The Effects of Material Appearance, Eco-label, and Brand Ethicality on Consumers' Perceived Packaging Sustainability

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ABSTRACT

Under the topic of sustainable packaging, this research looks into the effects of material appearance (ecological vs. conventional), eco-label, and brand ethicality on consumers' perceived sustainability as well as the subsequent product quality evaluation and purchase intention. A 2 × 2 × 2 between-subject experiment was designed and conducted to test the hypotheses among Dutch consumers based on two product categories: chocolate paste and cereal bars. First, in both food categories, eco-labels and ecological-looking materials both trigger higher sustainability perception. In the cereal bar category, an interaction effect was found that the eco-label has a more positive impact on consumers' sustainability perception when it's applied to conventional-looking packaging rather than ecological-looking packaging. Second, in the chocolate paste category, higher brand ethicality brings higher quality evaluation and purchase intention but has no effect on sustainability perception. Third, in the chocolate paste category, contrary to the increased sustainability perception, quality evaluation and purchase intention get lower when ecological-looking material is applied. Fourth, in the chocolate paste category, when consumers sense a higher fit between the product and the brand, their perceived packaging sustainability, quality evaluation, and purchase intention all increase accordingly.

Keywords

Sustainable packaging, packaging visual design, sustainability perception, eco-label, brand ethicality, material appearance, visual typicality, purchase intention

INTRODUCTION

Along with consumers' rising environmental concerns, sustainable packaging is becoming increasingly available in the marketplace (Granato et al., 2022). Sustainable packaging refers to packages that have a low negative impact on the environment and bring a reduced ecological footprint, which can be facilitated by increasingly utilizing life cycle inventories and life cycle assessments (Zabaniotou, 2003; Dube, 2022). Sustainable packaging seems to be a technological task, but in reality, it is closely related to consumer perception. The success of sustainable packages highly depends on consumers' understanding and acceptance of these packages (Magnier & Schoormans, 2015). Whether they can be comprehended and chosen by end users determines the prospect of sustainable packaging. However, currently, many sustainable packages fail to sufficiently and accurately communicate sustainable characteristics to consumers (Granato et al., 2022). This dilemma about information miscommunication can be solved via design cues that help to better signal sustainability. Consumers rely on visual cues to evaluate the quality and performance of products (Creusen & Schoormans, 2005). The perception of sustainability was also found to be connected to visual cues like packaging format and color (Steenis et al., 2017). However, the design of sustainable packaging falls into a contradictory situation due to the influence of visual novelty on consumer perception. On the one hand, the utilization of sustainable cues might more directly and sufficiently communicate sustainable traits, thus promoting consumers' perceived sustainability. But on the other hand, the atypical appearance brought by sustainable cues may bring reduced consumer acceptance because of the perceived risk and doubt about quality and reliability (Schnurr, 2017) and even arouse skepticism of "greenwashing" under the condition of overloading consumers with sustainable information (Aji & Sutikno, 2015; Walsh et al., 2007). More in-depth research is needed to further investigate the relationship between ecological design cues and consumer perception. Meanwhile, brand strength was found to influence consumers' perception of atypical product design (Goh et al., 2013). Previous research on durable products like cars and watches indicated that consumers have a higher acceptance of novel-looking products from strong brands rather than weak brands (Heitmann et al., 2020; Goh et al., 2013). This phenomenon might be explained by the finding of Celhay and Trinquecoste in 2014, which is, consumers are more likely to accept atypical packaging when the perceived risk is low. For a strong brand, the established brand trust can help to alleviate consumers' concerns about the potential risks associated with the purchase. As a result, consumers would be more daring to try products with atypical packaging because of the lower perceived risks. Besides the general brand strength, brand ethicality is especially pertinent to the topic of sustainable packaging. Nowadays, strong brands are constantly trying to incorporate ethics at the core of their identities (Ind & Iglesias, 2016). The responsibility for

the environment is a component of the value proposition encompassed in brand ethicality (Brunk, 2010; Fan, 2005). Thus, developing sustainable packaging would be an approach for brands to promote their perceived ethicality. In this case, brand ethicality can be regarded as another factor to consider when evaluating the influence of design cues on consumers' evaluation of sustainable packaging.

