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Influences on Consumers' Willingness to Pay for Sustainable Last Mile Delivery among Portuguese Consumers

António Manuel de Albuquerque Vilar Pereira Machado

Master in Management

Supervisor:
PhD Isabel Cristina de Seixas Patrício Duarte de Almeida, Invited Assistant Professor ISCTE-IUL

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Abstract

The growth of e-commerce has led to a rise in direct-to-consumer deliveries. Last mile delivery efficiency and sustainability have become crucial, considering consumer needs, economic profitability, and environmental impacts. To meet global sustainability goals, decarbonizing freight transport is imperative, with electrification seen as a promising solution. Sustainability's prominence in e-commerce influences consumer behaviour and company success, with consumers displaying greater environmental concern (EC).

This dissertation aims to predict and explain Portuguese consumer behavior concerning their willingness to pay for sustainable last mile deliveries. The Theory of Planned Behaviour (TPB) was employed to analyse the determinants that influence this willingness. Intention was assessed through WTP for sustainable last mile deliveries.

A questionnaire collected data on attitudes, subjective norms, perceived behavioural control (PBC) and EC, which was added as an additional construct to the TPB. By analysing 219 adult participants, the study supports the hypotheses, with the model explaining 43.9% of the variance in WTP. PBC and positive attitude significantly influence the intention to pay for sustainable services. The study highlights the applicability of the TPB and identifies gender and educational background as factors that influence attitudes while gender impacts EC. The scarcity of sustainable last mile delivery options in the e-commerce sector in Portugal has led to a focus on understanding the determinants and predictors of consumer´s willingness to pay for these alternatives.

Keywords: E-commerce, Last Mile Delivery, Sustainability, Consumer Behaviour, Willingness to Pay, Theory of Planned Behaviour, Environmental Concern.

JEL Classification System:

Q56 - Environment and Development • Environment and Trade • Sustainability • Environmental Accounts and Accounting • Environmental Equity • Population Growth

L91 - Transportation: General

D12 - Consumer Economics: Empirical Analysis

Resumo

O crescimento do comércio eletrónico (e-commerce) tem aumentado as entregas diretas aos consumidores. A eficiência e sustentabilidade da entrega da última milha (LM) tornaram-se cruciais, considerando as necessidades dos consumidores, a rentabilidade económica e os impactos ambientais. Para atingir objetivos globais de sustentabilidade, é crucial descarbonizar o transporte de mercadorias, sendo a eletrificação uma solução promissora. A importância da sustentabilidade no e-commerce afeta o comportamento dos consumidores (que apresentam maior consciência e preocupação ambiental (EC)) bem como o sucesso das empresas.

Esta dissertação tem como objetivo prever e explicar o comportamento do consumidor português em relação à disposição para pagar (WTP) por entregas sustentáveis na LM. Foi utilizada a Teoria do Comportamento Planeado (TPB) para analisar os fatores que influenciam essa disposição. A intenção foi avaliada através da WTP por entregas sustentáveis da LM.

Um questionário recolheu dados sobre atitudes, normas subjetivas, controlo comportamental percebido (PBC) e EC, que foi adicionada como um construto adicional à TPB. Ao analisar 219 participantes adultos, o estudo suporta as hipóteses, com o modelo a explicar 43,9% da variação na WTP. O PBC e a atitude positiva influenciam significativamente a intenção de pagar por serviços sustentáveis. O estudo destaca a aplicabilidade da TPB e identifica o género e a formação educacional como fatores que influenciam as atitudes enquanto o género impacta a EC. A escassez de opções sustentáveis de entrega da LM no setor do e-commerce em Portugal levou a um foco na compreensão das determinantes e preditores da disposição para pagar por essas alternativas.

Palavras-chave: Comércio Eletrónico, Última Milha, Sustentabilidade, Comportamento do Consumidor, Disposição para Pagar, Teoria do Comportamento Planeado, Preocupação Ambiental.

JEL Classification System:

Q56 - Environment and Development • Environment and Trade • Sustainability • Environmental Accounts and Accounting • Environmental Equity • Population Growth

L91 - Transportation: General

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Glossary of Terms

ATT – Attitude

B2B – Business-to-Business

B2C – Business-to-Consumer

C2C – Consumer-to-Consumer

EC – Environmental Concern

E-commerce – Electronic Commerce

ERS – Electric Road System

E-shopper – Electronic shopper

GHG – Greenhouse Gas

H – Hypotheses

HGV – Heavy Goods Vehicle

LMD – Last Mile Delivery

M-commerce – Mobile e-commerce

PBC – Perceived Behaviour Control

SARS-CoV-2 – Severe Acute Respiratory Syndrome Coronavirus 2

SCM – Supply Chain Management

SN – Subjective Norm

TPB – Theory of Planned Behaviour

TRA – Theory of Reasoned Action

WTP – Willingness to Pay

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CHAPTER 1
Introduction

E-commerce has become one of the most significant sales and distribution channels in the world as a result of the consistent growth of online purchases over the past few years (Masteguim & Cunha, 2022). As reported by Bai et al. (2021), forecasts point out that, by 2024, online sales could represent almost half of all retail revenues. However, this sharp increase in e-commerce leads to a surge in direct-to-consumer delivery among urban areas which creates difficulties for sustainable logistics (Savelsbergh & Van Woensel 2016).

Last mile delivery is essential for the growth of e-commerce because, unlike the conventional retail shopping model, e-commerce needs to deliver customized orders to extremely dispersed locations (Masteguim & Cunha, 2022). As a result, in large urban and densely populated regions, negative effects including congestion and pollution have been observed (Masteguim & Cunha, 2022). Last mile delivery efficiency and sustainability have become important fields of study that take consumer needs, economic profitability, as well as sustainability into consideration (Rai et al., 2019).

Currently, nations all around the world are promoting vigorous development of innovative and sustainable energy (Ji et al., 2023). The topics of climate change and CO2 emissions interlace corporations and society among the current debates about political, social, environmental, and economic areas, which are primarily taking place in Europe (Qureshia et al., 2022). To meet the 2015 Paris agreement's goals, the transportation sector must be widely decarbonized by the year 2050 (Gnann et al., 2022). In order to limit the global warming temperature below 1.5°C-2°C, we need to reduce CO2 emissions by 50–60% to 90% by 2050, depending on the scenario and model (Camarasa et al., 2022).

Freight transportation is among the largest growing sources of emissions around the world (Schniederjans & Starkey, 2014). Dablanc (2007) asserts that up to 50% of the air pollutants produced by transportation activities in cities are attributable to urban freight logistics. One of the most promising solutions to energy and environmental problems is the electrification of the urban freight transport sector (Hassouna, 2022). For Gnann et al. (2022), the most energy-efficient and cost-effective choice in the future will be electric vehicles.

“Sustainability has gained significant importance in e-commerce, as it impacts both consumer behaviour and company success” (Klein & Popp, 2022). Dangelico et al. (2022) conducted a study in which they found that after the appearance of the Covid-19 pandemic,

consumers started to behave more sustainably, being more aware of personal impacts and more concerned with environmental issues.

According to Ignat and Chankov (2020), the consumer perspective regarding the sustainability of the current different delivery methods is still poorly researched. For Cheah & Huang (2021), customers may be presented with multiple delivery options as a result of the more competitive e-commerce sector, but they may not be aware of the environmental impact of these options.

As Ignat and Chankov (2020) stated in their study, delivery businesses must provide clients with complete information about the delivery options, including information on social and environmental elements in addition to economic ones (such as time, cost, and location). In general, customers are more likely to select a more sustainable last mile delivery when the environmental and social effects of last mile deliveries are presented (Ignat and Chankov, 2020). In the author's study, most participants are willing to accept waiting longer, paying more, or choosing a less convenient location in exchange for a delivery that is better for the environment and/or society.

Cheah & Huang (2021) examined the effect of carbon labelling on shipping choices made by consumers. They found that if carbon labelling was presented, more than half of respondents would be willing to wait for a greener delivery.

The purpose of this master´s dissertation is to predict and explain Portuguese consumer behaviour regarding their willingness to pay (WTP) for a sustainable last mile delivery. WTP, as defined by Breidert (2006), represents the maximum price a person is willing to pay for a good or service. Therefore, this research aims to answer the following research question: What are the determinants that most affect Portuguese consumers in their willingness to pay for a sustainable last mile delivery?

In order to achieve the objective of this study, an extended framework of the theory of planned behaviour (TPB) was utilised. The TPB was designed to predict and explain particular human behaviours in specific contexts (Ajzen, 1991). The theory has been widely used to comprehend the determinants underlying various pro-environmental behaviours (Yuriev et al., 2020). The measure of intention in this study, a predictor of a behaviour according to the TPB is represented by the willingness to pay for eco-friendly last mile deliveries.

To achieve this objective, a questionnaire was administered to gather data on various constructs, including attitude, subjective norms, perceived behavioural control, and an additional construct of environmental concern, which was incorporated into the original TPB framework. The WTP was also assessed through the questionnaire.

It is important to highlight that the direct assessment of the actual purchasing behaviour was not feasible due to the limited availability of sustainable last mile delivery options in the e-commerce sector of Portugal. Consequently, this study focuses on comprehending the determinants and predictors of consumers' willingness to pay for sustainable last mile delivery services, providing valuable insights for businesses operating online.

In order to address the research goal, the study was structured as follows:

- The **Introduction** presents the research problem (increasing challenge of sustainable last mile delivery in the context of the growing e-commerce industry), outline the study's objectives (predict and explain Portuguese consumer behavior regarding their WTP for sustainable last mile delivery by identifying the key determinants that significantly impact their WTP for these services), delineate the existing gap in research (with the substantial growth of e-commerce and last mile delivery, there is a need to understand consumer behavior, particularly in relation to sustainability), and pose the research questions (what are the determinants that most affect Portuguese consumers in their willingness to pay for a sustainable last mile delivery?)
- The **Literature Review** section will provide essential information about relevant subjects for this research, examine prior studies, offering support for the current investigation. Additionally, it will encompass an exploration of the utilized model and its associated variables, which guide the questionnaire.
- The **Methodology** outlines the approach and techniques used to collect, analyze, and interpret data, ensuring the study's validity, reliability, and replicability.
- The **Results and Discussion** section will showcase statistical data and analysis, validating the model's reliability and identifying the most influential factors, thereby providing a solid foundation for drawing meaningful conclusions.
- **Conclusions** will delineate the significance of the previously presented results, acknowledge their limitations, and offer recommendations for further research within the field.

CHAPTER 2
Literature Review

2.1. E-commerce

2.1.1. Concept

The world has recently witnessed a growing interest in electronic commerce, which has been influenced by recent developments in the field of information and communication technologies (Al-Ayed, 2021). According to Al-Ayed (2021) e-commerce (electronic commerce) is considered one of the most significant applications of information and communication technology. Electronic commerce started in the United States, the term includes all business activities that use Internet technologies (Schneider, 2016). For Laudon & Traver (2021), e-commerce can be defined as “digitally enabled commercial transactions between and among organizations and individuals”, or less formally as "the use of the Internet, the Web, and mobile apps and browsers running on mobile devices to transact business*”* (Laudon & Traver, 2021). For Radovilsky (2015), e-commerce is described as the practice of purchasing and selling products, services, information, and communication using a computer network, most notably the Internet.

With the introduction of widely used commercial internet technologies, there have been unparalleled changes in business operations and customer behaviour (Moore & Breazeale, 2010). More recently, e-commerce has seen impressive growth as a result of the Covid-19 pandemic, which accelerated the adoption of e-commerce by five years forward (Jones, 2021).

2.1.2. Main Types of E-commerce

According to Laudon & Traver (2021), e-commerce comes in a variety of different types, and there are numerous ways to describe them. For the authors, the nature of the market relationship (who is buying from whom) is the most used form to distinguish them. These forms of e-commerce can be divided into mobile, social, and local subgroups (Laudon & Traver, 2021).

Following Laudon & Traver (2021), the major types of e-commerce are: B2C (business-to-consumer), B2B (business-to-business), C2C (consumer-to-consumer), M-commerce (mobile e-commerce), Social e-commerce and Local e-commerce.

- **Business-to-Consumer (B2C) E-commerce** refers to the companies that conduct business with consumers online, providing transactions, communication and

interactions with them (end users) (Radovilsky, 2015). Business-to-Consumer e-commerce can also be defined as “online businesses selling to individual consumers” (Laudon & Traver, 2021). For Radovilsky (2015), these businesses can be engaged in manufacturing, distribution, retail, or other activities that include selling goods or services to customers online.

Nogueira et al. (2022, as cited in Huang et al., 2018) highlight the fact that B2C e-commerce contributes to increased transit frequency, which affects the environment.

- **Business-to-Business (B2B) e-commerce** refers to the companies that conduct transactions, communication and interactions between business partners (Radovilsky, 2015). Selling goods and services to businesses, outsourcing from suppliers, product distribution to firms, logistics, and financial transactions, among other activities are examples of B2B transactions (Radovilsky, 2015). Also, B2B e-commerce can be defined as “online businesses selling to other businesses” (Laudon & Traver, 2021).

- **Consumer-to-consumer (C2C) e-commerce** occurs when consumers are selling to each other (Laudon & Traver, 2021). According to the authors, this type of e-commerce gives users a method to transact with one another online with the assistance of a market maker (also referred to as a platform provider). In C2C e-commerce, the consumer makes the product ready for market, lists it for auction or sale, and relies on the market maker to offer a catalogue, a search engine, and transaction-clearing capabilities so that goods can be conveniently displayed, found, and purchased (Laudon & Traver, 2021). For Radovilsky (2015), C2C takes place in “organizations that provide private sales and auctions between individual consumers”.

