the most impact on the PI.

Figure 13. Final model structure

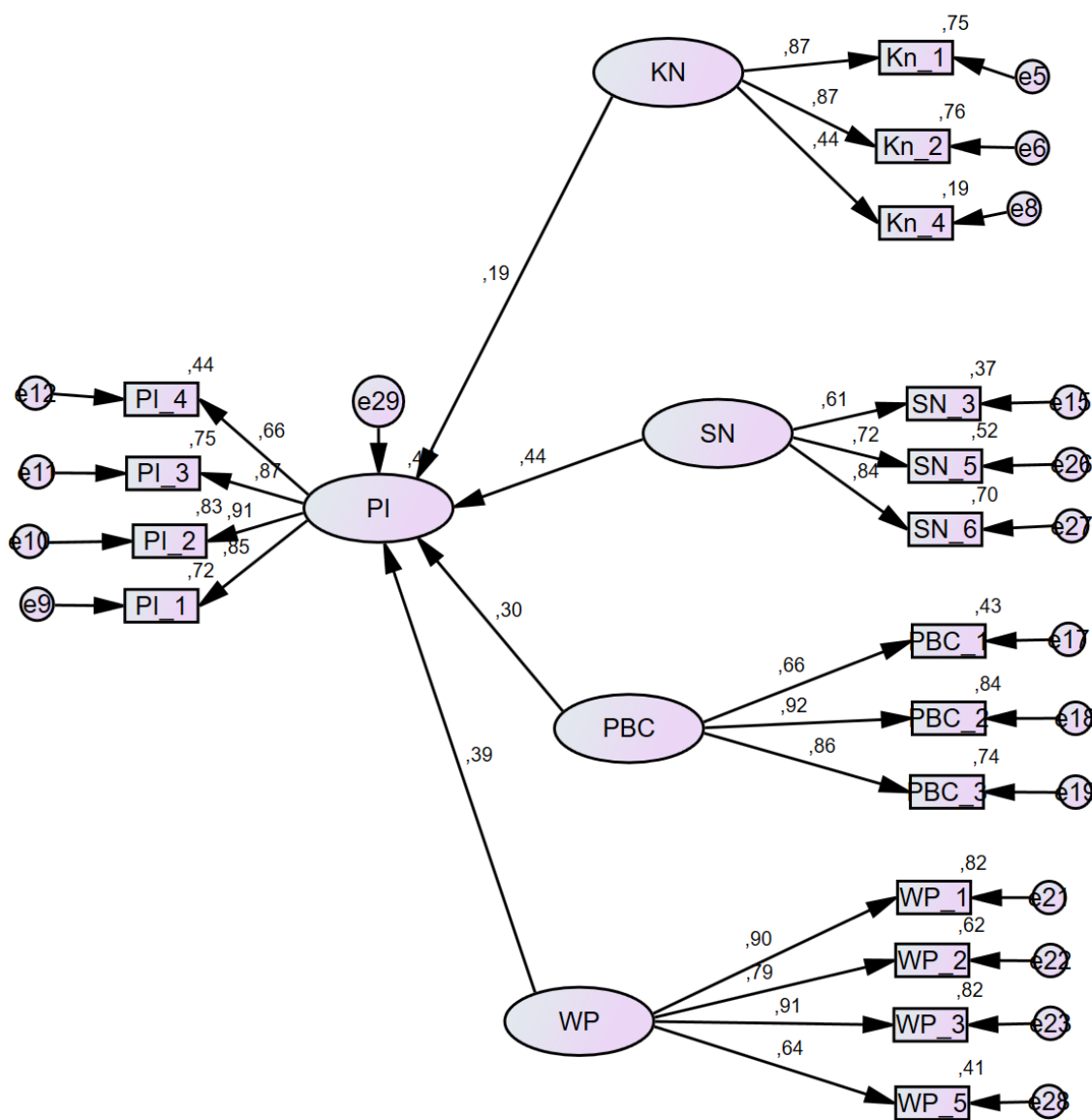


Table 19. Baseline Comparisons structural model

Baseline Comparisons					
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0,85	0,823	0,881	0,859	0,88

**Table 20.** RMSEA structural model

RMSEA				
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0,106	0,096	0,116	0

### 5.3. Discussion

The previously exposed results were thoroughly explored and analyzed together by the two programs SPSS and AMOS, as already mentioned, to study the model's viability in different ways. Therefore, with 293 responses, it is possible to have a sample in which 65.9% are female, 33.4% are male, and 0.7% are undifferentiated. The age range persisted essentially in the 20 to 24 age group with a percentage of 61.8. From 25 to 34, despite being a more extensive range, with 17.7% and the age group under 20 with 13%, these were the most considerable percentages for the sample in question. The study also looked at the academic structure of the respondents, and thus 43.7% corresponds to the highest percentage of respondents with a Bachelor's degree, very close to 41% for Masters. These two figures are the most significant relative to the other response options.