THEORETICAL BACKGROUND

Visual typicality and consumer perception

Packaging provides functional benefits of strengthening product protection and facilitating transport efficiency (Spence, 2016). Meanwhile, it serves as a silent salesman and a powerful marketing tool to signal product information (Sara, 1990). Packaging design is a broad term that consists of both functional attributes (ergonomics, durability, and recyclability) and visual attributes (Bloch, 1995). The visual attributes of package design comprise a wide range of elements including graphic forms (typeface, logo, color, labels, image) and package shape, etc (Orth et al., 2010). Those visual elements are all perceived as important cues that consumers rely on to evaluate the quality and performance of products (Creusen & Schoormans, 2005). In terms of consumers' responses to products, visual typicality is a crucial determinant that refers to the extent to which a product design fits into the typical design of the corresponding category (Veryzer & Hutchinson 1998). Consumers identify an object by placing it in a category they know, and product design influences how consumers categorize a product (Kim & Petitjean, 2021). In some cases, consumers are found to infer better product performance from an atypical package design and show higher purchase intention, while in other cases consumers tend to choose a more typical-looking product based on the trust in familiar products and the consideration of avoiding unnecessary risks (Mugge & Schoormans, 2012; Celhay et al., 2014; Schnurr, 2017). Examples of the former situation can be found in the beverage industry, such as Badoit sparkling mineral water (bright "Badoit Red") and Vittel's mineral water (bright red, sharp lines, and vertically-oriented text). These two unconventional packaging designs both bring more sales and higher consumer acceptance (Celhay et al., 2017). However, on the contrary, in the French wine market, many cases of product failure have occurred when companies tried to distinguish themselves through atypical visual appearances. Brands like E-motif, Chamarré, and Rock'n Rhône made daring attempts at unconventional label graphics. However, consumers' acceptance and evaluation of these products were negatively influenced by these distinctive designs (Celhay & Trinquecoste, 2008). Under this research topic, contradictory circumstances were presented and no more systematic explanations were provided. Thus, the relationship between visual typicality and consumer purchase intention needs to be further investigated by taking multiple possible influential factors (brands, product categories, etc) and the underlying mechanism into account.

Visual design of sustainable packaging

Sustainability in the packaging industry chain can be improved by multiple approaches, such as facilitating collection, sorting for recycling, composting, reusing, waste-to-energy processing, proper disposal, the processing of sorted packaging, more sustainable material sourcing, and reducing material use (Boz et al., 2020). According to the Sustainable Packaging Alliance (SPA) (2005), sustainable packaging is based on four principles: be efficient (i.e., minimize the use of resources, emissions, and waste), be effective (i.e., optimizing functionality), be safe (i.e., minimize the health risk to humans and ecosystems) and be cyclic (i.e., minimize degradation through the life cycle and maximize the recovery of used materials). As described above in the introduction section, the development of sustainable packaging is hampered by inadequate and inaccurate visual communication. Eco-packaging innovations are often not recognized by consumers in terms of both distinctiveness and improved sustainability. One of the causes of this phenomenon is that although these packages are designed to lower environmental impacts, they can easily be misunderstood because they look conventional (Magnier & Schoormans, 2015). For example, the use of plant-based or recycled plastic represents a more environment-friendly choice than petroleum-based plastic, but it might not be visibly recognizable as being more eco-friendly (Magnier & Schoormans, 2017). Because of the limitation on knowledge and time spent in front of shelves, consumers are ill-informed about the actual sustainability of packaging (Boz et al., 2020), and they spend little time carefully examining the information on the package (Mancini et al., 2017). This results in a disappointing situation where investments in sustainable packaging can't be translated into commercial returns and competitive advantages, which dampens companies' enthusiasm and hinders them from further investigating sustainable packaging. Therefore, how to better communicate sustainable information is a key industry problem. Research found that when visual cues are related to consumers' existing beliefs about sustainability, these cues can increase consumers' perceived sustainability of products (Nemat et al., 2019; Steenis et al., 2017). Thus, to solve the problem above, it's necessary to properly utilize visual cues to convey sustainable characteristics straightforwardly. By making the product look more "ecological" through visual cues, consumers' perception and acceptance of sustainable packaging are likely to be promoted accordingly.