- **Mobile e-commerce (m-commerce)** refers to “the use of mobile devices to enable online transactions” (Laudon & Traver, 2021). Cellular and wireless networks are used in m-commerce to link smartphones and tablet computers to the Internet (Laudon & Traver, 2021). As to Radovilsky (2015), Mobile commerce or M-commerce enables the conduct of e-commerce activities and transactions in a wireless setting, such as purchasing goods and services from a website on a mobile phone. The mobile app environment is expanding, with approximately 2.8 billion people accessing mobile applications around the world (Laudon & Traver, 2021).

- **Social e-commerce** is the "e-commerce that is enabled by social networks and online social relationships" (Laudon & Traver, 2021). To Fu (2020), social e-commerce "makes use of trust, interaction and communication between users to establish social relations and split". It can reach customers at a minimal cost through social activities, content sharing, and others by using social media tools (Fu, 2020).

  M-commerce and social e-commerce frequently go hand in hand, especially as more and more people access social networks through mobile devices (Laudon & Traver, 2021).

- **Local e-commerce** is the type of e-commerce that focuses on engaging customers based on their present location (Laudon & Traver, 2021). For the authors, local businesses employ a range of online marketing strategies to draw customers into their locations. Local e-commerce, powered by the growing popularity of local on-demand services like Uber, constitutes the third element of the mobile-social-local e-commerce trend (Laudon & Traver, 2021).

  Another potential definition of local e-commerce is provided by Radovilsky (2015). For the author, Location-based Commerce (L-commerce) is similar to the navigation systems in cars, in this type of electronic commerce, m-commerce transactions are targeted towards people in particular places and at specific times. By this definition, it is possible to conclude that "L-commerce" is another way of referring to the "Local e-commerce" concept, mentioned by Laudon & Traver in 2021.

2.1.3. Covid-19 crisis impact on E-commerce

According to Bai et al. (2021), consumers started to appreciate the variety and convenience of e-commerce even before the COVID-19 outbreak. The authors stated that in 2019, e-commerce accounted for almost 25% of overall retail sales.

In the word of Sułkowski et al. (2022), the SARS-CoV-2 infection spurred the growth of the global e-commerce market, which was already thriving. As reported by Bai et al. (2021), since the beginning of the Covid-19 crisis, consumer intent to purchase items through e-commerce channels has increased by 40 to 60 percent when compared to pre-pandemic levels across categories from everyday essential products to clothes and accessories. The authors suggest that these changes in consumer behaviour are likely to last in the long run as people become more accustomed to shopping online. The authors even stated that when the pandemic starts diminishing, more than 50 percent of consumers are expected to continue buying online.

Also, as reported by the authors, forecasts point out that, by 2024, online sales could represent almost half of all retail revenues.

2.1.4. E-commerce in Portugal

E-commerce information regarding Portuguese consumers, can be found in the Marktest E-Commerce Barometer. The e-Commerce Barometer, initiated by Marktest in 2021, investigates the behaviors of Portuguese consumers regarding online commerce. The group's E-Commerce Barometer has 2 biannual publications divided into two parts and an annual edition with the aggregate of the interviews carried out. In the first wave of the group's E-Commerce Barometer, interviews were conducted with exactly 2 262 individuals, carried out between March and May 2021.

According to Marktest (2021), the group's E-Commerce Barometer for the first wave of 2021 indicated that there are already more than 4.8 million Portuguese who do online purchases, representing 56.8% of individuals over 15 years old residing in mainland Portugal, and that among these, 12.1% already shop at least once a week and 42% shop online at least once a month. Also, as stated in Marktest (2022), the group's E-Commerce Barometer for the first wave pointed "UberEats", "AliExpress" and "Continente" as the most cited online stores among the Portuguese concerning the most recent purchases through digital media.

Regarding the second wave of the E-Commerce Barometer of 2021, the data was collected from a sample of 2000 interviews from residents in Portugal aged 15 years and above between October and December last year (Marktest, 2022).

According to Marktest (2022), between the study's first and second waves, the top 5 fastest growing brands in terms of online consumers are represented by "IKEA" in the top position, with a 45% increase in buyers through its digital store (totalling more than 1.7 million buyers), followed by "KuantoKusta" website, with a 29.2% increase (for more than 860 thousand online shoppers), then "Bolt", with a growth of 26.7% (to a total of 764 thousand users) next by "Zippy", with an increase of 21.2% (to 879 thousand buyers) and "Wook", with a growth of 18.1% (to more than 1.8 million buyers).

E-commerce information regarding Portuguese consumers can also be found in the study conducted by DPD Group in 2022. The study concluded that over the past two years, Portuguese e-commerce has expanded in a maturing market. For DPD Group (2022), there has been an increase in new e-shoppers, especially in 2020 (8%), and again (2%) in 2021. E-shoppers are internet users that bought goods or services online (DPD Group, 2022). Portuguese e-commerce

is highly concentrated on regular buyers, which represent about half (46%) of the entire Portuguese e-shopper population. In the study, regular buyers are defined as e-shoppers, aged between 18 and 70, who buy online in at least one category every month. Regular buyers use social media extensively, which is crucial to their online purchasing experience, because it provides them with information, recommendations, and opinions about the retailers, which can influence their decision to do business (DPD Group, 2022).

2.1.5. Sustainable Online Purchase (Portugal)

According to DPD Group (2022), Regular Buyers believe that a sustainable purchase is associated with the product and respective brand, and the dimensions around delivery are not relevant. However, 7 out of 10 regular Portuguese e-shoppers would prefer a website that offers green delivery options such as low-emission vehicles and concentrated delivery options for all products (DPD Group, 2022).

The aforementioned data, corresponds to the general online purchases, not specifying the product categories in detail. The study conducted by DPD Group is considered to be a valuable tool to have a general perspective of the current e-commerce scenario in Portugal.

The DPD study did not explore the Portuguese e-shopper's willingness to pay for a sustainable last mile delivery. Given that nearly half of the Portuguese population engages in online shopping, it is evident that addressing this topic is essential, particularly in light of the increased importance of sustainability issues not only in Portugal but also across the world.

2.2. Environmental Awareness

According to Li et al., (2023), green consumption has soared in popularity as environmental protection awareness gained more and more public attention. Consequently, an increasing number of environmentally conscious customers are willing to pay more for sustainable products (Li et al., 2023). The younger generations, for instance, are becoming more aware of social and environmental issues, which can be visible through young environmentalist movements around the world (Luger et al., 2022). In order to satisfy the demand of environmentally conscious consumers and enhance their brand image, more traditional enterprises adopt management behaviours about the design of their product line (Li et al., 2023).

According to Demir et al. (2022), aspiring green goals with intense economic demands are leading to the increase of environmental awareness and technological advancements for enhancing current logistics systems. For Phyper & MacLean (2009), it is encouraging to see

that people are becoming more aware of environmental and social issues. According to the authors, along with price and quality, customers care about the product's production process, including how and where it was made and who was involved.

2.3. Last Mile Delivery

Delivery logistics have become more important due to the SARS-CoV-2 pandemic's fast-rising online buying volume (Sułkowski et al., 2022).

According to Schröder et al. (2018, p. 5), “Last-mile delivery is the final stage in the network of courier, express, and parcel companies (CEP)”. As for Lim et al. (2018) the last mile delivery also known as LMD is considered the last stage of order fulfilment, which aims at delivering products ordered online to the ultimate consumers. In a simpler way, Stiller (2003), defines the term as the final distribution to the consumer.

For Boysen et al. (2020), all logistics tasks involved in delivering shipments to individual customers' homes in urban areas are considered a hot topic among cities all over the world.

In agreement with Gramling et al. (2021), “E-commerce success depends on the last mile” or in other words “The last mile is the crucial factor for e-commerce” (Stiller, 2003, p. 75).

Over the past few years, the growth of LMD due to B2C e-commerce has changed Supply Chain Management (SCM) with new environmental and economic issues. Last mile logistics offers a genuine opportunity to promote both monetary and environmental sustainability, rather than being just a consumer convenience requirement and a method of transport optimisation (Demir et al., 2022). For the authors, with the emergence of the pandemic crisis, online shopping has increased, which has created great pressure on logistics networks that connect us to goods, and, taking into consideration that customers ask for fast and reliable last mile delivery, there is an urgent need to integrate technological innovation into sustainable transportation systems. For Demir et al. (2022), the most researched negative externalities are GHG emissions which are primarily produced by power stations, transportation, and industrial processes. Governments are attempting to address this issue as the potential for global warming makes the reduction of emissions a crucial matter (Demir et al., 2022).

2.3.1. Electric Vehicles

The increase in the volume of orders via e-commerce has made customers to become more demanding on important factors such as product delivery speed, which puts further strain on the environmental effects of this consumption Nogueira et al. (2022, as cited in Manerba et al.,

2018; Guo et al., 2019). Home delivery has expanded due to B2C e-commerce, which has also made urban issues like traffic congestion, noise, increasing fossil fuel use, and concerns over levels of gaseous emissions worse (Nogueira et al., 2022, as cited in Arnold et al., 2018). Because of the increase in last mile delivery vehicles, and consequently, the rise of fuel consumption and carbon emissions, utilizing electric cars for last mile deliveries could assist in implementing green supply chain logistics techniques (Kishore et al., 2022). Electric vehicles, which may run entirely or in part on electricity, lessen reliance on fossil fuels and greenhouse gas emissions (Biresselioglu et al., 2018). For Melander et al. (2022), the transition to electric freight vehicles (EFVs) presents a significant opportunity to reduce emissions. Unlike internal combustion engines, which produce power by burning a mixture of fuel and gases, electric cars run on electric motors (Kishore et al., 2022). Electric vehicles have become an innovative technology that lowers local emissions, which helps to reduce the releases of fumes and noises during distribution in e-commerce (Kishore et al., 2022, as cited in Ehrler et al., 2021).

Some countries like Norway are moving efforts to meet CO_2 reduction goals. To achieve CO_2 reduction goals by 2030, Norway designed an ambitious transportation plan that calls for the adoption of zero-emission commercial freight vehicles (Hassouna, 2022). According to the authors, with the implementation of this plan, it is anticipated that in 2025 all-new lighter vans will be zero-emission vehicles. In 2030, 50% of new heavy freight vehicles as well as all new heavy vans are predicted to be zero-emission vehicles (Hassouna, 2022). Also, for the authors, electric trucking is a very promising means of freight transportation and it is anticipated to penetrate the market quickly.

In a related development, Germany has taken significant steps towards addressing carbon emissions and air quality in road freight transportation. An innovative project led by Costain and Siemens Mobility has introduced an electric road system (ERS) on a section of the A5 motorway. This initiative adapts railway overhead catenary technology to power and recharge the batteries of specially modified heavy goods vehicles (HGVs) as they drive along the motorway (Horgan, 2022). According to Horgan (2022), the A5 motorway is a major transportation route that has been selected for this project due to its high traffic volume and pollution levels. The electrified section of the motorway enables specially adapted HGVs to charge their batteries and receive power from overhead cables. The successful implementation of this project showcases Germany's commitment to explore innovative solutions for decarbonizing road freight and improving air quality.

According to Biresselioglu et al., (2018, as cited in European Commission, 2016), the transportation sector represents a quarter of Europe's GHG emissions and is consequently

regarded as a major source of air pollution, contributing to climate change. As reported by Biresselioglu et al., (2018, as cited in EEA, 2016), in Europe only 13% of vehicles are considered light and heavy commercial vehicles, but they account for more than a third of all CO_2 emissions from road transportation. Therefore, switching to electric mobility for freight transportation has tremendous potential for lowering environmental effects Biresselioglu et al., (2018).

In this master's dissertation, we only focus on the last mile stage of logistics. From this standpoint, we will address the electric vehicle utilization in the delivery of products ordered online to the final consumers. Electric vehicles were selected taking into consideration the aforementioned citations, in which there is a clear consensus on the fact that these vehicles are treated as sustainable automobiles.

2.4. The Theory of Planned Behavior

Maxwell (2005) defined theory in qualitative research as “a set of concepts and ideas and the proposed relationships among these, a structure that is intended to capture or model something about the world " (p. 48).

For Merriam & Grenier (2019), the theoretical framework, referred to as the conceptual framework for some authors, comprises the ideas and/or theories that shape or "frame" the research. It is constructed based on existing literature and serves as the perspective through which is developed the research questions while examining the phenomenon under investigation (Merriam & Grenier, 2019).

According to Merriam & Grenier (2019), researchers often have the flexibility to approach studies from various perspectives. The choice of a specific theoretical framework is influenced by several elements, including one's disciplinary background, the existing body of research on the subject, and one's individual philosophical stance (Merriam & Grenier, 2019). For Grant and Osanloo (2014), the theoretical framework “serves as the structure and support for the rationale for the study, the problem statement, the purpose, the significance, and the research questions”.

The theory of planned behaviour (TPB) offers a helpful conceptual framework to address the complexity of human social behaviour Ajzen (1991) (see Figure 2.1). For the author, the TPB was designed to predict and explain particular human behaviours in specific contexts.

Since its introduction in 1985, the theory of planned behaviour has developed into one of the most widely used and influential models for the analysis of human social behaviour (Ajzen,

2011). Numerous meta-analytic evaluations covering a variety of behaviours have supported the TPB's capacity to predict behaviour (Armitage & Conner, 2001).

The TPB has been widely used to comprehend the determinants underlying various pro-environmental behaviours (Yuriev et al., 2020). The use of alternative transportation (Muñoz et al., 2016; Hwang et al, 2021) or the prediction of green product consumption (Paul et al., 2016; Maichum, 2016; Chan, 2001), are just a few examples among many others.

The TPB is an extension of the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TRA was created by Fishbein and Ajzen with the purpose of predicting behaviour through the evaluation of intentions to perform the specified behaviour (Ajzen, 1991). For the author, in this context, intentions serve as indicators of how much effort people are willing to put in order to perform the behaviour. Consequently, "as a general rule the stronger the intention to engage in a behaviour, the more likely should be its performance" (Ajzen, 1991).

