UNIVERSIDADE CATÓLICA PORTUGUESA

Circular Economy: Behaviours, Attitudes, and Knowledge of College Students in Portugal

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Abstract

The growing threat of climate change and the scarcity of resources have posed challenges to the planet's long-term viability. It is in this framework that the need to move towards a sustainable economic model arises. As a result, the circular economy emerges as a feasible alternative to the linear economy, aiming to limit the consumption of virgin raw materials and close product life cycles. Instead of discarding goods as waste, the circular economy aims to reintroduce them into the market through procedures such as reuse, recycling, and repair, among others. However, the transition not only implies an effort of industries, governments, and businesses but also the efforts of consumers.

Consumers play a key role in this economic transition since the consumer initiates the entire supply chain process. As a result, consumer participation and interest determine whether circular models succeed or fail. Given the importance of the consumer in the economic transformation, this dissertation aims to evaluate the behaviours and attitudes of Portuguese college students toward the circular economy, as well as their level of awareness of the concept.

To address the identified research questions, an online questionnaire was conducted. The results show that students have a positive attitude towards this type of economy and engage in circular behaviours. However, regarding less common circular behaviours and attitudes, students reveal a negative attitude and unwillingness to adopt actions related to the purchase of remanufactured and second-hand products, as well as new circular business models, such as product-service systems and sharing economy. Furthermore, students associate the circular economy concept not only with the recycling principle and 4Rs but also with the principles of zero waste and shared resources, associating less with the premise of closing the life cycle of products/materials.

Keywords: Circular Economy; College Students; Behaviours; Attitudes Knowledge; Portugal.

Number of words: 9.985

Resumo

O crescente problema das alterações climáticas e a escassez dos recursos tem colocado desafios à sustentabilidade do planeta Terra. É neste paradigma que surge a necessidade de transitar para um modelo económico sustentável. Assim, a economia circular emerge como um modelo económico alternativo à economia linear, procurando reduzir a utilização de matéria-prima virgem e fechar o ciclo de vida dos produtos. Ao invés dos produtos serem descartados como lixo, a economia circular pretende que o produto seja inserido novamente no mercado através de processos como a reutilização, reciclagem, reparo, entre outros. No entanto, a transição económica linear-circular não só implica um esforço por parte das indústrias, governos e empresas, como também dos consumidores.

Os consumidores têm um papel primordial nesta transição económica, na medida em que é o próprio consumidor que inicia todo o processo da cadeia de abastecimento. Logo, o sucesso ou insucesso dos modelos circulares depende da participação e interesse do consumidor. Dada a importância do consumidor na transição económica, a presente dissertação pertente avaliar quais são os comportamentos e as atitudes dos estudantes universitários portugueses sobre a economia circular, bem como o seu nível de conhecimento sobre o conceito.

De modo a dar resposta às questões de investigação, optou-se por realizar um questionário online. Os resultados demonstram que os estudantes têm uma atitude positiva sobre este tipo de economia e praticam comportamentos circulares. Contudo, no que toca a comportamentos e atitudes circulares menos comuns, a população-alvo revela uma atitude negativa e indisponibilidade na adoção de ações referentes à compra de produtos remanufacturados e em segunda mão, bem como aos novos modelos de negócio circulares, como os sistemas de produto-serviço e a economia de partilha. Além disso, os resultados

revelam que os estudantes associam o conceito de economia circular não só ao princípio de reciclagem e 4Rs, como também aos princípios de zero desperdício e recursos partilhados.

Palavras-chave: Economia Circular; Estudantes Universitários; Comportamentos; Atitudes; Conhecimento; Portugal.

Número de palavras: 9.985

List of Abbreviations

CE	Circular Economy
EMF	Ellen MacArthur Foundation
EU	European Union
HEI	Higher Education Institution
NGO	Non-Governmental Organisation
PSS	Product-service systems

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Introduction

The circular economy (CE) is currently at the forefront of political discussions and initiatives. It advocates closing energy[1] and material cycles to make more intensive use of the available resources, rather than exploiting them and causing environmental degradation (Jaca et al., 2018). According to IPCC (2021), unless greenhouse gas emissions are dramatically decreased in the coming decades, global surface temperatures will continuously rise in the coming decades. Consequently, CE emerged as an alternative and much-needed model to counteract the current damaging patterns of linear economy actions (EMF, 2012; Geissdoerfer et al., 2017).

CE actively searches to reduce the usage of virgin materials and waste production (Wübbeke & Heroth, 2014; Haas et al., 2015). As a result, moving forward with the change to CE models will require cooperation and coordination across all domains of influence (Hazen et al., 2017). This includes the implementation of governmental policies and changes in business operations, societal standards, and behavioural thinking and acceptance (Liu et al., 2009; Hazen et al., 2017). Thus, consumers' perspectives on enabling the transition to a more circular future are becoming increasingly clear (Hobson, 2016).

Albeit consumers are considered enablers of CE deployment, they are still understood as mere recyclers (Korsunova et al., 2021). Because consumers are the primary goal of supply chains and the beginning of the reverse supply chain, the value chain can be considered to be centred on them (Boyer et al., 2021). Without their participation, the CE's objectives will be impossible to achieve given their numerous forms of contribution, including purchasing more durable products,

[1] By definition energy cannot be recycled. It is only used in cascade for prolonged use at lower temperature and pressure levels. However, for the sake of simplicity, it is referred to as closing the loop of energy.

being willing to repair objects, and appropriately disposing of garbage (Boyer et al., 2021).

Although the CE causes significant changes in consumption, current CE assessments do not provide comprehensive explanations of these difficulties, accounting for a smaller portion of the work done so far (Ghisellini et al., 2016; Camacho-Otero et al., 2018). For instance, according to Kirchherr et al. (2017), only 19% of publications in the literature mentioned consumption while defining the CE concept, indicating that more research into the consumer's point of view could help identify strategies to improve their contribution to CE. Similarly, Ghisellini et al. (2016) emphasized the importance of increasing knowledge and understanding of European consumers and producers, given their vital role in European policies. de Jesus & Mendonça (2018) also point to general inertia, current consumer habits, and a lack of awareness of all possible CE choices as contributing causes to the slow adoption of CE models.

Motivated by these observations, this dissertation aims at filling the aforementioned gap identified in the literature about consumers by specifically answering the following research questions: "What are consumers' behaviours and attitudes toward promoting CE?" and "What is the consumer's level of knowledge of CE?". As a result, the contribution of this study is to acquire a deeper understanding of the level of knowledge, and which attitudes and behaviours [2] students attending higher education have towards the CE, to determine whether there are general trends and attitude-behaviour gap[3], or if there is a deeper awareness of the topic beyond the recycling principle.

[2] Attitudes and behaviours are two different components. Attitudes represents a mental and physiological state of readiness towards certain actions, ideas or notions (Allport, 1967), whereas behaviours refers to the actions itself, which are observable (Ajzen & Fishbein, 1977).

[3] The attitude-behaviour gap is the difference between customer sentiment and actual purchase/act (Kozar & Connell, 2013).

This dissertation targets Portuguese college students. Until now, no studies on this target group have been found in Portugal[4], making this study imperative for the contribution of CE adoption in Portugal. Because college students are the future leaders, policymakers, consumers, entrepreneurs, and future decision-makers, understanding their actions and awareness is vital in pursuing other avenues for resolving issues (Vicente-Molina et al., 2013). These findings will aid in the development of a fair and efficient CE framework (European Commission, 2020). Also, they will provide useful insights on the mentioned target group of how different stakeholders (e.g., the government, universities, schools, educational and associative organisations, among others) can include consumers in their value chains, what still needs to change and be adjusted to increase information about CE.

The remainder of this dissertation is structured as follows. The next section includes a review of the literature on the CE concept, its roots, and principles, as well as on the business challenges, the emergence of new business models, the role of consumers and relevant studies. The methodology section follows, and it explains how the data was collected, how the survey was designed and distributed, and how the data was analysed to answer the study questions. The data findings are then presented, and independent variables are tested through chi-square tests. Chapter 4 discusses the findings from the questionnaire based on previous literature research. Finally, it concludes the topic, presenting the investigation's limitations and future research topics.

[4] Currently, there are studies conducted in Portugal on the subject of this dissertation. However, none of them has the target group identified in this academic work.

Chapter 1

Literature Review

2.1. CE: the concept, the roots and key contributors

The CE is a topic that has recently gained exponential recognition, emerging as a necessary paradigm shift in the fight against the current patterns of production and consumption, as well as an emergent response to climate change and environmental issues (Ghisellini et al., 2016; D'Amato & Korhonen, 2021). Even though it is a concept with great attractiveness to academics and practitioners, it still lacks a pronounced scientific consensus regarding its definition, which poses challenges and implications to the practical development of CE (Kirchherr et al., 2017).

The concept is not new in the literature, as it was mentioned implicitly in Boulding's study entitled "The Economics of the Coming Spaceship Earth" (1966). In his work, the author expressed his concern about the environment's destruction as a result of human activity and the societal systems that sustain it, proposing that Earth could function as a cyclical ecological system, recirculating limited resources and making them infinite (Boulding, 1966). Although Boulding does not mention the term CE in his work, the words used in his publication are quite similar to the CE terminology (Cardoso, 2018).

According to several authors, such as Su et al. (2013), Geissdoerfer et al. (2017), and Geisendorf & Pietrulla (2018), the introduction of the CE concept is connected to Pearce & Turner's (1990) work. Pearce & Turner's (1990) stated that the traditional linear economy is unsustainable and must be replaced by closing industrial loops, demonstrating the viability of considering environmental awareness in economic flows (Geisendorf & Pietrulla, 2018).

Walter Stahel was also a key proponent in the development of certain features of the CE with an emphasis on the industrial economy (Geissdoerfer et al., 2017). In 1976, Stahel and Reday-Mulvey coined the term 'closed-loop economy' (Murray et al., 2017), which has since become one of the pillars of today's CE. The authors envisioned the economy as a closed-loop where materials moved back and forth, preventing waste, increasing resource efficiency, and dematerializing the manufacturing sector (Geissdoerfer et al., 2017; Grdic et al., 2020). Stahel (1982) also stressed the performance economy model, suggesting that ownership is better suited to long-term business models (Geissdoerfer et al., 2017). He highlights the potential of selling goods as services to maximize resource efficiency, profit methods based on prevention, and new product design for the return and reuse of items (Ogunmakinde et al., 2021).

Moreover, in 2010, the Ellen MacArthur Foundation (EMF) emerged as a worldwide thought leader aimed at expediting the transition to CE. EMF has since then contributed significantly to the increase in knowledge about the topic, as well as the adoption of this form of the economy by undertaking several studies on the procedures required for businesses and governments to implement the CE (Homrich et al., 2018). As a result, EMF has provided one of the most widely cited definitions of the CE, defining it as:

> "(...) an industrial economy that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models." (EMF, 2012, p.7).

This definition appeared in the EMF's initial report, which was published in 2012, and is considered seminal (Lieder & Rashid, 2016; Geissdoerfer et al., 2017). EMF's definition is more inclusive since it covers both environmental and

economic benefits under the concept of regenerative performance (Lieder & Rashid, 2016), paving the way toward the adoption of circular initiatives by both public and private sectors (Barros et al., 2021).

Due to the concept gaining greater momentum, the number of research publications attempting to learn more about this notion has as well increased (Lieder & Rashid, 2016; Geissdoerfer et al., 2017). Recently, Kirchherr et al. (2017) provided the most extensive quantitative review of CE definitions currently accessible (Hartley et al., 2020). Based on a systematic analysis of 114 definitions, the authors defined CE as:

> "(...) an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro-level (products, companies, consumers), meso level (eco-industrial parks) and macro-level (city, region, nation and beyond), to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations."(Kirchherr et al., 2017, p. 229).

This conceptualization attempted to address most of the flaws in previous reviews sought to explain CE. It establishes a hierarchy among the various components that constitute this idea, prioritizing reduction and reuse over recycling and recovery. It also emphasises the nature of economic systems, the role of enterprises and consumers as catalysts (Camacho-Otero et al., 2018), and the need to contribute to sustainable development. Based on Brundtland's Report (1987), sustainable development is a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland, 1987, p. 43). This definition highlights the need to safeguard present and future generations' quality of life, which is challenged by unsustainable production and consumption practices. Taking this into account,

CE arises as an instrument to operationalize sustainability principles (Kirchherr et al., 2017) since it optimizes economic flows in which waste is reduced and is often seen as an input for the next cycle (Grdic et al., 2020). Likewise, CE is also viewed as a strategy that directly helps to attain the United Nations Sustainable Development Goals[5] (Schroeder et al., 2019).

In conclusion, CE departs from the traditional 'take-make-use-dispose' economic model, which is unsustainable since it consumes energy and materials throughout the manufacturing process. CE systems enhance the circulation of raw materials by redesigning physical streams of materials and energy, leading to a decrease in virgin resources, waste, and emissions (Korhonen et al., 2018). Furthermore, CE highlights the need to 'design out waste', with the primary objective of retaining added value from resources in the economic production chain for as long as feasible (Whalen, 2019; Grdic et al., 2020). To achieve a zero-waste economy, CE encompasses entire production networks to change the way economic processes are manufactured, and accountability is diffused throughout these networks with neither the producer nor the consumer being ethically neutral (Murray et al., 2017).

2.2. 3Rs principle

Predominantly, CE is widely misinterpreted as merely "an approach to more appropriate waste management." (Ghisellini et al., 2016, p. 12). Well-known principles such as the 3Rs (reduce, reuse, and recycle), which are commonly used to summarize the CE's fundamental strategy, support this viewpoint. Hence, the

[5] The Sustainable Development Goals (SDGs) are a collection of 17 global goals defined by the United Nations General Assembly to address the environmental, political, and economic concerns that our planet faces. The goals span a wide range of topics, including energy, economic growth, consumption and production, and climate action, and while each has its own set of objectives, they are all interconnected (UNGA, 2015).

3R-imperatives have become a central part of the CE concept (Murray et al., 2017).

Reduction principle aims to reduce primary energy, raw material and waste inputs by improving production and consumption processes (Castellani et al., 2015). Reuse principle means "any operation by which products or components that are not waste are used again for which they were conceived" (European Union, 2008, p.10). This principle takes fewer resources, less labour and less energy compared to the manufactured of new items from virgin materials. However, reuse imperative is dependent on the increase in consumer demand for reused or remanufactured products, the design of long-lasting products that may be reused several times, as well as incentives for businesses to encourage product return (Ghisellini et al., 2016; Lieder & Rashid, 2016). Lastly, recycling comprises "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes." (European Union, 2008, p.10). Recycling waste offers the benefits of still-usable materials while also reducing the amount of waste that needs to be handled and/or disposed of, lowering the environmental impact (Cagno et al., 2005; Dajian, 2008; Lazarevic et al., 2010; Birat, 2015). This operation, however, does not include energy recovery. Although recycling is the most commonly associated CE concept, it is the least resource-efficient and cost-effective option when compared to the principles of reuse and reduction (Ghisellini et al., 2016).

The European Union (EU) has recognised a fourth R- Recovery in its official CE policy framework. However, according to studies, only 3–4% of CE definitions contain the 4R framework (Kirchherr et al, 2017).

2.3. Challenges for businesses

According to a recent report from the World Business Council for Sustainable Development, the transition to CE material flows necessitates significant changes

in the way businesses operate, ranging from product designers developing a sustainable outlook to supply chain operations being reshaped (Smol et al., 2015). As management of reverse cycles, cascading, reuse and remanufacturing processes demand systemic changes across a wide range of domains from product development to production and supply chain management, the shift to CE models is necessarily determined by operations management decisions (Batista et al., 2018).

Typically, flows move from raw material to distribution and retailing of finished products to consumers (Neto et al., 2010). Nevertheless, in circular supply chains, the flow of resources and materials from suppliers to manufacturers, distributors, retailers and consumers, as well as the reverse flows of used items are considered (Souza, 2013). Reverse logistics changes the direction of the product, causing it to move backwards through the supply chain (Geisendorf & Pietrulla, 2018), which requires incentives to return and reuse to collect the used materials from consumers. This shift in logistics has ramifications for supply chain management, which is critical in moving toward a CE, as it enables the creation of new business models by closing, narrowing, and cycles (Bocken et al., 2016).