However, the role of visual cues on consumers' acceptance of sustainable packaging is two-sided. On the one hand, as described above, sustainable visual cues can be added to help sustainable packages have an "ecological appearance" which helps them stand out from normal packages and be more easily categorized into sustainable products because of this visual

distinctiveness. However, on the other hand, this atypicality comes with risks. The atypical appearance brought by sustainable cues may bring reduced consumer acceptance because of the perceived risk and doubt about quality and reliability (Schnurr, 2017). This risk needs to be particularly emphasized since sustainable packaging is still not mainstream in the marketplace. Therefore, the same controversial question is brought to designers' views, which is whether and when to make sustainable packaging look distinctive to bring about better consumer responses. Two approaches co-exist which are the imitation strategy and the differentiation strategy (Magnier & Schoormans, 2015). The risk of reduced consumer acceptance can be avoided via the imitation strategy while the distinctiveness of sustainability is more likely to be conveyed via the differentiation strategy (Granato et al., 2022). A premise of the discussion is that improvement in packaging sustainability doesn't necessarily bring specialness to its appearance, such as simply reducing the amount of plastic used by making the packaging lighter and thinner. Meanwhile, technological advances have offered packaging appearance a great deal of flexibility, such as making sustainable packaging look conventional (Magnier & Schoormans, 2015). In this case, functional attributes and visual attributes of sustainable packaging design can be detached, which means visual design elements get the chance to get rid of the strict restrictions of functionality and be utilized from a pure visual design perspective. This circumstance offers more freedom to designers when performing visual design for sustainable packaging.

Prior research has demonstrated that packaging design elements can be categorized into three main categories: structure, graphics, and textual information (Gelici-Zeko et al., 2012; Magnier & Crié, 2015). Research on Dutch students suggests that visual cues related to sustainability, such as packaging format and color, are easily associated with sustainability (Steenis et al., 2017). To be specific, for packaged tomato soup, a label containing sustainable-looking graphic elements like green fonts and illustrations of green leaves is significantly related to eco-friendliness by consumers compared to conventional label designs. The following section discusses some representative visual characteristics of sustainable packaging that are relevant to this research.

Material appearance

Material and shape are the two most noticeable packing characteristics that affect how a package appears at first glance (Poslon et al., 2021). Texture, transparency, color, etc. constitute the overall material appearance. Texture has an important influence on consumers' product perception (Spence, 2016). It has been reported that matte packaging can help to increase the perceived naturalness of food products (Marckhgott et al., 2019). The matte–natural association also leads to an increase in expected tastiness and purchase intention (Spence, 2021). Similarly, research has shown that shiny, glossy, metallic packaging will trigger consumers' concern about sustainability (Spence, 2021; Steenis et al., 2017). Many consumers have internalized an association between glossy packaging and unhealthy food products, while matte packaging tends to be connected with natural food instead (Spence, 2021; Ye et al., 2019). In terms of brand identity, glossy packaging makes consumers feel that brands are trying too hard to capture the attention of the consumer, thus lowering the perceived trustworthiness of the brand (Han, 2018). Transparency is another crucial factor that influences consumers' product evaluation. Previous research has demonstrated that transparent packaging enhances perceptions of product trustworthiness and leads to higher purchase intention and increased product choice (Billeter et al., 2012). The effect of transparency on product evaluation also depends on product categories. Research by Sabri et al. in 2020 found that transparent packaging positively influences consumers' evaluation of product quality and brings higher purchase intention toward the corresponding brand when the product category is of high product quality risk. However, for the product category with low product quality risk, this effect is not significant.

Color is one of the most salient cues of packaging (Spence & Velasco, 2018), which can attract attention in a very short time, communicating product-specific messages to consumers, conveying brand information, and creating strong brand identity (Luzzatto et al., 2001; Magnier & Schoormans, 2017). Research has shown that color has a great impact on consumers' quality evaluation of packaged food, like the taste, aroma, flavor, etc. (Spence, 2016). More importantly, color possesses the capability to signal naturalness (Marckhgott & Kamleitner, 2019) as well as sustainability (Vermeir & Roose, 2020). The color of packaging was a crucial factor in users' evaluation of products' ecological friendliness and sustainability (Hoogland et al., 2007). Therefore, to stress the sustainable characteristics, some particular colors are frequently adopted to better convey this distinctive attribute. For example, some studies suggest that green color is associated with sustainability and environment-friendliness in consumers' perceptions (Vermeir & Roose, 2020; Parguel et al., 2015). Similarly, cardboard brown packages are often used for organic products, because they are presumably linked to naturalness (Herbes et al., 2020). Besides these two mostly used "eco-colors", some other colors also have the potential to affect the perceived degree of eco-friendliness. White represents morality and purity (Sherman & Clore, 2009), thus might be linked to ethicality and sustainability in consumers' cognition. On the contrary, bright colors such as red are usually negatively correlated with environment-friendliness (Luchs et al., 2010). Meanwhile, the degree of saturation and brightness of color also influences consumer product perception. For example, when a color with low saturation and high brightness is used in food packaging, it will be strongly associated with healthiness but less connected to tastiness in consumers' perceptions (Tijssen et al, 2017).

