The provision of sustainable packaging as CSR strategy in the Irish Food and Drink Market: A comparison of consumers' perceptions of environmental friendliness and their identification of recyclable and compostable packaging materials.

Rachel McQuaid, MSc.

MSc Management

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Student Number: _____X18133231_____

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iii. Abstract

The provision of sustainable packaging as CSR strategy in the Irish Food and Drink market: A comparison of consumers' perceptions of environmental friendliness and their identification of recyclable and compostable packaging materials. By Rachel McQuaid

There is an increasing demand on industries to provide more sustainable packaging alternatives. As a Corporate Social Responsibility (CSR) strategy many companies in the food and drink industry have invested capital into creating and supplying food grade sustainable packaging. Before deciding on which sustainable packaging alternative to provide, food and drink companies would benefit from knowing more about how Irish consumers view different sustainable materials, and whether they are likely to identify them correctly or not. This study carried out a questionnaire on 422 respondents. The results show that while compostable materials are viewed as the most environmentally friendly packaging option, they are rarely identified correctly. In contrast, recyclable materials are viewed as slightly less environmentally friendly (but not environmentally unfriendly) but identified by most consumers. This study also tested for correlation between factors that might stimulate a consumers' purchase intentions (environmental interest, subjective knowledge, and objective knowledge) and the correct identification of either material. The results show that even the consumers most likely to purchase a product based on its sustainable packaging, are unlikely to identify compostables correctly and even those least likely to choose sustainable packaging are still likely to identify compostables correctly. Future research into the factors that help a consumer identify recyclable packaging would be beneficial to the literature and food and drink industry as the information could be use by marketers to make compostables more widely identified so that brands choosing to provide compostable packaging can yield the best results for their shareholders.

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Chapter One: Introduction

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1.1 Introduction

Due to its high level of waste output from packaging and containers, the environment is a key stakeholder in the food and drink industry. In Ireland businesses are experiencing increasing pressure from both consumers and the government to improve sustainability (McMahon. 2019). As a corporate social responsibility (CSR) effort many businesses have begun offering more sustainable alternatives to single use plastics. For example, supermarkets like Supervalu are offering 100% compostable shopping bags and takeaway chains like Camile are offering 100% compostable containers (Zeuspackaging.net).

While many food and drink businesses are willing to invest in sustainable packaging options, there are a few important factors that need consideration to ascertain how effective such investments would be to shareholders and which investment might offer the best returns. Bio0based materials are viewed as more environmentally friendly than fossil-based materials (Yeates & Barlow. 2013). However, a recent study on the Danish market uncovered a paradox between how consumers perceive bio-based compostables and their tendency to dispose of the incorrectly (Taufik, Reinders, Molenveld, & Onwezen (2020), this means that they also identify them incorrectly.

It is in the interest of shareholders to know which sustainable packaging option consumers view as the most environmentally friendly, as green marketing practices can increase corporate reputation and product image, which stimulates purchase intention (Ko, Hwang & Kim. 2013;Koenig-Lewis, Palmer, Dermody & Urbye. 2014) thus increasing sales and return to shareholders. However, for this to work, companies also need to know that

consumers are both able to identify the sustainable features of their packaging and that such packaging features can stimulate purchasing behaviour. If consumers can't identify the sustainability (recyclability or compostability) of packaging then the brand image and purchase intentions can't benefit from such efforts.

For the environment to benefit from the provision of sustainable packaging, consumers must be willing to engage in correct waste management practices and be able to identify the intended disposal method, as the end responsibility of ensuring sustainability by disposing of packaging in the correct manner lies entirely with the consumer. A compostable or recyclable container is sustainable if it goes in the correct bin, otherwise it goes into the same landfill as single-use plastic where it won't be disposed of as intended and will take considerably longer to break down.

This study will undergo quantitative research which will investigate how Irish consumers perceive and identify compostable and/or recyclable packaging and look at the relationships between factors which stimulate purchase intentions (environmental interest, subjective knowledge and objective knowledge of composting and recycling) to gain more of an idea of how the provision of recyclable and compostable packaging is working as a CSR strategy in the Irish food and drink market.

Chapter Two: Literature Review

Chapter Two: Literature Review

2.1. Introduction

There are two key elements one must consider around the topic of sustainability of food and drink packaging. Firstly, the role of the food and drink industry who are responsible for supplying consumers with sustainable packaging and secondly, the role of the consumers responsible for identifying and choosing sustainable packaging options and then disposing of the packaging correctly.

To begin, this literature review will look at the factors that are increasing demand for the provision of sustainable packaging in the Irish Food and Drink Market.

To understand whether consumers are likely to choose sustainable options literature around pro-environmental purchase behaviour and consumer perceptions around sustainable products and (more specifically) sustainable packaging was explored. Looking into research around the topic of waste management helped the researcher gain an understanding of how consumers dispose of and identify sustainable products.

The review of the literature around pro-environmental purchase behaviour and waste management highlighted two major factors: environmental interest and environmental knowledge (subjective and objective). Environmental interest is likely to increase purchase intentions whereas knowledge literature suggests that a knowledge deficit can be a barrier to behaviour and increasing knowledge through normative beliefs can motivate behaviour change.

2.1 The provision of packaging as CSR in the Irish Food and Drink Industry

The main factors of motivation for the provision of sustainable packaging in the food and drink industry are Corporate Social Responsibility (CSR) and Government pressure through legislation (McMahon. 2019). CSR deals with internal pressure from shareholders to maximise the brand's potential and external pressure from stakeholders like the public and the introduction of Government legislation such as levies (McMahon. 2019), pressure companies to seek more environmentally friendly solutions.

2.1.1. Government pressure on the food and drink industry

Government bodies have been showing increased interest in including more sustainable thinking in policy making. For example, in November 2019, Minister for Climate Action and Environment Richard Bruton lunched a public consultation announcing the introduction of three stages of levies on single use packaging. Beginning with a tax in 2021 which could add between 10-25 cent to the price of a takeaway coffee sold in a single use cup. In 2022 a second phase will focus on take away food containers and a third phase of levies will address food packaging in retail outlets and supermarkets such as packaging for baked items, fruit and vegetables. (McMahon. 2019) The aim of Bruton's new levy is to encourage a shift in behaviour towards the supply and use of more sustainable alternatives (McMahon. 2019). Brands within the Irish Food and drink Market have been choosing to provide sustainable packaging as a Corporate Social Responsibility (CSR) effort to benefit the shareholders and the environment.

2.1.2. Corporate Social Responsibility (CSR)

While academics like Barnard (1968) defined CSR as a responsibility that is economic, legal, moral, social and environmental, political bodies like the EU Commission describe it more as a concept where companies voluntarily integrate social and environmental concerns into their business operations and interaction with stakeholders (EU commission 2001). In the literature surrounding CSR there are three main perspectives; the Efficiency Perspective (which prioritises shareholders), the Social Responsibility Perspective (which prioritises stakeholders) and the Corporate Social Responsibility Perspective (which balances priorities between shareholders and stakeholders).

2.1.2.1: The Efficiency Perspective

The efficiency perspective focusses on maximising benefits of the Shareholders. Within this perspective there are opposing views. While Hetherington (1973) argues that shareholders won't tolerate corporate non-profit activity which could reduce the overall shareholder dividend or market performance of stock Drucker (1984) argues that a social problem could in fact benefit a business by presenting it with an opportunity to create a solution for economic gain. Under the Efficiency Perspective the position which benefits the shareholders is prioritised, even at the cost of other stakeholders like the environment. However, companies who make decisions based on an efficiency perspective are often faced with push back from the market for example the recent TCD Student Boycott of Aramark due to their economic gain made from Direct Provision Centres in Ireland. Today, society is both a stakeholder in the business environment and the controller of market demand, who can make businesses accountable for their actions and encourage them to be more socially responsible. Companies and managers are publicly pressured into playing an active role in

looking after the welfare of society (Balabanis, Phillips & Lyall. 1998). For a long time, consumer's environmental consciousness has pressured businesses to examine their environmental activities; for example in a 1990 survey conducted on company directors by Nash (1990)half of those surveyed felt under pressure by public opinion to develop an environmental policy.

2.1.2.2: The Social Responsibility Perspective

In the Social Responsibility Perspective, firms have a responsibility to society as a whole and not just shareholders. This school of thought views large businesses as important centres of decision making whose decisions and actions have a direct impact on society. Bowen (1953, p. 6) described social responsibilities as the obligation of businessmen to pursue policies and make decisions which are in line with the objectives and values of society. This perspective however, doesn't look after the interest of the shareholders enough and businesses exists to maximise profits to the shareholders therefore the perspective should take shareholders interest into account as well as being socially responsible.

2.1.2.3: The Corporate Social Responsibility (CSR) Perspective

The Corporate Social Responsibility (CSR) perspective aims to achieve a balance between being both efficient and socially responsible by looking after both the interest of the shareholders and stakeholders, respectively. According to Walton (1967, p18) the CSR perspective recognises the intimacy of relationships between corporations and society and acknowledges that these relationships must be kept in mind when corporations are pursuing their goals. Davis (1960, p70). states in some cases socially responsible business decisions

can lead to long term economic gain for a company therefore, paying it back for its socially responsible outlook. Similarly, Ko, Hwang & Kim (2013) believe that green marketing practices are more likely to increase corporate reputation (because consumers care about the environment), which alongside product image can significantly affect purchase intentions.

2.1.3 The Environment as a stakeholder in the food and drink industry

The key stakeholders for a business are all those who are impacted by their decisions and actions. In the CSR perspective, mangers need to look after multiple interests including employees, suppliers, dealers, local communities, and the nation, rather than solely striving to increase shareholder profits (Johnson,1966, p50). Businesses lead to the depletion of finite natural resources and the creation of waste therefore they have a duty to the environment to ensure they are being responsible and using more renewable energy sources and creating less waste by investing in more sustainable sociotechnical systems (Meadows & Randers., 2004) and operating in a more circular economy.

In contrast, in their nature, food and drink products have a linear life cycle as once they are consumed they disappear. While the food and drink products themselves don't contribute to a lot of waste, the packaging they come in does. To minimise production costs, many are packaged or served in single use plastic containers which end up in landfill. In 2015 each person in Europe generated about 30 kg of waste through plastic packaging alone (Eurostat. 2017), resulting in almost 20 million metric tons of waste in the form of plastic packaging (Plastics Europe. 2016), a large portion of which came from the food and drink industry.

The Circular Economy is a term used to describe a sustainable sociotechnical system that overcomes the traditional linearity of product life cycles by creating products which are available for a longer period of time (Ritzén & Sandstrom, 2017) in a continuous and closed

loop (Geissdoerfer, Savaget, Bocken & Hultink, 2017). Such systems are created by minimising both resource input as well as waste, emission and energy leakage. This is achieved through long lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling (Geissdoerfer et al. 2017).

2.1.4. A Corporate and socially responsible solution for the Irish Food and Drink Industry: Sustainable packaging

The Sustainable Packaging Coalition® (2011) define sustainable packaging as beneficial, safe and healthy throughout its life cycle and effectively recovered and utilized in biological or industrial closed loop cycles.

Creating a circular loop in food and drink packaging is not as straightforward as in other industries. Not all plastics can be recycled into new 'safe and healthy' food-grade packaging (The sustainable Packaging Coalition®. 2011). While polymer plastics are compostable and can undergo mechanical recycling to become new food packaging (Life rPack2L. 2017), multilayer plastics take years to break down and require compatibilizers before they can be blended and recycled, making them unsafe for human consumption (Geueke, Groh, & Muncke. 2018). As a result companies in the food and drink industry have had to invest a lot of money into creating and testing new sustainable food-grade packaging options, at the initial cost of shareholders, but with the intended longer term benefit of the environment and shareholders, which require packaging to be identified and disposed of correctly.

2.1.5. Bio-based packaging as an alternative to fossil-based

As a result of growing pressure on businesses to offer alternatives to single use products and packaging, the bio-based industry has emerged and is one of the fastest growing markets (Golden, Handfield, Daystar, & McConnell. 2015; Storz & Vorlop, 2013). There is no single definition for bio-based packaging (Alvarez-Chavez et al. 2012; Taufik et al. 2020) but the term can be used to describe any form of packaging which at least partially consists of biomass made materials (Brockhaus et al. 2016). The use of bio-plastic packaging is growing by between 20-25% annually and bio-based materials are being provided as an alternative to fossil-based materials at an increasing rate (Arikan & Ozsoy. 2015; Taufik et al. 2020). Bio-based materials are either recyclable, compostable or both (Álvarez-Chávez, Edwards, Moure-Eraso, & Geiser 2012). Studies such as Philp, Bartsev, Ritchie, Baucher & Guy (2012) show a growing popularity for the use of bio-based materials in products and Yates & Barlow (2013) demonstrate how bio-based products are generally seen as an eco-friendly alternative for fossil-based products. While the existing debate on bio-based materials and their environmental impact is still unresolved (Hottle, Bilec & Landis. 2013), Carus, Eder & Beckmann (2014) argue that companies are willing to pay a premium to include bio-based materials in their products if it gives them a strategic edge in the market. This thinking is in line with the CSR perspective which argues that strategies should benefit both shareholders and stakeholders.

To meet pressures of Corporate Social Responsibility (CSR) and government legislation the food and drink industry in Ireland will have to take responsibility and supply consumers with more sustainable packaging options. To guarantee, that offering sustainable packaging solutions will benefit the shareholders and stakeholder (the environment), one needs to also look at the pro-environmental behaviours and attitudes of consumers responsible for identifying and choosing the sustainable option and ensuring it is disposed of correctly.

2.2 Pro-environmental purchasing behaviour

Existing studies around pro-environmental purchasing behaviour (PPB) indicate a positive relationship between brand eco-friendliness and consumer purchase intention (Bekk, Spörrle, Hedjasie & Kerschreiter,. 2016; Konuk, 2015). To understand how this relates to consumer purchasing intention of sustainable packaging one must explore the topics of consumer perceptions of environmentally friendly products, bio-based products and sustainable packaging.

2.2.1. Attitudes to sustainable and environmentally friendly products

While researching design for environment (DFE), Boks & Stevels (2007) discovered that 'environmental friendliness' is perceived differently depending on the stakeholder in question, they categorise greenness into three ways; scientific green based on a life cycle assessment of a product throughout its entire life , government green relating to legal requirements and government agendas for example, waste disposal and customer green relating to consumer's perceptions of a product's eco-friendliness.They argue that customer green is strongly linked to emotions (Boks & stevels. 2007). Due to the consumer-centric nature of this study, focus will be placed on literature around consumer perceptions of environmental friendliness.