Slowing the loop refers to the practice of using and reusing products over time intending to lengthen the product's useful life (Lewandowski, 2016). The usage time of products is extended and/or intensified by the design of long-life goods, where the choice of durable materials is a crucial aspect of the design process (Bocken et al., 2016; De Angelis et al., 2018; Ogunmakinde et al., 2021). Product-life extension is a potential strategy for slowing cycles, implying an extension of the usable life of materials by incorporating service loops such as product reuse, maintenance, repair, and technical upgrading, as well as a combination of these (Bakker et al., 2014; Bocken et al., 2016). On those grounds, the design stage

encourages a more circular performance by extending the material's usage phase, consequently slowing the flow of resources (Todeschini et al., 2017).

Besides slowing the loops, reducing the manufacturing cycles is another way to extend the usable life of a product. Narrowing or reducing cycles is distinct from slowing and closing loops since it requires a reduction of resource flows (Bocken et al., 2016). The resource loop can be narrowed by making more efficient use of environmental resources, striving for a lower resource use per product (Braungart et al., 2007).

Closing loops entail the reuse of materials with the main goal of culminating material flows (both technical and biological) between post-use and production (Bocken et al., 2016). At the conclusion of a product's useful life, the cradle-to-cradle model distinguishes between biological and technical nutrients (Lieder & Rashid, 2016; Esposito et al., 2018). Biological nutrients are non-toxic and restorative, and they may be returned to nature without harming it, whereas technical nutrients (e.g., metals) are not suitable for the natural environment but are designed to be utilised in a series of cycles at the maximum quality (EMF, 2012).

The design strategies for closing the loop at the end of the product's life are divided according to the two nutrients. Designers strive to create products using components that can be continuously recycled into new materials and products, known as 'design for a technological cycle'. Additionally, there is the 'design for a biological cycle', where biological nutrients feed natural systems throughout their life cycle. The biodegradation of materials initiates a new biological cycle (Bocken et al., 2016). Finally, closing loop solutions also include the 'design for disassembly' strategy, which assures that goods and parts can be separated and easily reassembled (Bakker et al., 2014; Esposito et al., 2018).

Thus, the core principle of CE is that end-products are designed to be long-lasting so that they can be reused several times to decrease reliance on finite

virgin materials extraction (Ghisellini et al., 2016). This is achieved through the adoption of several approaches such as "maintenance, repair, reuse, remanufacturing, refurbishing, and recycling" (Geisendorf & Pietrulla, 2018, p. 579).

2.5. Emergence of new business models

The adoption of the CE requires enterprises to make various structural and operational transformations which translates into the creation of new and more sustainable business models, aligned with CE principles (Lieder & Rashid, 2016; Korhonen et al., 2018). As regards, many authors agree that providing services and sharing are important business models for a successful CE implementation (Todeschini et al., 2017; Lofthouse & Prendeville, 2018; Maffei et al., 2019).

Product-service system (PSS) business model consists of integrated product and service solutions that meet the needs of clients and provide value (Boehm & Thomas, 2013). These systems contribute to the virtualization and establish new concepts of ownership (Bressanelli et al., 2019), emphasizing the service that the product offers rather than the physical object (Sousa-Zomer et al., 2018; Yang et al., 2019). They are based on circular concepts and methods (Nußholz, 2017; Manninen et al., 2018) such as access or availability, and result and performance in the framework of the CE (Blomsma et al., 2019).

Similar to PSSs is the concept of sharing economy (or collaborative consumption) which is a mode of consumption aiming to maximize the use of otherwise underutilized assets (Belk, 2014). The sharing economy is founded on the idea of optimizing the utility of benefits by bringing consumer and production systems together (Korhonen et al., 2018) through technology-enabled lending, renting, swapping, trading, borrowing, buying second-hand, sharing, and so on (Brown & Vergragt, 2016; Dreyer et al., 2017). By promoting access to commodities rather than ownership of goods, net consumption decreases, and

material efficiency increases as consumers are prolonging the product's useful life (Belk, 2014; Seegebarth et al., 2016). Because items are kept in the production cycle for longer, resource consumption and greenhouse gas emissions are minimized. Thus, the notion revolves around the necessity for the distribution and utilization of idle capacity. This occurs when individuals share existing assets, allowing society as a whole to make greater use of products, talents, and time (Cherry & Pidgeon, 2018).

2.6. Consumers: their role and relevant studies

Consumers are an important enabler of CE (Ghisellini et al., 2016) since they are the agents who control the flow of processes of used materials. Their predisposition to repair, recycle and reuse materials will either fail or build reverse systems. This empathizes the necessity of educating consumers and driving a cultural shift toward circular behaviours (van Buren et al., 2016; Barros et al., 2021).

Citizens are not only purchasers, but also maintainers, repairers, sellers, collaborators, and recyclers. These roles reflect a shift in perceptions of citizens as more than just consumers, but also as increasingly active participants in the economy (e.g., in trading and exchanging goods)(Maitre-Ekern & Dalhammar, 2019). Therefore, consumers shift from being solely individuals who consume resources to individuals who have a part in extending the life of products across the production, distribution, and consumption cycle. As a result, there is a growing need for citizens to adjust their purchasing habits, reevaluate their needs, and learn more about the subject and required skills (Korsunova et al., 2021). Consequently, as consumers are such a key piece of the CE's implementation, academics have already conducted several studies to understand their behaviours, attitudes and knowledge.

Concerning the **attitudes** dimension, the literature defines it as a mental and physiological state of readiness, influenced by stimuli, that determines an individual's behaviour toward all items with which it is associated (Allport, 1967). Thurstone (1931) also adds that attitudes are subjective as they are seen as the total or aggregate of all feelings and dispositions toward a certain notion, idea, or action. On the other hand, **behaviour** refers to the action itself, which is a visible act. Ajzen and Fishbein (1977) define behaviour as one or more observable activities taken by a person and documented in some way by the investigator. At last, **knowledge** embodies all information that a person possesses or accrues about a certain topic of study (Alexander et al., 1995). Knowledge is divided into three types: declarative, or knowing what; procedural, or knowing how; and conditional, or understanding when and why (Lawless & Schrader, 2004).

Knowledge - or attitude - is not always a good predictor of behaviour on its own (Ajzen & Fishbein, 1977). The interaction of these three dimensions—knowledge, attitude, and behaviour—is dynamic and reciprocal at times. As a result, Ajzen & Fishbein (1977) enhances that it is advantageous to do research in this area with the understanding that these three dimensions do interact.

Hence, to assess the aforementioned elements, questionnaires are being used by numerous authors so that hurdles to CE implementation can be recognised and further investigated (Guo et al., 2017). Although various questionnaires have been used to assess individuals' general environmental awareness and attitudes toward environmentally sensitive behaviour since the early 1990s, only a few researchers have looked at people's understanding, attitudes and practices toward CE (Almulhim & Abubakar, 2021).

Of the several investigations carried out, Guo et al. (2017) conducted an interesting research in 2008 and 2013 to assess CE knowledge in a Chinese city. The findings were notable since, compared to other cities, just 41% of

respondents "had heard of CE notion" (Guo et al., 2017, p. 2182), possibly because of the respondents' lower educational level and present cultural mindset. Instead, inhabitants of the city displayed a stronger knowledge of the concept of sustainable development and the importance of water conservation and energy efficiency due to the city's climate. In contrast, Smol et al. (2018) found that the CE model is fairly understandable by residents of a Polish region, with the primary focus on raw material conservation and waste disposal methods. Based on the author's findings, the public's comprehension of the CE concept is linked to the educational level.

Furthermore, Lakatos et al. (2018) performed a survey in Romania to investigate young Romanians' opinions about environmental awareness and its effects, as well as their attitudes toward sustainable production and circular business models. Respondents are highly aware of the environment and the linear model's environmental effects, as well as having a positive attitude toward sustainable manufacturing and circular business models, according to the data. However, they have a more negative attitude toward adopting sustainable consumption habits (such as taking public transportation or riding a bike to work). This last conclusion is corroborated by the European Commission's (2018) research on behavioural consumer participation in CE which revealed that even though consumers are generally willing to participate in CE activities, on the other hand, their actual involvement is modest.

In Portugal, some studies were also conducted on the Portuguese population. Amongst them, is the research work of Cardoso Seiça (2021) dedicated to the measurement of attitudes and behaviours in the Portuguese general public toward more circular consumer solutions. The findings show that the population's awareness of product environmental impact is still low and that the circular practices, such as purchasing used products, sharing goods/services, renting products, purchasing recycled products, buying green products, and the

techniques of disposal and eradication, are insufficient to ensure the achievement of a CE model. Additionally, a study conducted on the residents of the municipality of Leiria yielded interesting results. The dissertation emerged to gather information about the public opinion, motivation, and challenges to the adoption of the CE in Leiria, and it was confirmed that while participants' familiarity with CE is limited, they have a favourable propensity to participate in rental activities, reuse, item repair, and recycling (Antunes, 2020).

Chapter 2

Methodology

3.1. Research Strategy & Data Collection Method

Once the literature review has been analysed, it was possible to define the objectives and research questions to be investigated in this dissertation. The goal of this academic investigation, as mentioned in Chapter 1, is to answer the following research questions:

- What are consumers' behaviours and attitudes toward promoting CE?
- What is the consumer's level of understanding of CE?

To answer them, quantitative research will be used. Cohen & Manion (1980) defines quantitative research as social research that employs empirical procedures and statements. Moreover, for Creswell (1994), quantitative research comprises collecting numerical data that will be analysed using mathematically based approaches, namely statistics methods, to explain events.

Quantitative research presents four types of strategies to execute research: a) survey research; b) correlational research; c) experimental research, and d) casual research (Kamolson, 2007). To fulfil this study's purpose, a survey using a structured questionnaire will be conducted on the identified target group. Survey research uses a "scientific sampling and questionnaire design to measure characteristics of the population with statistical precision" (Kamolson, 2007, p.4), and it is beneficial for a large and representative sample of respondents (Hox & Boeije, 2004).

The use of a survey as a defined data collection method will enable the collection of quantitative primary data, which is defined as the capture of data

for specific research using suitable methods. As a result, new information is added to the existing social knowledge database (Hox & Boeije, 2004).

The sampling process undertaken in this academic research was a non-probability convenience sampling. In this type of sampling, members of the target population are chosen for research if they meet a set of practical criteria, such as proximity to the research location, availability at a specific time, or accessibility (Farrokhi & Mahmoudi-Hamidabad, 2012). Compared to other sampling procedures, convenience sampling appeals to students and researchers given its cost-effectiveness and simplicity for overcoming research challenges (Dornyei, 2007). However, convenience sampling has some hurdles such as biases. This occurs since the sampling is chosen by the researcher which may directly affect the results, resulting in a lower population representation (Mackey & Gass, 2005).

3.2. Survey Design & Dissemination

To successfully deliver the questionnaire to the target group, an adequate questionnaire construction process was carried out. "Appropriate questions, correct ordering of questions, correct scaling, or good questionnaire format can make the survey worthwhile, as it may accurately reflect the views and opinions of the participants." (Roopa & Rani, 2012, p. 273).

Hence, articles containing questionnaire research on the CE issue were examined. This research was essential to compile a list of useful and engaging questions to assess the aspects under inquiry. These questions were slightly adapted to fit the socioeconomic context of Portugal and the study's focus. Consequently, the questions were based on and/or inspired by the studies presented in Chapter 2, as well as publications presented in Table 1 below:

Questionnaire Section	No. of Questionnaire Items	Type of Scale	Authors of questions
Behaviours	1	5-point Likert scale	Lakatos et al. (2016); Guo et al. (2017);European Commission (2018); Jaca et al. (2018); Antunes (2020)
	2 3 4 5 6 7	Multiple Choice	Testa et al. (2020) Liu et al. (2009) European Commission (2018) Created by the author of this dissertation Antunes (2020) van Langen et al. (2021)
Attitude	8	5-point Likert scale	European Commission (2018); Jaca et al. (2018); Smol et al. (2018); Diddi & Yan (2019); Hao et al. (2020)
Knowledge	9 10 11 12	Multiple Choice	Antunes (2020) van Langen et al. (2021) Liakos et al. (2019) Created by the author of this dissertation
	13	Dichotomous question	Created by the author of this dissertation

Table 1. Questionnaire characteristics

As a result, the questionnaire was divided into four parts: behaviours are addressed in the first segment, followed by attitudes, knowledge, and sociodemographic questions were presented last.

To assess the questions, closed-ended questions were mainly employed. Thus, the Likert scale[6] and multiple-choice questions were the main types of questions

[6] The Likert scale is one of the most basic and widely used psychometric tools in educational and social science research. The original Likert scale is a list of statements (items) that can be used to assess a real or

used in behavioural and attitudinal sections. The 5-point Likert scale was the scale chosen since it is frequently used in research to measure social attitudes (Joshi et al., 2015). For the knowledge division, open-questions, multiple-choice and dichotomous (yes/no) questions were used.

After drafting the questionnaire, a pre-test was applied to five college students in Portugal. This was carried out to ascertain the questionnaire's clarity, sequencing, and length. Subsequently, certain changes were made to the questions: their order, length, and appropriateness of the language employed.

The questionnaire was created using Google Forms and made available online. It was disseminated through social media platforms such as Facebook, LinkedIn, and Instagram. Aside from using social media, several emails were sent to Portuguese universities and their students. Messages were also distributed to groups that were linked to the study's issue. The questionnaire was written in Portuguese since the target population was college students studying in Portugal. Nevertheless, to ensure coherence, each questionnaire item was translated into English in this work.

The questionnaire was available online from March 15th to April 11th, 2022, and 379 individuals answered it. The questionnaire is available in Appendix 1.

3.3. Data Analysis

SPSS software will be used for data analysis of the results to extract important conclusions from the data. This software is valuable for obtaining descriptive statistics, such as means, standard deviations, frequencies and percentages, which are necessary for the initial descriptive analysis in Chapter 4. The goal of this academic work is to conduct descriptive research on the survey data and test several independent null hypotheses.

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hypothetical scenario. On a metric scale, participants must indicate their level of agreement (from strongly disagree to strongly agree) with the supplied statement (items) (Joshi et al., 2015).

Descriptive research is a quantitative method used by several researchers, including Liu et al. (2009), Guo et al. (2017), Masi et al. (2018), and can be used to quantify opinions, attitudes, and behaviours, as well as determine how a population feels about a specific issue (Kamolson, 2007). The descriptive analysis will be complemented by SPSS outputs, such as frequencies and central tendencies, to present data in a clear quantitative manner.

SPSS software will also be imperative to test null hypotheses through Pearson chi-square tests of independence. The chi-square test is a non-parametric statistical approach for determining whether or not two or more categories in a sample are independent (Zibran, 2008). "Unlike most statistics, chi-square can provide information not only on the significance of any observed differences but also provides detailed information on exactly which categories account for any differences found" (McHugh, 2012, p. 143). However, it is worth noting that the identification of a statistical association using chi-square does not always imply a causal relationship between the variables being compared, but it does suggest that the source of the association is worth investigating (Zibran, 2008).

Once the significance level is determined, Cramér's V will be used to determine the strength of the association. Cramér's V is a correlation test that has the same interpretation as the chi-square test.

Consequently, several hypotheses will be defined to determine whether there is an association/relationship between the two variables or not. For the implementation of the chi-square tests, a level of significance of 5% will be considered. The hypotheses and variables are presented below:

- H_0: There is **no association** between Variable I and Variable II.
- H_1: There is **an association** between Variable I and Variable II.

Test no.	Variable I (no.)	Variable II (no.)
T1	Professional Status (18)	I often buy environmentally friendly products (1.1)
T2	Gender (15)	I often buy second-hand clothes (1.5)

T3	Age (14)[7]	I have already bought remanufactured products (1.6)
T4	Professional Status (18)	I use public transport/bicycles/electric scooters to get to work/university (1.10)
T5	Gender (15)	When purchasing sustainable products, I look into/at: a) in choosing products with packaging made of recycled material and without plastic b) With information on whether it is easily recyclable c) I do not normally check any environmental aspect d) None of the above (2)
T6	Gender (15)	I am willing to give up things I enjoy doing if they harm the environment (8.2)
T7	Gender (14)	I consider paying for a clothes rental service instead of buying new clothes (8.4)
T8	Professional Status (18)	I am considering exchanging my mobile phone for a remanufactured one (8.7)
T9	Higher Education Frequency (16)[8]	Have you heard of the CE? (9)
T10	Higher Education Frequency (16)	Do you consider that you practice actions that promote CE? (13)
T11	Location (17)[9]	Have you heard of the CE? (9)

Table 2. Definition of variables for chi-square tests

[7] For the independent variable "Age", the data was divided into under 25 and over 25.