Eco-label

Environmental claims (green claims) are declarations made by companies about the features or attributes of their products and services that benefit the environment. They can discuss how goods are created, packaged, distributed, used, consumed, and/or disposed of (OECD, 2011). Environmental claims can appear on a product label, product packaging, related advertising and promotional material, and other forms of marketing. Claims can take the form of words, symbols, emblems, logos, graphics, colors, and product brand names. They can be transmitted through written media, electronic media such as television and radio, and digital media such as the Internet (OECD, 2011). An eco-label is a common form of environmental claim that appears on product packaging. An eco-label can be regarded as a cue for consumers to easily identify those products with sustainable traits. Research has shown that eco-labels which act as both graphical and informational cues can help consumers recognize packaging sustainability when it is not directly recognizable (Magnier & Crie, 2015). However, label trust gradually became a troubling issue for consumers because some companies and brands started to produce eco-labels containing misleading or deceptive information to "greenwash" their products after realizing the positive impact of eco-labels on consumers' perception of product sustainability (Shahrin et al., 2017). An increasing number of consumers seem to be confused about the various types of claims in the marketplace (KIDV, 2022).

The phenomenon of "greenwashing" needs to be emphasized in the discussion of eco-labels. The consumer and capital markets for green products and services have been expanding rapidly in the last decade. However, at the same time, more companies are exaggerating the greenness of their products and behaviors trying to reap the benefits of these expanding green markets in an unethical manner (Delmas & Burbano, 2011). This phenomenon can be defined as "greenwashing", which refers to marketing or publicity practices that deliberately convey misleading or deceptive information to promote the cognition that a company and its products are environmentally friendly (Aji & Sutikno, 2015). This study conducted by Aji and Sutikno also found that greenwashing is positively associated with "green consumer skepticism" and "green perceived risk". Keaveney's research result (1995) has shown that the ethical problems caused by greenwashing may lead to consumers' intention and behavior to switch to other products. Furthermore, perceptions of greenwashing can damage the consumer's attitude toward a company (Peattie et al., 2009). Regarding the design of sustainable packaging, prior research found that overloading consumers with sustainable information would result in skepticism of greenwashing, thus making it difficult for consumers to evaluate the product (Walsh et al., 2007). Therefore, when trying to sufficiently convey sustainable information in packaging design, the risk of being perceived as greenwashing should be paid attention to if ecological visual cues are excessively used.

Relevant sustainable materials

Paper-based materials and bioplastic materials are two mainstream directions of sustainable packaging currently in the food industry. Meanwhile, regarding visual appearance, they represent two opposite circumstances. For most FMCG food products, paper-based materials are always visually atypical while bioplastic materials are mostly visually typical. When a conventional glass or plastic bottle is replaced by paper-based materials, it will be relatively easy for consumers to identify this difference because of the distinctive color and texture of paper. However, the use of plant-based plastic might not be visibly recognizable as being more eco-friendly (Magnier & Schoormans, 2017). These two common types of sustainable materials also correspond to two strategies regarding the visual design of sustainable packaging. First, for sustainable materials that are visually atypical like paper, is it necessary to mitigate the special appearance through visual cues to avoid increasing perceived risks? If yes, how to achieve this mitigation? Second, for sustainable materials that are visually typical like bioplastic, is it necessary to enhance their special appearance through visual cues to better signal the distinctive value regarding eco-friendliness? If yes, how to achieve this enhancement?

Paper-based materials

Along with technological innovations, paper-based materials are becoming increasingly pragmatic for food packaging. In 2022, Heinz collaborated with Pulpex and developed a paper-based bottle for its ketchup which is highly renewable and recyclable. The new paper bottles are produced using pulp from feedstocks that are entirely renewable and responsibly sourced. Heinz & Pulpex bottles are coated on the inside with a food-grade coating that is PET-, HDPE-, and BPA-free, in contrast to other paper bottle technologies currently on the market that employ a plastic bladder or liner to offer a barrier. Compared to traditional packaging materials for ketchup bottles, its carbon footprint is 90% less than glass and 30% less than PET (Mohan, 2022). The same trend is happening in the snack industry. From 2023, Mars Wrigley will switch to paper-based packaging in Australia for its popular candy bars like Snickers, Milky Way, and Mars Bar. This paper-based packaging is made up of 86 percent paper. A thin plastic barrier is maintained to ensure the quality and freshness of the product. Though the packaging involves a thin plastic barrier, it remains able to be recycled via curbside recycling tools (Hughson, 2022). Meanwhile, paper-based packaging is on its way to becoming completely plastic-free because plastic coating as a barrier is no longer inevitable. A new barrier coating material was developed by Melodea using wood pulp, a byproduct of the paper manufacturing industry. This new material uses a special formula made of cellulose nanocrystals (CNC), which can endure high humidity and shield packaged goods from oxygen, water, and oil. This innovative material offers an alternative to plastic and metal which can also serve the purpose of maintaining the quality of packaged foods (Melodea, 2022).