There has been a long debate questioning whether eco-friendliness or ecological claims have positive or negative impacts on consumer perceptions of a brand or product. In early literature Toor (1992) revealed that 63% of UK shoppers in 1992 were suspicious of green claims and Polonsky (1995) argued that in the green market rather than viewing ecological products as environmentally friendly, they should be viewed as 'environmentally less

harmful'. While the green market provides consumers with the option to purchase an alternatively less harmful product, the process of producing products for the green market still increases consumption (Kilbourne et al., 1997) and benefits the interest of the shareholders. Polonsky (1995) also argued that the proliferation of ecological claims could lead to consumers viewing such claims as greenwashing or a brand appearing to "jump on the green bandwagon" or using 'green' to charge higher prices (Marketing, 1991). In contrast however, Giannelloni (1998) found that ecological cues had a positive effect on how consumers viewed factors such as trust, brand evaluation, product evaluation, purchase intention, long term brand loyalty and promoting behaviours.

In line with Giannelloni's thinking, more recent research has revealed that growing environmental concerns have increased the likelihood of consumers choosing 'green brands' (Hartmann, Ibáñez, and Sainz,2005; Teng, Wu & Huang., 2014) and the introduction of new environmentally friendly products can improve consumers' attitudes of a brand (Olsen, Slotegraaf & Chandukala. 2014) which can have a direct relationship with how consumers believe a brand acts ecologically (Rios Martinez, Moreno & Soriano, 2006).

McCarty & Shrum (2001) argue that when a consumer acts pro-environmentally the cost is immediate, but the benefit is long-term and often not visible. However, this is not always the case as Tilikidou (2007) proved that while pro-environmental behaviour mostly has long-term benefits on the environment, in some cases it can also have immediate benefits on consumers' health for example organic food which is believed to be better for the human body than food full of pesticides (Grunert. 1993) or finances (Tilikidou. 2007)

White & Simpson (2013) believe that the best way to appeal to a consumer depends on how the individual themselves is motivated. In their study which focusses on the sustainable behaviours of grasscycling (leaving grass clippings to decompose of the lawn when mowing)

and composting they found that when a participant's collective level of self was activated, injunctive appeals were more effective than benefit appeals, and when the individual level of self was activated self-benefit and descriptive appeals were particularly effective (White & Simpson,. 2013). Descriptive appeals are based on what we think other people are doing while injunctive appeals are based on what we think other people should be doing (Schultz. 2002). If a person's individual level of self is stronger messages using injunctive appeals might threaten their sense of autonomy (Brehm, 1966).

Depending on personal behavioural predictors (Schultz. 2002) and whether an individual responds to their collective level of self or individual level of self, pro-environmental behaviour can be encouraged through incentives. For example, Konuk (2013) found that stores can reduce food waste by discounting perishable goods approaching their sell by date, which incentivises price conscious consumers to purchase them. Similarly, Tilikidou (2007) found that Greek consumers were more willing to purchase eco-friendly products if there was no significant price or efficacy differences and that consumers may be more likely to make an environmentally friendly choice if it also has positive results on their health and finance on top of the environment.

2.2.2. Attitudes to bio-based products products

Consumers often link a brand's use of bio-based materials with making more of an effort to preserve the environment, which can stimulate purchase intentions (Grimmer & Bingham, 2013). Studies show that consumers are willing to pay more for bio-based than conventional fossil-based plastic products (Kainz, 2016), up to a premium of 25% depending on the type of product (Carus et al,. 2014). Bio-based claims are evaluated differently by consumers (Kainz, 2016) depending on the product and level of bio-based materials used. Consumers in Reinders, Onwezen & Meeusen study favoured a bio-based shampoo over a bio-based soft

drink despite both products having equal levels of bio-based materials (2017). Sijtsema et al. found that consumers viewed products made with 100% bio-based materials far more positively than those using partly bio-based materials (2016). Similarly, Reinders et al,. (2017) found that only brands with attributes that were 100% bio-based were consistently able to influence purchase intentions and that brand who introduced partially bio-based attributes did not always have a better influence than brands with no bio-based materials. This was particularly the case when comparing private label brands with global label brands, the private label that use partly bio-based materials was more likely to influence purchase intentions than the global label brands with partly bio-based materials (Reinders et al,. 2017).

While consumers view bio-based products positively, Tilikidou (2007) warns that marketers should not expect consumers to search thoroughly to find which product is truly biodegradable or not. Therefore, one might argue it should be easy for a consumer to identify such properties of a product's packaging so that they can easily find it and be informed of how to dispose of it as intended.

2.2.2. Consumer attitude to sustainable packaging

While packaging is usually considered an extrinsic attribute of a product (Teas & Agarwal, 2000) it has a major impact on the environment and can therefore influence whether a consumer purchases a product or not. Studies show that packaging is an important factor of consideration for many consumers making a purchase decision. Rokka & Uusitalo (2008) indicated a clear consumer preference for sustainable environmentally friendly packaging alternatives over non-recyclable packaging.

Magnier & Crié (2015) define eco-design packaging by its reduction, reusability or the range of ecological cues it displays and Parguel, Benoît-Moreau & Larceneux (2011) found

that consumers view packaging labels more credibly if they are issued by an independent regulatory agency, similar to Boks and Stevels (2007) DFE concept of Government Green.

When it comes to consumers purchase intention of ecologically packaged products, Schwepker & Cornwell (1991) found that psyco-sociological factors such as internal locus of control, perception of pollution as a problem, attitude towards litter and attitude towards ecologically conscious living had a stronger effect than socio-demographic variables. However, it is important to remember White & Simpson's (2013) point that the most effective way to appeal to an individual's pro-environmental behaviour depends on the whether they are motivated through a collective level of self or individual level of self .Koenig-Lewis, Palmer, Dermody & Urbye (2014) found that general environmental concern was more significant than rational evaluations and benefits when stimulating consumer purchase intentions of eco-packaging.

While on one hand Van Birgelen, Semeijn & Keicher (2009) believe that consumers are willing to trade off almost all food or drink product attributes bar taste and price, in favour of environmental packaging, Magnier & Crié (2015) argue that while they value eco-design packaging, consumers have concerns about potential negative impacts on attributes such as pleasure in consumption and the overall hygiene and integrity of a product. This suggests, consumers might lack trust in eco-designed packaging however, Magnier and Crié (2015) argue this can be easily combatted if brands, organisations and governments keep educating consumers to improve their expertise in environmental matters thus improving their ability to choose the most environmentally friendly alternative.

In line with the CSR perspective, brands can benefit from the introduction of new environmentally friendly products (Olsen et al., 2014; Rios et al, 2006). Studies have shown that consumers favour brands who use bio-based materials in products (Carus et al,. 2014;

Kainz. 2016; Reinders et al,. 2017) and offer sustainable environmentally friendly packaging solutions (Rokka & Uusitalo. 2008).

The existing literature shows that consumers favour environmentally friendly products, particularly those made with 100% bio-based materials (Sijtsema et al. 2016). However, Tafuk et al (2020) have uncovered a paradox between what how consumers perceive bio-based materials and their incorrect disposal of compostable packaging. To understand how consumers identify and dispose of products and packaging, the researcher needed to explore the topic of sustainable waste management behaviour.

2.3 Sustainable Waste Management Behaviour

Schultz (2002) described the disposal of solid waste as both an environmental and economic burden because reducing solid waste sent to landfill lowers disposal fees, reduces the strain on landfills and reduces the consumption of non-renewable raw materials in the case of recycling or composting where materials are circulated back into the system. Therefore, similar to pro-environmental behaviour, waste management can have short term economic benefits as well as long term environmental benefits (Tilikidou. 2007).

Households and consumers play a dominant role in waste management. In 2015 each person in Europe generated about 30 kg of waste through plastic packaging alone (Eurostat. 2017). Early household waste management saw the introduction of the reduce, reuse and recycle approach in an effort to reduce the disposal of solid waste (Schultz. 2002). Most recently, in Ireland the introduction of domestic composting ‘brown bins’ and bio-based materials has provided an alternative disposal option, whereby materials made from renewable bio-based materials are decomposed in industrial scale composters which turn waste into compost which can then be used to grow more biobased materials. While this

study aims to look at waste management in terms of recycling and composting, the existing research focusses predominantly on factors which motivate consumer participation in recycling programs.

2.3.1 Disposal of recyclable materials

Previous research has identified four main factors in motivating recycling behaviour: The benefits of recycling; personal inconvenience, external pressures, and financial motives (Oskamp, Burkhardt, Schultz, Hurin & Zelezny. 1998; Schultz. 2002). The success or failure of a recycling program hinges on the participation of the community (Shultz. 2002). A person's participation in recycling may be determined by personal behavioural predictors (Schultz. 2002), like those previously discussed by White & Simpson (2013) or situational predictors which are determined by the individual's situation such as access to recycling services or proximity to recycling facilities (Schultz. 2002). Recycling is widespread throughout Ireland with most waste management companies offering the collection of domestic recycling waste as well as waste for industrial compost and landfill.

Like Tilikidou (2007), McCarty & Shrum (2001) & Davies et al's., (2002)findings in relation to pro-environmental behaviour, when focusing on recycling consumers are also most likely to engage when cost and inconvenience are minimised. In a cross examination of 17 recycling studies Hornik, Cherian, Madansky & Narayana (1995) found that knowledge was the strongest variable to correlate with recycling behaviour. However, Schultz (2002) argues that knowledge is not a motive for recycling, however a deficit of knowledge can act as a barrier. Similarly, while consumers favour environmentally friendly packaging, they still hold some concerns about its potential impact on the product (Magnier & Crié. 2015) largely due to a lack of knowledge which prevents behaviour change (Schultz. 2002).

2.3.2 Disposal of Bio-Based Compostable materials

Taufik et al. (2020) conducted research to see how consumers perceived three types of packaging and whether they were able to dispose of the it correctly or not. Their study focuses on recyclable fossil-based, recyclable bio-based and compostable bio-based plastic water bottles. Their research revealed that consumers view bio-based compostables as the most environmentally friendly and bio-based and fossil-based recyclable materials relatively similarly. They also found a paradox between consumers perceptions and ability to dispose of packaging correctly and respondents in their study frequently disposed of the compostables incorrectly. They found that perceiving a material as more environmentally friendly didn't necessarily result in them disposing of it in the environmentally friendly way and that respondents with more knowledge about recycling and composting were more likely to dispose of the compostables correctly (Taufik et al,. 2020). Taufik et al, (2020) provide a similar argument to Schultz (2002) about the relevance of knowledge, particularly the negative impact that knowledge deficit can have on disposal behaviour. It has been believed that there is a gap between what people think and what they do (Peattie, 1995, p. 154; Shrum et al 1996), and that people are more emotionally involved with the environment than knowledgeable about it (Dispoto 1977. p. 457) the existing literature would suggest that this is the case for recycling and composting of packaging.

2.4 The role of knowledge in pro-environmental & waste management behaviour

The review of the literature around pro-environmental purchase behaviour and waste management has highlighted two major factors (environmental interest and environmental knowledge (subjective and objective) which are likely to influence behaviour. It has been established that Environmental interest is likely to increase purchase intentions (Yates & Barlow. 2013; Ko et al. 2013; Koenig-Lewis et al. 2014) whereas knowledge literature suggests that a knowledge deficit can be a barrier to behaviour (Schultz. 2020) and increasing knowledge through normative beliefs can motivate behaviour change (Synodinos.1990; Schultz. 2002).

Environmental knowledge is a term used to describe a person's ability to identify symbols, concepts and behaviour patterns related to environmental protection (Laroche et al. 2001). Leeming et al. (1995) was the first to explore environmental knowledge in their study which focused on school children.

Research has been conducted to investigate the link between environmental attitude and knowledge and third level education. Cohen (1973) found that groups of students who were taught courses with high environmental content had more environmental knowledge and a more positive attitude toward the environment than the control group who were taught courses with a low environmental content. Tilikidou's (2007) study showed that Greeks between 35-55 with a graduate or post graduate degree were the most engaged in PPB. Expanding further, Vincente- Molina, Fernández-Sáinz & Izagirre-Olaizola(2013) conducted a cross examination of third level students in countries with different levels of economic development. They found that while knowledge (objective and subjective) influences pro-environmental behaviour, attitude and informal education were not relevant variables (Vincente-molina et al. 2013).

As well as education, Tilikidou (2007) found that PPB correlated positively with environmental knowledge and negatively with environmental unconcern. While some studies show no significant relationship between environmental knowledge and pro-environmental behaviour (La Roche et al., 2001; Maloney & Ward, 1973), other studies show that people with a greater knowledge of environmental problems are more prone to pro-environmental behaviour (Oguz et al. 2010) and a shortage of knowledge or holding of contradictory information might prove a barrier to pro-environmental behaviour (Schultz. 2002).

2.4.1 Normative beliefs as motivation

While Maloney and Ward found low correlations between environmental knowledge and its effect on environmental attitudes (1973), Arbuthnott & Lingg (1975) argue that environmental knowledge acts as a mediating variable for environmental attitudes and behaviour. Synodinos (1990) believes that knowledge is independent of attitude however, he also thinks that increasing one's knowledge about environmental issues may result in a more positive environmental attitude. Similarly, when focusing on recycling Schultz found that increasing procedural knowledge only had a short term effect on behaviour change, however, the levels of knowledge through normative beliefs can motivate a change in behaviour (Schultz. 2002), most likely as a result of a positive change in environmental attitude (Synodinos. 1990).

In a similar but different argument Kilkeary (1975) found that consumers most likely to participate in conservation behaviour had knowledge about the financial benefits, similar as those mentioned in relation to PPB in Tilikidou (2007) and Grunert (1993).

2.4.2 Objective and subjective Knowledge as measurement

The literature suggests that consumer knowledge and behaviour are both determinants of pro-environmental behaviour (Engel et al., 1993) and researchers have tried to understand the relationship between the three (Martin & Simintiras,. 1995). When it comes to analysing the effects of knowledge, objective and subjective knowledge have been used as past measurements. Subjective knowledge refers who how much an individual thinks they know whereas objective knowledge refers to how much an individual actually knows (Han. 2019)

A small number of scales have been published in accordance with subjective knowledge (Amyx, DeJong, Xiaohua Lin, Chakraborty, Wiener, Lyle 1994; Schlegelmilch, Bohlen & Diamantopoulos, 1996) and objective knowledge (Leeming et al 1995; Laroche, Toffoli, Kim & Muller. 1996)

Amyx et all,. (1995) use subjective knowledge as one factor while investigating purchase intentions for ecologically safe products and Schlegelmilch (1996) uses subjective knowledge to measure environmental consciousness when comparing green purchasing behaviour of marketing students and members of the public in the UK.

While subjective knowledge will determine whether consumers are environmentally conscious or aware, it doesn't represent the level of knowledge and understanding they actually have and Dispoto (1977. p. 457) believes that people are more emotionally involved than knowledgeable about the environment and Vincente-Molina et al,. (2013) warns that in some cases an excess of self-perceived knowledge can lead to individuals making environmentally wrong decisions.