[8] In order to perform the tests, the independent variable of frequency in higher education was divided into the following categories: Bachelor, Master and Others (which includes post-graduate students and PhDs).

[9] In the case of the location variable, regions were separated into two groups based on whether they were interior or on Portugal's coast.

Chapter 3

Analysis of Results

4.1. Characterisation of Sample

Of the 379 responses obtained, only 377 are valid since two of the participants are not attending a higher education course. 278 responses are from women (73,7%), whereas 99 answers are from men (26,3%).

Regarding current attendance in higher education, more than half of the respondents are currently pursuing a bachelor's degree (210 students), which accounts for 55,7% of the sample, and 142 are enrolled in a master's degree (37,7%). This is followed by 15 PhD (4%) students, and 10 post-graduation students (2,7%). 265 of the respondents (70,3%) are only studying, while 112 are working students (29,7%).

The respondents come from different parts of Portugal, being Porto and Braga those with the largest representation. Most participants live in Porto (51,2%), Braga (23,9%), Portalegre (5,8%) and Aveiro (4,8%). The minority of the participants live in Leiria (0,3%), Guarda (0,5%), Bragança (0,5%) and Coimbra (0,5%).

The questionnaire obtained answers from 18 to 72 years of age. The biggest percentage of this sample is the age of 22 years (16,4%), which is followed by 23 years (14,1%), and 20 years old (10,6%). Ultimately, the sample contains a large proportion of the population between the ages of 18 and 25, totalizing 78.5% (see Appendix 2).

4.2. Behavioural Characterisation

The questionnaire's behavioural section started with 5-point Likert scale items, where respondents rated their level of agreement about their behaviour in several situations.

When asked about "buying environmentally friendly products", the sample demonstrated a neutral behavioural position, with 151 individuals (40,1%) selecting the option "agree", and 128 respondents (34,0%) expressed a neutral stance on this statement, suggesting that they buy eco-friendly products neither frequently nor infrequently. This results yielded in a mean of 3,36.

Additionally, the respondents showed a behavioural consensus on the questions "I usually separate materials for recycling and organic waste" and "I buy brand new electronic products and gadgets". In the first statement, 51,5% of the sample demonstrated total agreement, reflecting a positive mean result of 4,05. On the second, the participants partially (39,3%) and totally agreed (32,4%) to practice it.

"Carpooling for work and university" and "buying second-hand clothes" present different results from the above-mentioned. Carpooling is not common among participants, with 51,8% completely disagreeing (27,1%) or disagreeing (24,7%) with the item. Buying second-hand clothes is also an infrequent event as 65,5% of respondents somewhat or completely disagree with the statement, indicating a lack of second-hand clothing purchasing habits. The average of 2,28 obtained in this statement confirms this outcome.

Regarding the purchasing of remanufacturing products, participants demonstrate dispersed behaviour. Three options were selected: "Neither agree nor disagree" (30,2%), "Agree" (24,4%), and "Strongly Disagree" (20,4%). This yields a mean of 2,82 and a standard deviation of 1,230, indicating a negative attitude toward buying remanufactured goods. This is supported by 71,7% of the sample that said to purchase brand new technological devices and gadgets.

From questions 1.7 to 1.11, students mainly agree or strongly agree with the assertions. These answers reveal that respondents engage in the actions on regular basis. Among the statements' results, it is worth noting the outcomes of questions 1.8 and 1.11, as 88,1% of the sample agree or strongly agree with minimising food, and 79,6% expressed buying energy-saving bulbs for their homes. Question 1.8 presents the lowest standard deviation of all assertions, at 0,810, while question number 1.10 exhibits the largest standard deviation, at 1,663 (Figures 1 and 2).

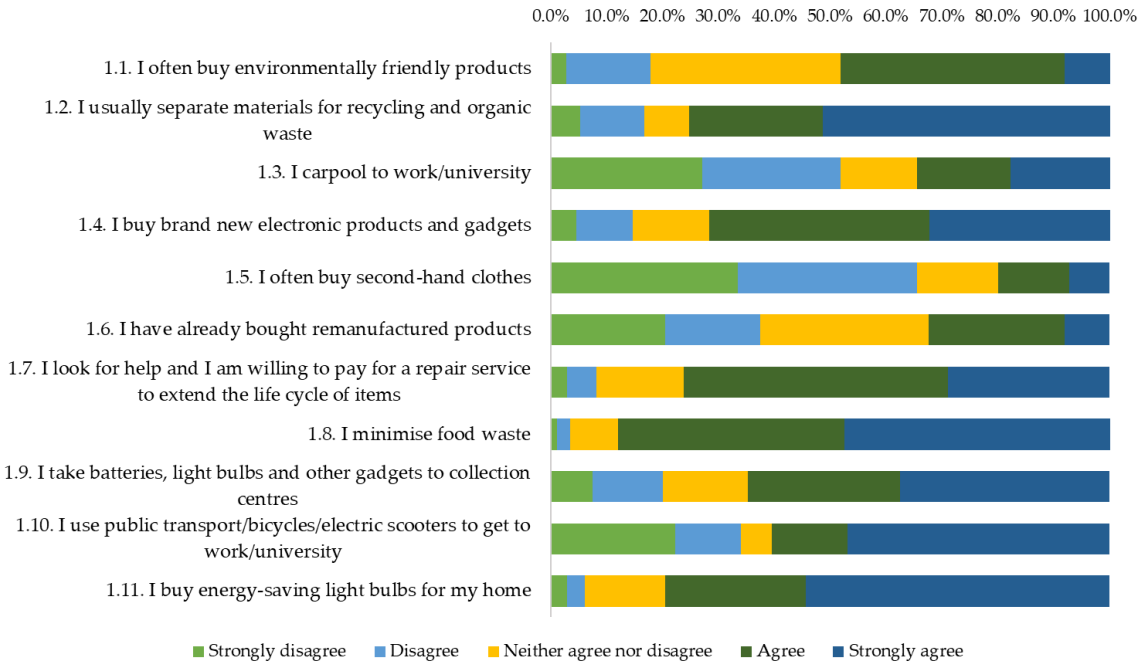

Figure 1. Frequency chart on 5-point Likert scale questions from the behaviour section

Descriptive Statistics

	N	Mean	Std. Deviation
1.1. I often buy environmentally friendly products	377	3,36	,927
1.2. I usually separate materials for recycling and organic waste	377	4,05	1,237
1.3. I carpool to work/university	377	2,73	1,464
1.4. I buy brand new electronic products and gadgets	377	3,85	1,118
1.5. I often buy second-hand clothes	377	2,28	1,249
1.6. I have already bought remanufactured products	377	2,82	1,234
1.7. I look for help and I am willing to pay for a repair service to extend the life cycle of items	377	3,94	,959
1.8. I minimise food waste	377	4,31	,810
1.9. I take batteries, light bulbs and other gadgets to collection centres	377	3,75	1,282
1.10. I use public transport/bicycles/electric scooters to get to work/university	377	3,51	1,663
1.11. I buy energy-saving light bulbs for my home	377	4,25	1,009
Valid N (listwise)	377		

Figure 2. Descriptive statistics from questions 1.1 to 1.11

About what respondents usually pay attention to when buying sustainable products, a large majority of the respondents answered they "do not normally check any environmental aspect" (38,5%) or buy "products with packaging made of recycled material and without plastic" (29,2%) (Figure 3). This finding might indicate that, despite their neutral position in question 1.1, students are less likely to purchase these items. However, college students also said in question 3 to "purchase green or organic food" (28,4%) and "products without plastic packaging" (25,7%) (Figure 4), reinforcing the findings of question 2, in which participants also express to choose packaging without plastic (N=110). Thereby, one can verify the presence of contradictory results.

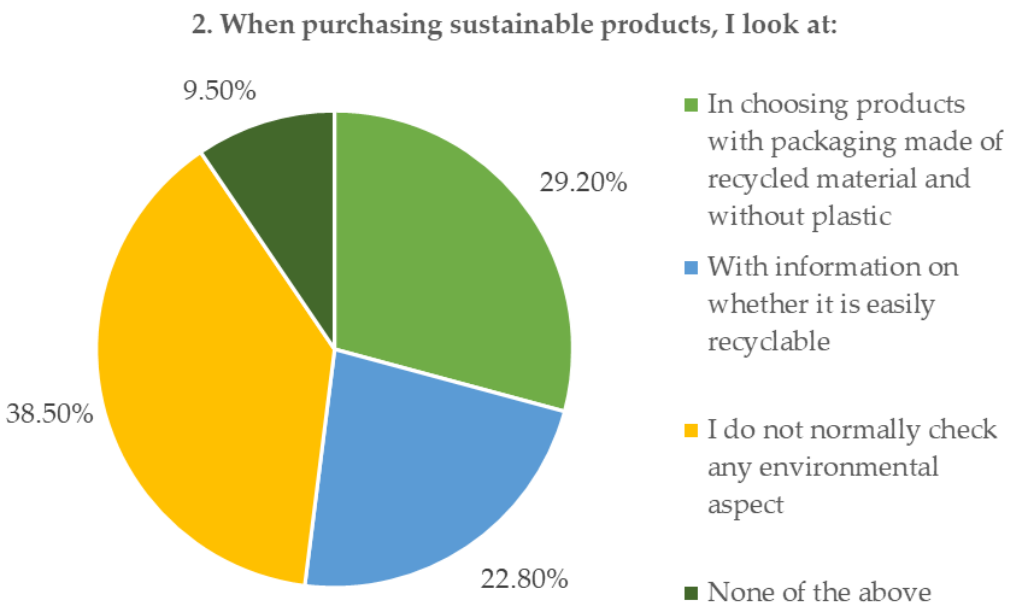

Figure 3. Frequency graph of question 2

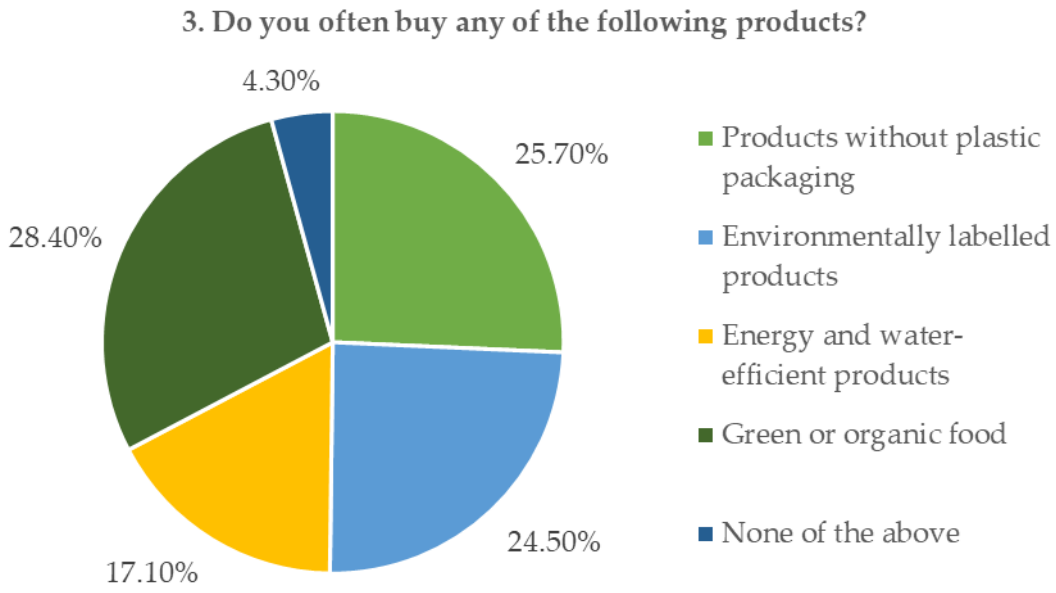

Figure 4. Frequency graph of question 3

Additionally, the participants were questioned about which actions they have already taken, such as booking a room on Airbnb, renting clothes, sharing a trip, and renting a room in their home to tourists. The most prevalent answer to this query was booking a room or apartment on Airbnb, with 115 students selecting that choice, while 34,4% chose the "None of the above" option (Figure 5).

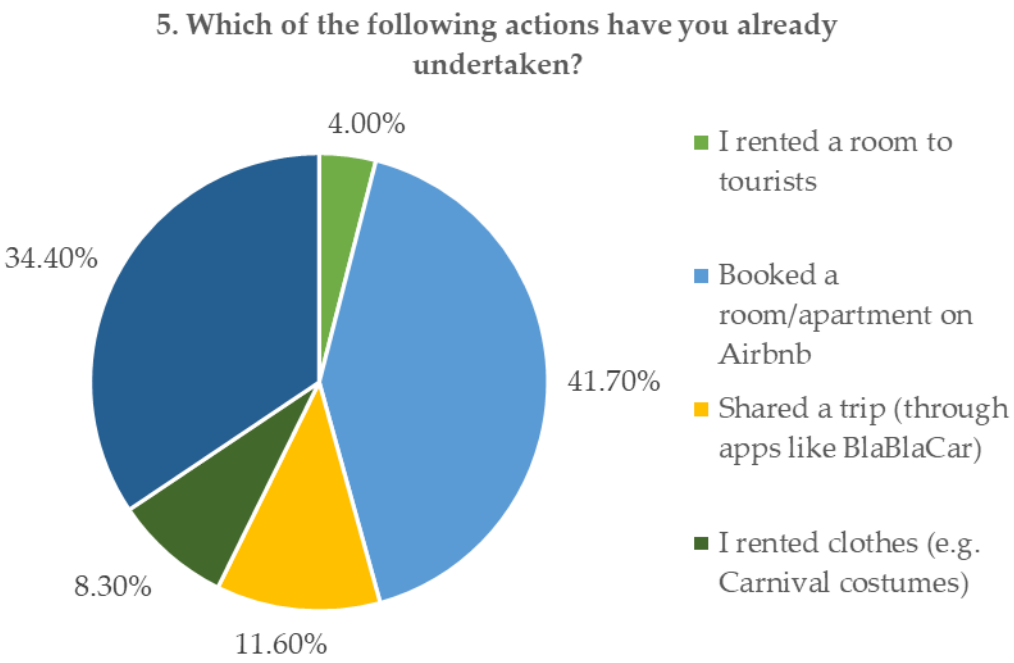

Figure 5. Frequency graph of question 5

When questioned about purchasing a mobile phone, respondents tend to opt for a brand-new mobile phone (82,8%) rather than a remanufactured or second-hand one (Figure 6). This result is consistent with question 1.4 since students also manifest to mainly buy new electronic devices (39,3% agreeing to purchase them).

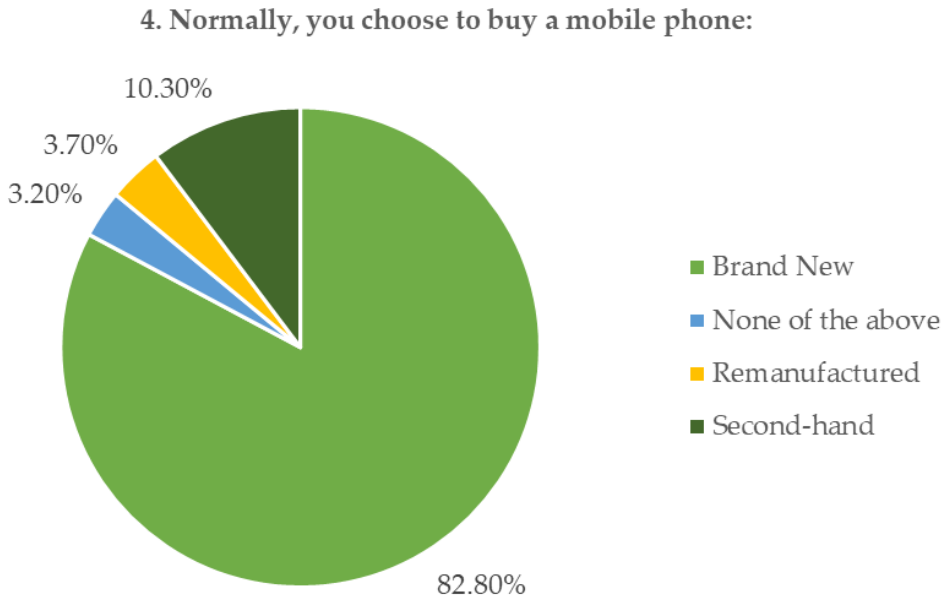

Figure 6. Frequency graph of question 4

Finally, when it came to how they treated their objects near the end of their lifecycle, the individuals showed positive behaviour: students said they usually donate unused goods, and 110 said they often repair them. Curiously, "keeping items at home" is the least popular option (Figure 7). Their behaviours are consistent with the attitude demonstrated in question 8.5.