Bioplastic

PlantBottle from Coca-Cola is one of the most representative bioplastic materials which has been widely in the market and constantly refined by the company. By turning sugarcane and molasses—a byproduct of sugar production—into a key component for PET plastic, a new bio-material was developed to reduce the dependence on petroleum (Mohan, 2021). Besides the increased sustainability, the original physical attributes and visual appearance of plastic packaging are well maintained. With constant development, from 2009 to 2021, the ratio of bio-based components of PlantBottle rose from 30% to 100% (Mohan, 2021), which brings a higher potential to bring more contributions to eco-friendliness. PlantBottle can be used for various kinds of packages for water, sparkling, juice, and tea beverages. Since introducing PlantBottle, Coca-Cola has allowed non-competitive companies to use the technology in their products like Heinz ketchup and Gold Peak tea, which helps PlantBottle create greater industry value. Bioplastic is also being adopted in chocolate and candy packaging. Futamura as a leading company in biodegradable and compostable packaging has developed a new material in 2020 called NatureFlexTM film, which is a plastic-free and aluminum-free alternative for the primary packaging of chocolate. This is a biodegradable package based on raw material wood fiber which comes from controlled and sustainable forestry. In terms of appearance and protective performance, this new material is basically identical to traditional chocolate packaging (Kupfer, 2018).

Brand strength and consumer perception

Brand strength plays a role in visual typicality's influence on consumer perception (Goh et al., 2013). Compared to fast-moving consumer goods, there are more existing research outcomes about this relationship for durable products. For example, research on the US car market (Heitmann et al., 2020) and research on shoes and watches (Goh et al., 2013) both found that for strong brands, consumers have higher acceptance when product designs deviate from the segment typicality. On the contrary, weaker brands tend to profit from staying closer to the segment typicality. Prior research found that higher reliability and trust are inferred by consumers when evaluating products from strong brands (Schnurr, 2017). The higher trust reduces consumers' concerns about the potential risks, thus making consumers more likely to accept products with atypical packaging (Celhay & Trinquecoste, 2014). In terms of sustainable packaging, research on the brand's role in this relationship is sparse. Prior research (Orth & Malkewitz, 2008; Magnier & Schoormans, 2015) mostly focuses on sustainable packaging's effect on brand equities but not the opposite effect mentioned above, which is brand equity's influence on consumers' evaluation of sustainable packaging. But there is still some pertinent research that can be referred to. For example, research found that an organic label does not affect the perception of product quality from strong brands, whereas it strongly improves the quality perception of the product from weak brands (Larceneux et al., 2012). The authors explained that the integrative effect of brand and organic label is just like cobranding which aims to enhance both brands' equity based on the consideration that two brand names may provide greater assurance about product quality than one alone (Park et al., 1996). However, brand equity transfers occur mainly when an individual brand cannot signal quality by itself (Rao & Ruekert, 1994). Therefore, organic labels bring stronger added value to weak brands rather than strong brands.

Despite general brand equity, brand ethicality is another perspective that can be taken into account when evaluating the brand's role in visual typicality's influence on consumer perception. Brand ethicality refers to the attitude and value proposition a firm shows by avoiding causing harm (Williams & Aitken 2011) and behaving with integrity, honesty, responsibility, accountability, and respect toward a wide set of stakeholders (Brunk, 2010; Fan, 2005). And the company's stance on corporate social responsibility is one of the most influential dimensions of consumers' ethical perceptions of a brand (Brunk, 2010). Nowadays, strong brands are constantly trying to incorporate ethics at the core of their identities (Iglesias & Ind, 2016). For some brands, brand ethicality is the key factor that distinguishes them from other brands and even constitutes the most core part of their brand image. In other words, these brands are particularly outstanding for ethicality but aren't equally outstanding regarding the overall brand strength. For example, Tony’s Chocolonely is a chocolate company dedicated to environmental protection and fair working conditions. The ethical aspect is the most distinctive segment in its overall brand image. Sustainable packaging design is strongly related to brand ethicality, but research on their relationship is currently missing. We speculate that when facing a product with sustainable packaging from a brand that is widely considered of high brand ethicality, consumers may feel a strong coherence between the product and the brand, thus causing relevant influence on their product evaluation and purchase intention. This assumption provides another angle to discuss the brand's impact on the relationship between the visual design of sustainable packaging and consumers' reaction.