According to Ajzen (1991), in the theory of planned behaviour, there are three distinct determinants that influence intention. For the author, the predictors are composed by attitudes, subjective norms and perceived behavioural control towards the behaviour.

For Ajzen (1991), the theory of planned behaviour differs from the theory of reasoned action in its addition of perceived behavioural control. In the TRA, only the volitional factors of attitudes and/or subjective norms affect intentions (and consequently behaviours), not considering the possession of requisite opportunities and resources to explain the individual's behavioural intention (Madden, Ellen, & Ajzen, 1992; Ajzen 2020). This extension is proved to be crucial due to the limitations of the model in dealing with behaviours over which people have incomplete volitional control (Ajzen, 1991). In the study conducted by Armitage & Conner (2001), the PBC was found to be a useful addition to the TRA, increasing on average 6% the intention's prediction over and above attitude and subjective norm.

The application of the TRA has been questioned because in some cases, non-volitional factors may also influence an individual's intention/behaviour (e.g., resources) (Han et al., 2010, as cited in Ajzen, 1985., Park, 2003). According to this line of thinking, the TRA cannot fully explain human behaviour since it ignores elements that may have an impact on behavioural intentions.

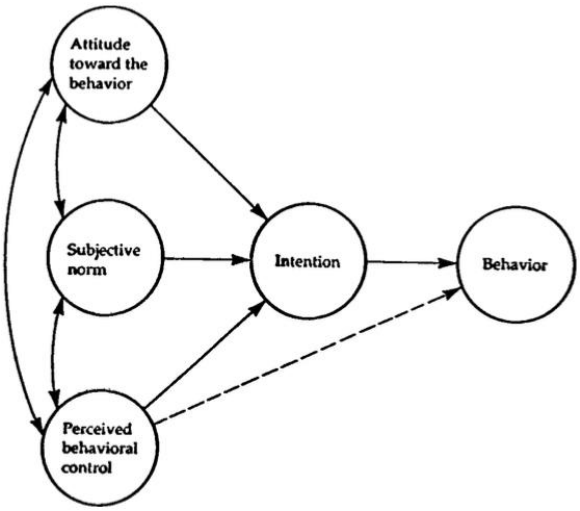

Figure 2.1 - Model of the Theory of Planned Behaviour (Model adapted from Ajzen, 1991)

In general, the intention´s strength to perform the considered behaviour is greater when the more favourable is the attitude and subjective norm (SN) regarding a behaviour and the stronger the perceived behavioural control (PBC) is (Ajzen 1991). The author referred that Attitude, SN, and PBC are all likely to play different roles in predicting intention depending on the specific behaviour and context.

According to Armitage & Conner (2001) from 185 studies covering a wide variety of domains published until the end of 1997, the TPB explained 27% and 39% of the variance in behaviour and intention, respectively. For the authors, The TPB accounted for 11% more of the variance in behaviour when self-reports were used to measure behaviour rather than when behaviour measures were objective or observed. Also, according to Ranjbar et al. (2021 as cited in Gao et al., 2017; Li et al., 2018; Rezaei et al., 2018; Yadav & Pathak, 2017) some researchers discovered that people's intentions to perform a behaviour can be influenced by their positive attitudes and high perceptions of the subjective norms.

A study that uses the TPB can be an important tool to understand the behaviour of Portuguese consumers regarding their willingness to pay for an eco-friendly delivery alternative, especially given that there has been a sharp increase of e-commerce delivery orders since the Covid-19 pandemic. Therefore, the results derived from this study may help companies operating in this segment to redesign their strategic decisions at the environmental level taking into consideration not only the increasing public environmental policies that are being implemented by governments all over the world, but also the increase environmental awareness of the public in general.

2.4.1. Attitudes

Attitude research is fundamental to social psychology (Terry & Hogg, 1999). According to Barber et al. (2009), attitudes are indispensable to consumer behaviour, so marketing frequently looks for strategies to determine and change attitudes about products, services, and brands. For the authors, by comprehending attitudes, market research about the consumer behaviour prediction accuracy increases, modifying consumers' attitudes to elicit a desired behaviour.

For Ajzen (1991), the attitude toward the behaviour is the first of the three independent determinants of intention in the TPB. The author defined it as "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behaviour in question". As for Tommasetti, et al. (2018), the term attitude refers to the "predisposition to interact in a predictably favorable or unfavorable way with an object, person, or situation".

Attitudes are shaped by the fusion of Behavioural Beliefs Strength (the beliefs about the outcome of behaviour) and Outcome Evaluation (the assessment of the advantages and disadvantages of the behaviour's outcome) (Nguyen et al., 2015).

A variety of studies demonstrate that attitudes toward the performance of environmentally friendly behaviours (such as recycling), rather than attitudes toward broad environmental issues, have been shown to increase the attitude-behaviour association (Chan, 2001 as cited in Hinesetal., 1987; Schwepker & Cornwell, 1991). According to Xu et al. (2022), environmental attitude refers to a person's subjective propensity to perform a certain environmental behaviour and it is one of the key aspects most frequently considered in the study of factors influencing environmental behaviour.

2.4.2. Subjective Norms

Subjective norm is the second determinant of intention, a social factor that refers to "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991).

For Tommasetti et al. (2018), subjective norm, is a way of indicating the influence of others, and it corresponds to the perception that a particular behaviour is more or less anticipated by the individuals who are important to the decision-maker. As for Fishbein and Ajzen (1975), the subjective norm is the "person's perception that most people who are important to him think he should or should not perform the behavior in question". The influence of people considered important to an individual, such as spouses, close friends, family, and colleagues represents a significant factor in determining an individual's behaviour (Bearden, Netemeyer, & Teel, 1989; Reis, Collins, & Berscheid, 2000).

Subjective norms are thought to arise from the combination of normative beliefs strength (beliefs about the level of approval/disapproval from significant individuals regarding the behaviour) and motivation to comply (the drive to comply to the views of prominent individuals) (Nguyen et al., 2015).

The greater the subjective norm, the more likely the person will intend to conduct the behaviour in question (Fishbein and Ajzen, 1975). In some circumstances, social pressure can even have more impact on someone's behaviour than their own attitude towards it (Ajzen & Fishbein, 1980).

Regarding the environment, Xu et al. (2022) referred that when consumers notice that those around them care about the environment, they will deliberately consider if their own conduct is congruent with the collective. If inconsistent, consumers will purposefully adopt the green purchasing behaviour of the group to avoid this distinction, and even perform better (Xu et al., 2022).

2.4.3. Perceived Behavioural Control

Perceived behavioural control (PBC) can be interpreted as the individual's perception of the ease or difficulty of conducting a behaviour (Ajzen, 1991), and it is regarded as the most significant antecedent in the TPB when considering behaviours that are partially under volitional control (Paul et al., 2016). According to Trafimow, et al. (2002), PBC is referred to as "the extent to which the person believes the behaviour is under his control". The likelihood that an action will be carried out is highly correlated with the feeling of having complete control over it (Armitage & Conner, 1999; Sutton, 2015).

The TPB was developed as a result of the TRA (Fishbein & Ajzen, 1975), which made the assumption that the majority of human social behaviours are under volitional control and can therefore be predicted only from intentions (Ajzen, 2002). For the author, in an effort to address the circumstances where people might not have full volitional control over the behaviour of interest, the concept of PBC was included. According to the theory, the more PBC an individual has, the stronger will be its intention to engage in the particular behaviour (Randall & Gibson, 1991).

Perceived behaviour control is determined by the amalgamation of control beliefs strength (beliefs about what enables or inhibits performance of the behaviour) and perceived power (the

perception of how influential these factors are in either constraining or improving the execution of the behaviour) (Nguyen et al., 2015).

Particularly, in the context of green behaviour PBC has been demonstrated to have a favorable link with WTP for green products (Maichum et al. 2016), green hotels (Chen & Tung, 2014; Han et al., 2010), green energy (Tan et al. 2017), organic foods (Canova et al., 2020; Tarkiainen & Sundqvist, 2005) and composting and recycling (Cho, 2019; Taylor & Todd, 1995).

2.4.4. Environmental Concern (EC)

In the literature, EC have been demonstrated to play important roles in consumers' environmentally friendly decision-making processes (e.g., Chen et al., 2022; Chen & Kuo, 2022; Roseira et al., 2022; Varah et al. 2020). Environmental concern is considered a major variable in green marketing literature (Paul et al., 2016). According to Paul et al. (2016, as cited in Ogle, 2004; Bamberg, 2003), the concept of "environmental concern" refers to values, attitudes, emotions, perceptions, knowledge, as well as behaviours that are related to the environment and was derived from political discourse. Kang et al. (2012) examined the willingness of hotel customers to pay more for environmentally friendly and sustainably managed hotel practices. More specifically, the purpose of this study was to analyse the relationship between U.S. hotel guests' EC and their WTP a premium for hotels' green practices. Researchers discovered that the New Ecological Paradigm (NEP), which was employed in the study to quantify EC, had a favorable and significant impact on consumers' WTP a premium for environmentally friendly practices. Also, Maichum et al. (2016) used an expanded framework of the TPB to examine adult (over 18) Thai customers (whose base education is high school) on their purchase intentions for green products (TPB). In this study, EC had a significant positive impact on green products´ purchase intention. Similarly, Paul et al. (2016) studied the intention of Indian customers to purchase green products. The TRA as well as the TPB and its extended version (mediating the role of TPB variables) were used by the authors. In this study, they found that the TPB mediates the link between EC and the intention to buy green products.

2.4.5. Purchase Intention

The objective of the TPB is to predict and explain an individual's behaviour (Ajzen, 1985). In the TPB, the immediate antecedent of a behaviour is its intention to perform it (Ajzen, 2020). Intention is considered the motivational antecedent of behaviour and it shows how much effort a person is likely to put into engaging in a behaviour (Darker & French, 2009). The strongest the intention, the more likely it is that the behaviour will follow Ajzen (2020). It is described that the interaction of the three determinants of intention described in the TPB (attitude toward the behaviour, subjective norms, and PBC) results in the determination of behavioural intention (Randall & Gibson, 1991). Depending on the sort of behaviour being anticipated and the circumstances in which the behaviour is carried out, the emphasis of the three components should change (Ajzen & Fishbein, 1980). Sheppard, Hartwick, and Warshaw (1988), among other authors, believe that behaviour and intention are highly correlated.

Intentions are usually considered to be the best predictors of behaviour and to fully mediate the effects of attitudes, subjective norms and PBC, according to several studies (Maichum et al., 2016, as cited in Gracia et al., 2013, Liobikiene et al., 2016 & Ajzen, 2002). “More specifically, intention is accepted as the best available predictor of human behaviour, which is at the heart of the TPB framework” (Maichum et al., 2016, as cited in Liobikiene et al., 2016 & Han et al., 2010).

An example of how intention serves as a reliable predictor of behaviour can be observed in the study conducted by Maichum et al. (2016), as cited in the work of Rezai et al. (2012). This research employed the Theory of Planned Behaviour to scrutinize green food consumption patterns in Malaysia, revealing that customers' intention to opt for more sustainable food choices plays a crucial role in the adoption of environmentally friendly products.

2.4.6. Willingness to Pay

Willingness to Pay (WTP) indicates how much a consumer is willing to spend for an improvement of a good or service (Caspersen et al., 2021, as cited in Masiero & Hensher, 2010). Breidert (2006, p. 27), defines the term willingness-to-pay has the “highest price an individual is willing to accept to pay for some good or service”. For the author, modern approaches to pricing decision-making depend heavily on determining customers' WTP for goods and/or services. Experimental survey-based methods have proven to be a promising tool for the indirect measurement of WTP, as asking customers directly about their readiness or reluctance to buy a given product at the prescribed price frequently results in unreliable estimations (Breidert, 2006).

With regards to implementing green consumerism, challenges are faced by consumers (Moser, 2015). Consumer preferences for various last mile delivery alternatives have previously been analysed in several empirical studies. For instance, a study conducted by Rao et al. (2011), found that a variety of shipping/delivery alternatives results in a more favorable consumer evaluation. Similarly, for Esper et al. (2003), when online consumers are given the option to select a carrier, their willingness to purchase and expected delivery satisfaction levels rise. For the author, positive delivery service alternatives, according to earlier studies, are essential to consumer willingness to buy.

In general, customers are willing to pay more for deliveries that are faster, more flexible, and, in some cases, more environmentally friendly (Joerss et al., 2016 & Prümm et al., 2018). According to Prümm et al. (2018) a third of Germans would be willing to pay for deliveries that are beneficial to the environment. Since making use of vehicles that produce less air pollution will help to reduce the negative environmental impacts of urban freight transport (Iwan et al., 2021). Schniederjans & Starkey (2014) investigated the drivers of consumer intention and WTP for environmentally friendly transportation. More precisely, with the support of the TPB, they analysed the impact of attitudes, PBC, and peer pressure on consumers' intentions and WTP for a t-shirt that was sent using energy-efficient fuel. The results of the study were obtained by an U.S. survey that reveal consumer attitude and peer pressure are positively associated with intention which is positively associated with WTP. Kim & Han (2010) studied another type of pro-environmental behaviour by investigating the willingness to pay conventional-hotel prices for a green hotel. The authors found out that respondents were willing to experience little difficulties, such as using recycled materials and reusing towels, and they were eager to learn about the environmental benefits of green hotels. In the study findings, it was established that benefit awareness importantly influences customer decision making.

The TPB is a tested theory in the analysis of WTP choices for environmental initiatives (Obeng et al., 2019, as cited in Ajzen & Peterson 1989; Fielding, McDonald & Louis, 2008; Harris, Driver, & McLaughlin, 1989; Liebe, Preisendörfer & Meyerhoff, 2011; López-Mosquera & Sánchez, 2012; Pouta & Rekola, 2001). The TPB defends that behaviour is determined by intention or willingness (Ajzen 1988, 1991). The term WTP can be interpreted as a behavioural intention and can be predicted by the TPB (Pouta & Rekola, 2001, as cited in Ajzen and Madden 1986; Ajzen 1991). For this reason, this investigation considers WTP for sustainable last mile delivery as a behavioural intention to predict the act of adopting sustainable last mile deliveries when purchasing online.