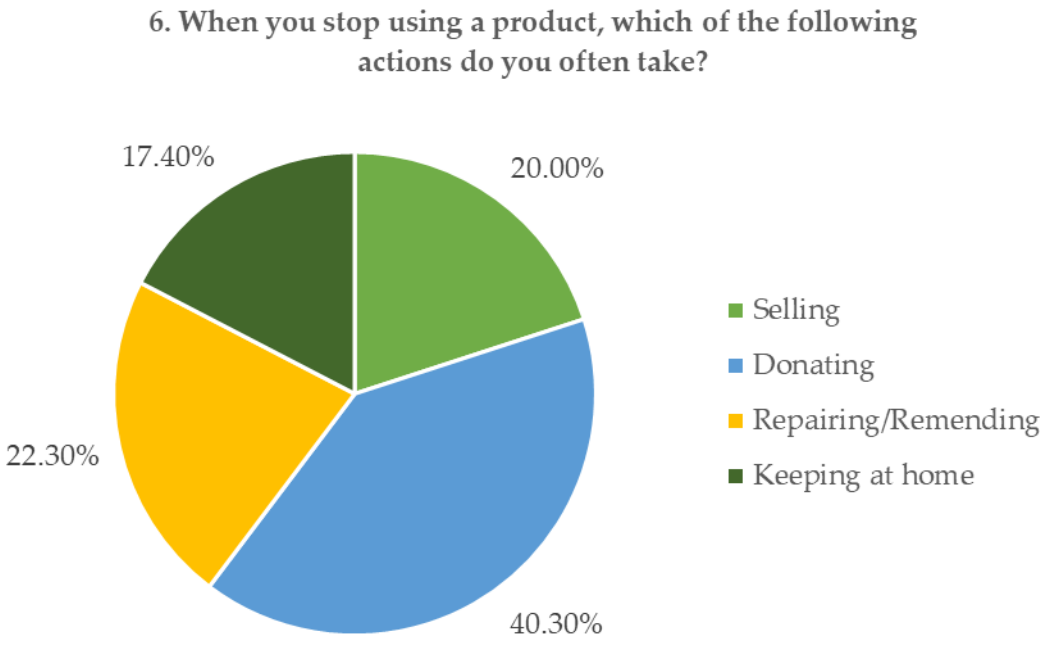

Figure 7. Frequency graph of question 6

4.3. Attitudes Characterisation

The 5-point Likert scale was employed to measure the target group's views as it is the best measurement scale to assess an individual's attitude towards an issue (Joshi et al., 2015). The findings revealed opposed attitudes: considerable negativity and significant positivity.

Concerning the intention to donate or sell items with no longer use, respondents show an encouraging attitude toward this action, being validated by the mean of 4,64. Following this great result is the question "I intend to reduce waste", where college students also express a positive tendency to reduce waste output by agreeing (30,5%) or strongly agreeing (63,9%). Similarly, the

willingness to improve recycling habits and buy water and electricity-saving gadgets also show strong results, with the first having a mean of 4,55 and the second one 4,54. The standard deviations are very low in these statements, which suggests that the sample results are homogenous (Figure 9).

On the other hand, some results express a more negative attitude. For instance, college students reveal a low willingness to pay for rental services of clothes by mainly disagreeing (29,7%) and strongly disagreeing (20,4%) (Figure 8). Likewise, they also show a negative position toward purchasing a remanufactured mobile phone, resulting in a mean of 2,79. This statement is the one that presents a higher standard deviation of 1,198 (Figure 9).

In the attitudinal section, there are also neutral viewpoints. The willingness to buy more sustainable products even if that means paying more uncovers a mean of 3,49, reflecting the neutral position of respondents (45,9% of the sample agreed with the statement and 21,5% neither agreed nor disagreed). Furthermore, the willingness to give up things on behalf of the environmental improvement shows that college students do not either agree or disagree with the statement, also adopting a neutral stance (*M*=3,50).

With a mean of 3,77, participants show their interest in carpooling to work or university facilities. Consequently, questions 1.3 (from the behavioural division) and 8.3 can confirm an attitude-behaviour gap as students say that they do not carpool, despite their positive attitude towards it (Figures 8 and 9).

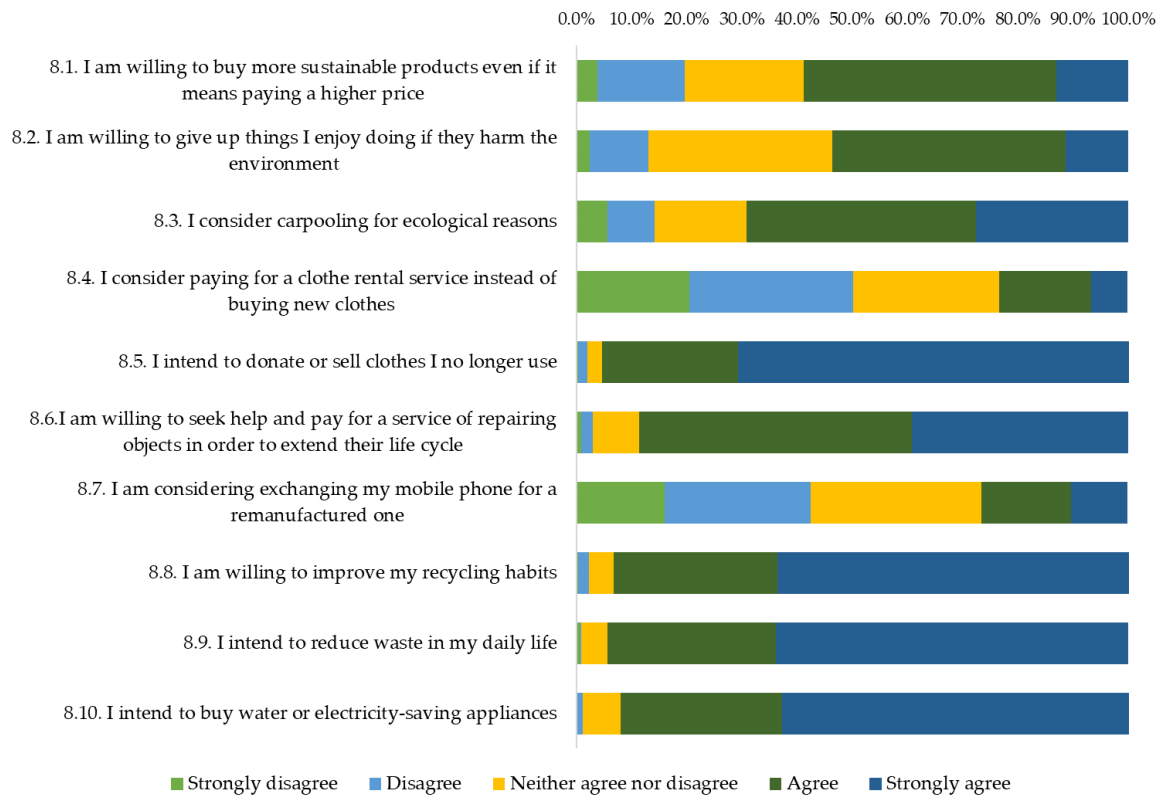

Figure 8. Frequency chart on 5-point Likert scale questions from the attitudinal section

Descriptive Statistics

	N	Mean	Std. Deviation
8.1. I am willing to buy more sustainable products even if it means paying a higher price	377	3,49	1,026
8.2. I am willing to give up things I enjoy doing if they harm the environment	377	3,50	,914
8.3. I consider carpooling for ecological reasons	377	3,77	1,111
8.4. I consider paying for a clothes rental service instead of buying new clothes	377	2,59	1,177
8.5. I intend to donate or sell clothes I no longer use	377	4,64	,641
8.6.I am willing to seek help and pay for a service of repairing objects in order to extend their life cycle	377	4,24	,760
8.7. I am considering exchanging my mobile phone for a remanufactured one	377	2,79	1,198
8.8. I am willing to improve my recycling habits	377	4,55	,695
8.9. I intend to reduce waste in my daily life	377	4,57	,649
8.10. I intend to buy water or electricity-saving appliances	377	4,54	,672
Valid N (listwise)	377		

Figure 9. Descriptive statistics from questions 8.1 to 8.10

4.4. Knowledge Characterisation

In the last section of the questionnaire, several multiple-choice questions were made. The first question was a filter query, where students assessed their level of knowledge of CE. Therefore, they could select from "Never heard of it" to "Quite a lot". As a result, 28,6% of respondents demonstrated to moderately understand CE concept, meanwhile, 23,9% said that they never heard of CE. Following this result, 76 respondents also expressed that they knew little about CE[10]. Only 103 participants (27,3%) answered that they knew very much and quite a lot of CE. The level of awareness of CE from students is low to moderate (Figure 10).

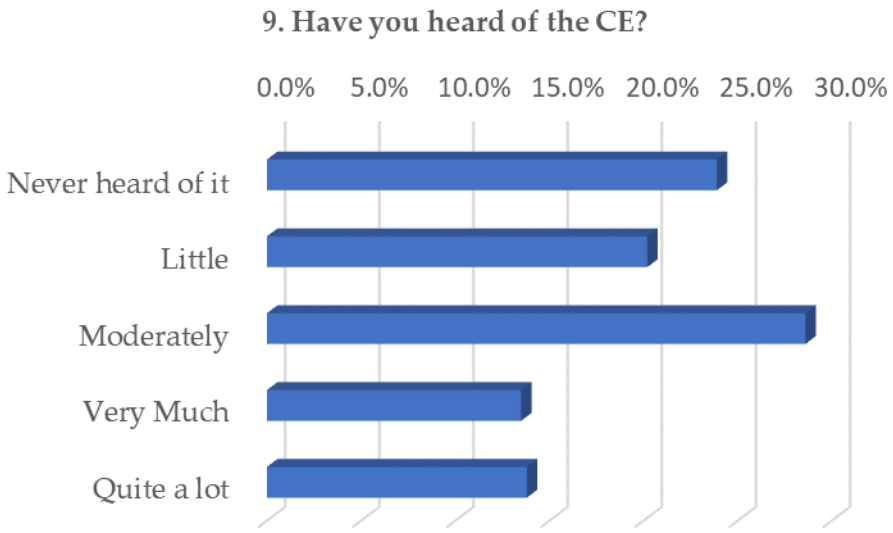

Figure 10. Frequency chart of question 9

The second question was designed to evaluate what CE means for the target group. Most students responded that CE is "reduce, reuse, remanufacture, recycle" (28,6%), followed by "an economy that is able to regenerate itself" response (21,8%). "Recycling waste" is the answer with the lowest percentage (0,8%) (Figure 11).

[10] The respondents whose answer was "Never heard of it" were immediately directed to the sociodemographic questions at the end of the questionnaire and did not respond to the remaining questions of this section.

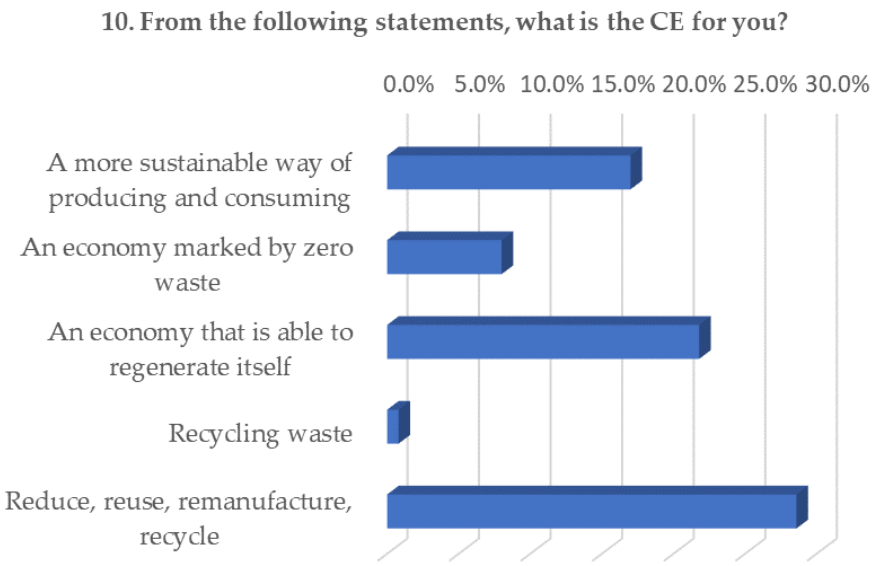

Figure 11. Frequency chart of question 10

Concerning the main principles of CE, 23.6% of the sample responded that one of the main principles of the CE is recycling, with 220 choices, followed by the principle of "zero waste" (21,6%), "shared resources" (18,7%), "using more renewable energy" (17,2%), being "closing the products/materials lifecycle" (8,0%) the least selected option (Figure 12). Although "recycling" was the least selected option in question 10, the behaviours and attitudes are overall more aligned with the recycling principle, and albeit respondents present a lesser degree of awareness of CE in question 10, the type of knowledge they have is satisfactory.

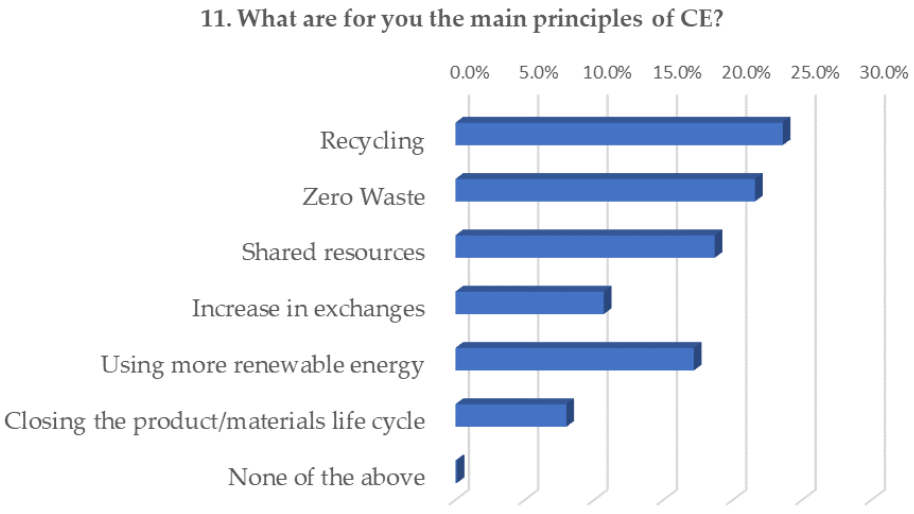

Figure 12. Frequency chart of question 11

62,1% of the sample population consider that they engage in CE-related actions, compared to the 14,1% who responded "No" (Figure 13). For those whose answer was "No" in question 13, there is a degree of consistency with the behaviours displayed in the behavioural section. The results demonstrate a negative attitude toward numerous scenarios, as shown in Appendix 4, for questions 1.1, 1.2, 1.3, 1.5, 1.6, 1.9, and 1.10. Only questions 1.4,1.7,1.8, and 1.11 exhibit more positive behaviours. In contrast, the attitude outcomes reveal to be more optimistic than the behaviours dimension, as the respondents only manifested a negative attitude toward the willingness to pay for renting clothes services (*M*=2,36), exchanging their mobile phone for a remanufactured one (*M*=2,58) and to buy more sustainable products even if it implies paying more (*M*=3,09). In terms of those who answered positively to perform circular actions, their response to question 13 is also in line with their behaviours. Participants exhibit favourable attitudes toward CE activities, excluding the practising of carpooling (*M*= 2,70) and purchasing remanufactured phones (*M*=2,92) and second-hand clothes (*M*=2,34) (Appendix 5). The resistance to buying second-hand products is confirmed, as previous results, by question 4, where 80,3% of the sample answered that they usually buy new mobile phone products.