Tilikidou (2007) used objective environmental knowledge to see if it had an impact on Pro-environmental purchase behaviour. A scale was created by providing respondents with 3 possible answers, only one of which is correct, a similar approach will be take in this study's

collection of objective knowledge data, but questions will be made more specific to composting and recycling rather than the environment in general.

2.5 Summary

The food and drinks industry is under increasing pressure to provide more sustainable options and has invested a lot of capital in creating food-grade sustainable packaging. The literature around consumer engagement and motivations in PPB and waste disposal, suggests that consumers are willing to choose sustainable packaging options, particularly if they can benefit personally from engaging in such practices (Tilikidou. 2007) and it does not have a negative impact on their consumption experience of the product (Magnier & Crié. 2015). While consumers are willing to choose sustainable packaging options this doesn't guarantee they can identify such options. Taufik et al. (2020) found that most of the consumers who favoured bio-based compostable containers disposed of them incorrectly. Considering they favoured the bio-based compostable options one can assume they intended to dispose of them correctly therefore, the only possible reason for their incorrect disposal is that they didn't identify the compostable nature of the packaging correctly.

Food an drink companies would benefit from know which packaging alternative Irish consumers view as the most environmentally friendly, whether Irish consumers are likely to identify recyclable and compostable packaging correctly, and whether factors likely to stimulate purchase intentions have any relationship with the identification of recyclable or compostable packaging.

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Chapter Three: Methodology

Chapter Three Methodology

3. Introduction

This chapter will begin by defining a research problem and outlining the research question and objectives of this study. The research objectives of a study have a major influence on the choice of research design. The research design, sampling and data collection methods used will be discussed in this chapter.

3.1 The Research Process

This thesis aims to research consumers' interests, knowledge and practices therefore it has adopted Malhotra & Birk's (2007) Market Research Process which follows the 6 broad stages of as illustrated below:

1. Problem Definition
2. Research Approach Developed
3. Research Design Developed
4. Field Work or Data Collection
5. Data Preparation and Analysis
6. Report Preparation and Presentation

This chapter will outline the ways in which each stage was developed and conducted throughout the research process.

3.2 Problem Definition

The first and most important step in the Market Research Process is the definition of a problem. This step outlines the general problem and its components, providing a reason for a research study to be undertaken. (Domegan & Fleming, 2007) A clearly defined research problem will facilitate the proper resolution to a research question (Malhotra & Birks, 2007). Outlining research objectives and sub objectives enabled the author to address all aspects of the research question.

3.3 Research Approach Developed

3.3.1 Research Question

After undertaking a deep examination and analysis of the relevant literature around the topic of providing sustainable packaging in the food and drink industry the author has defined the overall research question as:

How do consumers view and identify recyclable and compostable packaging and are there any specific factors which make a consumer more likely to identify either?

3.3.2 Research Objectives

The author firstly wishes to establish which sustainable packaging alternative provides the best alternative for the Irish food and drink industry by determining which material

consumers view as the most environmentally friendly and which materials consumers are most likely to correctly identify (recyclable or compostable). Secondly, to determine if there is a relationship between factors which make an individual more likely to purchase sustainable materials (environmental interest, subjective knowledge and objective knowledge) and the correct identification of recyclable and or compostable materials. To achieve these wishes the research question was broken down into three objectives.

Objective 1: ***Do Irish consumers view packaging made with compostable materials as more environmentally friendly than other sustainable material packaging options (recyclable and reusable)?***

There is a clear consumer preference for sustainable environmentally friendly packaging (Rokka & Uusitalo. 2008) and the introduction of environmentally friendly products can improve consumer attitudes towards a brand and how consumers view the brand's environmental and ecological efforts (Olsen, Slotegraaf & Chandukala. 2014; Rios Martinez, Moreno & Soriano. 2006; Grimmer & Bingham. 2013). Existing literature suggests that consumers favour bio-based products and are willing to pay a premium for them (Kainz. 2016; Carus, Eder & Beckmann. 2014) once their consumption experience (particularly taste with food and drink products) is not impacted negatively (Van Birgelen, Semeijn & Keicher. 2009; Sijtsema, Onwezen, Reinders, Dagevos, Partanen & Meeusen. 2016). Products which are 100% bio-based (such as bio-based compostables), rather than partially (such as bio-based recyclables) are most favoured by consumers and most likely to stimulate purchase intention (Taufik, Reinders, Molenveld, & Onwezen. 2020; Reinders, Onwezen & Meeusen. 2017). With increasing pressure on Irish food and drink companies to provide alternative solutions to single use plastic packaging (McMahon. 2019) it is important to understand the options available. Determining whether participants (n=422) of this study view compostable

materials as the most environmentally friendly could provide valuable information to food and drink companies who are interested in providing the best alternative sustainable packaging option for their shareholders and the environment.

Objective 2: ***Do Irish consumers correctly identify recyclable and compostable packaging?***

Despite viewing compostable materials as the most environmentally friendly option, when presented with a variety of packaging options, participants in Taufik et al. (2020) largely disposed of the bio-based compostable packaging incorrectly. Tilikidou (2007) has warned marketers not to expect consumers to search thoroughly to find out which products are truly biodegradable or not. Determining whether consumers can correctly identify compostable and recyclable packaging is important for the food and drink industry. If a brand is providing the most environmentally friendly option, but consumers are not recognising/ identifying it as such then the brand cannot fully benefit from the positive association of using sustainable materials and if the packaging is disposed of incorrectly, it is no longer truly sustainable.

Objective 3: Are there any correlations between factors that might stimulate a consumers' purchase intention of sustainable packaging (Environmental Interest, Subjective knowledge or Objective knowledge) and the correct identification of either recyclable or compostable materials?

This study also tested for correlation between factors that might stimulate a consumers' purchase intentions (environmental interest, subjective knowledge, and objective knowledge) and the correct identification of both materials.

Specific attributes can make a consumer more likely to purchase a product purely because it uses sustainable packaging. Assessing the relationship between factors such as environmental interest (Koenig-Lewis, Palmer,Dermody & Urbye. 2014), subjective knowledge and objective knowledge and whether a consumer correctly identifies recyclable or compostable packaging, can help brands and marketers see whether existing sustainable packaging is successfully getting the messages of recyclability or compostability across to the *lowest hanging fruit* in the market. To answer this objective the factors likely to stimulate purchase intentions have been broken into three sub-objectives:

Sub-objective 3.1: *Does a consumer's level of environmental interest correlate with their ability to identify compostable and/or recyclable packaging?*

General environmental concern and environmental interest can stimulate consumer purchase intentions of eco-packaging (Koenig-Lewis et al. 2014).

Sub-objective 3.2: *Does a consumer's level of Subjective knowledge of recycling and composting correlate with their ability to identify compostable and/or recyclable packaging?*

An individual's subjective knowledge indicates how confident they are in not only their ability to dispose of recyclables and compostables but also (as a result) their ability to identify whether a package is recyclable or compostable.

Sub-objective 3.3: *Does a consumer's level of objective knowledge of recycling and composting correlate with their ability to identify compostable and recyclable packaging?*

An individual's objective knowledge indicates a level of understanding that they have about the processes of recycling and composting which could give them also more of an understanding about which materials are recyclable and/or compostable.

3.4 Research Design Developed

A research design lays the foundations for conducting a research project, helping to solve the research problem (Malhotra, Birks & Wills, 2012). It acts as the overall blueprint, guideline and plan-of-action framework for the research process (Domegan & Fleming, 2003), which guides decision making throughout. A research design can be either exploratory or conclusive. The primary goal of exploratory research is to gain insights into a specific research area, which can be used to guide future research studies. In contrast, the aim of conclusive research is to examine hypotheses and relationships and to examine the data collected to reach a conclusion. (Malhotra, Agarwal & Paterson, 1996)

This study aims to gain definitive answers to the research question so a conclusive research approach was adopted. This research study intends to provide new findings and insights that may be use to inform future research.

3.4.1 Quantitative vs Qualitative

Once the research approach is chosen, the methodological approach to data collection must be considered. When conducting research, there are several ways to construct and justify knowledge in the social sciences (Goulding, 1999). According to Gabriel (1990) one research approach is no more valid than the other and choosing the best methodological approach to a study depends on the research study. While qualitative methods are more suited

to exploratory research approaches, quantitative methods are more suited to conclusive research approaches such as this study.

3.4.2 Rationale for using Quantitative

Due to the conclusive nature of the research question and objectives in this study, a quantitative approach was chosen for the research design. The author wishes to compare how consumers view and identify compostable and recyclable packaging and determine which factors most relate to consumer identification of both types of packaging. The analysis of facts and figures through a quantitative approach allows for a more conclusive answer to the research question and objectives compared to a more exploratory and flexible but less conclusive, qualtitative approach. Quantitative research allows for the generalisation of results by measuring views and responses of the sample but there are still some limitations which are beyond our control (Simon. 2011) which were taken into consideration during the research design process.

3.4.5 Limitations of Qualitative.

Limitations of quantitative research include the researchers inability to control the environment in which respondents provide answers to questions and the fact that quantitative methods require complex analysis of the data (Saunders, Thornnhill & Lewis. 2009) which is entirely dependent on the researcher's (from a non-statistical background's) abilities to use the relevant software and conduct the correct tests. In the case of this research a global pandemic has resulted in all data collection being carried out thought an online questionnaire and the responses are dependant on the (unusual) conditions presented to consumers at this time. Despite these cons, the pros for using a qualitative research design for this study far

outweigh these limitations, and a qualitative approach is the only logical way to answer the research question and objective of this study.

3.4.6 Data collection method

After the research question was outlined, a research approach was developed, and a research design was chosen, the next step in Malhotra & Birks (2007) Market Research Process was the collection of Data. This section will now discuss the choice of data collection process and how it met the research objectives of the study

Most recently, Taufik et al. (2020) collected data relating directly to packaging disposal through a face to face experiment with consumers however, the limitations of covid-19 have resulted in an alternative way of collecting the same sort of data. Rather than having consumers place packaging in bins, a section of the questionnaire will present participants with the image of a package or product and ask them to place it in one of three bins: general waste; recycling and compost.

Questionnaires have been an effective method of collecting data related to pro-environmental purchase behaviour (Tilikidou. 2007), attitudes around sustainable materials (Rokka & Uusitalo. 2008) and waste disposal (Schultz. 2002) in previous research studies.

3.5 Data Collection

3.5.1 Sampling

The first step in the sampling process is to define the target population (Malhotra & Birks, 2007). The were no population requirements for this study, as partitpants of all ages

are likely to engage with food and drink companies and have experienced with sustainable packaging and waste management. Convenience sampling was used (Malhotra & Birks, 2007) and respondents from all over Ireland took part in the questionnaire. This facilitated the answering of the research question and objectives through the collection and analysis of 422 data samples. Ideally the sample would be representative of the population however, a larger proportion were female (75%), which was also the case in Tilikidou. (2007)**.** Respondents for this study ranged in age from 14-85 years with a round 20% of them in their 20s and 27% in their 50s**.** They lived in either rural (22%), urban (28%) or suburban (50%)locations.

3.5.4 Data collection Instrument: Questionnaire

Data was collected through a structured questionnaire. The questionnaire was designed and launched through Typeform. Due to the limitations of Covid-19 and the fact that this data collection couldn't be conducted in person the researcher felt it was important to ensure that the questionnaire was visually stimulating and engaging, and that the questions relating to the identification and disposal of materials in particular were easy to follow. The Questionnaire was broken into 5 main sections: Demographic information, environmental interest and subjective waste management knowledge, perception of sustainable materials, objective knowledge of both recycling and composting and identification of sustainable materials through waste management exercise.

The demographic information was collected to provide an insight into the sample and focused on variables of gender, age and type of location they lived. The researcher was careful when designing the questionnaire not to ask questions which might give away the true nature of the study and influence the data so some 'dummy' questions were used in the waste management section (egg shells, crispo packet and veg scraps).

The objective knowledge questions used a number of questions testing the ability to identify symbols, concepts and behaviour patterns (Laroche et al. 2001) related specifically to waste management processes of recycling and composting. The identification of symbols also plays an important part in being able to identify characteristics of packaging and products.

The questionnaire was piloted with 27 participants and any objective knowledge questions which were deemed too difficult or too easy were removed. Some questions were reworded to make them easier to understand.

The questionnaire was launched and shared through social media predominantly through Facebook Forums and Whatsapp Groups or friends and relatives. Respondents were asked to share the questionnaire with people they knew after they had completed it and many did. This facilitated the answering of the research question and objectives through the the collection and analysis of 422 data samples.

3.5.5 Questionnaire Design

The full questionnaire can be found in Appendix 1.

Sections 1,2 & 3 Demographics: Age Gender Location	This section aims to provide data which can be used to gain a better understanding of the sample and how it is broken down by age, gender, and where participants live.
Section 4: **4.a.** Are you interested in environmental issues? (Scale 1 *strongly disagree* – 7 *strongly agree*) **4.c.** You know a lot about recycling (Scale 1 *strongly disagree* – 7 *strongly agree*) **4.d.** You know a lot about composting (Scale 1 *strongly disagree* – 7 *strongly agree*)	Uses a 7- point Likert Scale similar to the ones used in Reinders et al (2017) & Tilikidou, (2007) to measure environmental interest and subjective knowledge however, questions were worded slightly differently. This section aims to provide data to answer and sub-objectives 3.1 (Q4a) and 3.2 (Q4b & 4c) (Chapter 3.3.2)

Section 5 Environmentally friendliness of sustainable packaging options **5.a** In your opinion how environmentally friendly is packaging made from **recyclable** materials? 1 - 5 **5.b**In your opinion how environmentally friendly is packaging made from **reusable** materials like **glass**? 1- 5 **5.c**. In your opinion how environmentally friendly is packaging made from **biodegradable** materials? 1- 5	Through the use of a rating scale like the one used in Herbes et. al. (2018) Cross country comparison of perceived environmental friendliness. Also similar to Korhonen et al. (2015) & Boesen, et al. (2019) studies on attributes of sustainable packaging which both ask participants to rate based on a 5 point rating scale. This sections aims to provide data to answer objective 1 (Chapter 3.3.2)
Section 6 **Composting and Recycling knowledge Quiz** **Questions 6a-6i**	To gather data on consumers' objective knowledge of recycling and composting each item is measured on a right-wrong basis out of 4 choices similar to the scales used in Tilikidou, (2007) Vincente-Molina et al. (2013). Facts used to create the questions relating specifically to composting and recycling knowledge were take from a variety of educational resources (repak.ie, recyclenow.com, mywaste.ie, Taylor(2020) and globalactionplan.ie.) In SPSS a value of 1 is awarded for each correct answer and 0 for incorrect answers and total scores are added up to make the variables. This sections aims to provide data to answer objective 3.2 and objectives 3.3 (Chapter 3.3.2)
Section 7 **Waste management Quiz** **Questions 7a-7j**	Similar to Taufik's (2020) study which presented respondents with a series of bins and a variety of products to place them in, this questionnaire uses the same right-wrong basis out of 3 choices which was used by Tilikidou, (2007) and Vincente-Molina et al. (2013). In SPSS a value of 1 is awarded for each correct answer and 0 for incorrect answers and total scores are added up to make the variables. This section aims to provide data to answer objective 2.