Sustainability perception and purchase intention

In the narrative above, consumers' evaluation of sustainable packaging encompassed two levels. One is sustainability perception, which represents the direct consumer response regarding sustainable attributes. The other is purchase intention, which represents consumers' overall evaluation of the product and the actual purchase behavior. Prior research seldom investigated the relationship between these two levels of consumer evaluation, but there are still some findings that supported that they are related. For example, perceived brand sustainability was found to have a positive indirect effect on purchase intention mediated by the impressions and attitudes towards a brand (Gidaković et al., 2022). Furthermore, prior research (Krah et al., 2019) proposed

that consumers' purchase intention is based on the trade-off between perceived sustainability and perceived usability. Some previous research has indicated that sustainability perception can influence consumers' evaluation of other functional attributes such as product quality and usability. For example, it was found that an increased perception of sustainability can have a positive spillover effect on other functional attributes such as taste and health (Fernqvist & Ekelund, 2014; Liem et al., 2018). Similarly, research has shown that sustainability manifested in a product positively influences consumers' perception of product quality (Lee et al., 2013). However, on the other hand, the atypical appearance brought by sustainable packaging may bring doubt about quality and reliability (Schnurr, 2017). Research on bottled water (Krah et al., 2019) found that a package that looks more ecological triggers higher perceived sustainability but lower perceived usability. The relationship between consumers' sustainability perception and their evaluation of other functional product attributes needs to be further studied in a more systematic approach.

RESEARCH MODEL AND HYPOTHESES

Based on the literature review, the research question is proposed as:

How and why do brand ethicality and eco-label affect consumers' sustainability perception toward sustainable packaging made of conventional-looking (vs. ecological-looking) material?

The individual effects of material appearance, eco-label, and brand ethicality on consumer perception as well as the interaction effects between them will be studied in the context of sustainable packaging. Material appearance (ecological vs. conventional) and eco-label were selected as two representative packaging design cues to test their roles in communicating sustainable attributes of packaging. Brand ethicality is chosen to be the focus of this research instead of overall brand strength because brand ethicality has a larger gap in current academic studies and it's especially relevant to the context of sustainable packaging. Consumers' responses to the product with sustainable packaging will be studied from three aspects: sustainability perception, product quality evaluation, and purchase intention. Sustainability perception represents consumers' cognition and identification of sustainable properties, which is expected to be a direct response to sustainable packaging. In addition, as described in the theoretical background part, sustainability perception shows a tendency to influence consumers' evaluation of product quality. However, the exact effects remain uncertain. Thus, we would like to test whether perceived sustainability influences quality evaluation, and further serves as a mediator in the relationship between the three factors of sustainable packaging (eco-label, material appearance, and brand ethicality) and quality evaluation. Meanwhile, consumers' purchase intention will also be measured since it's closely related to consumers' actual purchase behaviors and represents consumers' overall responses to the product. We want to test whether perceived sustainability will contribute to consumers' final purchase decisions. The research model can be concluded as shown in Figure 1. The independent variable is material appearance (ecological vs. conventional). The moderating variables are eco-label and brand ethicality. The mediating variable is sustainability perception. The dependent variables are quality evaluation and purchase intention.

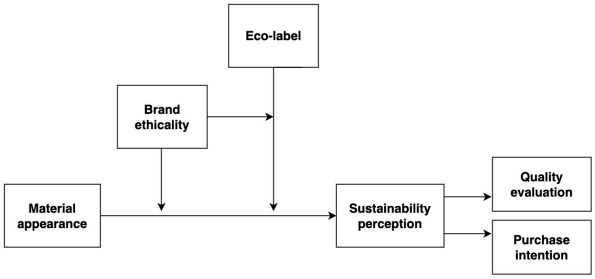

Figure 1. Research model.