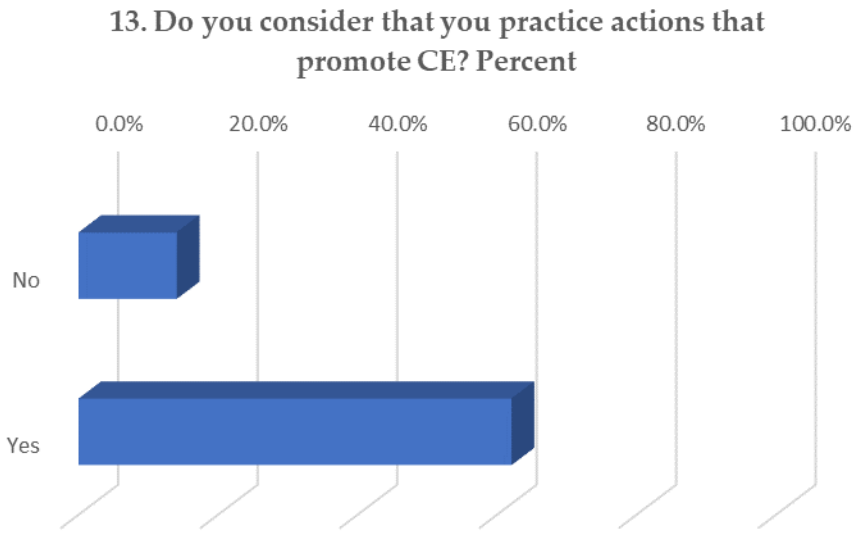

Figure 13. Frequency chart of question 13

Even though 90 students answered not having heard about CE before, it does not mean that they do not have circular behaviours and attitudes. In this case, it can be proven that the majority of the 90 participants do indeed engage in CE-related behaviours and attitudes. For instance, in the behaviours section, Likert scale items 1.2, 1.4, 1.7, 1.8, 1.10 and 1.11 have significant positive means ranging from 3,99 to 4,31. On the other hand, having into account the Likert scale attitudinal items, the respondents have also demonstrated encouraging attitudes. Only 4 of the 10 questions present means between 2 and 3. As for multiple-choice queries, they often donate (37,9%) and repair (27,9%) their products, book rooms/apartments on Airbnb (29,5%) and buy products without plastic packaging (30,8%), which reflects optimistic behaviours (Appendix 6).

Lastly, students have also responded through what means did they obtained information about CE, having the majority responded that they heard of CE mostly through "Social media" (N=134), followed by "In a university context (lessons)" (N=124) and "In conversation with friends or family" (N=87) (Figure 14).

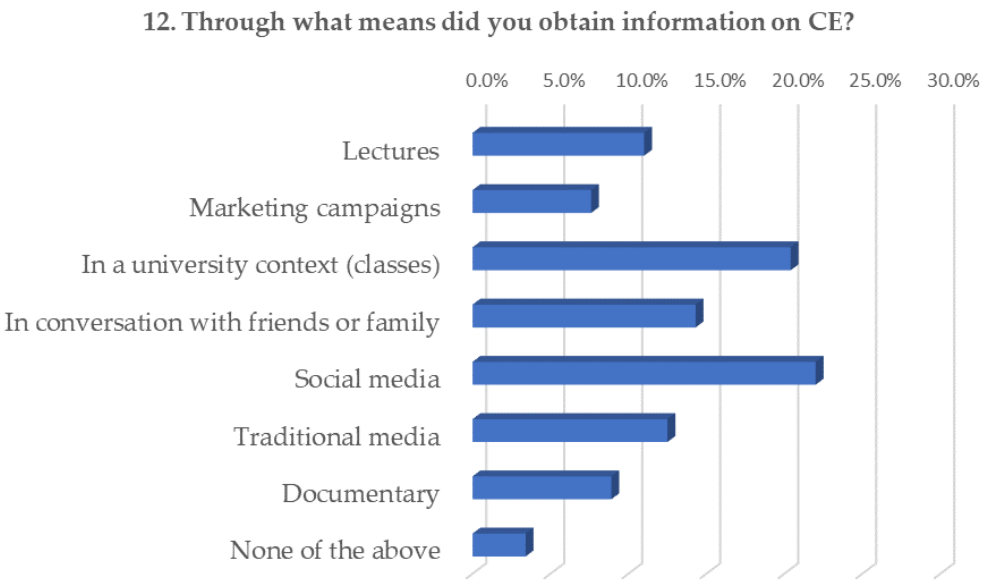

Figure 14.Frequency chart of question 12

4.5. Validation of hypotheses

The results of the hypotheses are summarized in the table below (see Appendix 7):

Test no.	Result of Hypotheses
T1	A test of independence was calculated by comparing professional status with purchasing environmentally friendly products. α^2 (4, N=377) = 5,914; p = ,206. So, there is **no statistically significant association** between them.
T2	A test of independence was calculated by comparing gender with buying secondhand clothes. α^2 (4, N=377) = 7,115; p = ,130. So, there is **no statistically significant association** between them.
T3	A test of independence was calculated by comparing age with buying remanufactured products. α^2 (4, N=377) = 14,515; p = ,006. So, there **is a statistically significant association** between them.
T4	A test of independence was calculated by comparing professional status with using more sustainable transportation modes. α^2 (4, N=377) = 13,709; p = ,008. So, there **is a statistically significant association** between them.
T5	A test of independence was calculated by comparing gender with the aspects that respondents consider when purchasing sustainable products. α^2 (3, N=377) = 4,660; p = ,198. So, there is **no statistically significant association** between them.
T6	A test of independence was calculated by comparing gender with the willingness to give up things on behalf of environmental improvement. α^2 (4, N=377) = 16,240; p = ,003. So, there **is a statistically significant association** between them.
T7	A test of independence was calculated by comparing gender to pay for a clothing rental service. α^2 (4, N=377) = 3,890; p = ,421. So, there is **no statistically significant association** between them.

T8	A test of independence was calculated by comparing professional status and exchanging a mobile phone for a remanufactured one. α^2 (4, *N*=377) = 5,314; *p* = ,257. So, there **is no statistically significant association** between them.
T9	A test of independence was calculated by comparing higher education attendance and the level of knowledge of CE. α^2 (8, *N*=377) = 36,776; *p* = <,001. So, there **is a statistically significant association** between them.
T10	A test of independence was calculated by comparing higher education attendance and the practice of CE-related actions. α^2 (2, *N*=287) = 8,675; *p* = ,013. So, there is **a statistically significant association** between them. The effect size for this finding, Cramér's V[11], is strong[12] (*V*=,174) (J. Cohen, 1988).
T11	A test of independence was calculated by comparing location and the level of knowledge of CE. α^2 (4, *N*=377) = 16,514; *p* = ,002. So, there is **a statistically significant association** between them.

Table 3. Validation of hypotheses.

[11] The Cramér's V test is the most often used strength test for the Chi-square (McHugh, 2012). Cramér's V, on the other hand, is only applicable when there are only nominal variables (Bergsma, 2013). Thus, because the variables in test 10 are nominal, the Cramér's V test can be performed, whereas this is not possible in the remaining tests where there is an association between variables as they present two types of variables: nominal and ordinal, making the Cramér's V test to assess the strength between variables impossible.

[12] The association strength is strong since the test value is more than 0,15 but less than 0,25. As a result, according to (Akoglu, 2018), the variables have a strong relationship.

Chapter 4

Discussion of Results

This chapter aims to answer the two research questions under discussion. Considering the first question on the type of behaviours and attitudes adopted by college students toward promoting CE, data shows that more 'conventional' behaviours, such as reducing food waste, recycling organic and e-waste, and purchasing energy-saving products, are more embedded in students' habits. Nevertheless, students show a greater aversion to changing their behaviours regarding new consumption trends like the sharing economy, PSSs, and remanufactured and second-hand purchases. These findings are not just only present in the consumer's behaviours but also in their attitudes.

College students have significant recycling practices and positive attitudes toward improving recycling behaviours. A comparable survey conducted by *Novo Verde* (2019) also shows promising results in terms of Portuguese consumers' recycling habits, concluding that 84% of the sample recycles. Those who said they do not recycle (16%) reveal that they do not do it given a lack of habit and because they do not have an eco-point at home. The target population also says to minimise waste food (88,1%) and have a positive attitude toward it, which is aligned with the results of a survey implemented by Abdulganio (2013). The author reveals that 21,46% of the sample usually makes a new receipt/reheats and eats leftovers at the next meal and 17,88% reheats and eats at the next meal/freezes for another occasion, preventing food waste. Furthermore, repairing damaged products is recurring in student's life (76,1%) and it is later validated when 25,1% of participants declare to repair/alter products when they stop using them. These findings are supported by EC's (2018) study as

respondents have a generally positive attitude toward repairing damaged products, with 92% of European citizens having decided to repair at least one object over a repair experiment activity. Hence, consumers prefer to fix rather than replace a product, and they believe that restoring it is valuable.

Concerning more neutral behaviours and attitudes, students show a neutral stance in purchasing environmentally friendly products, with the average remaining at 3. However, the findings of question 3 show a preference for not purchasing them. In response to the question, students manifested not frequently checking any environmental aspect when purchasing sustainable products (38,5%). *Novo Verde's* (2019) research confirms the result of question 3 since only 23,5% manifested to be prepared not to buy a product due to having plastic packaging. Price, income barriers, lack of time to digest information or look for green alternatives and muddled marketing communications were all listed by consumers as barriers to buying green products. In particular, younger generations manifest an "all or nothing" approach, in which they "opt to do nothing because they do not believe their small actions can make a difference" (Johnstone & Tan, 2015, p. 816).

Contrasting the abovementioned results, 51,8% of college students said they had never carpooled to work or college. Similarly, a survey of EU27 and UK residents found that almost half (46,2%) of the sample had never used a carpooling service, confirming the public's aversion to car sharing. This aversion may be related to security, driver experience and increased time and trip costs concerns (Mitropoulos et al., 2021). However, students express a positive attitude over carpooling for ecological reasons, suggesting an attitude-behaviour gap.

Second-hand product purchasing also presents negative behavioural results. Data shows that 65,8% of students do not frequently buy second-hand clothes, which is confirmed by the research carried out by Lima Mayer (2021) on Portuguese consumers' apparel purchasing habits. The author verified that 34%

of participants claimed they buy apparel from second-hand stores, while 88% declare to buy apparel from fast-fashion retailers. According to a report by EC (2018), this opposition stems from concerns about product quality.

Likewise, remanufactured items have lesser engagement since students prefer to acquire new technological equipment and gadgets. This is subsequently confirmed by the sample who preferred buying brand new mobile phones (82,8%) over remanufactured (3,7%) or used phones (10,3%). According to studies, there are various reasons for this aversion to remanufactured items, including the uncertainty inherent in the remanufacturing process (Hazen et al., 2012) and their lack of awareness and comprehension of these products. As a result of this lack of knowledge, consumers believe that remanufactured items are of poorer quality (Wallner et al., 2022).

Another important finding is how students feel about PSSs. Students demonstrate a negative attitude toward paying for an apparel rental service (49,6%), evidencing an opposition that is confirmed by other studies. For instance, the EC (2018) study concluded that 90% of respondents have no experience with renting second-hand products. Thereby, PSS has notable challenges to consumer acceptance, such as the loss of personal ownership (Catulli, 2012). This is especially important in the context of clothing. Dematerialization through rental, sharing or other means may be objectionable due to the emotional aspect of personal ownership for objects that confer status, and a sense of control, self-expression, or memory keeping (Catulli, 2012).

Regarding the level of knowledge, 28,6% demonstrate to moderately understand the concept and 23,9% declared not to have heard of CE. These relatively low results are aligned with Gelder's (2020) research on the population of the Netherlands, in 2018. The study found that 75% of the sample had never heard of the concept, 16% knew something about it and 9% knew what CE is. This lack of awareness and in-depth understanding of the subject can relate to

the absence of consensus on the definition of CE (Antunes, 2020), as well as the lack of consumer interest since citizens do not believe they are accountable for that transition, being the government and businesses responsibility. Additionally, students declare to associate CE with 4Rs and choose to select recycling as one of the main principles of CE. The findings are comparable to those of a previous study, which found in focus groups that half of the participants consider recycling to be an important component of CE (Sijtsema et al., 2020). Although the findings suggest low levels of awareness, the 277 people who claim to understand the idea display a deeper understanding of CE by evaluating other basic concepts such as zero waste, shared resources and renewable energy.

This level of understanding, according to Smol et al. (2018) and van Langen et al. (2021), can be traced to educational level, which is in line with test 9 of the hypotheses that uncover a correlation between student's CE awareness and higher education attendance. Also, higher education attendance and the practice of CE actions present a relationship. Based on Cramér's V, the strength of the association is strong, as both bachelor's and master's degrees show positive and approximate results regarding the practice of circular actions, implying that the higher the level of education, the greater the knowledge of CE.

It was also possible to confirm a link between gender and readiness to take action in the name of environmental improvement. In this scenario, women had exceptionally favourable attitudes toward adopting greener attitudes (69,8% of women willing to give up items for the environment vs 30,2% of males), which is consistent with Witek & Kuźniar (2021). Likewise, location has also a relationship with the level of CE understanding, being coastal residents more connoisseurs of the CE concept (94,2%) in comparison to interior residents (5,8%). Test 4 finds that students use more environmentally friendly modes of transportation than working students, which could be due to a lack of driver's

licenses, or the costs associated with automobile driving. For working students, research reveals that "some working young adults said the financial aspect became less important when they started working, which explains the results" (Simons et al., 2014, p.154). Moreover, the absence of suitable infrastructure for green transportation modes is cited as a hindrance. Additionally, participants under the age of 25 have more favourable attitudes toward buying remanufactured goods than those above the age of 25. This can be explained by the fact that remanufactured products are less expensive than new technologies.

Overall, although college students display some circular behaviours and have positive opinions toward CE, it is also clear that they are not engaging in the latest circular actions (e.g., remanufactured and second-hand products, sharing economy, PSSs, amongst others). Consumers associate CE not just with the 4Rs and recycling, but also with zero waste, shared resources, and an economy that can regenerate itself, which goes beyond the conventional recycling premise. However, there is still work to be done, and higher education institutions (HEIs) must change their educational approaches to set a positive and sustainable circular mindset in students.

HEIs are critical to the local and regional acceptance of circular initiatives as they can influence people's views, ideas, and behaviours, all of which are necessary for a successful CE transformation. In fact, by mobilizing policymakers, stakeholders, and business leaders in the private sector to learn, think, and act differently, HEIs can generate the essential knowledge and tools to facilitate the transition to CE (Serrano-Bedia & Perez-Perez, 2022). To achieve that, HEIs must develop a unified educational management system to meet today's socio-technical challenges. It is within this framework that HEIs must effectively reform their curricula to engage students in real-world environments for applied learning. It also needs to include students in research CE projects through the development of university-industry-government collaboration

projects that might serve as CE incubators (Serrano-Bedia & Perez-Perez, 2022). This transformation must be complemented by an investment in teacher training given their role in spreading CE as a new paradigm to students. HEIs must also improve their efforts to address sustainability in campus operations (e.g., the development of a shared cycling scheme on the university campus), which are imperative to foster more circular behaviours in students' life (Bugallo-Rodríguez & Vega-Marcote, 2020) beyond the campus grounds.

Conclusion

1. Final considerations

The present study aimed to assess the behaviours and attitudes toward the concept of CE and the level of knowledge about CE of college students in Portugal. As a result, data collection from the target audience was made using an online questionnaire, and then a descriptive and statistical analysis was performed to further investigate the findings.

The data collected demonstrated overall positive behaviours and attitudes regarding CE, suggesting that students practice circular actions. However, these encouraging behaviours and attitudes are intrinsic to the more traditional actions, such as recycling, minimising waste, and buying energy and water-saving appliances. Remanufactured products, second-hand purchases, and circular business models (PSSs and sharing economy) are elements that college students are wary of.