3.6 Data Preparation and analysis

The Data was entered into SPSS and variables were edited based on the codebook. A codebook was created to determine how each variable would be treated (Pallant. 2020) (Appendix 2). To convert the individual objective knowledge and waste management answers into total scores right answers were given a value of 1 and incorrect answers a value of 0. New variables (Objective recycling knowledge score, objective composting knowledge score, correct identification of recyclable packaging score and correct identification of compostable packaging score) were computed by combining the total value of correct (+1) and incorrectly (+0) answered questions. Data was analysed using a combination of non-parametric tests including Friedman Test, Wilcoxon-signed rank test and Spearman-rank correlation coefficient. To perform the Spearman-rank correlation scatter plots were drawn up of the variables for testing (see appendix) and outliers were located and left out of relevant equations to ensure the relationship between the data was monotonic (Statistics.lared.com. 2020).

3.6.1 Descriptive Statistics

Descriptive statistics were used to summarize and describe the data in a meaningful way, but do not facilitate any conclusive answers about the data, they have been represented in figures with histograms and tables throughout the findings and results chapter. Descriptive measures included means, medians and standard deviation of the sample, which provides a summary measure of the differences of each individual participant's data from the mean.

(Statistics. 2020; Pallant. 2020)

3.6.2 Friedman Test

The Friedman test is a non-parametric alternative to the one-way ANOVA with repeated measures and can be used to test for differences in data that violates at least one of the following assumptions of the one-way ANOVA:

1. One group is measured on three occasions or more.
2. The group is a random sample of the population
3. Sample's don't need to be normally distributed
4. The dependent variable is measured at the ordinal or continuous level.

The Friedman test was used to measure ordinal data based on consumers' ranking three items environmental friendliness out of a 5-point scale.

(Statistics. 2020; Pallant. 2020)

3.6.3 Wilcoxon Signed-rank test

The Wilcoxon signed-rank test* is another nonparametric test, which was used in this study in two different ways, either following on from the Friedman test or independent of the Friedman test in cases where differences were only being tested between 2 variables e.g. objective knowledge of recycling scores and correctly identified recyclable packaging scores. The Wilcoxon Signed-rank test assumes no normality of data and is used when the dependent t-test is unsuitable and the following assumptions are met:

1. The dependent variable is measured at the ordinal or continuous level

2. The independent variable consists of two categorical related groups comparing data from the same subjects or matched pairs.

3. The distribution of differences between the two related groups are symmetrical in shape.

The Wilcoxon-signed rank test was used to measure ordinal data based on consumers' ranking of items' environmental friendliness out of a 5-point scale and subjective recycling and composting knowledge based on a 7-point Likert scale and the identification of different compostable packaging based on a score out of 1.

When comparing scores of different values, (for example objective knowledge of composting out of 7 vs. objective knowledge of recycling out of 6) scores were converted into percentages to make them easier to analyse.

* In all cases a Bonferroni Adjustment was used to test significance where P value<0.05.

(Statistics. 2020; Pallant. 2020)

3.6.4 Spearman-rank correlation coefficient (Spearman correlation)

The Spearman correlation is another non-parametric test which measures the strength and direction of relationship that exists between two variables that meet the following assumptions:

1. The two variables are measured at the ordinal, interval or ratio scale or continuous scale that doesn't meet the assumptions for the Pearson's product-moment correlation.

2. The two variables represent paired observations.

3. There is a monotonic relationship between the two variables meaning they either increase in value together or as one increases the other decreases. A scatterplot provided an

indication of any outliers which were subsequently removed during the analysis of correlation.

(Statistics. 2020; Pallant. 2020)

3.6 Report Preparation and Presentation

This report was written up, starting with the Literature review which led into the Methodology chapter. After data was analysed and the Results and findings were written up. To transfer the collected data into this research report, analysis of the three main research objectives was addressed individually. This can be seen in the following chapter.

3.7 Limitations

This study faced two main limitations. Firstly, as mentioned previously, Covid-19 resulted in the only possible option for of quantitative data collection being questionnaires.

The second limitation was in relation to the inexperience of the researcher, particularly during collection of data through questionnaire designed by the researcher. Despite this limitation every step was taken to ensure the interviews were conducted correctly. Due to the qualitative nature of this study, it can't provide conclusive analysis and must only be taken as a guide for future research.

3.8 Conclusion

This research study adopted the market research process of Malhotra & Birks (2007). The research process began with an extensive review of literature around sustainable

packaging, and consumer opinions and pro-environmental behaviour and led to the identification of a problem definition. From this a conclusive research approach was developed and a quantitative approach was adopted for the data collection and analysis. Structured questionnaires were used to collect data, which was then coded and imported into SPSS. The data was analysed using non-parametric tests (Friedman's Test and, Wilcoxon's Signed-rank test) which analysed any significant differences or correlations between variables. Finally, this report was prepared and drawn up. This chapter outlines the way in which data was collected to analyse how consumers view and identify recyclable and compostable packaging, and determine if there is a specific consumer type who correctly identifies recyclables and or compostable packaging. The results and findings of this study will be discussed in the next chapter.

3.9 Chapter Three: List of References

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Chapter Four: Results and Findings

Chapter four: Results and Findings

4.1 Introduction:

To achieve the research objectives, questionnaires were carried out and data was collected, presented and analysed through descriptive statistics charts and tables and non-parametric tests in SPSS software. This chapter will discuss how the data was interpreted and how key findings were used to inform the research objectives. The first objective assessed whether consumers view compostable packaging as more environmentally friendly than recyclable packaging. The second objective assessed whether consumers correctly identify compostable and recyclable packaging. The third objective assessed whether there is a specific consumer type that correctly identified either recyclable or compostable packaging by assessing variables of environmental interest, subjective knowledge or objective knowledge.

4.2 Objective 1:

Do Irish consumers view compostable packaging as more environmentally friendly than other sustainable (recyclable and reusable) packaging options?

A Friedman test was conducted to see if there was a difference in how consumers perceived the environmental friendliness of all three packaging options . The test showed a statistically significant difference between the Subjective environmental friendliness of the three different types of sustainable materials. $X^2(2) = 176.236$, $p = .000$. $df = 2$.

Following on from the results of the Friedman test 3 Wilcoxon Signed-Rank tests were conducted using a Bonferroni Adjustment to test significance (p value < 0.05) to see specifically where the differences were relating to consumers perceptions of the environmental friendliness of compostable, recyclable and reusable materials. The tests showed that consumers perception of the environmental friendliness of Reusable Materials elicited a statistically different (higher) rating to their view of Recyclable materials ($z=-8.548$, $p<.05$), compostable materials elicited a different rating (higher) than Reusable materials ($z=-4.562$, $p<0.05$) and Compostable materials elicited the largest difference in rating when compared with recyclable materials ($z=-11.674$, $p<0.05$). The median rating for recyclables was 3.0 whereas reusable and compostable materials median value ratings were both 4.0. The mean values for Subjective environmental friendliness of each sustainable packaging material

option as shown in Figure 1 were: Compostable material = 4.01; Reusable material=3.76; Recyclable material = 3.28.

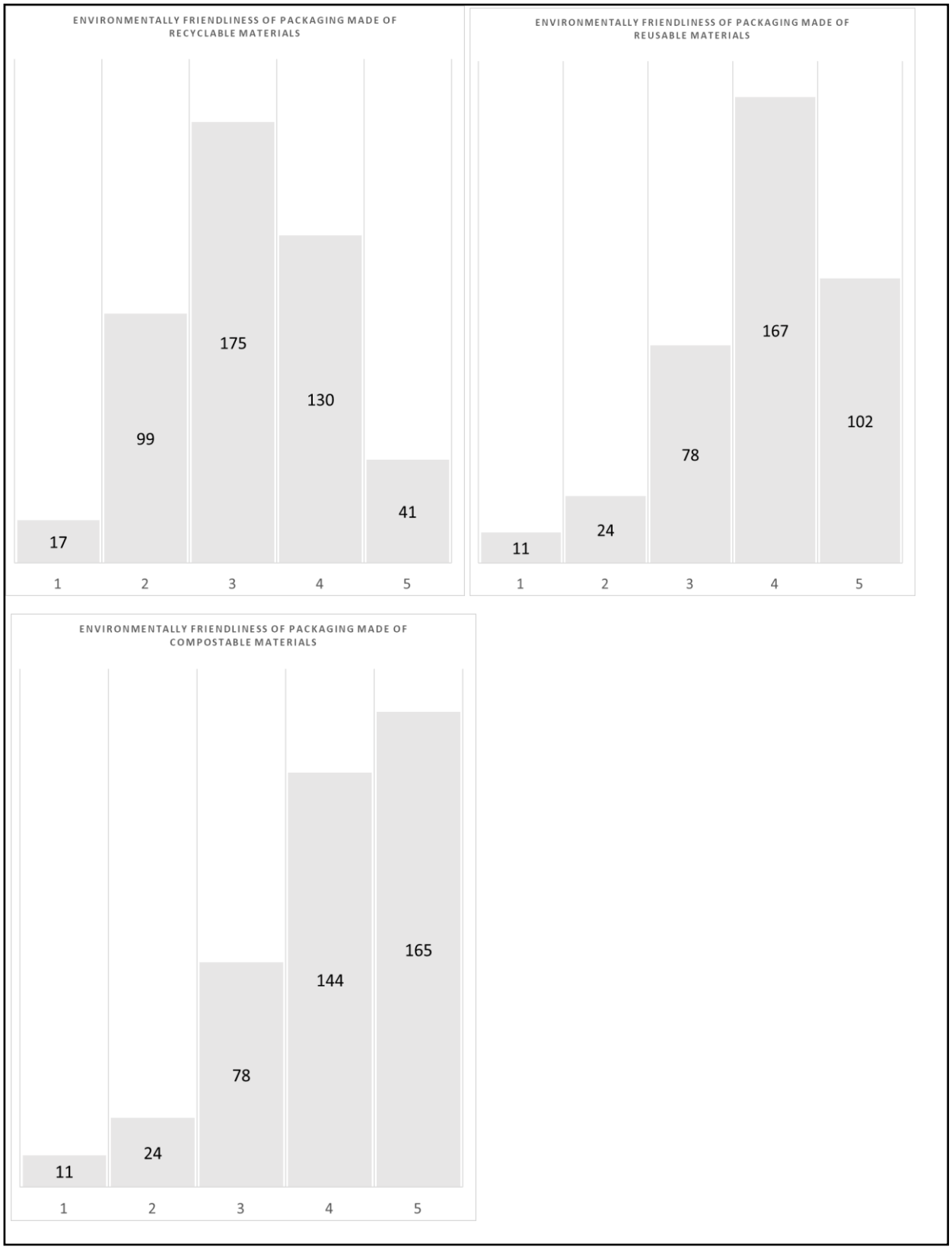


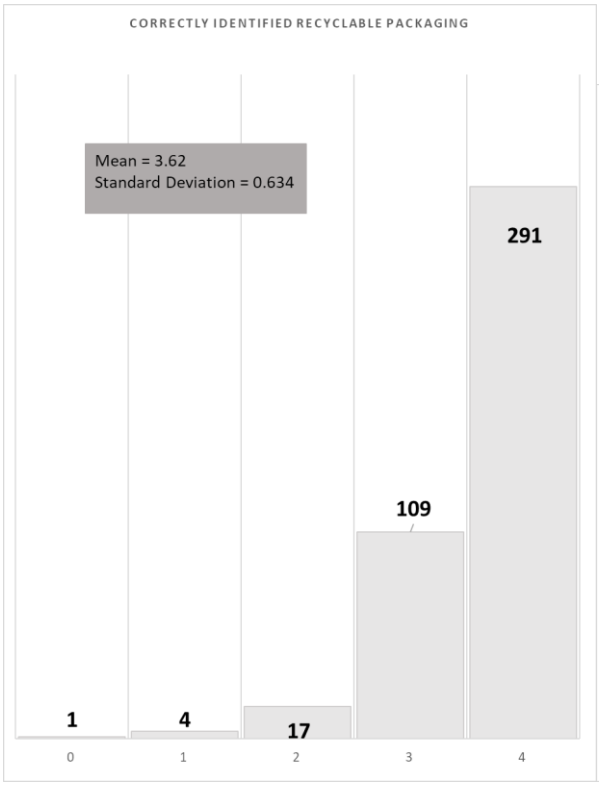
Figure 1. Histogram of Consumers' Subjective environmental friendliness of different sustainable packaging materials (Recyclable, reusable & compostable).

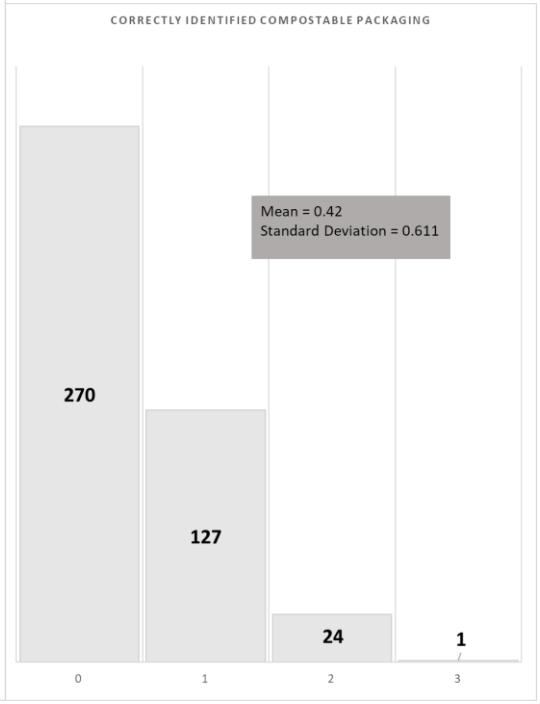
4.3. Objective 2:

Do Irish consumers correctly identify recyclable and compostable packaging?

The waste management quiz section.of the questionnaire (shown in in chapter 3.5.5) provided the data used to calculate the scores for correctly identified recyclable and compostable packaging.