Previously, brand strength was studied mainly in terms of a brand's equity which refers to a set of assets or liabilities linked to a brand's name and symbol that adds the value provided by a product or service (Beverland, 2018). As another perspective to examine a brand, we expect brand ethicality to play a similar role in consumers' product evaluation. That is, in consumers' established perception, a more ethical brand has stronger relation to ethical behaviors and higher trustfulness regarding the fulfillment of the promises on ethicality, thus helping to provide additional values besides the product itself. Therefore, we may assume when facing the same product with sustainable packaging from two brands that are widely considered to differ in brand ethicality, consumers will derive a higher sustainability perception from the one produced by the more ethical brand because of its established stronger association with sustainability. Thus, the following hypothesis is proposed:

H1: *Packaging sustainability will be perceived as higher when the package is from a brand of higher ethicality.*

Eco-label's impact on consumers' perception of packaging sustainability is controversial. On the one hand, research has shown that eco-labels which act as graphical and informational cues can help consumers better recognize packaging sustainability when it is not directly recognizable (Magnier & Crie, 2015). However, on the other hand, trust in eco-labels is being weakened because of the increasing misuse of eco-labels by companies to serve the purpose of greenwashing their products (Shahrin et al., 2017). As stated in OECD's report about environmental claims in 2011, an increasing number of consumers seem to be confused over the various types of claims on the marketplace. Regarding fast-moving consumer goods, we want to further test whether the doubt on the validity of eco-labels has

become mainstream and diminishes the positive effect of labels on sustainability perception. Thus, we hypothesize:

H2: *Packaging sustainability will be perceived as higher when an eco-label appears on the package.*

When consumers face a bioplastic package that can't be distinguished from normal plastic by physical appearance, if there is an eco-label on it, the positive added value of eco-labels might be more obvious because it's the only element that strongly signals sustainability information. However, on the contrary, when an eco-label is on a paper-based material package, the added value of eco-labels would be relatively weak since consumers can already sense sustainability directly from this special material, which can be supported by the result of previous research that paper-based material has a positive effect on sustainability perception (Magnier & Schoormans, 2015; Krah et al., 2019). Therefore, to further investigate this possible interaction effect, we made the following hypothesis:

H3: *Eco-label will moderate the relationship between material appearance (ecological vs. conventional) and sustainability perception. The impact of eco-label on sustainability perception is more positive when it's applied to conventional-looking packaging rather than ecological-looking packaging.*

Taking a further step based on the controversy around the validity of eco-labels, we may conjecture that consumers' skepticism toward the validity of eco-labels will be lower when evaluating products from a well-known ethical brand because of its established higher trustfulness in consumers' minds regarding ethics-related behaviours. Consequently, the interaction effect between eco-label and brand ethicality is proposed as:

H4: *Eco-label will moderate the relationship between brand ethicality and sustainability perception. The impact of eco-label on sustainability perception is more positive for ethical brands than for unethical brands.*

Previous research has demonstrated that organic materials of a cardboard-like appearance are often perceived to possess a higher sustainability level (Magnier & Schoormans, 2015). In the current marketplace, paper-based material is a representative material to promote packaging sustainability. Therefore, from the consumers' perspective, it won't be very surprising that well-known ethical brands will introduce products with paper-based material packaging to the marketplace because this sustainable practice is consistent with the established ethical brand image. Therefore, we may assume that when facing ecological-looking packaging (eg. paper-based material) from a widely-recognized ethical brand, consumers may feel a stronger coherence between the product and the brand, thus bringing a higher trust in the sustainability of this package. Thus, the corresponding hypothesis is proposed as:

H5: *Brand ethicality will moderate the relationship between material appearance (ecological vs. conventional) and sustainability perception. The impact of ecological-looking material on sustainability perception is more positive for ethical brands than for unethical brands.*

Following the discussion above on the three factors of sustainable packaging (eco-label, material appearance, and brand ethicality) that may influence consumers' perceived sustainability, we want to further test whether the effect of these three factors on sustainability perception will be further translated to the impact on consumers' evaluation of product quality as well as their purchase intention. Thus, the following hypotheses are proposed:

H6: *Sustainability perception mediates the effect of material appearance (ecological vs. conventional) on quality evaluation.*

H7: *Sustainability perception mediates the effect of material appearance (ecological vs. conventional) on purchase intention.*

METHOD

A 2*2*2 between-subject experiment was designed and conducted in this research. The three independent variables all have two levels in the experiment, which are conventional-looking & ecological-looking materials, with & without eco-label, and high & low brand ethicality.

Stimuli

Two product categories were selected in this experiment, which are chocolate paste and cereal bars. The chocolate paste is a common FMCG food that is widely consumed by major consumers. Compared to chocolate paste that targets the general mass market, cereal bars tend to be positioned as wholesome and natural food which competes with other healthy snacks such as nuts, fruits, and fruit smoothies (UKEssays, 2018).