2.5. Literature Influence on the Investigation

The literature review underscores the vital role played by electric vehicles in mitigating emissions and environmental impact, particularly in last mile e-commerce delivery. Concrete instances from Norway and Germany offer valuable implementation models. The Theory of Planned Behavior stands as a robust framework for comprehending consumer behavior, focusing on attitudes, subjective norms, and perceived behavioral control.

Consumer attitudes wield substantial influence over the adoption of sustainable last mile delivery methods. Social influence and perceived norms also play pivotal roles. Furthermore, consumers' belief in their ability to influence last mile delivery choices and their perceived control exert significant impacts on forming intentions.

The literature also highlights consumers' willingness to pay a premium for sustainable last mile delivery options. Notably, this study incorporates "Environmental Concern" (EC) as an additional determinant of intention. The inclusion of EC expands the TPB model, addressing consumers' heightened environmental awareness and its impact on their willingness to pay for sustainable last mile deliveries.

This enhancement is a direct result of the comprehensive literature review. The review spotlighted a critical trend in consumer behavior - a growing environmental consciousness. By incorporating "Environmental Concern" into the model, the research takes a significant step towards capturing and understanding this influential factor in consumers' willingness to pay for sustainable last mile deliveries.

2.6. Conceptual Research Model and Hypothesis

The proposed modified research model (see figure 2.2) illustrates the relationship between the key variables of attitude, subjective norms, perceived behavioral control, and environmental concern on consumers' willingness to pay for sustainable last mile delivery.

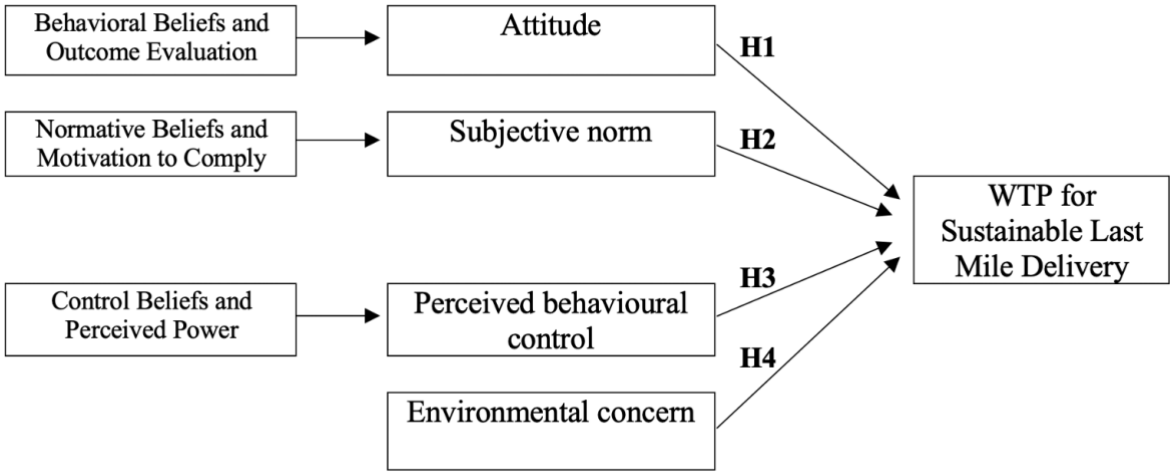

Figure 2.2 - Proposed research model of the extended TPB (Source: Author's Elaboration)

The adapted research model adopted in the present study was designed to test the relationship between the variables of attitude, subjective norms, PBC and EC on WTP for sustainable last mile delivery. Specifically, it examines how the primary constructs of the TPB, along with the additional construct of environmental concern, influence the willingness to pay for sustainable last mile deliveries. The intentional choice of not directly accessing the antecedents ("Behavioral Beliefs and Outcome Evaluation" for attitudes, "Normative Beliefs and Motivation to Comply" for subjective norms, and "Control Beliefs and Perceived Power" for PBC) serves to maintain a more focused and clear approach. While these antecedents may hold significance in broader contexts, their inclusion could potentially diffuse analytical efforts and detract from the central focus.

Importantly, including antecedents may not directly address our research question, which centers on TPB constructs and their impact on WTP for sustainable last mile deliveries.

Examining antecedents could potentially divert attention from the core investigation. This approach of emphasizing core constructs mirrors that of numerous prior studies, which have recognized it as an effective strategy in research of this nature.

Several studies have applied TPB framework models without directly addressing the antecedent beliefs of attitude, subjective norm, and perceived behavioural control in the literature (Maichum et al., 2016; Zhang et al., 2022; Chen and Kuo, 2021; Paul et al., 2015; Chen and Wang, 2021).

The current investigation presents a model that expands the TPB by including "Environmental Concern" (EC) as a determinant of intention. The intention in this case corresponds to the "Willingness to Pay" for a last mile eco-friendly delivery. Numerous research studies have adeptly integrated the construct of environmental concern into the original framework of the TPB model, demonstrating its growing significance in contemporary behavioural science (Chen & Wang, 2021; Zhang et al., 2022; Chen & Kuo, 2021).

The TPB is considered a reliable model for explaining human behaviour, but it can also be changed by including other predictor variables to increase its power (Ajzen, 1991; Conner & Armitage, 1998). By incorporating the environmental concern variable into the Theory of Planned Behaviour, this study aims to extract the factors that influence the willingness to pay for sustainable delivery of the last mile.

Hypothesis 1: The Attitudes resulting from behaviour beliefs and outcome evaluation, positively influences consumers' Willingness to Pay for sustainable last mile deliveries.

Hypothesis 2: The Subjective Norms resulting from beliefs and motivation to comply, positively influences consumers' Willingness to Pay for sustainable last mile deliveries.

Hypothesis 3: The Perceived Behavioural Control resulting from control beliefs and perceived power, positively influences consumers' willingness to pay for sustainable last mile deliveries.

Hypothesis 4: The Environmental Concern positively influences consumers' Willingness to Pay for sustainable last mile deliveries.

CHAPTER 3
Methodology

3.1. Target Population

According to Maichum et al. (2016, as cited in Chan, 2001), the green context under investigation is very difficult for minors to understand due to its conceptual complexity.

For Paul et al. (2015), adults are thought to have higher comparison, evaluation, and decision-making skills. Also, according to Maichum et al. (2016, as cited in Hedlund, 2011; Han et al. 2010; Han and Kim, 2010; Alwitt and Pitts, 1996), on the environmental literature, highly educated individuals are better able to comprehend the subject at hand and contribute to the collection of accurate data than less educated individuals. Because of this, a sample of participants aged 18 or older was selected for this investigation.

3.2. Data Collection

According to Zikmund (2009), qualitative data refers to the non-numerical data that are expressed in text, images, or oral form while quantitative data is represented by organized and meaningfully assigned numbers. For the author, surveys are the most popular approach to gathering primary quantitative data for business research. The author stated that the common purpose of quantitative research is to test hypothesis or specific research questions. The present research follows a quantitative approach.

There are three types of business research (Zikmund, 2009, as presented in Table 3.1).

Table 3.1 - Types of business research

1. Exploratory	Conducted to shed light on ambiguous situations or find concepts that could present potential business opportunities.
2. Descriptive	Provide details about things, people, groups, organizations, or settings in an effort to "create a picture" of a particular scenario.
3. Causal	Enables causal inferences to be created; searches for the identification of cause-and-effect relationships.

For the author, to find relevant research results requires matching the specific decision issue with the appropriate research design. A causal research approach will be undertaken because the current investigation aims to study and explore variables that have a cause-and-effect relationship.

According to the author, the outcomes of qualitative research are believed to be more subjective, implying that they depend on the researcher (the findings of different researchers could differ). In contrast, the author stated that it is believed that a survey respondent's commitment score on a quantitative scale is more objective because the value will remain the same regardless of the researcher who is conducting the analysis. Additionally, numerous studies suggest that people frequently experience pressure to be environmentally friendly, particularly when they are in situations where they are being seen by others (Schniederjans & Starkey, 2014 as cited in Simon, 2010). When a respondent must make a choice in front of another person, this potential pressure may lead to an incorrect response regarding their green buying intentions and Willingness to Pay for products (Schniederjans & Starkey, 2014).

In line with the citations mentioned above, and taking into consideration that the current study demands for quantitative data, it was employed a quantitative research method through the application of an anonymous online survey questionnaire.

The purpose of this master's dissertation is to explain and predict consumer behavior regarding the choice of sustainable last mile delivery methods, through the examination of Portuguese consumers' willingness to pay for sustainable last mile delivery. This will be achieved by employing a conceptual framework based on the Theory of Planned Behaviour.

After the collection of data and the examination of the referred TPB framework, the research hypothesis presented along will be tested.

The questionnaire was elaborated on Google Forms, and shared through multiple online social networks (LinkedIn, Facebook, Instagram, and WhatsApp).

3.3. Pre-test of the Survey

Since the questionnaire was initially in Portuguese, there was a possibility of losing some concepts during the translation process. As a result, the pre-tests were conducted to rephrase specific statements to aid respondents in comprehending and responding to the survey. It is worth mentioning that the responses collected during the pre-testing phase were not included in the final sample analyzed.

In the pre-test, questions were posed regarding the assessment of the behavior itself, namely the selection of sustainable last mile delivery options when purchasing online. Yet, considering the feedback obtained, respondents conveyed that they refrained from opting for sustainable last mile delivery methods, citing its restricted availability across the majority of online retailers in Portugal. This presents a challenge in directly scrutinizing purchasing behavior. To ensure the integrity of the research and avoid using biased data that could compromise the study, the questions assessing behavior itself were removed.

Several authors have already turned to the Theory of Planned Behaviour (TPB) to analyse "willingness to pay", without accessing the behaviour, such as López-Mosquera, García, & Barrena (2014) and He, Yu & Fukuda (2021).

3.4. Survey Design

Three requirements had to be satisfied for respondents to be eligible for the questionnaire:

1) Respondents had to be over 18
2) Respondents had to have experience in ordering online

The survey applied in this master's dissertation is based on comparable surveys from the literature (see Appendix 13) to ensure the validity and reliability of this study.

The construct items in the survey were carefully adapted to align with the specific focus of this study, which centers around environmentally friendly last mile deliveries. This adaptation ensures that the survey questions are tailored to capture the relevant aspects related to this particular context. Also, each question was translated from English to Portuguese in order to prevent potential misinterpretations among Portuguese consumers (see Appendix 13).

As regards wording, the questions should be phrased simply, clearly, and specifically, without using abbreviations, jargon, or foreign phrases in order to be properly understood and receive the information intended (Taylor-Powell, 1998).

The survey was created to be self-administered, meaning that it may be completed without the researcher's assistance. Respondents would follow a distributed hyperlink and complete the online form directly on Google Forms. All questions were required to be answered in order for the survey to be completed.

The questionnaire was structured in two sections. The first part included the questions related to the constructs of Attitude, Subjective Norm, Perceived Behavioral Control, Environmental Concern, and Willingness to Pay. The second section was composed by demographic variables such as age, gender, marital status, number of children, residence area, concluded academic qualifications, monthly net income and professional status.

3.5. Measures

The constructs listed below were assessed using validated items that have previously been used in the research on pro-environmental behaviour. The scoring for the items follows a 5-point Likert scale, with responses ranging from 1 (totally disagree) to 5 (totally agree).

3.5.1. Attitude (ATT)

The attitude construct was measured with a five-point semantic differential scale, adopted from Kim and Han (2010). The items are as follows:

ATT1: I think paying for an eco-friendly delivery is very positive.

ATT2: I think paying for an eco-friendly delivery is a responsibility.

ATT3: I think paying for an eco-friendly delivery is pro-environmental behavior.

3.5.2. Subjective Norm (SN)

To assess the Subjective Norm, three items adopted by Maichum et al. (2016) were used. These items were measured with a 5-point Likert's scale, which ranges from totally disagree (1) to totally agree (5). The items to measure this construct are:

SN1: My family think that I should choose an eco-friendly delivery rather than a regular delivery.

SN2: My close friends think that I should choose an eco-friendly delivery rather than a regular delivery.

SN3: Most people who are important to me think I should choose an eco-friendly delivery rather than a regular delivery.

3.5.3. Perceived Behavioural Control (PBC)

To measure the construct of Perceived Behaviour Control, four items were applied. The items were adopted from Maichum et al. (2016). The items are scored on a 5-point Likert scale ranging from totally disagree (1) to totally agree (5). The items are:

PBC1: I am confident that I can choose an eco-friendly delivery rather than a regular delivery.

PBC2: I see myself as capable of choosing an eco-friendly delivery in future.

PBC3: I have the resources, time and willingness to purchase online products using an eco-friendly delivery option.

PBC4: There are likely to be plenty of opportunities for me to pay for eco-friendly deliveries.

PBC5: I think my payment will improve the urban environment.

3.5.4. Environmental concern (EC)

To measure the construct of Environmental concern (EC), four items were applied. The items were adopted from Maichum et al. (2016). The items are also scored on a 5-point Likert scale ranging from totally disagree (1) to totally agree (5). The items are:

EC1: I am very concerned about the state of the world's environment.

EC2: I am willing to reduce my consumption to help protect the environment.

EC3: Major social changes are necessary to protect the natural environment.

EC4: Major political change is necessary to protect the natural environment.

3.5.5. Willingness to Pay (WTP)

When assessing Willingness to Pay, two items from Schniederjans & Starkey (2014) were utilized. A 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree) was employed to score the items. It is worth noting that the items adopted from Schniederjans & Starkey (2014) were transformed from a 7-point Likert scale to a 5-point Likert scale to maintain consistency in the response structure.