Furthermore, data also showed an attitude-behaviour gap, where students presented positive attitudes towards carpooling but do not act under their attitude, confirming resistance to newer trends. Statistical analysis reveals a relationship between some independent variables: gender and buying eco-friendly products, professional status and the type of transportation mode, and gender and readiness to give up things for the environment.

Most students link CE with the 4Rs and the recycling principle, which is consistent with prior studies. However, data also showed that students also tend to associate CE with principles such as zero waste economy, renewable energy and shared resources, which suggests that their knowledge of CE is satisfactory. Those who claimed to understand CE also stated that they put it into practice. Findings also show that the level of understanding has a relationship with the

level of education and the individual's location, and the level of education has a close association with the practice of CE behaviours.

Nevertheless, data shows that much work remains to be done, with a particular emphasis on raising awareness, educating students to become eco-citizens, and changing the current higher education system and campus operations to promote not only the transition to CE, but also the change in students' knowledge, values, and behaviours toward CE. Therefore, the conclusions of this study are important for HEIs, policymakers, businesses, educational associations, and other NGOs as they gain a better knowledge of what are the perceptions and consumption behaviours of students, which will help them determine future measures to enhance circular consumption patterns among Portuguese students.

2. Limitations and Future Research Recommendations

The most relevant limitations of this work derive from the methodology employed. Given the sample's convenience sample, the whole Portuguese population is not represented. Furthermore, the number of answers gathered was limited and does not reflect the entire target audience. Moreover, as one of the key disadvantages of questionnaires is the lack of responses due to the time necessary for completion, the current questionnaire did not address all of the circular behaviours, attitudes and knowledge aspects.

Nonetheless, there are several opportunities for further research in this field. Thus, investigating the study topics addressed in this work for alternative target groups, such as adolescents or middle-aged individuals, as well as identifying generational discrepancies, would be worthwhile. Besides, future research could also focus on the investigation of the motivations and barriers of students, as well as mapping all HEIs initiatives and creating an action plan for HEIs, which is more effective in changing students' perceptions and behaviours.

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Appendix

Appendix 1- Questionnaire

Economia Circular: comportamentos, atitudes e conhecimentos dos estudantes universitários portugueses

O presente questionário foi desenvolvido no âmbito da dissertação para obtenção do grau de Mestre em Gestão pela Católica Porto Business School.
Este estudo tem como propósito avaliar os comportamentos, atitudes e conhecimentos na promoção da Economia Circular em Portugal. Destina-se aos estudantes universitários portugueses.

Este questionário terá a duração de 4 minutos.

Todas as informações recolhidas serão confidenciais e utilizadas apenas para fins da dissertação. É importante mencionar que não existem respostas certas ou erradas.

A sua colaboração é extremamente importante!
Obrigada pela sua participação! Pode contactar-me através do seguinte email:
marcialves828@gmail.com

*Obrigatório

Comportamentos

*Remanufaturado: Que se submeteu a um processo industrial aplicado a produtos usados que sofrem desmontagem, limpeza e reparação ou substituição de componentes, para posteriormente serem novamente montados e testados. Fonte: https://dicionario.priberam.org/remanufaturado

1. 1. Indique em que medida cada uma das seguintes frases traduz o seu comportamento fac a um conjunto de situações numa escala de 1 (discordo totalmente) a 5 (concordo totalmente) *

Marcar apenas uma opção por linha.

Marcar apenas uma oval por linha.

	Discordo totalmente	Discordo	Não concordo nem discordo	Concordo	Concordo totalment
Compro frequentemente produtos amigos do ambiente					
Tenho por hábito separar materiais para reciclagem e resíduos orgânicos					

Faço viagens partilhadas para trabalho/universidade (carpooling)					
Compro produtos eletrónicos e gadgets completamente novos					
Compro frequentemente roupa em segunda mão					
Já comprei produtos remanufacturados*					
Procuro ajuda e estou disponível para pagar o serviço de reparação de objetos de forma a prolongar o seu ciclo de vida					
Minimizo o desperdício alimentar					
Levo pilhas, lâmpadas e outros gadgets para centros de recolha					
Utilizo transportes públicos/bicicletas/trotinetes elétricas para me deslocar para o trabalho/universidade					
Compro lâmpadas economizadoras para a minha habitação					

2. 2. Quando compra um produto, preocupa-se: *

Marcar apenas uma opção.

Marcar apenas uma oval.

- ◯ Em escolher produtos com embalagens compostas por material reciclado e sem plástico
- ◯ Com a informação sobre se é facilmente reciclável
- ◯ Não verifico normalmente nenhum aspeto ambiental
- ◯ Nenhuma das anteriores

3. 3. Compra com frequência algum dos seguintes produtos? *

Marcar tudo o que for aplicável.

Marcar tudo o que for aplicável.

- ☐ Produtos sem embalagens de plástico
- ☐ Produtos com rótulo amigo do ambiente
- ☐ Produtos eficientes na utilização de energia e água
- ☐ Alimentos verdes ou alimentos orgânicos
- ☐ Nenhum dos anteriores

4. 4. Normalmente, opta por comprar um telemóvel: *

Marcar apenas uma opção.

Marcar apenas uma oval.

- ◯ Em segunda mão
- ◯ Novo
- ◯ Remanufaturado
- ◯ Nenhuma das anteriores

5. 5. Quais das seguintes ações já realizou? *

Marcar tudo o que for aplicável.

Marcar tudo o que for aplicável.

- [ ] Aluguei um quarto a turistas
- [ ] Reservei um quarto/apartamento no Airbnb
- [ ] Partilhei uma viagem (através de aplicações como o BlaBlaCar)
- [ ] Aluguei roupa (ex. disfarce de Carnaval)
- [ ] Nenhuma dos anteriores

6. 6. Quando deixa de utilizar um produto, quais das seguintes ações costuma adotar com frequência? *

Marcar tudo o que for aplicável.

Marcar tudo o que for aplicável.

- [ ] Vender
- [ ] Doar
- [ ] Guardar em casa
- [ ] Reparar/Remendar
- [ ] Nenhuma das anteriores

7. 7. Em quais das seguintes iniciativas já participou? *

Marcar tudo o que for aplicável.

Marcar tudo o que for aplicável.

- [ ] Recolha de lixo nas praias/florestas
- [ ] Sessões/palestras informativas sobre ações mais circulares
- [ ] Petição de apoio à proteção ambiental
- [ ] Iniciativa de sensibilização pública
- [ ] Voluntariado Social
- [ ] Nenhuma das anteriores

Atitudes

*Remanufaturado: Que se submeteu a um processo industrial aplicado a produtos usados que sofrem desmontagem, limpeza e reparação ou substituição de componentes, para posteriormente serem novamente montados e testados. Fonte: https://dicionario.priberam.org/remanufaturado

8. 8. Indique em que medida cada uma das seguintes frases traduz a sua atitude face a um conjunto de situações numa escala de 1 (discordo totalmente) a 5 (concordo totalmente) *

Marcar apenas uma opção por linha.

Marcar apenas uma oval por linha.

	Discordo totalmente	Discordo	Não concordo nem discordo	Concordo	Concordo Totalment
Estou disposto a comprar produtos mais sustentáveis mesmo que isso implique pagar um preço superior	◯	◯	◯	◯	◯
Estou disposto a desistir de coisas que gosto de fazer se estas prejudicarem o meio ambiente	◯	◯	◯	◯	◯
Considero partilhar boleia por motivos ecológicos	◯	◯	◯	◯	◯
Considero pagar por um serviço de aluguer de roupa ao invés de a comprar nova	◯	◯	◯	◯	◯
Tenho intenção de doar ou vender roupa que já não utilizo	◯	◯	◯	◯	◯
Estou disposto a procurar ajuda e pagar o serviço de reparação de objetos de forma a prolongar o seu ciclo de vida	◯	◯	◯	◯	◯
Considero trocar o meu telemóvel por um telemóvel remanufaturado*	◯	◯	◯	◯	◯
Estou disposto a melhorar os meus hábitos de reciclagem	◯	◯	◯	◯	◯
Tenho intenções de diminuir o desperdício no meu quotidiano	◯	◯	◯	◯	◯

Tenho intenções de comprar eletrodomésticos economizadores de água ou luz					

Conhecimentos

9. 9. Já ouviu falar da Economia Circular? *

Marcar apenas uma opção.

Marcar apenas uma oval.

- Nunca ouvi falar *Avançar para a pergunta 14*
- Pouco
- Moderamente
- Muito
- Bastante

Conhecimentos

10. 10. Das seguintes afirmações, o que é para si a Economia Circular? *

Marcar apenas uma opção.

Marcar apenas uma oval.

- Um modo mais sustentável de produzir e consumir
- Reciclar os resíduos
- Reduzir, reutilizar, remanufaturar, reciclar
- Uma economia que é capaz de se regenerar por si mesma
- Uma economia marcada por zero desperdício
- Nenhuma das anteriores

11. 11. Quais são para si os principais princípios da Economia Circular? *

Marcar tudo o que for aplicável.

Marcar tudo o que for aplicável.

- [ ] Reciclagem
- [ ] Zero Desperdício
- [ ] Recursos partilhados
- [ ] Aumento de trocas
- [ ] Utilizar energias mais renováveis
- [ ] Fechar o ciclo de vida dos produtos/materiais
- [ ] Nenhuma das anteriores

12. 12. Através de que meios obteve informação acerca da Economia Circular? *

Marcar tudo o que for aplicável.

Marcar tudo o que for aplicável.

- [ ] Palestras
- [ ] Campanhas comerciais
- [ ] Em contexto universitário (aulas)
- [ ] Em conversa com amigos ou familiares
- [ ] Redes sociais
- [ ] Media tradicionais
- [ ] Documentário
- [ ] Nenhuma das anteriores

13. 13. Considera que pratica ações que promovem a Economia Circular? *

Marcar apenas uma opção.

Marcar apenas uma oval.

- ◯ Sim
- ◯ Não

Dados sociodemográficos

14. Idade *

_____

15. Género *

Marcar apenas uma oval.

- ◯ Masculino
- ◯ Feminino
- ◯ Outra: _____

16. Ensino Superior- Frequência: *

Marcar tudo o que for aplicável.

- ☐ Bacharelato/Licenciatura
- ☐ Mestrado
- ☐ Doutoramento
- ☐ Pós-Graduação

Outra: ☐ _____

17. Localidade *

Marcar apenas uma oval.

- ◯ Viana do Castelo
- ◯ Braga
- ◯ Vila Real
- ◯ Bragança
- ◯ Porto
- ◯ Aveiro
- ◯ Viseu
- ◯ Coimbra
- ◯ Guarda
- ◯ Leiria
- ◯ Castelo Branco
- ◯ Santarém
- ◯ Portalegre
- ◯ Lisboa
- ◯ Setúbal
- ◯ Évora
- ◯ Beja
- ◯ Faro
- ◯ Açores
- ◯ Madeira

18. Situação Profissional *

Marcar apenas uma oval.

- ◯ Estudante
- ◯ Trabalhador-Estudante

Appendix 2- Sociodemographic sample characterisation

Characteristics	Frequency (n=377)	Valid Percentage (%)
Gender		
Female	278	73,7
Male	99	26,3
Higher Education		
Bachelor's Degree	210	55,7
Master's Degree	142	37,7
Post-Graduation	10	2,7
PhD	15	4,0
Location		
Açores	5	1,3
Aveiro	18	4,8
Braga	90	23,9
Bragança	2	0,5
Coimbra	2	0,5
Évora	4	1,1
Guarda	2	0,5
Leiria	1	0,3
Lisboa	10	2,7
Portalegre	22	5,8
Porto	193	51,2
Santarém	6	1,6
Setúbal	2	0,5
Viana do Castelo	9	2,4
Vila Real	4	1,1
Viseu	7	1,9
Professional Status		
Students	265	70,3
Working students	112	29,7
Age		
18	24	6,4
19	35	9,3
20	40	10,6
21	37	9,8
22	62	16,4
23	53	14,1

24	32	8,5
25	13	3,4
26	8	2,1
27	3	0,8
28	9	2,4
29	9	2,4
30	5	1,3
31	5	1,3
32	4	1,1
33	2	0,5
34	2	0,5
35	2	0,5
36	2	0,5
37	2	0,5
38	2	0,5
39	4	1,1
40	1	0,3
41	1	0,3
42	2	0,5
43	2	0,5
44	1	0,3
45	1	0,3
46	2	0,5
47	2	0,5
48	3	0,8
52	1	0,3
53	1	0,3
57	1	0,3
58	1	0,3
59	1	0,3
62	1	0,3
72	1	0,3

Appendix 3 – SPSS results of the behaviour, attitudes and knowledge sections

3.1. SPSS results of the behaviour section

1.1. I often buy environmentally friendly products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	10	2,7	2,7	2,7
	Disagree	57	15,1	15,1	17,8
	Neither agree nor disagree	128	34,0	34,0	51,7
	Agree	151	40,1	40,1	91,8
	Strongly agree	31	8,2	8,2	100,0
	Total	377	100,0	100,0	

1.2. I usually separate materials for recycling and organic waste

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	20	5,3	5,3	5,3
	Disagree	43	11,4	11,4	16,7
	Neither agree nor disagree	30	8,0	8,0	24,7
	Agree	90	23,9	23,9	48,5
	Strongly agree	194	51,5	51,5	100,0
	Total	377	100,0	100,0	

1.3. I carpool to work/university

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	102	27,1	27,1	27,1
	Disagree	93	24,7	24,7	51,7
	Neither agree nor disagree	52	13,8	13,8	65,5
	Agree	63	16,7	16,7	82,2
	Strongly agree	67	17,8	17,8	100,0
	Total	377	100,0	100,0	

1.4. I buy brand new electronic products and gadgets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	17	4,5	4,5	4,5
	Disagree	38	10,1	10,1	14,6
	Neither agree nor disagree	52	13,8	13,8	28,4
	Agree	148	39,3	39,3	67,6
	Strongly agree	122	32,4	32,4	100,0
	Total	377	100,0	100,0	

1.5. I often buy second-hand clothes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	126	33,4	33,4	33,4
	Disagree	121	32,1	32,1	65,5
	Neither agree nor disagree	55	14,6	14,6	80,1
	Agree	48	12,7	12,7	92,8
	Strongly agree	27	7,2	7,2	100,0
	Total	377	100,0	100,0	

1.6. I have already bought remanufactured products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	77	20,4	20,4	20,4
	Disagree	64	17,0	17,0	37,4
	Neither agree nor disagree	114	30,2	30,2	67,6
	Agree	92	24,4	24,4	92,0
	Strongly agree	30	8,0	8,0	100,0
	Total	377	100,0	100,0	

1.7. I look for help and I am willing to pay for a repair service to extend the life cycle of items

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	11	2,9	2,9	2,9
	Disagree	20	5,3	5,3	8,2
	Neither agree nor disagree	59	15,6	15,6	23,9
	Agree	178	47,2	47,2	71,1
	Strongly agree	109	28,9	28,9	100,0
	Total	377	100,0	100,0	

1.8. I minimise food waste

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	1,1	1,1	1,1
	Disagree	9	2,4	2,4	3,4
	Neither agree nor disagree	32	8,5	8,5	11,9
	Agree	153	40,6	40,6	52,5
	Strongly agree	179	47,5	47,5	100,0
	Total	377	100,0	100,0	

1.9. I take batteries, light bulbs and other gadgets to collection centres

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	28	7,4	7,4	7,4
	Disagree	48	12,7	12,7	20,2
	Neither agree nor disagree	57	15,1	15,1	35,3
	Agree	103	27,3	27,3	62,6
	Strongly agree	141	37,4	37,4	100,0
	Total	377	100,0	100,0	

1.10. I use public transport/bicycles/electric scooters to get to work/university

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	84	22,3	22,3	22,3
	Disagree	44	11,7	11,7	34,0
	Neither agree nor disagree	21	5,6	5,6	39,5
	Agree	51	13,5	13,5	53,1
	Strongly agree	177	46,9	46,9	100,0
	Total	377	100,0	100,0	

1.11. I buy energy-saving light bulbs for my home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	11	2,9	2,9	2,9
	Disagree	12	3,2	3,2	6,1
	Neither agree nor disagree	54	14,3	14,3	20,4
	Agree	95	25,2	25,2	45,6
	Strongly agree	205	54,4	54,4	100,0
	Total	377	100,0	100,0	

2. When purchasing sustainable products, consumers look at:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I do not normally check any environmental aspect	145	38,5	38,5	38,5
	In choosing products with packaging made of recycled material and without plastic	110	29,2	29,2	67,6
	None of the above	36	9,5	9,5	77,2
	With information on whether it is easily recyclable	86	22,8	22,8	100,0
	Total	377	100,0	100,0	

$Question3 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question3[a]	Products without plastic packaging	125	25,7%	54,1%
	Environmentally labelled products	119	24,5%	51,5%
	Energy and water efficient products	83	17,1%	35,9%
	Green or organic food	138	28,4%	59,7%
	None of the above	21	4,3%	9,1%
Total		486	100,0%	210,4%

a. Dichotomy group tabulated at value 1.