A Wilcoxon Signed-Rank tests was conducted to see if there was a difference relating to consumers correct identification of recyclable and compostable packaging. When both scores were converted into percentages, the test showed that the score of correctly identified recyclable packaging elicited a statistically different (higher) rating to the score of correctly identified compostable packaging. ($z= -17.970$, $p<.05$). Out of a perfect score of 4 the median score for identifying recyclable packaging was 4, out of a perfect score of 3 the median score for identifying compostable packaging was .00. As shown in figure 2, the mean value score for correctly identifying recyclable packaging was 3.62, whereas the mean value for compostable packaging was 0.42





Identified Recyclables score	Frequency	**Percentage %**
0	1	0.2
1	4	0.9
2	17	4
3	109	25.8
4	291	69
Total sample	422	100
Mean	3.62	
Standard Deviation	0.634	

Identified Recyclables score	Frequency	**Percentage %**
0	270	64
1	127	30.1
2	24	5.7
3	1	0.2
Total sample	422	100
Mean	0.42	
Standard Deviation	0.611	

Figure 2. Histogram and Tables with a breakdown of Consumers' scores for correctly identified recyclable and compostable packaging.

4.4. Objective 3:

Are there any correlations between factors that might stimulate a consumers' purchase intention of sustainable packaging (Environmental Interest, Subjective Knowledge or Objective Knowledge) and the correct identification of either recyclable or compostable materials? As part of this objective the following 3 sub-objectives will be answered separately:

Sub-objective 3.1: Does a consumer's level of environmental interest correlate with their ability to identify compostable and/or recyclable packaging?

Sub-objective 3.2: Does a consumer's level of Subjective knowledge of recycling and composting correlate with their ability to identify compostable and/or recyclable packaging?

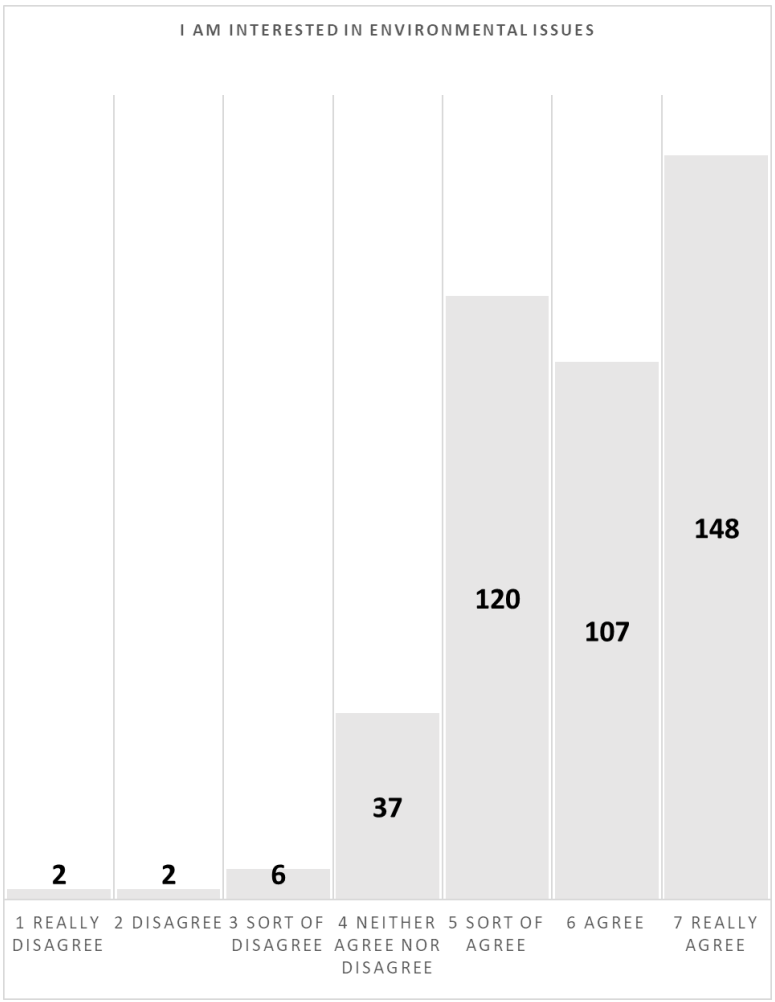
Sub-objective 3.3: Does a consumer's level of objective knowledge of recycling and composting correlate with their ability to identify compostable and recyclable packaging?

4.4.1: Sub-objective 3.1:

Does a consumer's level of environmental interest correlate with their ability to identify compostable and/or recyclable packaging?

Participants in the sample mostly agreed with the statement of environmental interest which had a mean value of 5.81 (between sort of agree and agree) on the 7-point Likert scale shown in figure 3.

A Spearman's rank-order correlation was run to determine any relationship there might be between consumers' level of environmental interest and their correct identification of sustainable packaging (depicted in figures 5 & 6). There was no correlation for either recyclable ($r_s(8) = .079$, $p = .120$) or compostable packaging ($r_s(8) = .021$, $p = .672$). When looking at the variable of correct identification of recyclable packaging, the results show a ceiling effect as indicated in figure 2. 291 respondents (69% of the sample) achieved a perfect score of 4/4 and 400 (94.8% of the sample) got at least 3 right. A similar reversed effect can be seen in the variable of correctly identified compostable packaging where 270 respondents (64% of the sample) achieved a score of 0/3 and 397 (94.1% of the sample) only correctly identified 1 or less.



7-point Likert scale	Frequency	Percentage %
1 Really disagree	2	0.5
2 Disagree	2	0.5
3 Sort of disagree	6	1.4
4 Neither agree nor disagree	37	8.8
5 Sort of agree	120	28.4
6 Agree	107	25.4
7 Really Agree	148	35.1
Total sample	422	100
Mean	5.81	
Standard Deviation	1.128	

Figure 3: Histogram and table of Environmental Interest.

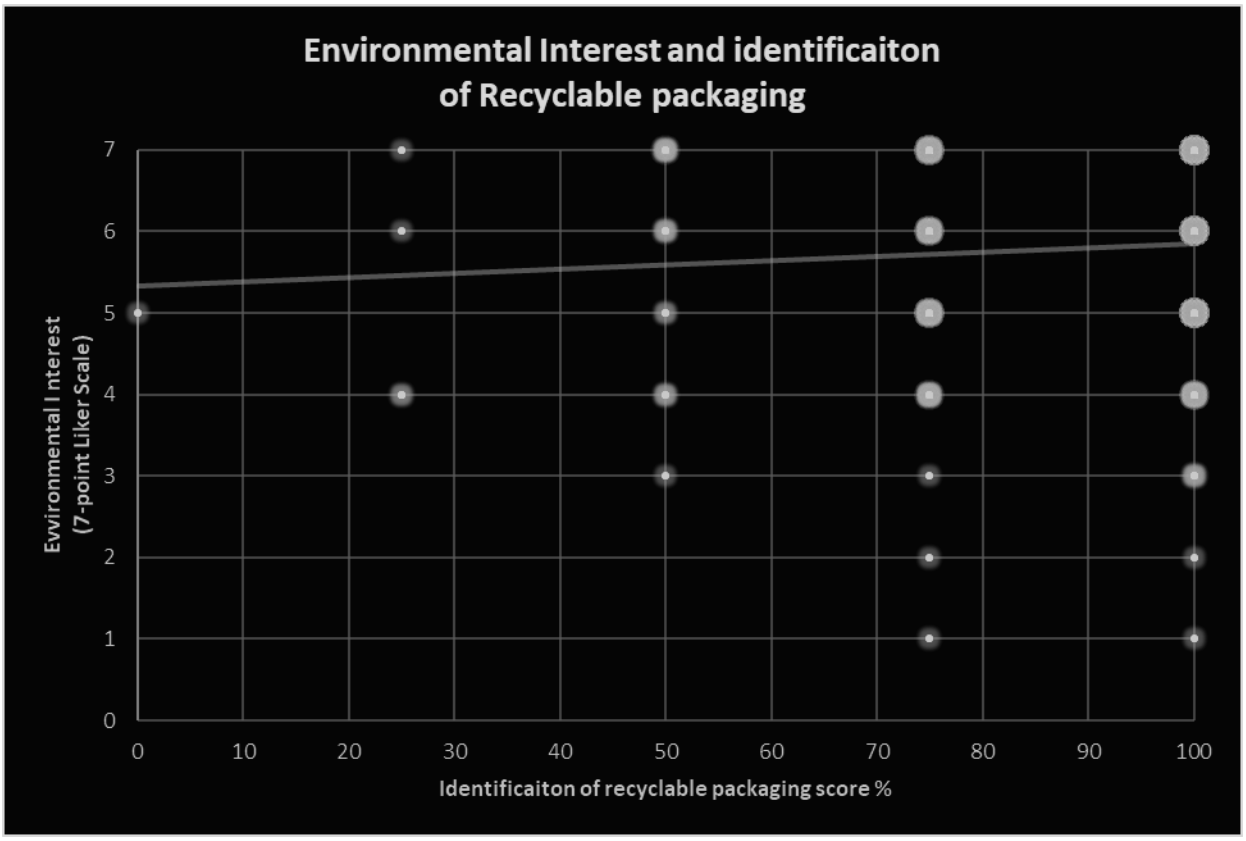


Figure 4: Scatterplot of Environmental Interest and Identification of Recyclable Packaging
(The Larger the area of the circle, the larger the proportion of the sample it represents)

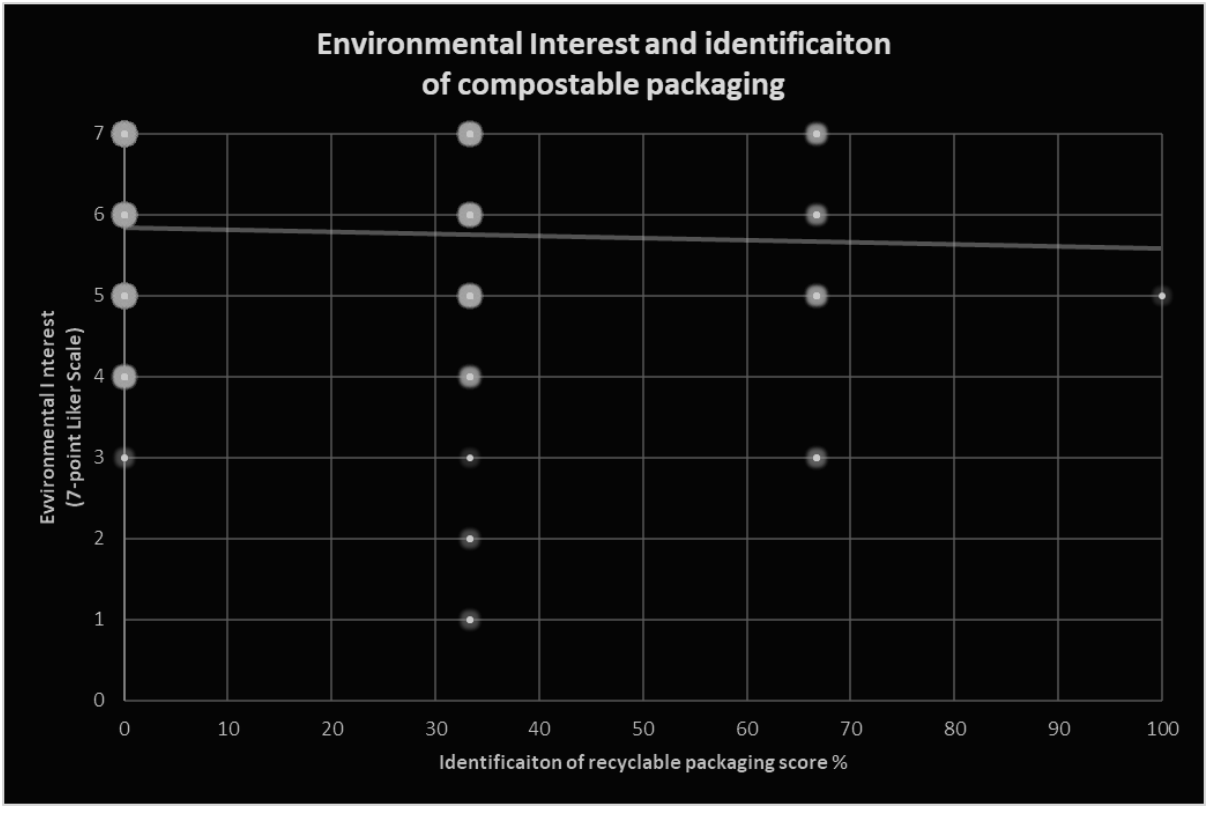


Figure 5: Scatterplot of Environmental Interest and Identification of Compostable Packaging
(The Larger the area of the circle, the larger the proportion of the sample it represents)

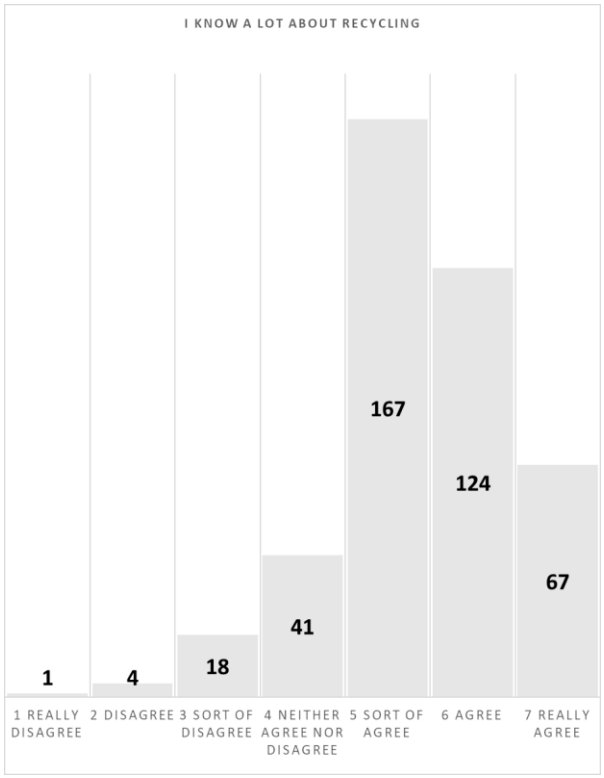
4.4.2: Objective 3.2:

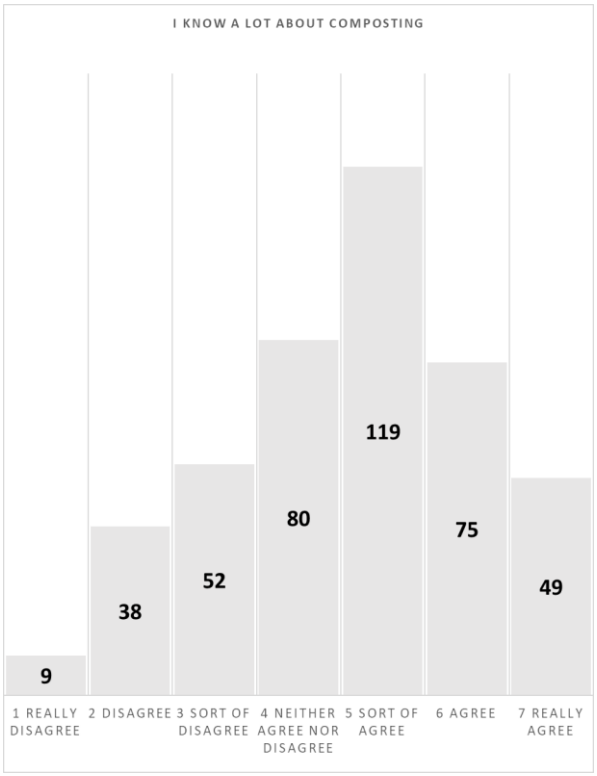
Does a consumer's level of Subjective knowledge of recycling and composting correlate with their ability to identify compostable and/or recyclable packaging?