WTP1: I am willing to pay a higher price for the green transportation than for the normal delivery.

WTP2: Even if the normal delivery is priced lower, I will still buy the green transportation delivery.

CHAPTER 4
Results and Discussion

The present study utilizes a sample of 219 Portuguese adult individuals who currently reside in Portugal. The demographic and socio-economic characteristics of the study's sample are shown in the Table below (Table 4.1). The original sample had a total of 220 responses, and after a preliminary data analysis, 1 of the 220 responses was considered ineligible since it did not comply with the age criterion. As a result, the number of valid responses was reduced to 219, which will be considered in the analysis of this research.

To enhance the reliability of the model and provide more confidence in the outcomes and conclusions, the analysis included control variables such as age and gender among others. Control variables are additional factors that are not the main focus of the study but need to be considered as they may have an impact on the outcomes. By including these control variables, the study aims to establish a stronger internal validity and determine correlational or causal relationships between the variables of interest. The incorporation of these external control variables strengthens the overall robustness of the model (Bhandari, 2021).

The SPSS software was utilized for all the analyses in this study, ensuring a rigorous and systematic approach to data analysis.

4.1. Sample Profile

The sample for this study comprises 219 Portuguese respondents of whom 78 are male (35,6%) and 141 are female (64,4%). Half of the sample population is between 18 and 31 years old (see Table 4.1 for details). In terms of academic qualifications, it is observed that 16% of respondents completed high school, 42% hold a bachelor's degree and 24% have a master's degree. The age and educational background variables were recorded to better reflect the reality of this study (consult Table 4.1 for further information).

To appropriately represent the sample's characteristics, age was categorized into three intervals: "> 31 years of age," "25-31 years of age," and "18-24 years of age". The oldest range begins at early 30s, since it is usually the time people start becoming more financially independent and having a more stable life. Additionally, a distinction was made between those

with higher and non-higher educational backgrounds, with roughly 80% of participants holding a higher education qualification (see Table 4.1).

Table 4.1 - Demographic Statistics: Sex, Age and Concluded Academic Qualifications

		N	%
Sex	Male	78	35.6
	Female	141	64.4
Age	18-24 years old	65	29.7
	25-31 years old	45	20.5
	> 31 years old	109	49.8
Concluded Academic Qualifications	No Higher Education	44	20.1
	Higher Education	175	79.9
	Total	219	100.0

Additionally, it is possible to observe that there are more single individuals (67,6%) (see Table 4.2) and people without children (63%) (refer to table 4.3). In terms of the current employment position, half of respondents are employed (51,6%) and 30% (29.7%) are students (whether working or not) (see Table 4.2).

Table 4.2 - Demographic Statistics: Marital and Professional Status

		N	%
Marital Status	Single	148	67.6%
	Married	55	25.1%
	Divorced	12	5.5%
	Widowed	1	0.5%
	Other situation	3	1.4%
	Total	219	100.0%
Professional Status	Student	26	12.1%
	Student Worker	39	18.1%
	Self-employed	22	10.2%
	Employed	113	52.6%
	Unemployed	9	4.2%
	Retired	6	2.8%
	Other	4	0.0%
	Total	219	100.0%

Table 2.3 - Demographic Statistics: Number of children

		N	%
Number of children	0	138	63.0
	1	42	19.2
	2	27	12.3
	3	12	5.5
	>3	0	.0
	Total	219	100.0

The main residential area that stood out in this research was Lisbon, which had 121 responses, accounting for 55.3% of the total answers. The second most significant area was Leiria, with 17 participants representing 7.8% of the responses, and the third was Setúbal, with 16 participants representing 7.3% of the responses (see Table 4.4).

Table 4.4 - Demographic Statistics: Residence Area

		N	%
Residence Area	Lisboa	121	55.3
	Porto	12	5.5
	Setúbal	16	7.3
	Aveiro	11	5.0
	Beja	3	1.4
	Braga	7	3.2
	Bragança	2	.9
	Castelo Branco	1	.5
	Coimbra	6	2.7
	Évora	4	1.8
	Faro	8	3.7
	Guarda	1	.5
	Leiria	17	7.8
	Portalegre	0	.0
	Santarém	6	2.7
	Viana do Castelo	2	.9
	Vila Real	0	.0
	Viseu	1	.5
	Região Autónoma da Madeira	1	.5
	Região Autónoma dos Açores	0	.0
	Total	219	100.0

Regarding the respondents' income, the study revealed that 53 of them (24.2%) had an income range of 1000€ to 1499€. The group with the second-highest number of respondents consisted of 46 individuals (21%) whose income was between 799€ to 999€. Moreover, 44 individuals (20%) had an income below 999€, 23 respondents chose not to disclose their income (consult Table 4.5 for further information).

Table 4.5 - Demographic Statistics: Income

		N	%
Income	< 500€	22	10.0
	500€ to 799€	22	10.0
	799€ to 999€	46	21.0
	1000€ to 1499€	53	24.2
	1500€ to 1999€	27	12.3
	2000€ to 2499€	7	3.2
	2500€ to 2999€	9	4.1
	3000€ to 3499€	1	.5
	= or > 3500€	9	4.1
	Prefer not to say	23	10.5
	Total	219	100.0

4.2. Reliability Analysis

To access the reliability of the various constructs in the study, a reliability analysis was conducted using SPSS. This analysis aimed to evaluate the internal consistency of the measurement items within each construct. By examining the reliability of these constructs, it was possible to ensure the strength and validity of the collected data for subsequent analysis and interpretation.

The reliability analysis involved calculating Cronbach's alpha coefficients for each construct, which indicates the level of internal consistency within the items.

Cronbach's alpha is a measure that assesses the internal consistency among variables (questions) and, therefore, was utilized to assess the reliability of all constructs in this study,

with the exception of willingness to pay. For this construct, the preferred method for estimating reliability is the Spearman-Brown coefficient. This decision was taken because Cronbach's alpha is not suitable for estimating reliability when dealing with only two items. However, Cronbach's alpha was also calculated and inserted in the attachments. The choice to include Cronbach's alpha in the attachments arises from a commitment to transparency and a goal to provide a comprehensive overview of the reliability assessment. Despite its potential limitations regarding the “Willingness to Pay” construct, it is provided to ensure that all relevant data is available for examination. This serves as a valuable reference for those interested in conducting their own comparative analysis or exploring the finer details of the study's reliability assessment.

The results demonstrated that all constructs exhibited strong reliability, as reflected by Cronbach's alpha values ranging from .849 to .928. This indicates a high level of internal consistency in the measured data. The survey questions consistently captured the intended constructs, suggesting that the results would likely remain consistent if the study were replicated. Consequently, this contributes to the robustness and trustworthiness of the findings.

For the attitude construct, the Cronbach's alpha coefficient was .899, indicating high internal consistency (see Appendix 7). The individual questions within this construct also demonstrated strong correlations with the overall construct, with corrected item-total correlations ranging from .768 to .824 (see Appendix 7). Similarly, the subjective norms construct exhibited high reliability with a Cronbach's alpha of .928 (Appendix 8). The corrected item-total correlations for the questions within this construct ranged from .823 to .877, indicating strong relationships with the overall construct (Appendix 8).

The perceived behavioural control construct had a Cronbach's alpha of .849, indicating good internal consistency (see Appendix 9). The corrected item-total correlations for the questions ranged from .589 to .698, suggesting moderate associations with the construct (Appendix 9).

The environmental concern construct showed high reliability with a Cronbach's alpha of .923 (Appendix 10). The corrected item-total correlations for the questions ranged from .783 to .847, indicating strong relationships with the overall construct (see Appendix 10).

Lastly, the willingness to pay exhibited good reliability with a Cronbach's alpha of .923 (see Appendix 11). The corrected item-total correlations for the questions within this construct were both .846, indicating a strong association with the construct (Appendix 11).

Overall, the reliability analysis confirmed the internal consistency of the constructs examined in the dissertation, suggesting that the measurement items effectively captured the intended constructs.

Cronbach's alpha, widely acknowledged in the field, establishes an acceptability threshold that typically includes values as low as 0.7. Alpha results below this threshold are generally considered less robust than the desired level (Taber, 2018).

To provide further context, alpha values within the range of 0.91 to 1.00 are described as excellent, while alphas ranging from 0.81 to 0.90 are considered good. Additionally, the range of 0.71 to 0.80 encompasses both good and acceptable alpha values. Furthermore, alpha values falling between 0.61 and 0.70 are considered acceptable, while those ranging from 0.01 to 0.60 are regarded as non-acceptable (Konting, 2009).

After confirming the acceptance of the reliability analysis, each variable was calculated by summing the average score of each question and then dividing by the total number of questions within their respective constructs. The decision to transform the individual question responses into a single metric variable was motivated by the goal of improving data analysis and interpretation in the research. By aggregating the responses and creating composite scores, it becomes easier to compare and analyze the relationships between variables, which facilitates the derivation of meaningful conclusions based on the overall construct scores.

In relation to the results presented in this thesis, parametric tests were primarily utilized for the analyses. Despite the lack of normal distribution among all constructs, both parametric and non-parametric tests were initially performed to evaluate their agreement. Due to consistent results, the majority of the reported tests were parametric, with only one exception where a non-parametric test was utilized.

4.3. Analysis of Construct Results

4.3.1. Attitude

Three measures were used to assess the construct of Attitude on a 5-point semantic differential scale (see table 4.6).

Table 4.6 – Attitude about sustainable last mile deliveries (means)

I think paying for an eco-friendly delivery is very positive.	3,9
I think paying for an eco-friendly delivery is a responsibility.	3,8
I think paying for an eco-friendly delivery is pro-environmental behaviour.	4,2

Scale: 1 = Totally disagree; 5 = Totally agree

From the observed data, we can notice that the three items have average values ranging from 3,8 to 4,2. The resulting distribution among respondents is as follows (see table 4.7):

Table 4.7 – Attitude by sex, age and education (means)

		N	Mean
Attitude	Male	78	3,7
	Female	141	4,1
	18-24 years old	65	4,1
	25-31 years old	45	4,2
	> 31 years old	109	3,8
	No Higher Education	44	3,7
	Higher Education	175	4,0

Scale: 1 = minimum; 5 = maximum

Regarding sex, the statistical analysis indicates that there is a statistically significant difference in this variable. The t-value is -2.279, and the degrees of freedom (df) are 134.542. The p-value is less than 0.05 (=.024), suggesting that the observed difference in sex is unlikely to have occurred by chance (see Appendix 2).

As to the academic qualifications, a Mann-Whitney U test was conducted. By opting for the Mann-Whitney U test, a non-parametric test, the analysis considered the ranks of the

observations, allowing for a valid comparison between the two groups while accommodating the non-normal distribution of the data. Regarding the academic qualifications results, the p-value of .014 indicates that there is a statistically significant difference in attitude towards eco-friendly deliveries between individuals with non-higher education and those with higher education. The negative Z-score (-2.461) suggests that individuals with higher education tend to have a more positive attitude towards eco-friendly deliveries compared to those with non-higher education (see Appendix 2).

In relation to age, the analysis indicated that there were no statistically significant differences observed among the age groups.

In summary, the analysis shows that there are significant differences in attitude based on sex and education level, but not based on age. Specifically, females and individuals with higher education tend to have more positive attitudes towards eco-friendly deliveries. Further details about these analyses can be found in Appendix 2.

4.3.2. Subjective Norm

The construct of Subjective Norm was assessed through three measures on a 5-point Likert scale (see Table 4.8 for details).

Table 4.8 - Subjective Norm about sustainable last mile deliveries (means)

My family think that I should purchase eco-friendly deliveries rather than normal deliveries.	2,7
My close friends think that I should purchase eco-friendly deliveries rather than normal deliveries	2,9
Most people who are important to me think I should purchase eco-friendly deliveries rather than normal deliveries	2,9

Scale: 1 = Totally disagree; 5 = Totally agree

Based on the observed data, the three items have average values ranging from 2,7 to 2,9. As we can see, the scores are lower compared to the attitude construct, suggesting a lesser impact on willingness to pay for sustainable last mile deliveries.

The distribution among respondents is as follows (see Table 4.9):

Table 4.9 - Subjective norm by sex, age and education (means)

		N	Mean
Subjective norm	Male	78	2,8
	Female	141	2,9
	18-24 years old	65	2,7
	25-31 years old	45	2,9
	> 31 years old	109	2,9
	No Higher Education	44	2,7
	Higher Education	175	2,9

Scale: 1 = minimum; 5 = maximum

No statistically significant differences were found among the variables of gender, educational background, and age in relation to the construct of subjective norms. Further details regarding this construct, obtained from the analysis conducted in the SPSS program, can be found in Appendix 3.

4.3.3. Perceived Behavioural Control

The construct of Environmental Concern was measured using five indicators on a 5-point Likert scale (see Table 4.10).

Table 4.3 - Perceived Behavioural Control about sustainable last mile delivery (means)

I am confident that I can pay for eco-friendly deliveries rather than normal deliveries when I want.	3,2
I see myself as capable of paying for eco-friendly deliveries in future.	3,5
I have resources, time and willingness to pay for eco-friendly deliveries.	3,1
There are likely to be plenty of opportunities for me to pay for eco-friendly deliveries.	3,1
I think my payment will improve the urban environment.	3,4

Scale: 1 = Totally disagree; 5 = Totally agree

As observed in Table 4.10, the five items presented have average values ranging from 3,1 to 3,5. Using the average of these five indicators, a composite index for the Perceived Behavioral Control regarding sustainable last mile deliveries was created.

Despite the limited availability of sustainable last mile delivery options on online stores in Portugal, respondents have generally assigned positive evaluations to this construct. Future research should aim to identify potential causes.

It is worth highlighting that the questions receiving the highest scores were:

- "I see myself as capable of paying for eco-friendly deliveries in the future."
- "I think my payment will improve the urban environment."