The analyses performed based on Cronbach's alpha to study the reliability of the study were significantly important to understand which items were causing constraints to the model itself. For example, At\_3, if removed, the Cronbach's alpha of the attitude construct would rise from 0.331 to 0.705, and this type of item and others were removed to make the model reliable. Therefore, these items that have been removed from the SPSS analysis need to be eliminated for a coherent study between the two statistical programs. In the same way that SPSS indicated which items should be eliminated using Cronbach's alpha, by using the covariance study, the AMOS indicates which items have unfavorable loading for the model, e.g., WP\_4 (-0.34) PBC\_4(0.04) and as expected AT\_3 (-0.15).

However, after eliminating these items, the exploratory factor analysis resulted in significant values of 0.922 for the Kaiser-Meyer-Olkin measure. For Bartlett's test of sphericity, the result was an approximate Chi-square of 5108.049, 325 degrees of freedom, and a sign of zero, which should be as close to zero as possible. The EFA also results from

a rotating component matrix, resulting in the variables being grouped by their constructs into the same component. The highest loading of each item was grouped in the same component as its corresponding construct. For example, At\_1, At\_2 and At\_4 have their highest loading in component 1, likewise Items (EC\_1, EC\_2, EC\_3, EC\_4, EC\_5) from the environmental concern (EC) construct are grouped in component 1. The remaining items have loadings in other components, but PBC\_1, PBC\_2, PBC\_3 are grouped in component 4. PI\_1 and PI\_3, although table 14 shows other values in component 3 and component 1, their greater loading prevails over component 1, where they are grouped with the remaining PI items.

When the AFC was performed, it was found that the attitude construct had a very high correlation with the environmental concern construct, so it was necessary to remove it, and the structure was changed so that the construct that was directly related to attitude, Kn, became directly related to purchasing intention (PI). This final structure and new correlations lead to the study of the hypotheses that these constructs present. Thus, the following table shows that these relationships are positive as previously stated, all the constructs positively influenced purchase intention, and the same is valid with this structure. The relationships are considered positive since the p-value in Table 21 is positive, and the value represented by "\*\*\*\*" is relative to values less than 0.001.

**Table 21.** Standardized regression weights

			Estimate	S.E.	C.R.	P	Label
PI	<---	KN	0,19	0,052	3,558	***	par_13
PI	<---	SN	0,438	0,061	6,533	***	par_14
PI	<---	PBC	0,304	0,058	5,414	***	par_15
PI	<---	WP	0,39	0,032	7,328	***	par_16
Kn_1	<---	KN	0,865				
Kn_2	<---	KN	0,873	0,104	10,124	***	par_1
Kn_4	<---	KN	0,441	0,11	7,121	***	par_2
PI_1	<---	PI	0,847				
PI_2	<---	PI	0,911	0,054	20	***	par_3
PI_3	<---	PI	0,866	0,056	18,609	***	par_4
PI_4	<---	PI	0,665	0,078	12,613	***	par_5
SN_3	<---	SN	0,608				
PBC_1	<---	PBC	0,657				
PBC_2	<---	PBC	0,915	0,122	12,096	***	par_6
PBC_3	<---	PBC	0,858	0,108	12,127	***	par_7

WP_1	<---	WP	0,903				
WP_2	<---	WP	0,788	0,043	17,261	***	par_8
WP_3	<---	WP	0,905	0,044	21,709	***	par_9
SN_5	<---	SN	0,721	0,127	9,012	***	par_10
SN_6	<---	SN	0,839	0,152	9,112	***	par_11
WP_5	<---	WP	0,641	0,052	12,502	***	par_12

The variable Kn influenced the attitude in the previous hypotheses and, after removing these variables, is now directly influencing PI instead of indirectly, and so the new hypotheses are:

- H2 - There is a positive relationship between subjective norm and purchase intention.
- H3 - There is a positive relationship between perceived behavioral control and purchase intention.
- H4 - There is a positive relationship between knowledge and attitude
- H5 - There is a positive relationship between willingness to pay and purchase intention.

Through the regression table (Table 21) and the p-value, it is possible to affirm that the hypotheses that were later adapted are positively influencing the purchase intention. As expected from the theoretical framework, these variables would be positive in their influence on the purchase intention, as shown in the following table.

**Table 22.** Hypotheses and positive relations

Hypotheses and positive relations			
Hypotheses		Positive Relation	
H4	PI	<---	KN
H2	PI	<---	SN
H3	PI	<---	PBC
H5	PI	<---	WP

## 6. CONCLUSION

In order to conclude the study presented, it is essentially necessary to mention that one of the goals, besides studying the consumers' perception regarding these types of packaging, would be to gather some basic definitions and concepts regarding sustainability and sustainable packaging.