Participants in the sample appear to agree more with the statement of recycling knowledge (mean value 5.39, between sort of agree and agree on 7-point Likert scale) than composting knowledge (mean value 4.62) between neither agree to disagree and sort of agree on the 7-point Likert scale) shown in figure 5. Despite the difference in mean, the median score for Subjective knowledge was 5.00 (sort of agree) in cases of both recycling and composting.

A Wilcoxon Signed-Rank tests was conducted to see if there was a significant difference between consumers' Subjective knowledge of recycling and composting. The test showed that the Subjective recycling knowledge elicited a statistically different (higher) rating to the Subjective composting knowledge ($z=-11.188$, $p<.05$).

A Spearman's rank-order correlation was run to determine any relationship there might be between consumers' level of Subjective knowledge and their correct identification of sustainable packaging (depicted in figures 8 & 9).. There was a low, positive correlation between Subjective knowledge of recycling and correct identification of recyclable packaging ($r_s(8) = .229$, $p<.005$), whereas there was no correlation between Subjective knowledge of composting and identification of compostable packaging ($r_s(8) = -.030$, $p= .540$).





7-point Likert scale	Frequency	Percentage %
1 Really disagree	1	.2
2 Disagree	4	.9
3 Sort of disagree	18	4.3
4 Neither agree nor disagree	41	9.7
5 Sort of agree	167	39.6
6 Agree	124	29.4
7 Really Agree	67	15.9
Total sample	422	100
Mean	5.39	
Standard Deviation	1.082	

7-point Likert scale	Frequency	Percentage %
1 Really disagree	9	2.1
2 Disagree	38	9
3 Sort of disagree	52	12.3
4 Neither agree nor disagree	80	19
5 Sort of agree	119	28.2
6 Agree	75	17.8
7 Really Agree	49	11.5
Total sample	422	100
Mean	4.62	
Standard Deviation	1.582	

Figure 7: Histograms and Tables of Subjective Recycling and Composting Knowledge.

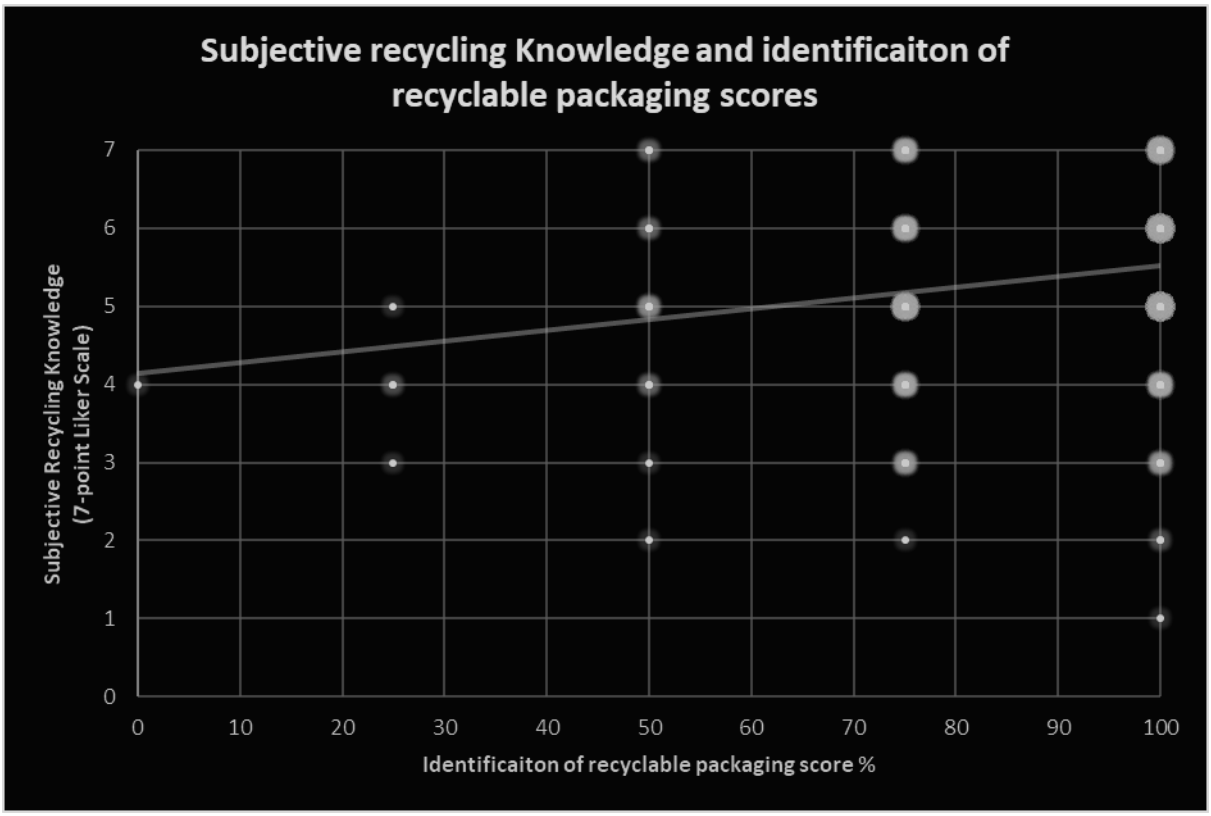


Figure 8: Subjective knowledge of recyclingand Identification of Compostable Packaging
(The Larger the area of the circle, the larger the proportion of the sample it represents)

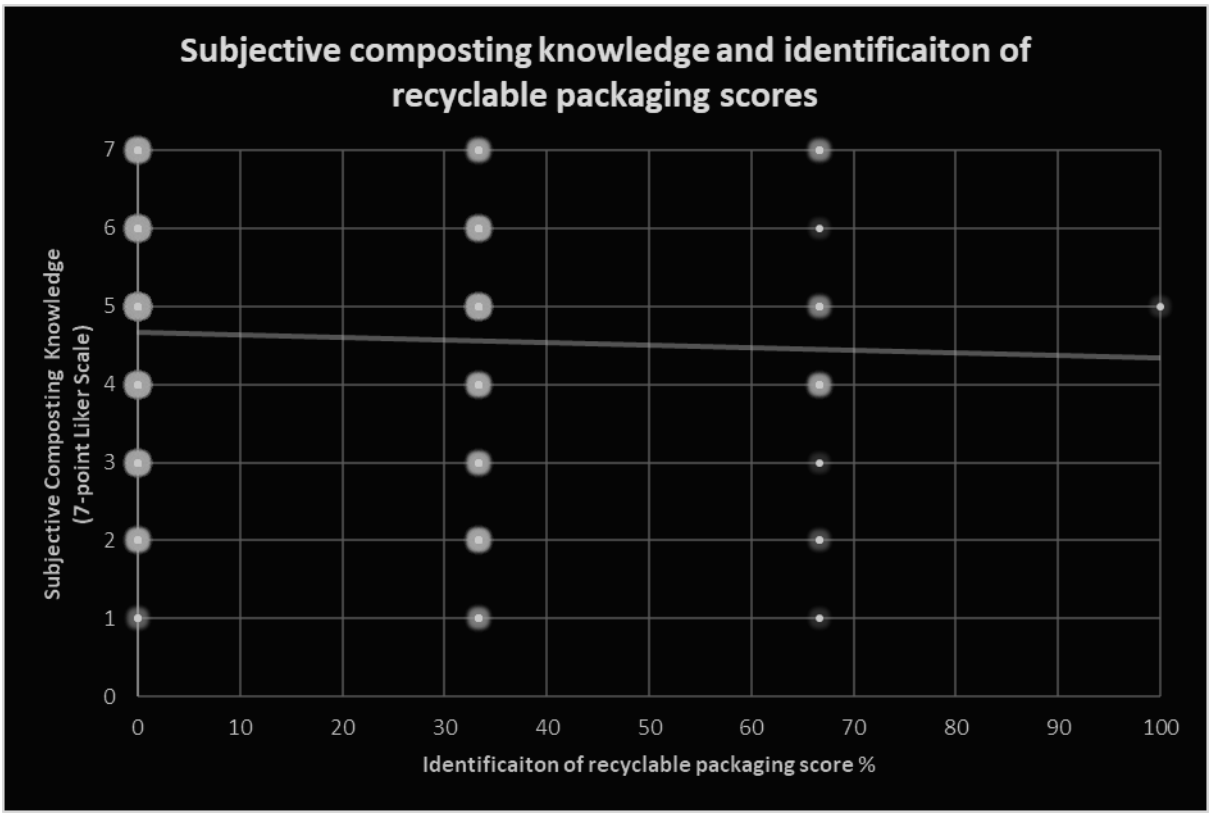


Figure 9: Subjective knowledge of composting and Identification of Compostable Packaging
(The Larger the area of the circle, the larger the proportion of the sample it represents)

4.4.3.: Objective 3.3:

Does a consumer's level of objective knowledge of recycling and composting correlate with their ability to identify compostable and recyclable packaging?

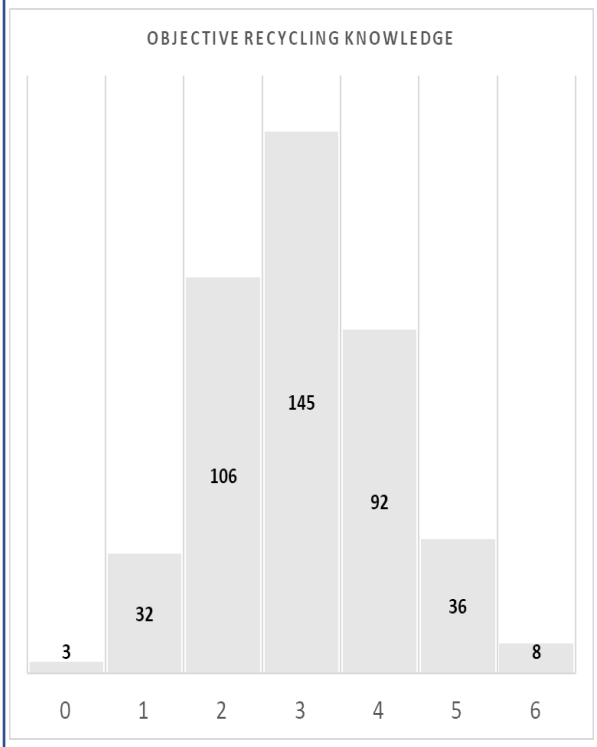
The recycling and composting quiz section.of the questionnaire (shown in in chapter 3.5.5) provided the data used to calculate the scores for correctly objective knowledge of recyclable and compostable packaging.

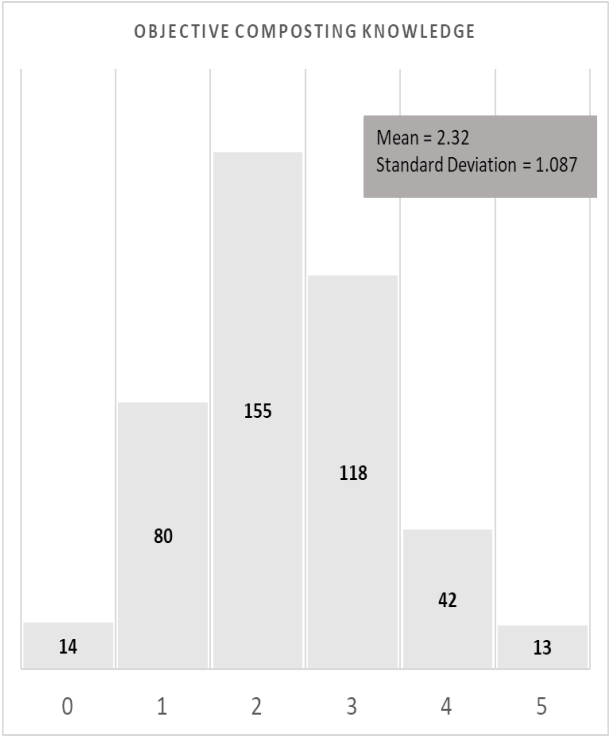
Participants in the sample were tested on their objective knowledge of recycling (mean score 3.02 out of 6) and composting (mean score 2.32 out of 7) in figure 6. The Median was 3.00 for Objective Knowledge of Recycling and 2.00 for Objective Knowledge of Composting.

A Wilcoxon Signed-Rank test showed that consumers' objective recycling knowledge elicited a statistically different (higher) % score to their objective composting knowledge ($z=-11.186$, $p<.05$). When comparing the means, the objective knowledge scores for composting (2.32 out of 7) appears to be higher than the scores for correctly identified compostable packaging (0.42 out of 3). A Wilcoxon Signed-Rank test was conducted to test any significant difference between the two scores showed that scores for correctly identified compostable packaging elicited a statistically different (lower) score to objective composting knowledge ($z=-12.897$, $p<.05$). The correctly identified recyclable packaging scores also elicited a statistically different (higher) score to objective recycling knowledge ($z=-17.031$, $p<.05$).

A Spearman's rank-order correlation was run to determine any relationship there might be between consumers' level of objective knowledge and their correct identification of sustainable packaging (depicted in figures 11 & 12). There was no correlation between objective knowledge of recycling and correct identification of recyclable packaging ($r_s(8) =$

.013, p=.794), or objective knowledge of composting and identification of compostable packaging (r_s (8) = -.002, p= .974).





Objective knowledge recycling score	Frequency	Percentage %
0	3	0.7
1	32	7.6
2	106	25.1
3	145	34.4
4	92	21.8
5	36	8.5
6	8	1.9
Total sample	422	100
Mean	3.02	
Standard Deviation	1.162	

Objective knowledge composting score	Frequency	Percentage %
0	14	3.3
1	80	19.0
2	155	36.7
3	118	28.0
4	42	10.0
5	13	3.1
6	0	0.0
7	0	0.0
Total sample	422	100
Mean	2.32	
Standard Deviation	1.087	

Figure 10: Histograms and Tables of Oubjective Recycling and Composting Knowledge.