Concerning the first question, "I see myself as capable of paying for eco-friendly deliveries in the future.", respondents demonstrated a significant level of confidence (scoring 3.5) in their ability to select sustainable deliveries in upcoming instances. This could suggest a readiness to embrace sustainable last mile delivery alternatives as they become more accessible on online stores in Portugal.

As for the second question, "I think my payment will improve the urban environment.", it is noteworthy that this item closely trailed the former question by only a tenth of a point (scoring 3.4). Respondents believe that their payment for sustainable deliveries will have a positive

impact on the urban environment. This question does not directly confront the limited accessibility of environmentally sustainable LMD options in Portugal, a factor that may justify a more favourable evaluation.

The distribution among respondents for this composite index is as follows (see Table 4.11):

Table 4.11 - Perceived behavioural control by sex, age and education (means)

		N	Mean
Perceived behavioural control	Male	78	3,1
	Female	141	3,3
	18-24 years old	65	3,2
	25-31 years old	45	3,2
	> 31 years old	109	3,3
	No Higher Education	44	3,1
	Higher Education	175	3,3

Scale: 1 = minimum; 5 = maximum

No statistically significant variations were observed in the variables of gender, educational background, and age concerning the construct of perceived behavioural control. Additional information related to this construct, as obtained from the SPSS program, can be found in Appendix 4.

4.3.4. Environmental Concern

The construct of Environmental Concern was assessed using four indicators rated on a 5-point Likert scale (see Table 4.12).

Table 4.4 - Environmental concern for a sustainable last mile delivery (means)

I am very concerned about the state of the world's environment.	4,4
I am willing to reduce my consumption to help protect the environment.	4,2
Major social changes are necessary to protect the natural environment.	4,5
Major political change is necessary to protect the natural environment.	4,5

Scale: 1 = minimum; 5 = maximum

Based on the data observed, the four items exhibit average values ranging from 4,2 to 4,5. The resulting distribution among respondents is as follows (see Table 4.13):

Table 4.13 - Environmental concern by sex, age and education (means)

		N	Mean
Environmental concern	Male	78	4,2
	Female	141	4,5
	18-24 years old	65	4,4
	25-31 years old	45	4,3
	> 31 years old	109	4,4
	No Higher Education	44	4,5
	Higher Education	175	4,4

Scale: 1 = minimum; 5 = maximum

There is no statistically significant disparity observed between the variables of age and education level (Appendix 5).

Concerning the variable of sex, the statistical analysis reveals a significant difference in this aspect. The t-value is -2.371, and the degrees of freedom (df) are 125.919. The p-value is

less than 0.05 (=.019). Based on the visual representation of the means, the analysis suggests a higher level of environmental concern among women compared to men. For more comprehensive information on this analysis, please refer to Appendix 5.

4.3.5. Willingness to Pay

The construct of Willingness to Pay was assessed utilizing two indicators measured on a 5-point Likert scale (as shown in Table 4.14).

Table 4.14 - Willingness to Pay for a sustainable last mile delivery (means)

I am willing to pay a higher price for the eco-friendly transportation than for the normal delivery.	3,1
Even if the normal delivery is priced lower, I will still buy the eco-friendly transportation delivery.	3,0

Scale: 1 = minimum; 5 = maximum

Based on the table, the two items exhibit average values of 3,0 and 3,1. The resulting distribution among respondents is as follows (see Table 4.15):

Table 4.15 - Willingness to pay by sex, age and education (means)

		N	Mean
Willingness to pay	Male	78	2,9
	Female	141	3,1
	18-24 years old	65	3,0
	25-31 years old	45	3,0
	> 31 years old	109	3,1
	No Higher Education	44	2,8
	Higher Education	175	3,1

Scale: 1 = minimum; 5 = maximum

There is no evidence of statistically significant variations among the variables of gender, educational background, and age with respect to this particular construct. Additional information pertaining to this construct, derived from the SPSS program, can be found in Appendix 6.

4.4. Linear Regression Analysis

The model used in the study accounted for 43.9% of the variance in individuals' willingness to pay. The adjusted R-squared value of .439 indicates that approximately 43.9% of the variation in individuals' willingness to pay can be explained by the combined influence of the independent variables: Attitude, Subjective Norms, Perceived Behavioral Control, and Environmental Concern (Appendix 12). The Durbin-Watson statistic for the model is 2.086 suggesting that there is no significant autocorrelation present in the model (Appendix 12). Additionally, the significance level in the ANOVA was below 0.05 (.000), indicating that the model is statistically significant. (see Appendix 12).

When examining the relationship between each individual construct and willingness to pay, it is important to note that all constructs demonstrate a positive association. Perceived behavioural control exhibits the strongest effect on willingness to pay, with a highly significant beta coefficient of .440 ($p < .001$) (see Appendix 12). The attitude construct follows suit, displaying a statistically significant positive relationship with willingness to pay, as indicated by its beta coefficient of .142 ($p = .048$) (see Appendix 12). Subjective norms also demonstrate a positive association with willingness to pay, although it does not reach conventional statistical significance, with a beta coefficient of .112 ($p = .090$) (Appendix 12). Finally, the construct of environmental concern, while exhibiting a positive relationship with willingness to pay (beta = .087), does not achieve statistical significance, with a p-value of .205, suggesting no significant impact (see Appendix 12).

The results reveal no significant multicollinearity among the predictor variables, indicated by tolerance values above 0.2 and VIF (Variance Inflation Factor) values below 5 (see Appendix 12). This ensures a reliable interpretation of each construct's individual effect on willingness to pay, without distorted or misleading results. The variables included in the analysis are not highly correlated, providing unique information to explain the relationship with willingness to pay.

The standardized residuals range between -2.597 and 2.271, indicating that most of the residuals are within a reasonable range (Appendix 12). Additionally, the Cook's distance is less than 1 (0.059), suggesting that outliers are not significantly impacting the model. Overall, these findings support the validity and reliability of the model (see Appendix 12).

4.5. Structural Model

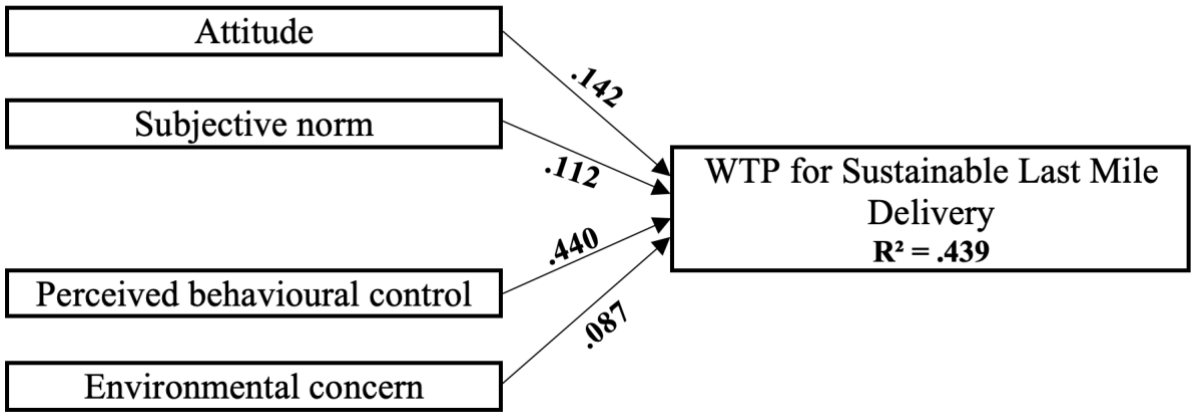

Figure 4.1 - Structural framework of the proposed research model (Source: Author's Elaboration)

The model employed in this thesis (as noted in Figure 4.1), was constructed using IBM SPSS AMOS 29, offers valuable insights into the determinants shaping consumers' willingness to pay for sustainable last mile delivery. As illustrated in Figure 4.1, the findings reveal that Attitude, Subjective Norms, Perceived Behavioral Control, and Environmental Concern jointly account for 43.9% of the variability in willingness to pay for such eco-friendly delivery services. This significant explanatory power suggests that the model effectively captures the underlying determinants of consumers' willingness to invest in environmentally friendly last mile delivery options.

CHAPTER 5
Conclusions

The research was primarily driven by the increasing environmental concerns observed worldwide. Its main goal was to explore how various factors influence Portuguese consumers' willingness to pay for sustainable last mile deliveries.

In the context of this dissertation, the willingness to pay for sustainable last mile deliveries represents an ecological intention, while the actual act of making payments reflects the corresponding behaviour. Empirical studies, in general, have consistently indicated a significant positive relationship between individuals' ecological intention and their behaviour (Li, 1997; Maloney & Ward, 1973).

The study´s results present essential theoretical and practical evidence, illustrating the model's ability to explain consumer willingness to pay. Below are the main findings of the study, theoretical contribution, along with its limitations and directions for future research.

5.1. Main Findings

Based on an analysis of a sample of 219 Portuguese adults, the research findings support the formulated hypothesis. The model used in the study accounted for 43.9% of the variance in individuals' willingness to pay for sustainable last mile delivery services (see Appendix 12). These results provide evidence for the practicality and applicability of the Theory of Planned Behavior in assessing consumers' willingness to pay for eco-friendly last mile delivery solutions within the Portuguese context. However, the study did not establish the validation of incorporating the environmental concern construct into the original TPB framework. This construct did not significantly improve the predictive capability of the Theory of Planned Behaviour when examining consumers' willingness to pay associated with the selection of sustainable last mile delivery alternatives. Additionally, the subjective norm construct, inherent to the original TPB, did not have a significant impact on consumers' willingness in this study.

Perceived behavioural control emerged as the most influential indicator of individuals' willingness to pay followed by attitude. This indicates that the impact of these variables remains separate from the influence of other factors.

Perceived behavioural control, which refers to individuals' perceived ability to perform the behaviour of paying for sustainable last mile deliveries, played a crucial role in shaping individuals' willingness to engage in this behaviour.

Similarly, attitude, which pertains to individuals' positive or negative evaluations of paying for sustainable last mile delivery, significantly influenced individuals' willingness to engage in this behaviour. The findings indicate that individuals with a more positive attitude towards sustainable last mile delivery were more likely to express a willingness to pay for such services.

Regarding the main control variables of gender, age, and educational background, significant differences were found only in the constructs of attitude and environmental concern. Women and individuals with higher education exhibited a more positive attitude towards eco-friendly deliveries. No significant differences were observed based on age across all constructs. Additionally, it was found that women have a higher level of environmental concern compared to men.

5.2. Theoretical Contribution

The theoretical contribution of this study lies in its application of the Theory of Planned Behaviour framework, along with the extended proposed constructs, to investigate consumers' WTP for sustainable last mile delivery. The analysis revealed positive correlations between all the constructs and consumers' willingness. Of particular interest were attitude and PBC which emerged as the most influential determinants. Notably, perceived behavioural control exhibited the highest predictive strength, as evidenced by its substantial beta coefficient of .440 (see Appendix 12).

By employing this theoretical framework, the study contributes to the existing body of knowledge by offering comprehensive insights into the underlying factors that influence consumers' inclination towards adopting sustainable last mile delivery. Policymakers, businesses, and researchers can benefit from these findings to foster and implement sustainable practices within the last mile delivery sector, thus promoting environmentally responsible consumer behaviour.

5.3. Limitations and Future Research

This study's limitation lies in its exclusive focus on electric vehicles as a sustainable last mile transportation option, without considering the broader spectrum of available sustainable transportation alternatives. Future research could address this limitation by incorporating a range of sustainable transportation options into the analysis. This would provide a more comprehensive understanding of the impact of different types of sustainable transportation on customers' willingness to choose sustainable last mile delivery.

Additionally, it is suggested that future studies incorporate the environmental impacts of last mile deliveries into the questionnaire. By including this information, researchers can assess whether customers are more likely to pay for a more sustainable last mile delivery option when they are made aware of the environmental consequences associated with different delivery methods.

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Appendix

Appendix 1| Survey (in Portuguese)

Title: Predisposição dos Consumidores em Pagar por Entregas Sustentáveis

Introduction:

O presente questionário pertence a uma tese de Mestrado em Gestão no ISCTE e destina-se a todas as pessoas que realizam ou já realizaram encomendas online em Portugal.

Perante a visibilidade do tipo de entrega disponível no ato de pagamento, a presente investigação tem como objetivo explicar e prever o comportamento do consumidor em relação à sua disposição em pagar por uma entrega sustentável (neste caso, relativo ao transporte realizado através de veículos elétricos).

As suas respostas serão anónimas e confidenciais. Os dados recolhidos não serão analisados individualmente, mas de forma agregada, conjuntamente com as respostas dos restantes participantes.