4. Normally, you choose to buy a mobile phone:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Brand New	312	82,8	82,8	82,8
	None of the above	12	3,2	3,2	85,9
	Remanufactured	14	3,7	3,7	89,7
	Second-hand	39	10,3	10,3	100,0
	Total	377	100,0	100,0	

$Question5 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question5[a]	I rented a room to tourists	11	4,0%	4,8%
	Booked a room/apartment on Airbnb	115	41,7%	49,8%
	Shared a trip (through apps like BlaBlaCar)	32	11,6%	13,9%
	I rented clothes (e.g. Carnival costumes)	23	8,3%	10,0%
	None of the above	95	34,4%	41,1%
Total		276	100,0%	119,5%

a. Dichotomy group tabulated at value 1.

$Question6 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question6[a]	Selling	99	20,0%	42,9%
	Donating	199	40,3%	86,1%
	Repairing/Remending	110	22,3%	47,6%
	Keeping at home	86	17,4%	37,2%
Total		494	100,0%	213,9%

a. Dichotomy group tabulated at value 1.

$Question7 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question7[a]	Beach/forest litter collection	59	15,0%	30,4%
	Information sessions/lectures on more circular actions	104	26,4%	53,6%
	Petition in support of environmental protection	63	16,0%	32,5%
	Public awareness initiative	42	10,7%	21,6%
	Social volunteering	82	20,8%	42,3%
	None of the above	44	11,2%	22,7%
Total		394	100,0%	203,1%

a. Dichotomy group tabulated at value 1.

3.2. SPSS results of the attitudes section

8.1. I am willing to buy more sustainable products even if it means paying a higher price

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	14	3,7	3,7	3,7
	Disagree	60	15,9	15,9	19,6
	Neither agree nor disagree	81	21,5	21,5	41,1
	Agree	173	45,9	45,9	87,0
	Strongly agree	49	13,0	13,0	100,0
	Total	377	100,0	100,0	

8.2. I am willing to give up things I enjoy doing if they harm the environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	9	2,4	2,4	2,4
	Disagree	40	10,6	10,6	13,0
	Neither agree nor disagree	126	33,4	33,4	46,4
	Agree	159	42,2	42,2	88,6
	Strongly agree	43	11,4	11,4	100,0
	Total	377	100,0	100,0	

8.3. I consider carpooling for ecological reasons

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	21	5,6	5,6	5,6
	Disagree	32	8,5	8,5	14,1
	Neither agree nor disagree	63	16,7	16,7	30,8
	Agree	157	41,6	41,6	72,4
	Strongly agree	104	27,6	27,6	100,0
	Total	377	100,0	100,0	

8.4. I consider paying for a clothes rental service instead of buying new clothes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	77	20,4	20,4	20,4
	Disagree	112	29,7	29,7	50,1
	Neither agree nor disagree	100	26,5	26,5	76,7
	Agree	63	16,7	16,7	93,4
	Strongly agree	25	6,6	6,6	100,0
	Total	377	100,0	100,0	

8.5. I intend to donate or sell clothes I no longer use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	,3	,3	,3
	Disagree	6	1,6	1,6	1,9
	Neither agree nor disagree	10	2,7	2,7	4,5
	Agree	93	24,7	24,7	29,2
	Strongly agree	267	70,8	70,8	100,0
	Total	377	100,0	100,0	

8.6.I am willing to seek help and pay for a service of repairing objects in order to extend their life cycle

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	,8	,8	,8
	Disagree	8	2,1	2,1	2,9
	Neither agree nor disagree	32	8,5	8,5	11,4
	Agree	186	49,3	49,3	60,7
	Strongly agree	148	39,3	39,3	100,0
	Total	377	100,0	100,0	

8.7. I am considering exchanging my mobile phone for a remanufactured one

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	60	15,9	15,9	15,9
	Disagree	100	26,5	26,5	42,4
	Neither agree nor disagree	117	31,0	31,0	73,5
	Agree	61	16,2	16,2	89,7
	Strongly agree	39	10,3	10,3	100,0
	Total	377	100,0	100,0	

8.8. I am willing to improve my recycling habits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	,3	,3	,3
	Disagree	7	1,9	1,9	2,1
	Neither agree nor disagree	17	4,5	4,5	6,6
	Agree	112	29,7	29,7	36,3
	Strongly agree	240	63,7	63,7	100,0
	Total	377	100,0	100,0	

8.9. I intend to reduce waste in my daily life

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	,5	,5	,5
	Disagree	1	,3	,3	,8
	Neither agree nor disagree	18	4,8	4,8	5,6
	Agree	115	30,5	30,5	36,1
	Strongly agree	241	63,9	63,9	100,0
	Total	377	100,0	100,0	

8.10. I intend to buy water or electricity-saving appliances

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	1,1	1,1	1,1
	Neither agree nor disagree	26	6,9	6,9	8,0
	Agree	110	29,2	29,2	37,1
	Strongly agree	237	62,9	62,9	100,0
	Total	377	100,0	100,0	

3.3. SPSS results of the knowledge section

9. Have you heard of the Circular Economy?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never heard of it	90	23,9	23,9	23,9
	Little	76	20,2	20,2	44,0
	Moderately	108	28,6	28,6	72,7
	Very	51	13,5	13,5	86,2
	Quite a lot	52	13,8	13,8	100,0
	Total	377	100,0	100,0	

10. From the following statements, what is the Circular Economy for you?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A more sustainable way of producing and consuming	64	17,0	22,3	22,3
	An economy marked by zero waste	30	8,0	10,5	32,8
	An economy that is able to regenerate itself	82	21,8	28,6	61,3
	Recycling waste	3	,8	1,0	62,4
	Reduce, reuse, remanufacture, recycle	108	28,6	37,6	100,0
	Total	287	76,1	100,0	
Missing	999	90	23,9		
Total		377	100,0		

$Question11 Frequencies

		Responses		Percent of Cases
		N	Percent	
Question 11[a]	Recycling	220	23,6%	76,7%
	Zero Waste	202	21,6%	70,4%
	Shared resources	175	18,7%	61,0%
	Increase in exchanges	100	10,7%	34,8%
	Using more renewable energy	161	17,2%	56,1%
	Closing the product/materials life cycle	75	8,0%	26,1%
	None of the above	1	0,1%	0,3%
Total		934	100,0%	325,4%

a. Dichotomy group tabulated at value 1.

$Question12 Frequencies

		Responses		Percent of Cases
		N	Percent	
Question12[a]	Lectures	67	11,0%	23,3%
	Marketing campaigns	46	7,6%	16,0%
	In a university context (lessons)	124	20,4%	43,2%
	In conversation with friends or family	87	14,3%	30,3%
	Social media	134	22,0%	46,7%
	Traditional media	76	12,5%	26,5%
	Documentary	54	8,9%	18,8%
	None of the above	21	3,4%	7,3%
Total		609	100,0%	212,2%

a. Dichotomy group tabulated at value 1.

13. Do you consider that you practice actions that promote Circular Economy?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	53	14,1	18,5	18,5
	1	234	62,1	81,5	100,0
	Total	287	76,1	100,0	
Missing	999	90	23,9		
Total		377	100,0		

Appendix 4- Participants whose answer was "No" in question 13

Descriptive Statistics

	N	Mean	Std. Deviation
1.1. I often buy environmentally friendly products	53	2,92	,829
1.2. I usually separate materials for recycling and organic waste	53	3,02	1,308
1.3. I carpool to work/university	53	2,47	1,339
1.4. I buy brand new electronic products and gadgets	53	4,04	1,018
1.5. I often buy second-hand clothes	53	1,96	1,109
1.6. I have already bought remanufactured products	53	2,68	1,140
1.7. I look for help and I am willing to pay for a repair service to extend the life cycle of items	53	3,51	1,120
1.8. I minimise food waste	53	3,94	1,045
1.9. I take batteries, light bulbs and other gadgets to collection centres	53	2,98	1,201
1.10. I use public transport/bicycles/electri c scooters to get to work/university	53	2,94	1,770
1.11. I buy energy-saving light bulbs for my home	53	4,21	1,063
Valid N (listwise)	53		

Descriptive Statistics

	N	Mean	Std. Deviation
8.1. I am willing to buy more sustainable products even if it means paying a higher price	53	3,09	1,043
8.2. I am willing to give up things I enjoy doing if they harm the environment	53	3,21	,927
8.3. I consider carpooling for ecological reasons	53	3,55	,972
8.4. I consider paying for a clothes rental service instead of buying new clothes	53	2,36	,922
8.5. I intend to donate or sell clothes I no longer use	53	4,25	,939
8.6.I am willing to seek help and pay for a service of repairing objects in order to extend their life cycle	53	3,98	,747
8.7. I am considering exchanging my mobile phone for a remanufactured one	53	2,58	1,134
8.8. I am willing to improve my recycling habits	53	4,23	,776
8.9. I intend to reduce waste in my daily life	53	4,17	,672
8.10. I intend to buy water or electricity-saving appliances	53	4,38	,686
Valid N (listwise)	53		

Appendix 5- Participants whose answer was "Yes" in question 13

Descriptive Statistics

	N	Mean	Std. Deviation
1.1. I often buy environmentally friendly products	234	3,50	,918
1.2. I usually separate materials for recycling and organic waste	234	4,30	1,071
1.3. I carpool to work/university	234	2,70	1,490
1.4. I buy brand new electronic products and gadgets	234	3,82	1,122
1.5. I often buy second-hand clothes	234	2,34	1,244
1.6. I have already bought remanufactured products	234	2,92	1,256
1.7. I look for help and I am willing to pay for a repair service to extend the life cycle of items	234	4,07	,883
1.8. I minimise food waste	234	4,39	,791
1.9. I take batteries, light bulbs and other gadgets to collection centres	234	3,96	1,202
1.10. I use public transport/bicycles/electric scooters to get to work/university	234	3,52	1,673
1.11. I buy energy-saving light bulbs for my home	234	4,32	,970
Valid N (listwise)	234		

Descriptive Statistics

	N	Mean	Std. Deviation
8.1. I am willing to buy more sustainable products even if it means paying a higher price	234	3,66	,999
8.2. I am willing to give up things I enjoy doing if they harm the environment	234	3,59	,880
8.3. I consider carpooling for ecological reasons	234	3,74	1,155
8.4. I consider paying for a clothes rental service instead of buying new clothes	234	2,74	1,213
8.5. I intend to donate or sell clothes I no longer use	234	4,74	,514
8.6.I am willing to seek help and pay for a service of repairing objects in order to extend their life cycle	234	4,31	,764
8.7. I am considering exchanging my mobile phone for a remanufactured one	234	2,94	1,194
8.8. I am willing to improve my recycling habits	234	4,66	,596
8.9. I intend to reduce waste in my daily life	234	4,71	,566
8.10. I intend to buy water or electricity-saving appliances	234	4,62	,626
Valid N (listwise)	234		

Appendix 6- Individuals whose answer was "Not have heard of CE" in question 9

Descriptive Statistics

	N	Mean	Std. Deviation
1.1. I often buy environmentally friendly products	90	3,27	,922
1.2. I usually separate materials for recycling and organic waste	90	3,99	1,285
1.3. I carpool to work/university	90	2,98	1,453
1.4. I buy brand new electronic products and gadgets	90	3,81	1,160
1.5. I often buy second-hand clothes	90	2,28	1,316
1.6. I have already bought remanufactured products	90	2,66	1,201
1.7. I look for help and I am willing to pay for a repair service to extend the life cycle of items	90	3,84	,970
1.8. I minimise food waste	90	4,31	,630
1.9. I take batteries, light bulbs and other gadgets to collection centres	90	3,62	1,346
1.10. I use public transport/bicycles/electric scooters to get to work/university	90	3,82	1,496
1.11. I buy energy-saving light bulbs for my home	90	4,09	1,067
Valid N (listwise)	90		

Descriptive Statistics

	N	Mean	Std. Deviation
Participant's ID	90	208,66	103,647
8.1. I am willing to buy more sustainable products even if it means paying a higher price	90	3,26	,989
8.2. I am willing to give up things I enjoy doing if they harm the environment	90	3,42	,971
8.3. I consider carpooling for ecological reasons	90	3,99	1,055
8.4. I consider paying for a clothes rental service instead of buying new clothes	90	2,33	1,171
8.5. I intend to donate or sell clothes I no longer use	90	4,63	,644
8.6.I am willing to seek help and pay for a service of repairing objects in order to extend their life cycle	90	4,23	,735
8.7. I am considering exchanging my mobile phone for a remanufactured one	90	2,52	1,211
8.8. I am willing to improve my recycling habits	90	4,44	,809
8.9. I intend to reduce waste in my daily life	90	4,46	,721
8.10. I intend to buy water or electricity-saving appliances	90	4,43	,750
Valid N (listwise)	90		

$Question3 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question3[a]	Products without plastic packaging	49	30,8%	54,4%
	Environmentally labelled products	34	21,4%	37,8%
	Energy and water efficient products	21	13,2%	23,3%
	Green or organic food	39	24,5%	43,3%
	None of the above	16	10,1%	17,8%
Total		159	100,0%	176,7%

a. Dichotomy group tabulated at value 1.

$Question5 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question5[a]	I rented a room to tourists	4	3,8%	4,4%
	Booked a room/apartment on Airbnb	31	29,5%	34,4%
	Shared a trip (through apps like BlaBlaCar)	5	4,8%	5,6%
	I rented clothes (e.g. Carnival costumes)	10	9,5%	11,1%
	None of the above	55	52,4%	61,1%
Total		105	100,0%	116,7%

a. Dichotomy group tabulated at value 1.

$Question6 Frequencies

		Responses N	Responses Percent	Percent of Cases
Question6[a]	Selling	36	18,9%	40,0%
	Donating	72	37,9%	80,0%
	Repairing/Remending	53	27,9%	58,9%
	Keeping at home	29	15,3%	32,2%
Total		190	100,0%	211,1%

a. Dichotomy group tabulated at value 1.

Appendix 7- SPSS outputs of chi-square tests

7.1. Test 1

18. Professional Status * 1.1. I often buy environmentally friendly products Crosstabulation

			1.1. I often buy environmentally friendly products					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
18. Professional Status	Student	Count	9	42	92	105	17	265
		Expected Count	7,0	40,1	90,0	106,1	21,8	265,0
		% within 18. Professional Status	3,4%	15,8%	34,7%	39,6%	6,4%	100,0%
		% within 1.1. I often buy environmentally friendly products	90,0%	73,7%	71,9%	69,5%	54,8%	70,3%
		% of Total	2,4%	11,1%	24,4%	27,9%	4,5%	70,3%
	Working-student	Count	1	15	36	46	14	112
		Expected Count	3,0	16,9	38,0	44,9	9,2	112,0
		% within 18. Professional Status	0,9%	13,4%	32,1%	41,1%	12,5%	100,0%
		% within 1.1. I often buy environmentally friendly products	10,0%	26,3%	28,1%	30,5%	45,2%	29,7%
		% of Total	0,3%	4,0%	9,5%	12,2%	3,7%	29,7%
Total		Count	10	57	128	151	31	377
		Expected Count	10,0	57,0	128,0	151,0	31,0	377,0
		% within 18. Professional Status	2,7%	15,1%	34,0%	40,1%	8,2%	100,0%
		% within 1.1. I often buy environmentally friendly products	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	2,7%	15,1%	34,0%	40,1%	8,2%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5,914[a]	4	,206
Likelihood Ratio	6,075	4	,194
N of Valid Cases	377		

a. 1 cells (10,0%) have expected count less than 5. The minimum expected count is 2,97.