For the specialized functions that sustainable packaging is designed to perform, the most recurrent concepts related are reducing, improving, and increasing the positive sense of sustainability. The packaging involves studies so that its environmental impact also goes through its design, in which minor details are important for that same impact, through material, color, and shape. This, directly and indirectly, impacts losses, transport, and storage, hence the importance of design to make packaging more efficient.

However, the study was conducted on what consumers perceived sustainable packaging to be. Using the theory of planned behavior, we built a model based on the existing Ajzen model and added two variables considered fundamental to this study, namely environmental concern, and knowledge about the subject. To test the model, we proceed to a questionnaire conducted exclusively online using social networks. The questionnaire was designed based on the initial model to identify the factors that influence purchase intention. A final sample of 293 was obtained. Of these answers, the affluence of female answers was almost double than that of male answers. In this way, the age group where the most significant number of respondents was concentrated was between 20 and 24 years old, with more than half of the referenced answers. Therefore, this study was based heavily on responses from young people aged 20 to 24, consumers who in the future may have the power of choice in the purchase of products with sustainable packaging. It is essential to highlight that more than 80 of the respondents are graduating or have already graduated from university and have a Master's degree or are finishing it. Thus, it is possible to verify that the sample used is quite literate.

The various analyses performed readjusted the model since some items and a construct presented loadings that did not show construct validity or were overly correlated with other elements. However, after these analyses, a final model resulted in which the constructs would positively influence the purchase intention according to the theory. That means that consumers with intentions to purchase products with sustainable packaging are positively influenced by their knowledge regarding the type of packaging, ecology, and sustainability, their concern for the environment, and their perception of their actions. Although willingness to pay is a concept that could be negative because it is often a decisive factor in the purchase act, it is positive and influences the purchase intention.

With this study, it was only evaluated the intention of consumers to purchase products with sustainable packaging, and it would not be possible or very feasible to relate purchase intention to purchase behavior because the industry (Portugal) is starting to develop this type of products. It is important to emphasize that consumers are positively influenced in their intention to buy products with more environmentally friendly packaging, which is an excellent point for the Portuguese industry and not only because it demonstrates that consumers are intentionally willing to buy products with packaging characteristically with a reduced ecological footprint.

This work has opened horizons concerning sustainability and the importance of packaging and of studies like this one, which researches which consumer intentions can matter for companies. However, it is considered that it was not an essentially easy study as far as the collection of answers is concerned, and it was necessary to recall it several times in order to obtain answers, which could be derived from the season, especially since it coincides with the bathing and hot season.

This study allows continuity, as sustainable packaging is impactful for consumers and companies, so it would be possible to conduct investigations on companies' necessary processes and intentions to adopt this type of packaging for their products or the transportation of their products. Therefore, it is also possible to link studies on consumer intentions to products with sustainable packaging and other intentions that particular consumers may have.



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## APPENDIX A

A sustentabilidade é um conceito cada vez mais presente nas nossas vidas. As embalagens têm recebido recentemente atenção devido ao impacto que estas podem ter na diminuição da poluição ambiental. Assim, as embalagens sustentáveis representam-se como uma oportunidade para a redução do desperdício. Devem ser benéficas, seguras e saudáveis para os indivíduos ao longo do seu ciclo de vida; Ser fabricadas utilizando tecnologias de produção limpas e melhores práticas; Ser provenientes de fontes limpas ou de materiais reciclados com o intuito de serem recicladas de novo ou ainda serem biodegradáveis. O questionário seguinte pretende recolher dados sobre os principais fatores que influenciam o comportamento dos consumidores no que respeita à importância dos produtos terem embalagens sustentáveis.

Chamo-me Pedro Rocha, sou estudante e o questionário que se segue foi desenvolvido no âmbito de uma dissertação do Mestrado em Engenharia e Gestão Industrial na Universidade de Coimbra. O questionário tem uma duração de 5 minutos. Obrigado.

Sustainability is an increasingly present concept in our lives. Packaging has recently received attention due to the impact it can have in reducing environmental pollution. Thus, sustainable packaging represents an opportunity for waste reduction. They should be beneficial, safe, and healthy for individuals throughout their life cycle; be manufactured using clean production technologies and best practices; come from clean sources or recycled materials in order to be recycled again or be biodegradable. The following questionnaire aims to collect data on the main factors that influence consumer behavior regarding the importance of products having sustainable packaging.

My name is Pedro Rocha, I am a student, and the following questionnaire was developed as part of a dissertation for the Master's degree in Industrial Engineering and Management at the University of Coimbra. The questionnaire lasts 5 minutes. Thank you.