1st block: Evaluation of model Constructs

1. Relativamente à atitude perante a intenção de pagar por uma entrega amiga do ambiente, escolha a resposta mais adequada das seguintes afirmações: *

	Discordo Totalmente	Discordo Parcialmente	Não Concordo nem Discordo	Concordo Parcialmente	Concordo Totalmente
Penso que pagar por uma entrega amiga do ambiente é muito positivo.	○	○	○	○	○
Penso que pagar por uma entrega amiga do ambiente é uma responsabilidade.	○	○	○	○	○
Penso que pagar por uma entrega amiga do ambiente é um comportamento pró-ambiental.	○	○	○	○	○

2. Em relação ao contexto social, indique o grau de concordância com as seguintes afirmações: *

	Discordo Totalmente	Discordo Parcialmente	Não Concordo nem Discordo	Concordo Parcialmente	Concordo Totalmente
A minha família pensa que eu deveria pagar por entregas amigas do ambiente em vez de entregas normais	○	○	○	○	○
Os meus amigos chegados pensam que eu deveria pagar por entregas amigas do ambiente em vez de entregas normais	○	○	○	○	○
A maioria das pessoas que são importantes para mim pensam que eu deveria pagar por entregas amigas do ambiente em vez de entregas normais	○	○	○	○	○

3. Com base na perceção de controlo que possui, indique o grau de concordância com as seguintes afirmações: *

	Discordo Totalmente	Discordo Parcialmente	Não Concordo nem Discordo	Concordo Parcialmente	Concordo Totalmente
Estou confiante de que posso pagar por entregas amigas do ambiente em vez de entregas normais quando quiser.	○	○	○	○	○
Eu vejo-me capaz de pagar por entregas amigas do ambiente no futuro	○	○	○	○	○
Tenho recursos, tempo e disposição para comprar refeições online usando uma opção de entrega amiga do ambiente.	○	○	○	○	○
É provável que haja muitas oportunidades para eu pagar por entregas amigas do ambiente	○	○	○	○	○
Penso que o meu pagamento irá melhorar o meio ambiente urbano.	○	○	○	○	○

4. No que se refere à sua preocupação ambiental, indique o grau de concordância com as seguintes afirmações:

	Discordo Totalmente	Discordo Parcialmente	Não Concordo nem Discordo	Concordo Parcialmente	Concordo Totalmente
Estou muito preocupado com o estado do meio ambiente no planeta	○	○	○	○	○
Estou disposto a reduzir meu consumo para ajudar a proteger o meio ambiente	○	○	○	○	○
Grandes mudanças sociais são necessárias para proteger o ambiente natural	○	○	○	○	○
É necessária uma grande mudança política para proteger o ambiente natural	○	○	○	○	○

5. Em relação à sua disposição para pagar mais pela entrega amiga do ambiente. *
Indique o grau de concordância com as seguintes afirmações:

	Discordo Totalmente	Discordo Parcialmente	Não Concordo nem Discordo	Concordo Parcialmente	Concordo Totalmente
Estou disposto a pagar um preço mais alto pela entrega com transporte sustentável do que pela entrega com transporte normal	○	○	○	○	○
Mesmo que a entrega normal tenha um preço mais baixo, ainda comprarei a entrega com transporte amigo do ambiente	○	○	○	○	○

2nd block: Demographic data

8. Nacionalidade

- ○ Portuguesa
- ○ Outra

9. Sexo *

- ◯ Feminino
- ◯ Masculino

10. Idade *

- ◯ Inferior a 18 anos
- ◯ 18 a 24 anos
- ◯ 25 a 31 anos
- ◯ 32 a 38 anos
- ◯ 39 a 45 anos
- ◯ 46 a 52 anos
- ◯ 53 a 59 anos
- ◯ 60 anos ou mais

11. Local de Residência *

Selecionar

12. Grau de Escolaridade concluído *

- ◯ Ensino básico 1º Ciclo (1º ao 4º ano)
- ◯ Ensino básico 2º Ciclo (5º ao 6º ano)
- ◯ Ensino básico 3º Ciclo (7º ao 9º ano)
- ◯ Ensino Secundário (10º ao 12º ano)
- ◯ Licenciatura
- ◯ Mestrado
- ◯ Pós-Graduação
- ◯ Doutoramento
- ◯ Outra: _____

13. Estado Civil *

- ◯ Solteiro(a)
- ◯ Casado(a)
- ◯ Divorciado(a)
- ◯ Viúvo(a)
- ◯ Outra:

14. Número de Filhos *

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ Mais de 3

Appendix 2| Attitude Construct by Sex, Academic Qualifications and Age

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Attitude	Male	78	3.6966	1.32485	.15001
	Female	141	4.0969	1.08492	.09137

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Attitude	Equal variances assumed	6.851	.009	-2.413	217	.008	.017	-.40035	.16590	-.72733	-.07336
	Equal variances not assumed			-2.279	134.542	.012	.024	-.40035	.17564	-.74773	-.05297

Group Statistics

	Concluded Academic Qualifications	N	Mean	Std. Deviation	Std. Error Mean
Attitude	No Higher Education	44	3.6515	1.19420	.18003
	Higher Education	175	4.0305	1.17839	.08908

Test Statistics[a]

	Attitude
Mann-Whitney U	2940.500
Wilcoxon W	3930.500
Z	-2.461
Asymp. Sig. (2-tailed)	.014

a. Grouping Variable: Concluded Academic Qualifications

Descriptives

Concluded Academic Qualifications			Statistic
Attitude	No Higher Education	Median	4.0000
		Interquartile Range	1.67
	Higher Education	Median	4.6667
		Interquartile Range	1.33

Descriptives

Attitude								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
18-24 years old	65	4.1026	.85984	.10665	3.8895	4.3156	1.33	5.00
25-31 years old	45	4.1556	1.01653	.15154	3.8502	4.4610	1.00	5.00
> 31 years old	109	3.7829	1.39028	.13316	3.5189	4.0468	1.00	5.00
Total	219	3.9543	1.18861	.08032	3.7960	4.1126	1.00	5.00

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Attitude	Based on Mean	13.620	2	216	<.001
	Based on Median	6.270	2	216	.002
	Based on Median and with adjusted df	6.270	2	184.835	.002
	Based on trimmed mean	11.590	2	216	<.001

Robust Tests of Equality of Means

Attitude

	Statistic[a]	df1	df2	Sig.
Brown-Forsythe	2.792	2	189.041	.064

a. Asymptotically F distributed.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of Attitude is the same across categories of Age.	Independent-Samples Kruskal-Wallis Test	.624	Retain the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Multiple Comparisons

Dependent Variable: Attitude

	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	18-24 years old	25-31 years old	-.05299	.22913	.971	-.5937	.4877
		> 31 years old	.31969	.18516	.198	-.1173	.7567
	25-31 years old	18-24 years old	.05299	.22913	.971	-.4877	.5937
		> 31 years old	.37268	.20935	.179	-.1214	.8668
	> 31 years old	18-24 years old	-.31969	.18516	.198	-.7567	.1173
		25-31 years old	-.37268	.20935	.179	-.8668	.1214
Games-Howell	18-24 years old	25-31 years old	-.05299	.18530	.956	-.4951	.3891
		> 31 years old	.31969	.17061	.149	-.0837	.7230
	25-31 years old	18-24 years old	.05299	.18530	.956	-.3891	.4951
		> 31 years old	.37268	.20173	.159	-.1065	.8519
	> 31 years old	18-24 years old	-.31969	.17061	.149	-.7230	.0837
		25-31 years old	-.37268	.20173	.159	-.8519	.1065

Appendix 3| Subjective Norm Construct by Sex, Academic Qualifications and Age

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Subjective norms	Male	78	2.7607	1.18541	.13422
	Female	141	2.9031	1.07463	.09050

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Subjective norms	Equal variances assumed	1.608	.206	-.905	217	.183	.367	-.14239	.15737	-.45256	.16778
	Equal variances not assumed			-.880	146.297	.190	.381	-.14239	.16188	-.46232	.17754

Test Statistics[a]

	Subjective_norms
Mann-Whitney U	5143.500
Wilcoxon W	8224.500
Z	-.803
Asymp. Sig. (2-tailed)	.422

a. Grouping Variable: Sex

Group Statistics

	Concluded Academic Qualifications	N	Mean	Std. Deviation	Std. Error Mean
Subjective norms	No Higher Education	44	2.7273	1.18403	.17850
	Higher Education	175	2.8838	1.09793	.08300

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Subjective norms	Equal variances assumed	1.349	.247	-.832	217	.203	.406	-.15654	.18813	-.52733	.21426
	Equal variances not assumed			-.795	62.876	.215	.429	-.15654	.19685	-.54993	.23685

Test Statistics[a]

	Subjective_norms
Mann-Whitney U	3655.000
Wilcoxon W	4645.000
Z	-.527
Asymp. Sig. (2-tailed)	.598

a. Grouping Variable: Concluded Academic Qualifications

Descriptives

Subjective norms

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
18-24 years old	65	2.7385	1.10474	.13703	2.4647	3.0122	1.00	5.00
25-31 years old	45	2.8667	1.01105	.15072	2.5629	3.1704	1.00	4.67
> 31 years old	109	2.9144	1.16482	.11157	2.6932	3.1355	1.00	5.00

Total	219	2.8524	1.11473	.07533	2.7039	3.0008	1.00	5.00

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Subjective norms	Based on Mean	.413	2	216	.662
	Based on Median	.416	2	216	.660
	Based on Median and with adjusted df	.416	2	213.927	.660
	Based on trimmed mean	.436	2	216	.647

ANOVA

Subjective norms

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.272	2	.636	.509	.602
Within Groups	269.621	216	1.248		
Total	270.893	218			

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of Subjective_norms is the same across categories of Age.	Independent-Samples Kruskal-Wallis Test	.448	Retain the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Multiple Comparisons

Dependent Variable: Subjective norms

	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	18-24 years old	25-31 years old	-.12821	.21666	.825	-.6395	.3831
		> 31 years old	-.17591	.17509	.575	-.5891	.2373
	25-31 years old	18-24 years old	.12821	.21666	.825	-.3831	.6395
		> 31 years old	-.04771	.19797	.968	-.5149	.4195
	> 31 years old	18-24 years old	.17591	.17509	.575	-.2373	.5891
		25-31 years old	.04771	.19797	.968	-.4195	.5149
Games-Howell	18-24 years old	25-31 years old	-.12821	.20370	.804	-.6128	.3564
		> 31 years old	-.17591	.17670	.581	-.5945	.2427
	25-31 years old	18-24 years old	.12821	.20370	.804	-.3564	.6128
		> 31 years old	-.04771	.18752	.965	-.4943	.3989
	> 31 years old	18-24 years old	.17591	.17670	.581	-.2427	.5945
		25-31 years old	.04771	.18752	.965	-.3989	.4943

Appendix 4| Perceived Behavioural Control Construct by Sex, Academic Qualifications and Age

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Perceived behavioral control	Male	78	3.0590	1.10776	.12543
	Female	141	3.3390	1.01811	.08574

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Perceived Behavioral control	Equal variances assumed	1.763	.186	-1.889	217	.030	.060	-.28003	.14828	-.57229	.01222
	Equal variances not assumed			-1.843	148.000	.034	.067	-.28003	.15193	-.58027	.02021

Test Statistics[a]

	Perceived Behavioral Control
Mann-Whitney U	4724.500
Wilcoxon W	7805.500
Z	-1.729
Asymp. Sig. (2-tailed)	.084

a. Grouping Variable: Sex

Group Statistics

	Concluded Academic Qualifications	N	Mean	Std. Deviation	Std. Error Mean
Perceived behavioral control	No Higher Education	44	3.1136	1.11012	.16736
	Higher Education	175	3.2709	1.04409	.07893

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Perceived Behavioral control	Equal variances assumed	.183	.669	-.882	217	.189	.379	-.15722	.17834	-.50873	.19429
	Equal variances not assumed			-.850	63.478	.199	.399	-.15722	.18503	-.52693	.21249

Test Statistics[a]

	Perceived_behavioral_control
Mann-Whitney U	3565.000
Wilcoxon W	4555.000
Z	-.760
Asymp. Sig. (2-tailed)	.447

a. Grouping Variable: Concluded Academic Qualifications

Descriptives

Perceived behavioral control								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
18-24 years old	65	3.1662	.94046	.11665	2.9331	3.3992	1.00	5.00
25-31 years old	45	3.2089	.89235	.13302	2.9408	3.4770	1.00	4.80
> 31 years old	109	3.2954	1.18309	.11332	3.0708	3.5200	1.00	5.00
Total	219	3.2393	1.05696	.07142	3.0985	3.3800	1.00	5.00

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Perceived behavioral control	Based on Mean	4.937	2	216	.008
	Based on Median	2.329	2	216	.100
	Based on Median and with adjusted df	2.329	2	191.299	.100
	Based on trimmed mean	4.548	2	216	.012

Robust Tests of Equality of Means

Perceived_behavioral_control

	Statistic[a]	df1	df2	Sig.
Brown-Forsythe	.374	2	194.366	.688
a. Asymptotically F distributed.				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of Perceived_behavioral_control is the same across categories of Age.	Independent-Samples Kruskal-Wallis Test	.281	Retain the null hypothesis.
a. The significance level is .050.				
b. Asymptotic significance is displayed.				

Multiple Comparisons

Dependent Variable: Perceived behavioral control							
						95% Confidence Interval	
	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	18-24 years old	25-31 years old	-.04274	.20561	.976	-.5280	.4425
		> 31 years old	-.12926	.16615	.717	-.5214	.2629
	25-31 years old	18-24 years old	.04274	.20561	.976	-.4425	.5280
		> 31 years old	-.08652	.18787	.890	-.5299	.3568
	> 31 years old	18-24 years old	.12926	.16615	.717	-.2629	.5214
		25-31 years old	.08652	.18787	.890	-.3568	.5299
Games-Howell	18-24 years old	25-31 years old	-.04274	.17692	.968	-.4638	.3783
		> 31 years old	-.12926	.16263	.707	-.5140	.2555
	25-31 years old	18-24 years old	.04274	.17692	.968	-.3783	.4638
		> 31 years old	-.08652	.17475	.874	-.5018	.3288
	> 31 years old	18-24 years old	.12926	.16263	.707	-.2555	.5140
		25-31 years old	.08652	.17475	.874	-.3288	.5018

Appendix 5| Environmental Concern Construct by Sex, Academic Qualifications and Age

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Environmental concern	Male	78	4.1859	1.07316	.12151
	Female	141	4.5160	.80690	.06795

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Environmental concern	Equal variances assumed	8.545	.004	-2.569	217	.005	.011	-.33006	.12846	-.58325	-.07687
	Equal variances not assumed			-2.371	125.919	.010	.019	-.33006	.13922	-.60558	-.05454

Group Statistics

	Concluded Academic Qualifications	N	Mean	Std. Deviation	Std. Error Mean
Environmental concern	No Higher Education	44	4.4659	.78797	.11879
	Higher Education	175	4.3814	.95398	.07211

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Environmental concern	Equal variances assumed	1.274	.260	.542	217	.294	.588	.08448	.15574	-.22247	.39143
	Equal variances not assumed			.608	77.918	.273	.545	.08448	.13897	-.19219	.36115

Test Statistics[a]

	Environmental_concern
Mann-Whitney U	3833.500
Wilcoxon W	4823.500
Z	-.046
Asymp. Sig. (2-tailed)	.964

a. Grouping Variable: Concluded Academic Qualifications

Descriptives

Environmental concern								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
18-24 years old	65	4.4462	.73619	.09131	4.2637	4.6286	1.00	5.00
25-31 years old	45	4.3056	.94882	.14144	4.0205	4.5906	1.00	5.00
> 31 years old	109	4.4083	1.01131	.09687	4.2163	4.6003	1.00	5.00
Total	219	4.3984	.92196	.06230	4.2756	4.5212	1.00	5.00

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Environmental concern	Based on Mean	1.996	2	216	.138
	Based on Median	.537	2	216	.585
	Based on Median and with adjusted df	.537	2	199.506	.585
	Based on trimmed mean	1.132	2	216	.324

ANOVA

Environmental concern					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.547	2	.273	.320	.727
Within Groups	184.755	216	.855		
Total	185.302	218			

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of Environmental_concern is the same across categories of Age.	Independent-Samples Kruskal-Wallis Test	.246	Retain the null hypothesis.
a. The significance level is .050.				
b. Asymptotic significance is displayed.				