7.2. Test 2

15. Gender * 1.5. I often buy second-hand clothes Crosstabulation

			1.5. I often buy second-hand clothes					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
15. Gender	Female	Count	85	87	44	39	23	278
		Expected Count	92,9	89,2	40,6	35,4	19,9	278,0
		% within 15. Gender	30,6%	31,3%	15,8%	14,0%	8,3%	100,0%
		% within 1.5. I often buy second-hand clothes	67,5%	71,9%	80,0%	81,3%	85,2%	73,7%
		% of Total	22,5%	23,1%	11,7%	10,3%	6,1%	73,7%
	Male	Count	41	34	11	9	4	99
		Expected Count	33,1	31,8	14,4	12,6	7,1	99,0
		% within 15. Gender	41,4%	34,3%	11,1%	9,1%	4,0%	100,0%
		% within 1.5. I often buy second-hand clothes	32,5%	28,1%	20,0%	18,8%	14,8%	26,3%
		% of Total	10,9%	9,0%	2,9%	2,4%	1,1%	26,3%
Total		Count	126	121	55	48	27	377
		Expected Count	126,0	121,0	55,0	48,0	27,0	377,0
		% within 15. Gender	33,4%	32,1%	14,6%	12,7%	7,2%	100,0%
		% within 1.5. I often buy second-hand clothes	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	33,4%	32,1%	14,6%	12,7%	7,2%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7,115[a]	4	,130
Likelihood Ratio	7,398	4	,116
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,09.

7.3. Test 3

Age Groups * 1.6. I have already bought remanufactured products Crosstabulation

			1.6. I have already bought remanufactured products					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Age Groups	Over 25	Count	20	14	18	28	14	94
		Expected Count	19,2	16,0	28,4	22,9	7,5	94,0
		% within Age Groups	21,3%	14,9%	19,1%	29,8%	14,9%	100,0%
		% within 1.6. I have already bought remanufactured products	26,0%	21,9%	15,8%	30,4%	46,7%	24,9%
		% of Total	5,3%	3,7%	4,8%	7,4%	3,7%	24,9%
	Under 25	Count	57	50	96	64	16	283
		Expected Count	57,8	48,0	85,6	69,1	22,5	283,0
		% within Age Groups	20,1%	17,7%	33,9%	22,6%	5,7%	100,0%
		% within 1.6. I have already bought remanufactured products	74,0%	78,1%	84,2%	69,6%	53,3%	75,1%
		% of Total	15,1%	13,3%	25,5%	17,0%	4,2%	75,1%
Total		Count	77	64	114	92	30	377
		Expected Count	77,0	64,0	114,0	92,0	30,0	377,0
		% within Age Groups	20,4%	17,0%	30,2%	24,4%	8,0%	100,0%
		% within 1.6. I have already bought remanufactured products	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	20,4%	17,0%	30,2%	24,4%	8,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14,515[a]	4	,006
Likelihood Ratio	14,031	4	,007
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,48.

7.4. Test 4

18. Professional Status * 1.10. I use public transport/bicycles/electric scooters to get to work/university Crosstabulation

			1.10. I use public transport/bicycles/electric scooters to get to work/university					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
18. Professional Status	Student	Count	49	28	14	34	140	265
		Expected Count	59,0	30,9	14,8	35,8	124,4	265,0
		% within 18. Professional Status	18,5%	10,6%	5,3%	12,8%	52,8%	100,0%
		% within 1.10. I use public transport/bicycles/electric scooters to get to work/university	58,3%	63,6%	66,7%	66,7%	79,1%	70,3%
		% of Total	13,0%	7,4%	3,7%	9,0%	37,1%	70,3%
	Working-student	Count	35	16	7	17	37	112
		Expected Count	25,0	13,1	6,2	15,2	52,6	112,0
		% within 18. Professional Status	31,3%	14,3%	6,3%	15,2%	33,0%	100,0%
		% within 1.10. I use public transport/bicycles/electric scooters to get to work/university	41,7%	36,4%	33,3%	33,3%	20,9%	29,7%
		% of Total	9,3%	4,2%	1,9%	4,5%	9,8%	29,7%
Total		Count	84	44	21	51	177	377
		Expected Count	84,0	44,0	21,0	51,0	177,0	377,0
		% within 18. Professional Status	22,3%	11,7%	5,6%	13,5%	46,9%	100,0%
		% within 1.10. I use public transport/bicycles/electric scooters to get to work/university	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	22,3%	11,7%	5,6%	13,5%	46,9%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13,709[a]	4	,008
Likelihood Ratio	13,778	4	,008
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 6,24.

7.5. Test 5

15. Gender * 2. When purchasing sustainable products, consumers look at: Crosstabulation

			2. When purchasing sustainable products, consumers look at:				
			I do not normally check any environmental aspect	In choosing products with packaging made of recycled material and without plastic	None of the above	With information on whether it is easily recyclable	Total
15. Gender	Female	Count	98	86	28	66	278
		Expected Count	106,9	81,1	26,5	63,4	278,0
		% within 15. Gender	35,3%	30,9%	10,1%	23,7%	100,0%
		% within 2. When purchasing sustainable products, consumers look at:	67,6%	78,2%	77,8%	76,7%	73,7%
		% of Total	26,0%	22,8%	7,4%	17,5%	73,7%
	Male	Count	47	24	8	20	99
		Expected Count	38,1	28,9	9,5	22,6	99,0
		% within 15. Gender	47,5%	24,2%	8,1%	20,2%	100,0%
		% within 2. When purchasing sustainable products, consumers look at:	32,4%	21,8%	22,2%	23,3%	26,3%
		% of Total	12,5%	6,4%	2,1%	5,3%	26,3%
Total		Count	145	110	36	86	377
		Expected Count	145,0	110,0	36,0	86,0	377,0
		% within 15. Gender	38,5%	29,2%	9,5%	22,8%	100,0%
		% within 2. When purchasing sustainable products, consumers look at:	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	38,5%	29,2%	9,5%	22,8%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4,660[a]	3	,198
Likelihood Ratio	4,602	3	,203
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,45.

7.6. Test 6

15. Gender * 8.2. I am willing to give up things I enjoy doing if they harm the environment Crosstabulation

			8.2. I am willing to give up things I enjoy doing if they harm the environment					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
15. Gender	Female	Count	2	26	99	121	30	278
		Expected Count	6,6	29,5	92,9	117,2	31,7	278,0
		% within 15. Gender	0,7%	9,4%	35,6%	43,5%	10,8%	100,0%
		% within 8.2. I am willing to give up things I enjoy doing if they harm the environment	22,2%	65,0%	78,6%	76,1%	69,8%	73,7%
		% of Total	0,5%	6,9%	26,3%	32,1%	8,0%	73,7%
	Male	Count	7	14	27	38	13	99
		Expected Count	2,4	10,5	33,1	41,8	11,3	99,0
		% within 15. Gender	7,1%	14,1%	27,3%	38,4%	13,1%	100,0%
		% within 8.2. I am willing to give up things I enjoy doing if they harm the environment	77,8%	35,0%	21,4%	23,9%	30,2%	26,3%
		% of Total	1,9%	3,7%	7,2%	10,1%	3,4%	26,3%
Total		Count	9	40	126	159	43	377
		Expected Count	9,0	40,0	126,0	159,0	43,0	377,0
		% within 15. Gender	2,4%	10,6%	33,4%	42,2%	11,4%	100,0%
		% within 8.2. I am willing to give up things I enjoy doing if they harm the environment	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	2,4%	10,6%	33,4%	42,2%	11,4%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16,240[a]	4	,003
Likelihood Ratio	14,281	4	,006
N of Valid Cases	377		

a. 1 cells (10,0%) have expected count less than 5. The minimum expected count is 2,36.

7.7. Test 7

15. Gender * 8.4. I consider paying for a clothes rental service instead of buying new clothes Crosstabulation

			8.4. I consider paying for a clothes rental service instead of buying new clothes					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
15. Gender	Female	Count	50	81	72	54	21	278
		Expected Count	56,8	82,6	73,7	46,5	18,4	278,0
		% within 15. Gender	18,0%	29,1%	25,9%	19,4%	7,6%	100,0%
		% within 8.4. I consider paying for a clothes rental service instead of buying new clothes	64,9%	72,3%	72,0%	85,7%	84,0%	73,7%
		% of Total	13,3%	21,5%	19,1%	14,3%	5,6%	73,7%
	Male	Count	27	31	28	9	4	99
		Expected Count	20,2	29,4	26,3	16,5	6,6	99,0
		% within 15. Gender	27,3%	31,3%	28,3%	9,1%	4,0%	100,0%
		% within 8.4. I consider paying for a clothes rental service instead of buying new clothes	35,1%	27,7%	28,0%	14,3%	16,0%	26,3%
		% of Total	7,2%	8,2%	7,4%	2,4%	1,1%	26,3%
Total		Count	77	112	100	63	25	377
		Expected Count	77,0	112,0	100,0	63,0	25,0	377,0
		% within 15. Gender	20,4%	29,7%	26,5%	16,7%	6,6%	100,0%
		% within 8.4. I consider paying for a clothes rental service instead of buying new clothes	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	20,4%	29,7%	26,5%	16,7%	6,6%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3,890[a]	4	,421
Likelihood Ratio	3,972	4	,410
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 6,23.

7.8. Test 8

18. Professional Status * 8.7. I am considering exchanging my mobile phone for a remanufactured one Crosstabulation

			8.7. I am considering exchanging my mobile phone for a remanufactured one					
			Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
18. Professional Status	Student	Count	39	70	91	40	25	265
		Expected Count	42,2	70,3	82,2	42,9	27,4	265,0
		% within 18. Professional Status	14,7%	26,4%	34,3%	15,1%	9,4%	100,0%
		% within 8.7. I am considering exchanging my mobile phone for a remanufactured one	65,0%	70,0%	77,8%	65,6%	64,1%	70,3%
		% of Total	10,3%	18,6%	24,1%	10,6%	6,6%	70,3%
	Working-student	Count	21	30	26	21	14	112
		Expected Count	17,8	29,7	34,8	18,1	11,6	112,0
		% within 18. Professional Status	18,8%	26,8%	23,2%	18,8%	12,5%	100,0%
		% within 8.7. I am considering exchanging my mobile phone for a remanufactured one	35,0%	30,0%	22,2%	34,4%	35,9%	29,7%
		% of Total	5,6%	8,0%	6,9%	5,6%	3,7%	29,7%
Total		Count	60	100	117	61	39	377
		Expected Count	60,0	100,0	117,0	61,0	39,0	377,0
		% within 18. Professional Status	15,9%	26,5%	31,0%	16,2%	10,3%	100,0%
		% within 8.7. I am considering exchanging my mobile phone for a remanufactured one	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	15,9%	26,5%	31,0%	16,2%	10,3%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5,314[a]	4	,257
Likelihood Ratio	5,428	4	,246
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,59.

7.9. Test 9

Frequency in Higher Education * 9. Have you heard of the Circular Economy? Crosstabulation

			9. Have you heard of the Circular Economy?					
			Never heard of it	Little	Moderately	Very	Quite a lot	Total
Frequency in Higher Education	Bachelor	Count	66	51	55	16	21	209
		Expected Count	49,9	42,1	59,9	28,3	28,8	209,0
		% within Frequency in Higher Education	31,6%	24,4%	26,3%	7,7%	10,0%	100,0%
		% within 9. Have you heard of the Circular Economy?	73,3%	67,1%	50,9%	31,4%	40,4%	55,4%
		% of Total	17,5%	13,5%	14,6%	4,2%	5,6%	55,4%
	Master's	Count	18	22	46	28	28	142
		Expected Count	33,9	28,6	40,7	19,2	19,6	142,0
		% within Frequency in Higher Education	12,7%	15,5%	32,4%	19,7%	19,7%	100,0%
		% within 9. Have you heard of the Circular Economy?	20,0%	28,9%	42,6%	54,9%	53,8%	37,7%
		% of Total	4,8%	5,8%	12,2%	7,4%	7,4%	37,7%
	Others	Count	6	3	7	7	3	26
		Expected Count	6,2	5,2	7,4	3,5	3,6	26,0
		% within Frequency in Higher Education	23,1%	11,5%	26,9%	26,9%	11,5%	100,0%
		% within 9. Have you heard of the Circular Economy?	6,7%	3,9%	6,5%	13,7%	5,8%	6,9%
		% of Total	1,6%	0,8%	1,9%	1,9%	0,8%	6,9%
Total		Count	90	76	108	51	52	377
		Expected Count	90,0	76,0	108,0	51,0	52,0	377,0
		% within Frequency in Higher Education	23,9%	20,2%	28,6%	13,5%	13,8%	100,0%
		% within 9. Have you heard of the Circular Economy?	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	23,9%	20,2%	28,6%	13,5%	13,8%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	36,776[a]	8	<,001
Likelihood Ratio	37,539	8	<,001
N of Valid Cases	377		

a. 2 cells (13,3%) have expected count less than 5. The minimum expected count is 3,52.

7.10. Test 10

Frequency in Higher Education * 13. Do you consider that you practice actions that promote Circular Economy? Crosstabulation

			13. Do you consider that you practice actions that promote Circular Economy?		
			0	1	Total
Frequency in Higher Education	Bachelor	Count	36	107	143
		Expected Count	26,4	116,6	143,0
		% within Frequency in Higher Education	25,2%	74,8%	100,0%
		% within 13. Do you consider that you practice actions that promote Circular Economy?	67,9%	45,7%	49,8%
		% of Total	12,5%	37,3%	49,8%
	Master's	Count	14	110	124
		Expected Count	22,9	101,1	124,0
		% within Frequency in Higher Education	11,3%	88,7%	100,0%
		% within 13. Do you consider that you practice actions that promote Circular Economy?	26,4%	47,0%	43,2%
		% of Total	4,9%	38,3%	43,2%
	Others	Count	3	17	20
		Expected Count	3,7	16,3	20,0
		% within Frequency in Higher Education	15,0%	85,0%	100,0%
		% within 13. Do you consider that you practice actions that promote Circular Economy?	5,7%	7,3%	7,0%
		% of Total	1,0%	5,9%	7,0%
Total		Count	53	234	287
		Expected Count	53,0	234,0	287,0
		% within Frequency in Higher Education	18,5%	81,5%	100,0%
		% within 13. Do you consider that you practice actions that promote Circular Economy?	100,0%	100,0%	100,0%
		% of Total	18,5%	81,5%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8,675[a]	2	,013
Likelihood Ratio	8,888	2	,012
N of Valid Cases	287		

a. 1 cells (16,7%) have expected count less than 5. The minimum expected count is 3,69.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,174	,013
	Cramer's V	,174	,013
N of Valid Cases		287	

7.11. Test 11

Location * 9. Have you heard of the Circular Economy? Crosstabulation

			9. Have you heard of the Circular Economy?					
			Never heard of it	Little	Moderately	Very	Quite a lot	Total
Location	Coast	Count	69	61	98	48	49	325
		Expected Count	77,6	65,5	93,1	44,0	44,8	325,0
		% within Location	21,2%	18,8%	30,2%	14,8%	15,1%	100,0%
		% within 9. Have you heard of the Circular Economy?	76,7%	80,3%	90,7%	94,1%	94,2%	86,2%
		% of Total	18,3%	16,2%	26,0%	12,7%	13,0%	86,2%
	Interior	Count	21	15	10	3	3	52
		Expected Count	12,4	10,5	14,9	7,0	7,2	52,0
		% within Location	40,4%	28,8%	19,2%	5,8%	5,8%	100,0%
		% within 9. Have you heard of the Circular Economy?	23,3%	19,7%	9,3%	5,9%	5,8%	13,8%
		% of Total	5,6%	4,0%	2,7%	0,8%	0,8%	13,8%
Total		Count	90	76	108	51	52	377
		Expected Count	90,0	76,0	108,0	51,0	52,0	377,0
		% within Location	23,9%	20,2%	28,6%	13,5%	13,8%	100,0%
		% within 9. Have you heard of the Circular Economy?	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	23,9%	20,2%	28,6%	13,5%	13,8%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16,514[a]	4	,002
Likelihood Ratio	16,811	4	,002
N of Valid Cases	377		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,03.