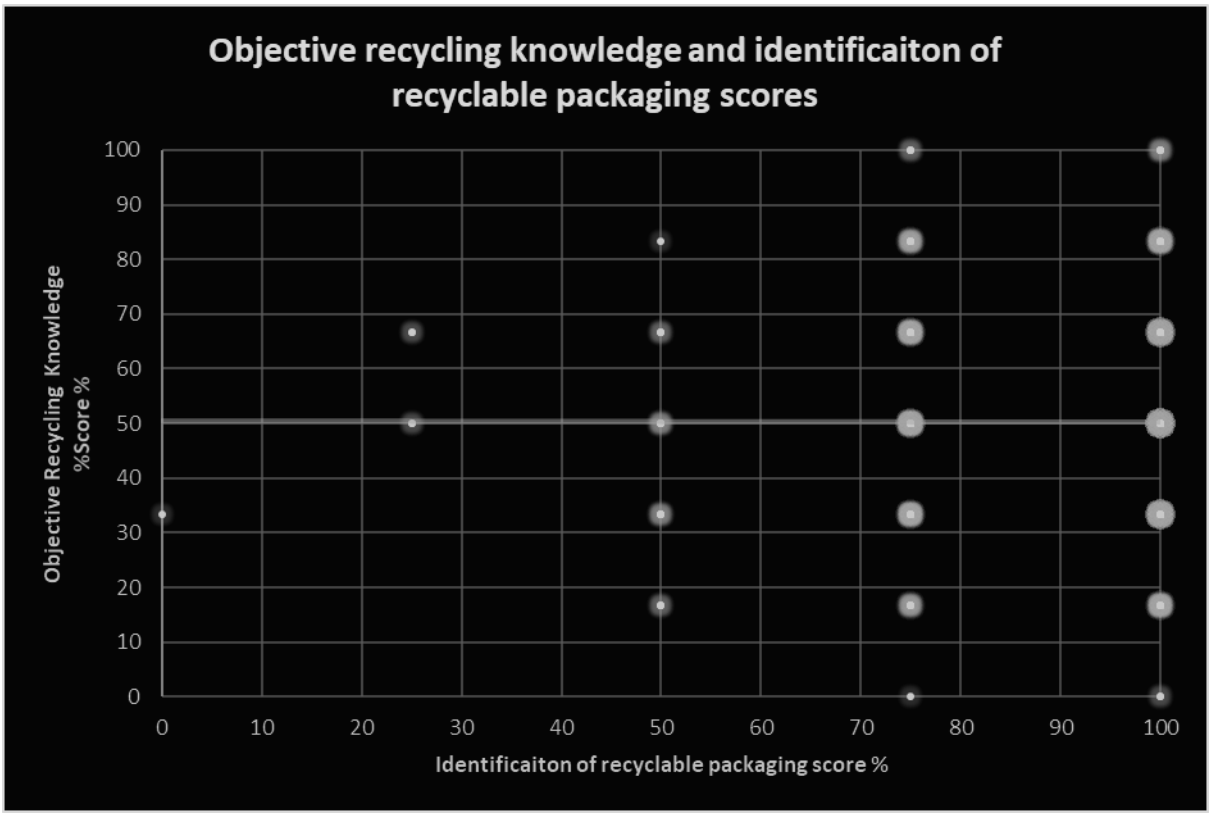


Figure 11: Objective knowledge of recycling and Identification of Compostable Packaging
(The Larger the area of the circle, the larger the proportion of the sample it represents)

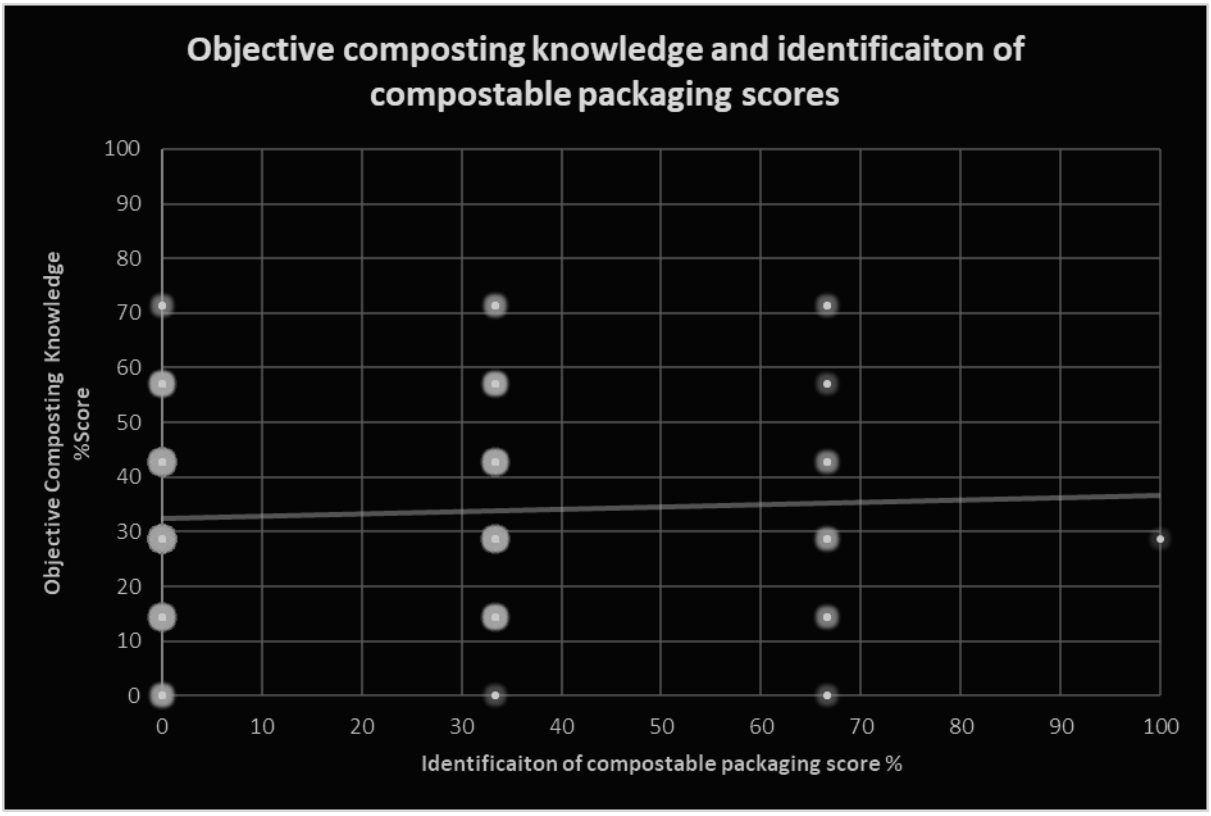


Figure 12: Objective knowledge of composting and Identification of Compostable Packaging
(The Larger the area of the circle, the larger the proportion of the sample it represents)

4.5 Cross-check of comparability of recyclable vs. compostable packaging used in this study:

Limitations of this study being carried out during covid-19 have resulted in the identification of packaging being carried out through photographs with the font and logo of the composability messages on two of the samples (compostable coffee cup and compostable avocado film) being very small, rather than in person and limited access to samples of compostable packaging resulting in 3 items tested against 4 recyclable packaging items (plastic bottle, metal tin, cardboard box & tetrapak milk carton). However, by looking at figure 13 and comparing the results of those who correctly identified each compostable package correctly, one can see that despite having significantly smaller font in the message of compostability, the coffee cup was identified by the more respondents than the brown bread film. Similarly, despite being tested on 1 less items for compostability than recyclability, the overall scores were low as indicated my the median of 0.00 and mean of 0.42 so it seems likely that testing 4 items would have yielded a similar percentage score for correctly identified compostables.

A Wilcoxon Signed-Rank tests showed that the score of correctly identified coffee cups elicited a statistically different rating to the score of correct identified brown bread film ($z = -6.49$, $p<.05$). Out of a perfect score of 1 the median score for identifying both forms of packaging was 0.00 however as show in figure 3, the mean for identifying the coffee cup was 0.28 whereas the mean for identifying the brown bread film was 0.11.

Another limitation of this study arose in the lack of access to packaging with officially recognised symbols showing compostability. The avocado film was the only package in the test which used an officially recognisable symbol. A Wilcoxon Signed-Rank test showed that the score of correctly identified Avocado Film elicited a statistically different rating to the score for the correctly identified coffee cup ($z = -9.621$, $p<.05$), and the correctly identified

brown bread packaging (z= -5.013, p<.05). The mean value for identifying the avocado film was 0.03 which is much lower than the means for the coffee cup and brown bread film as shown in figure 13 below.

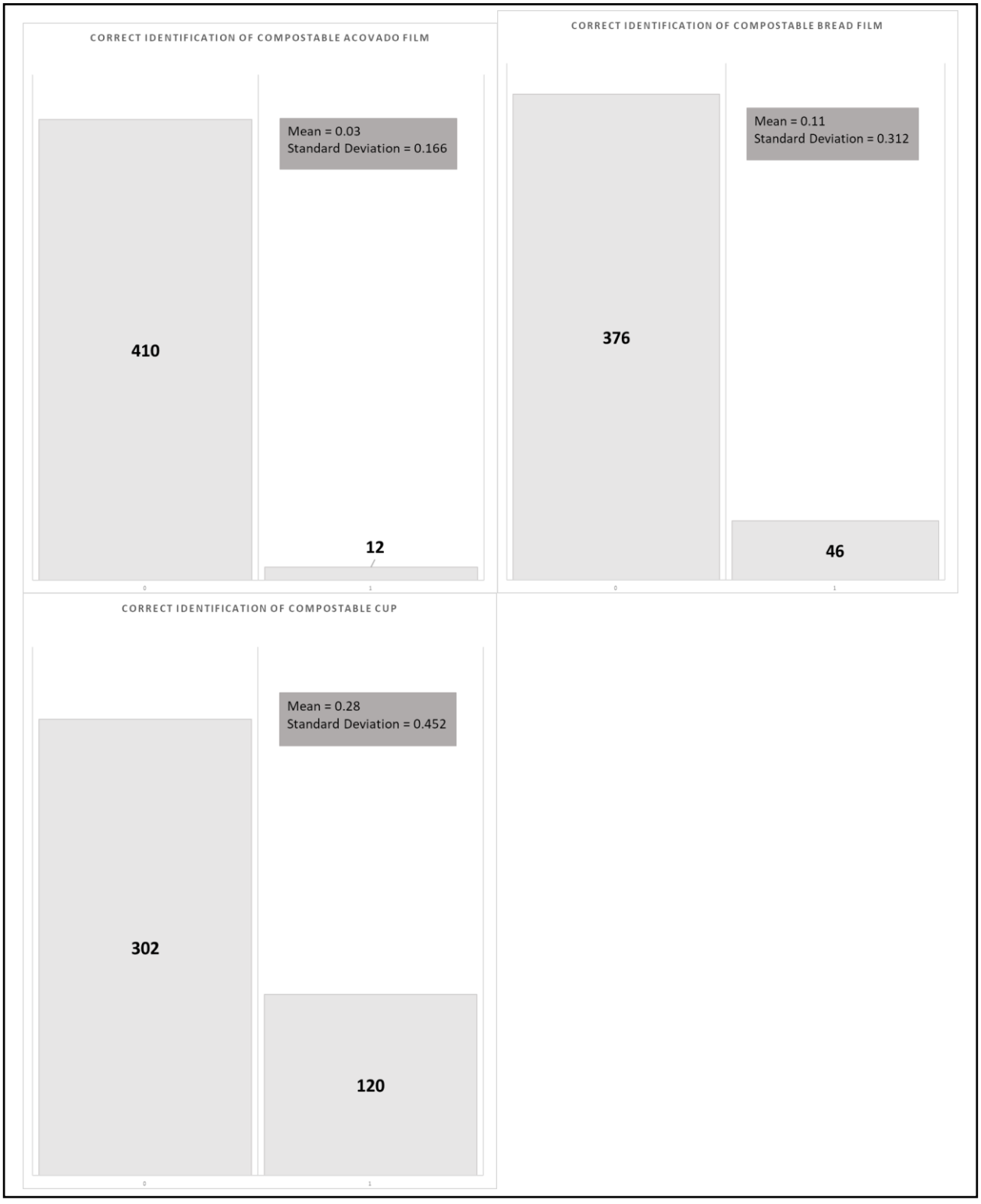


Figure 13. Histogram of Consumers' scores for correctly identified compostable packaging: (compostable cup, compostable brown bread film & compostable avocado film).

Chapter Five:

Discussion, conclusion and Recommendations

Chapter Five: Discussion, Conclusions and Recommendations

5.1 Introduction

This chapter will begin with a discussion of the results of this study which will be summarised in the conclusion section. Points made in the conclusion will be used to form recommendations for future research and potentially inform strategies (relating to sustainable packaging) for marketers and companies in the food and drink industry.

5.2 Discussion

This section will discuss the results and findings of this study in greater detail and focus on how they provide the relevant information required to answer the 3 research objectives.

5.2.1 Objective 1: Do Irish consumers view compostable packaging as more environmentally friendly than other sustainable (recyclable and reusable) packaging options?

The existing literature states that consumers favour products that are bio-based (Kainz. 2016; Carus, Eder & Beckman. 2014; Sitjtsema, Onwenzen, Reinders,Davegos, Partanen & Meeusen. 2016), and Taufik, Reinders, Molenveld, & Onwezen (2020) recently discovered that, consumers view compostable bio-based packaging as more environmentally friendly than recyclable bio-based and recyclable fossil-based packaging. A Wilcoxon signed-rank test revealed that participants in this study showed a similar response by viewing packaging made of compostable materials as more environmentally friendly than packaging made of both recyclable and reusable materials. In a rating out of 5 the mean values that consumers awarded each material was as follows: Compostable materials= 4.01; Reusable materials=

3.76 and Recyclable material= 3.28 (Chapter 4.2). Knowing that compostable materials are viewed significantly more environmentally friendly than recyclables, and therefore more likely to benefit the brand and stimulate purchase intentions (Olsen, Slotegraaf & Chandukala. 2014; Rios Martinez, Moreno & Soriano. 2006; Grimmer & Bingham. 2013) can benefit food and drink companies who are trying to decide which sustainable packaging alternative to choose.

5.2.2 Objective 2: Do Irish consumers correctly identify recyclable and compostable packaging?

Taufik et al. (2020) also discusses the paradox between compostables being the material that consumers view most environmentally friendly, and the fact that they dispose of them incorrectly. Similar to Taufik et al.'s (2020) findings, most participants in this study identified all the compostable materials incorrectly, interestingly however, the majority identified all of the recyclable materials correctly.

When creating scatter plots of data and removing outliers, the majority of the outliers relating to the variable of correct identification of Compostable packaging were those who scored 2 or 3 out of 3. The outliers in the correct identification of recyclable packaging were those who scored 1 or less out of 4. Interestingly only 1 person managed to score 3 out of 3 in the identification of compostables and only one person scored 0 out of 4 in the identification of recyclables. In the case of all products tested, particularly the compostables, at least 12 participants were able to correctly identify each product proving that they were identifiable to some consumers, but in all cases only a very small proportion of the sample (n=422).