Multiple Comparisons

Dependent Variable: Environmental concern							
						95% Confidence Interval	
	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	18-24 years old	25-31 years old	.14060	.17935	.713	-.2827	.5639
		> 31 years old	.03790	.14494	.963	-.3041	.3799
	25-31 years old	18-24 years old	-.14060	.17935	.713	-.5639	.2827
		> 31 years old	-.10270	.16387	.806	-.4894	.2840
	> 31 years old	18-24 years old	-.03790	.14494	.963	-.3799	.3041
		25-31 years old	.10270	.16387	.806	-.2840	.4894
Games-Howell	18-24 years old	25-31 years old	.14060	.16836	.682	-.2616	.5428
		> 31 years old	.03790	.13312	.956	-.2769	.3527
	25-31 years old	18-24 years old	-.14060	.16836	.682	-.5428	.2616
		> 31 years old	-.10270	.17143	.821	-.5115	.3061
	> 31 years old	18-24 years old	-.03790	.13312	.956	-.3527	.2769
		25-31 years old	.10270	.17143	.821	-.3061	.5115

Appendix 6| Willingness to pay Construct by Sex, Academic Qualifications and Age

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Willingness to pay	Male	78	2.8782	1.41004	.15966
	Female	141	3.1135	1.28781	.10845

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Willingness to pay	Equal variances assumed	2.783	.097	-1.251	217	.106	.212	-.23527	.18803	-.60586	.13532
	Equal variances not assumed			-1.219	147.217	.112	.225	-.23527	.19301	-.61669	.14615

Test Statistics[a]

	Willingness_to_pay
Mann-Whitney U	5011.500
Wilcoxon W	8092.500
Z	-1.104
Asymp. Sig. (2-tailed)	.270

a. Grouping Variable: Sex

Group Statistics

	Concluded Academic Qualifications	N	Mean	Std. Deviation	Std. Error Mean
Willingness to pay	No Higher Education	44	2.7727	1.29154	.19471
	Higher Education	175	3.0943	1.34056	.10134

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Willingness to pay	Equal variances assumed	.000	.984	-1.433	217	.077	.153	-.32156	.22447	-.76397	.12085
	Equal variances not assumed			-1.465	68.213	.074	.148	-.32156	.21950	-.75954	.11642

Test Statistics[a]

	Willingness_to_pay
Mann-Whitney U	3321.500
Wilcoxon W	4311.500
Z	-1.431
Asymp. Sig. (2-tailed)	.153

a. Grouping Variable: Concluded Academic Qualifications

Descriptives

Willingness to pay								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
18-24 years old	65	3.0000	1.30504	.16187	2.6766	3.3234	1.00	5.00
25-31 years old	45	3.0111	1.27693	.19035	2.6275	3.3947	1.00	5.00
> 31 years old	109	3.0550	1.38500	.13266	2.7921	3.3180	1.00	5.00
Total	219	3.0297	1.33420	.09016	2.8520	3.2074	1.00	5.00

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Willingness to pay	Based on Mean	.836	2	216	.435
	Based on Median	.528	2	216	.591
	Based on Median and with adjusted df	.528	2	207.200	.591
	Based on trimmed mean	.833	2	216	.436

ANOVA

Willingness_to_pay					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.143	2	.071	.040	.961
Within Groups	387.914	216	1.796		
Total	388.057	218			

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of Willingness_to_pay is the same across categories of Age.	Independent-Samples Kruskal-Wallis Test	.881	Retain the null hypothesis.
a. The significance level is .050.				
b. Asymptotic significance is displayed.				

Multiple Comparisons

Dependent Variable: Willingness_to_pay							
						95% Confidence Interval	
	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	18-24 years old	25-31 years old	-.01111	.25988	.999	-.6244	.6022
		> 31 years old	-.05505	.21001	.963	-.5507	.4406
	25-31 years old	18-24 years old	.01111	.25988	.999	-.6022	.6244
		> 31 years old	-.04393	.23746	.981	-.6043	.5165
	> 31 years old	18-24 years old	.05505	.21001	.963	-.4406	.5507
		25-31 years old	.04393	.23746	.981	-.5165	.6043
Games-Howell	18-24 years old	25-31 years old	-.01111	.24987	.999	-.6060	.5837
		> 31 years old	-.05505	.20929	.963	-.5508	.4407
	25-31 years old	18-24 years old	.01111	.24987	.999	-.5837	.6060
		> 31 years old	-.04393	.23202	.980	-.5970	.5091
	> 31 years old	18-24 years old	.05505	.20929	.963	-.4407	.5508
		25-31 years old	.04393	.23202	.980	-.5091	.5970

Appendix 7| Reliability analysis – Attitude

Reliability Statistics

Cronbach's Alpha	N of Items
.899	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I think paying for an eco-friendly delivery is very positive.	7.95	5.749	.824	.835
I think paying for an eco-friendly delivery is a responsibility.	8.10	5.650	.813	.845
I think paying for an eco-friendly delivery is pro-environmental behavior.	7.68	6.411	.768	.884

Appendix 8| Reliability analysis – Subjective norms

Reliability Statistics

Cronbach's Alpha	N of Items
.928	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
My family think that I should purchase eco-friendly deliveries rather than normal deliveries.	5.82	5.092	.823	.920
My close friends think that I should purchase eco-friendly deliveries rather than normal deliveries	5.66	5.206	.877	.877
Most people who are important to me think I should purchase eco-friendly deliveries rather than normal deliveries	5.63	5.152	.859	.890

Appendix 9| Reliability analysis – Perceived behavioural control

Reliability Statistics

Cronbach's Alpha	N of Items
.849	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I am confident that I can pay for eco-friendly deliveries rather than normal deliveries when I want.	13.05	18.255	.692	.809
I see myself as capable of paying for eco-friendly deliveries in future.	12.71	18.343	.698	.808
I have resources, time and willingness to pay for eco-friendly deliveries.	13.08	18.305	.662	.817
There are likely to be plenty of opportunities for me to pay for eco-friendly deliveries.	13.15	19.046	.656	.819
I think my payment will improve the urban environment.	12.79	18.797	.589	.837

Appendix 10| Reliability analysis – Environmental concern

Reliability Statistics

Cronbach's Alpha	N of Items
.923	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I am very concerned about the state of the world's environment.	13.24	7.622	.836	.895
I am willing to reduce my consumption to help protect the environment.	13.41	7.655	.783	.915
Major social changes are necessary to protect the natural environment.	13.09	8.015	.847	.892
Major political change is necessary to protect the natural environment.	13.05	8.094	.829	.898

Appendix 11| Reliability analysis – Willingness to Pay

Reliability Statistics

Cronbach's Alpha	N of Items
.917	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I am willing to pay a higher price for the eco-friendly transportation than for the normal delivery.	2.96	1.916	.846	.
Even if the normal delivery is priced lower, I will still buy the eco-friendly transportation delivery.	3.10	1.940	.846	.

Correlations

			I am willing to pay a higher price for the eco-friendly transportation than for the normal delivery.	Even if the normal delivery is priced lower, I will still buy the eco-friendly transportation delivery.
Spearman's rho	I am willing to pay a higher price for the eco-friendly transportation than for the normal delivery.	Correlation Coefficient	1.000	.840**
		Sig. (2-tailed)	.	<.001
		N	219	219
	Even if the normal delivery is priced lower, I will still buy the eco-friendly transportation delivery.	Correlation Coefficient	.840**	1.000
		Sig. (2-tailed)	<.001	.
		N	219	219
**. Correlation is significant at the 0.01 level (2-tailed).				

Appendix 12| Linear Regression Analysis – Attitude, Subjective norms, Perceived behavioural control, Environmental concern and Willingness to Pay

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.670[a]	.450	.439	.99911	2.086

a. Predictors: (Constant), Environmental_concern, Subjective_norms, Perceived_behavioral_control, Attitude
b. Dependent Variable: Willingness_to_pay

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	174.439	4	43.610	43.688	<.001[b]
	Residual	213.618	214	.998		
	Total	388.057	218			

a. Dependent Variable: Willingness_to_pay
b. Predictors: (Constant), Environmental_concern, Subjective_norms, Perceived_behavioral_control, Attitude

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.337	.332		-1.015	.311		
	Attitude	.159	.080	.142	1.984	.048	.502	1.990
	Subjective_norms	.134	.078	.112	1.706	.090	.598	1.672
	Perceived_behavioral_control	.556	.089	.440	6.238	<.001	.516	1.937
	Environmental_concern	.126	.099	.087	1.271	.205	.548	1.823

a. Dependent Variable: Willingness_to_pay

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.6378	4.5385	3.0297	.89453	219
Std. Predicted Value	-2.674	1.687	.000	1.000	219
Standard Error of Predicted Value	.069	.393	.140	.055	219
Adjusted Predicted Value	.6117	4.5395	3.0285	.89631	219
Residual	-2.59481	2.26891	.00000	.98990	219
Std. Residual	-2.597	2.271	.000	.991	219
Stud. Residual	-2.613	2.301	.001	1.002	219
Deleted Residual	-2.62609	2.32914	.00118	1.01363	219
Stud. Deleted Residual	-2.649	2.324	.000	1.007	219
Mahal. Distance	.036	32.760	3.982	4.534	219
Cook's Distance	.000	.059	.005	.009	219
Centered Leverage Value	.000	.150	.018	.021	219

a. Dependent Variable: Willingness_to_pay

Appendix 13| Methodological Research Design

Contructs	Original Statement	Adapted Statement	Source
Attitude [ATT] Totally disagree (1)/Totally agree (5)	**ATT1**: I think paying for MSW management is very positive. **ATT2**: I think paying for MSW management is a responsibility. **ATT3**: I think paying for MSW management is pro-environmental behaviour.	**ATT1**: I think paying for an eco-friendly delivery is very positive. **ATT2**: I think paying for an eco-friendly delivery is a responsibility. **ATT3**: I think paying for an eco-friendly delivery is pro-environmental behavior.	**He et al. (2021)**
Subjective norm [SN] Totally disagree (1)/Totally agree (5)	**SN1:** My family think that I should purchase green products rather than normal products. **SN2**: My close friends think that I should purchase green products rather than normal products. **SN3**: Most people who are important to me think I should purchase green products rather than normal products.	**SN1:** My family think that I should purchase eco-friendly deliveries rather than normal deliveries. **SN2:** My close friends think that I should purchase eco-friendly deliveries rather than normal deliveries. **SN3:** Most people who are important to me think I should purchase eco-friendly deliveries rather than normal deliveries.	**Maichum et al. (2016)**
Perceived behavioural control [PBC] Totally disagree (1)/Totally agree (5)	**PBC1:** I am confident that I can purchase green products rather than normal products when I want. **PBC2**: I see myself as capable of purchasing green products in future. **PBC3**: I have resources, time and willingness to purchase green products. **PBC4**: There are likely to be plenty of opportunities for me to purchase green products. **PBC5:** I think my payment will improve the urban environment.	**PBC1:** I am confident that I can pay for eco-friendly deliveries rather than normal deliveries when I want. **PBC2:** I see myself as capable of paying for eco-friendly deliveries in future. **PBC3:** I have resources, time and willingness to pay for eco-friendly deliveries. **PBC4:** There are likely to be plenty of opportunities for me to pay for eco-friendly deliveries. **PBC5:** I think my payment will improve the urban environment.	**Maichum et al. (2016);** **He et al. (2021)**
Environmental concern [EC] Totally disagree (1)/Totally agree (5)	**EC1:** I am very concerned about the state of the world's environment. **EC2**: I am willing to reduce my consumption to help protect the environment. **EC3**: Major social changes are necessary to protect the natural environment. **EC4**: Major political change is necessary to protect the natural environment.	**EC1**: I am very concerned about the state of the world's environment. **EC2**: I am willing to reduce my consumption to help protect the environment. **EC3**: Major social changes are necessary to protect the natural environment. **EC4**: Major political change is necessary to protect the natural environment.	**Maichum et al. (2016)**
Willingness To Pay [WTP] **Totally disagree (1)/Totally agree (5)**	**WTP1:** I am willing to pay a higher price for the ''green transportation t-shirt'' than for the ''general t- shirt''. **WTP2:** Even if the ''general t-shirt'' is priced lower, I will still buy the ''green transportation t-shirt''.	**WTP1:** I am willing to pay a higher price for the eco-friendly transportation than for the normal delivery. **WTP2:** Even if the normal delivery is priced lower, I will still buy the eco-friendly transportation delivery.	**Schniederjans and Starkey (2014)**