While compostables provide a packaging alternative most likely to stimulate consumer purchase intentions, most consumers don't identify them correctly therefore, a brand is unlikely to benefit from their perceived environmental friendliness unless they can guarantee consumers can identify them correctly.

5.2.3 Objective 3: Are there any correlations between factors that might stimulate a consumers' purchase intention of sustainable packaging (Environmental Interest, Subjective knowledge or Objective knowledge) and the correct identification of either recyclable or compostable materials?

All variables tested showed no correlation with correct identification of either compostable or recyclable packaging other than subjective knowledge of recycling and correct identification of recyclable packaging. The fact that consumers' objective knowledge (which proves an understanding of recycling and composting processes) and environmental interest has no relationship with their identification of compostable packaging is particularly important as these factors increase purchase intention of environmentally friendly products/ packaging and indicate which consumers are the *lowest hanging fruit* for marketers to target. The results of this study suggest that compostable packaging is not effectively communicating its message of compostability to most consumers, in particular those who are (environmentally interested or knowledgeable about composting) most likely to purchase them.

The data collected for correctly identified compostable and recyclable scores both show a ceiling effect. This ceiling contributed to the fact that no relationship was identified between either objective knowledge or environmental interest and both types of packaging

identification scores. Interestingly most consumers, regardless of the level of understanding they demonstrated through objective knowledge scored high in correctly identifying recyclable packaging, but also scored low in correctly identifying compostable packaging. Overall objective knowledge scores for recycling were higher (mean= 3.02) than composting (mean = 2.32). The results of this study suggest that consumers have more confidence in their knowledge of recycling than composting, more understanding about recycling than composting processes and regardless of their environmental interest or level of understanding, consumers identify recyclable packaging correctly and compostable packaging icorrectly. This suggests that unlike compostables, the recyclability message in recyclable packaging is communicated in an effective manner and future research into this could inform marketers of ways to improve messages to help identify compostable packaging.

5.3 Conclusions

The following conclusions can be made from the research: Consumers view compostable materials as more environmentally friendly than recyclable materials. Most consumers can identify packaging made of recyclable materials but can't identify packaging made of compostable materials at all. There is a positive relationship between consumers' identification of packaging made of recyclable materials and their subjective knowledge, but no relationship with objective knowledge or environmental interest. There is no relationship between consumers' identification of compostable materials and the factors likely to stimulate purchase intention (environmental interest, subjective knowledge and objective knowledge.

5.4 Recommendations

The following recommendations arose from the research:

More academic research is required in the area of the provision of sustainable packaging in the food and drink industry. In particular, there is a lack of information on consumers' identification of sustainable packaging. Increasing the level of research in this area could provide valuable information about what helps consumers identify the sustainability features of recyclable packaging and how this could be applied to compostable packaging.

From the food and drink industry's point of view, the introduction of compostable packaging is likely to yield the most positive results for a brand, as consumers favour compostables, are willing to pay a premium (Kainz. 2016), and view them as more environmentally friendly than packaging made of both recyclable and reusable materials (Chapter 4.2). However, at the moment most consumers aren't able to identify compostable packaging. Interestingly they can identify recyclable packaging yet don't view it as equally as environmentally friendly as compostable packaging. The food and drink industry would benefit from finding out what factors help a consumer identify recyclable packaging and applying them to compostable packaging to ensure they can provide the best sustainable packaging alternative, and guarantee it is identified and disposed of correctly to yield the best results for shareholders and the environment.

Standardisation applied to all the questionnaires and questions were phrased in such a way that they would not lead or mislead the respondents in any way. Due to the limitations of Covid-19, participants' waste management practices were tested through the questionnaire so some samples had smaller font than others, however in the case of compostable packaging, the packaging with the largest message was identified less frequently than an item of packaging with a considerably smaller font message. Only one sample contained an official

symbol of compostability, however this was also identified less frequently than packaging without any official symbols. The results of this study may be specifically related to the packaging that was used to test respondents however due to the large sample size of 422 respondents, it seems likely that they can be used to generalise the population at large. This study was successful in achieving the research objectives and providing conclusive answers as to which sustainable packaging is viewed as most environmentally friendly and whether consumers identify recyclable or compostable packaging. The researcher feels that this study could be used to guide future research around sustainable packaging and inform the process of providing sustainable packaging in the food and drink industry.

Chapter six: List of References

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Appendix 1: Questionnaire

Introduction

Hi there! My name is Rachel and I'm a final year student in the MSc in Business Management in NCI. As part of the program I am carrying out an independent research project which aims to investigate consumer's experiences and knowledge of waste management.
The results of this survey will be presented in my final dissertation which will be submitted to the National College of Ireland. If you have any queries or concerns please do not hesitate to contact me directly on the email address below to discuss.
Participation in this survey is entirely voluntary. You can withdraw from the study at any time, by simply closing the browser window. However due to the anonymous nature of the survey, it will not be possible to withdraw your data from the study once it has been submitted. The results of this survey will be retained for 5 years in accordance with NCI data retention policy.
Please feel free to share this survey with anyone else you think may be eligible and interested in participating in this survey.
Kind regards
Rachel McQuaid
x18133231@student.ncirl.ie

1 Age_____

2 Gender (Male**/** Female**/** Rather not say)

3 Where do you live? (Urban**/** Suburban**/** Rural)

Section 4. *Environmental Interest and Subjective Knowledge*: Please answer the following set of questions as honestly as you can.

4.a. I am interested in environmental issues? (Scale 1 *strongly disagree* – 7 *strongly agree*)

4.b. I know a lot about recycling (Scale 1 *strongly disagree* – 7 *strongly agree*)

4.c. I know a lot about composting (Scale 1 *strongly disagree* – 7 *strongly agree*)

Section 5. *Environmentally Friendliness of Sustianable materials*

5.a. In your opinion how environmentally friendly is packaging made from **recyclable** materials? Rating from 1 - 5

5.b. In your opinion how environmentally friendly is packaging made from **reusable** materials like **glass**? Rating from 1- 5

5.c. In your opinion how environmentally friendly is packaging made from **biodegradable** materials? Rating from 1- 5

Section 6. Recycling and composting quiz

6.a. I think that plastic can be _____

Bio-based (made from substances derived from living organism). Fossil-based (made from substances derived from fossil fuels (oil, coal or gas)

Fossil-based
Bio-based
Both Fossil-based or Bio-based
Neither Fossil-based or Bio-based

6.b. I think that Hard/ Rigid Plastic packaging can be made from materials which are _____

Recyclable only
Compostable only
Either recyclable or compostable
Neither recyclable nor compostable

6.c.. I think that Soft Plastics packaging can be made from materials which are _____

Recyclable only
Compostable only
Either recyclable or compostable
Neither recyclable nor compostable

6.c. Around how many years does it take for a plastic bottle to break down in a landfill?

20 years
50 years
over 1,000 years

6.d. Recycling an aluminium can conserves enough energy to power a TV for how long?

20 seconds
3 mins
3 hrs

6.e. What do you think this logo commonly found on products means?

This product is capable of being recycled
This product is suitable for composting
The producer of this product made a financial contribution towards the recovery and recycling of packaging in Europe.

6.f What do you think this logo commonly found on products means?

Plant-based product
Wood-based product
Suitable for composting

6.g. How many times can a single sheet of paper be recycled?

Once
7 times
There's no limit

6.h. What do you think this logo commonly found on products means?

This is a plastic product which is capable of being recycled
This is a paper product which is capable of being recycled
This product must be disposed of in an appropriate manner

6.i.How long does it take for a compostable cup to break down in an industrial compost?
5 days
84 days
377 days

6.j. What do you think this logo commonly found on products means?

This product is capable of being recycled
This product is made from recycled materials
This product is not capable of being recycled

6.k. How long does it take for a compostable cup to break down in a landfill?
166 days
30 years
Over 100 years

6.l. What do you think this logo commonly found on products means?

This product is suitable for composting in the EU
This product is is certified organic in the EU
This product is suitable for composting at home

Section 7. Which bin would you normally put the following items in?

7.a. . Which bin would you put this packet in?

General Waste Recycling Compost

7.b. Which bin would you put these egg shells in?

General Waste Recycling Compost

7.c. Which bin would you put this bottle in?

General Waste Recycling Compost

7.d. Which bin would you put this carton in?

General Waste Recycling Compost

7.e. Which bin would you put these scraps in?

General Waste Recycling Compost

7.f. Which bin would you put the plastic film in?

General Waste Recycling Compost

7.g. Which bin would you put the cup in?

General Waste

Recycling

Compost

7.h. Which bin would you put the box in?

General Waste | Recycling | Compost

7.i. Which bin would you put this plastic film in?

General Waste | Recycling | Compost

7.j. Which bin would you put this tin in?

General Waste

Recycling

Compost

Appendix 2: Code book

	SPSS Name	Variable	Coding Instructions	Measurement
1	AGE	Age	Age in years	Ordinal
2	Gender	Gender	1= Male 2= Female 3= Rather not say	Nominal
3	Living	Where they live	1=Urban 2=Suburban 3= Rural 4= Other	Nominal
4	EI	Environmental Interest	1= Strongly Disagree 2= Disagree 3=Disagree a little 4= Neither Agree nor Disagree 5= Agree a little 6= Agree 7 Strongly Agree	Scale
5	SKR	Perceived Knowledge of recycling	1= Strongly Disagree 2= Disagree 3=Disagree a little 4= Neither Agree nor Disagree 5= Agree a little 6= Agree 7 Strongly Agree	Scale
6	SKC	Perceived Knowledge of composting	1= Strongly Disagree 2= Disagree 3=Disagree a little 4= Neither Agree nor Disagree 5= Agree a little 6= Agree 7 Strongly Agree	Scale
7	EnvFr01	Perceived Environmentally Friendliness of Recyclable Packaging	1/5 2 /5 3 /5 4 /5 5/5	Scale
8	EnvFr02	Perceived Environmentally Friendliness of Reusable Packaging	1/5 2 /5 3 /5 4 /5 5/5	Scale
9	EnvFr03	Perceived Environmentally Friendliness of Biodegradeable or compostable Packaging	1/5 2 /5 3 /5 4 /5 5/5	Scale

10	OKR	Objective knowledge of recyclable packaging (Sum OKR01:OKR06)	0/6 1/6 2/6 3/6 4/6 5/6 6/6	
11	OKC	Objective knowledge of compostable packaging (Sum OKC01:OKC07)	0/7 1/7 2/7 3/7 4/7 5/7 6/7 7/7	
12	IRP	Correctly identified recyclable packaging (WM03+WM04+WM08+WM10)	0/4 1/4 2/4 3/4 4/4	
13	ICP	Correctly identified compostable packaging (WM06+WM07+WM09)	0/3 1/3 2/3 3/3	
14	OKR01	Knowledge of bio-based plastic	A=Fossil-based only=0 B=Bio-based only=0 **C=Both Fossil-based or bio-based=1** D=Neither Fossil-based or bio-based=0	ordinal
15	OKC02	Knowledge of bio-based - hard plastic	A=Recyclable only=0 B=Compostable only=0 **C=Either Recyclable or compostable=1** D=Neither Recyclable nor compostable=0	ordinal
16	OKC03	Knowledge of bio-based- soft plastic	A=Recyclable only=0 **B=Compostable only=1** C=Either Recyclable or compostable=0 D=Neither Recyclable nor compostable=0	ordinal
17	OKR01	How many years does it take for a plastic bottle to break down in a landfill?	A=20 years=0 B=50 years=0 **C=over 1,000 years=1**	ordinal
18	OKR02	Recycling an aluminium can conserves enough energy to	A=20 seconds=0 B=3 mins=0	ordinal

		power a TV for how long?	**C= 3 hrs=1**	
19	OKR03	What do you think this logo commonly found on products means? 	A=This product is capable of being recycled=0 B=This product is suitable for composting=0 **C=The producer of this product made a financial contribution towards the recovery and recycling of packaging in Europe.=1**	ordinal
20	OKC04	What do you think this logo commonly found on products means? 	A=Plant-based product=0 **B=Wood-based product=1** C=Suitable for composting=0	ordinal
21	OKR04	How many times can a single sheet of paper be recycled?	A=Once=0 **B=Maximum of 7 times=1** C=There is no limit=0	ordinal
22	OKR05	What do you think this logo commonly found on products means? 	A=This is a plastic product which is capable of being recycled=0 B=This is a paper product which is capable of being recycled=0 **C=This product must be disposed of in an appropriate manner=1**	ordinal
23	OKC05	How long does it take for a compostable cup to break down in an industrial compost?	A=5 days=0 **B=84 days=1** C=377 days=0	ordinal
24	OKR06	What do you think this logo commonly found on products means? 	**A=This product is capable of being recycled=1** B=This product is made from recycled materials=0 C=This product is not capable of being recycled=0	ordinal
25	OKC06	How long does it take for a compostable cup to break down in a landfill?	A=166 days=0 B=30 years=0 **C=Over 100 years=1**	ordinal
26	OKC07	What do you think this logo commonly found on products means? 	A=This product is suitable for composting in the EU=0 **B=This product is certified organic in the EU=1** C=This product is suitable for composting at home.=0	ordinal

27	WM01	Crisp Packet	**A= General Waste=1** B= Recycling=0 C= Compost=0	ordinal
28	WM02	Egg shells	A= General Waste=0 B= Recycling=0 **C= Compost=1**	ordinal
29	WM03	Plastic Bottle Coke	A= General Waste=0 **B= Recycling=1** C= Compost=0	ordinal
30	WM04	Tetrapak Milk Carton	A= General Waste=0 **B= Recycling=1** C= Compost=0	ordinal
31	WM05	Vegetable Scraps	A= General Waste=0 B= Recycling=0 **C= Compost=1**	ordinal
32	WM06	Compostable Bread Film	A= General Waste=0 B= Recycling=0 **C= Compost=1**	ordinal
33	WM07	Compostable Coffee Cup	A= General Waste=0 B= Recycling=0 **C= Compost=1**	ordinal
34	WM08	Cardboard Tea Box	A= General Waste=0 **B= Recycling=1** C= Compost=0	ordinal
35	WM09	Compostable Avocado Film	A= General Waste=0 B= Recycling=0 **C= Compost=1**	ordinal
36	WM10	Coffee Tin	A= General Waste=0 **B= Recycling=1** C= Compost=0	ordinal

Data Types:

Demographics

EI - Environmental Interest (1-7 Likert Scale)

PP – Perception of packaging **which is most env friendly to them? - Subjective**

SKR – Subjective knowledge of recycling **How they perceive their own knowledge – Subjective** (1-7 Likert Scale)

SCR – Subjective knowledge of composting **How they perceive their own knowledge – Subjective** (1-7 Likert Scale)

OKR –Objective Knowledge of Recycling **right or wrong - objective**

OKC –Objective Knowledge of Composting **right or wrong - objective**

IRP – Correct identification of recyclable packaging **right or wrong - objective**

ICP – Correct identification of compostable packaging **right or wrong – objective**