Material appearance

Bioplastic is chosen to represent the conventional-looking sustainable material while paper-based material is chosen to represent the ecological-looking sustainable material. Cardboard brown packages are often used for organic products because they are presumably linked to naturalness (Herbes et al., 2020). Meanwhile, previous research has shown that organic materials of a cardboard-like appearance are often perceived to possess a higher sustainability level (Magnier & Schoormans, 2015). Therefore, when a conventional glass jar or plastic package is replaced by paper-based material, it will be relatively easy for consumers to identify this difference because of the distinctive color and texture of the paper. However, the use of bioplastic might not be visibly recognizable as being more eco-friendly (Magnier & Schoormans, 2017). For example, as one of the most widely-used bioplastic materials on the market, PlantBottle from Coca-Cola well maintains the original physical attributes and visual appearance of conventional plastic packaging, which makes it nearly impossible for

consumers to distinguish this innovation if additional information is not provided (Mohan, 2021).

Eco-label

An eco-label is designed and produced with Adobe Photoshop based on materials from the Internet. It's a green round label with green leaves in the middle. The text "sustainable packaging" circles the label's inner edge. In the domain of food products, the concept of sustainability and the sense of naturalness are strongly related (Gjerde, 2022). Therefore, images that evoke a sense of nature such as green leaves are often used on sustainable packaging to highlight sustainability features. The green color is selected because wide studies have indicated that the green color is associated with sustainability and environment-friendliness in consumers' perception (Vermeir & Roose, 2020; Parguel et al., 2015). A relatively general and vague claim "sustainable packaging" is adopted instead of giving a more detailed description of the particular traits of this sustainable package. In this way, we want to see whether consumers' attitudes toward this general claim differ when facing brands with different levels of ethicality. The eco-labels for chocolate paste and cereal bars are designed to be slightly different to better fit the characteristics of each category.

Figure 2. The eco-label for the chocolate paste category (left) and the eco-label for the cereal bar category (right).

Brand ethicality

For the chocolate paste category, Tony's Chocolonely and Nestle are chosen to represent brands with higher and lower ethicality. They are both well-known brands in the Dutch market but differ in perceived brand ethicality. Tony's Chocolonely is a Dutch chocolate brand dedicated to producing 100% slave-free chocolate and revolutionizing the chocolate industry by promoting fair trade. It has been elected by Dutch consumers as the most sustainable brand in the Netherlands in the Sustainable Brand Index ranking for four consecutive times (Sustainable Brand Index, 2023). On the contrary, Nestle, as a leading international food company, is in a huge controversy about corruption and unethical behaviors, such as deceptive PR stunts in baby formula, extensive use of non-recyclable plastic bottles, widespread pollution due to irresponsible wastewater discharge, etc. Especially in the chocolate industry, Nestle is accused of selling a wide range of chocolate goods made with cocoa obtained through forced and trafficked child labor (Tamta, 2022). For either Tony's Chocolonely or Nestle, the chocolate paste is currently not its business focus. However, it's not rare for a chocolate brand to do a brand extension and march into the chocolate paste market. For example, as a well-known brand chocolate manufacturer, Hershey's also has chocolate paste and chocolate syrup in its product portfolio. Therefore, the extension from chocolate to chocolate paste basically won't bring about much inconsistent feeling for consumers. For the category of cereal bars, Zonnatura was selected as the brand with higher ethicality since it ranked No.5 in the top 20 most sustainable brands of 2023 in the Dutch market (Sustainable Brand Index, 2023). Zonnatura has always been working to improve the sustainability of its product packaging. The packaging of its cereal and crunchies is 45% derived from vegetable material (cane sugar). The plant-based drinks of Zonnatura also come with biobased packaging that is 88% derived from plant material (sugar cane and wood fibers). Hero b'tween was chosen to represent the brand of lower ethicality compared to Zonnatura since the reported effort for the sustainability of this brand was relatively rare. Both Zonnatura and Hero b'tween are well-known brands in the Dutch market but differ in perceived brand ethicality. For both categories, the two selected brands vary in brand ethicality. But there are two differences between these two categories. First, the comparison of two chocolate paste brands is between an ethical brand and an unethical brand, but the comparison of two cereal bar brands is between an ethical brand and a neutral brand. We want to involve both of these two situations in our research. Second, the chocolate paste is a line extension for both Tony's Chocolonely and Nestle, whereas Hero b'tween and Zonnatura already have cereal bars on the market. This may result in a difference in consumers' familiarity with products.

Based on the considerations above, eight stimuli for each category were created with Adobe Photoshop. For the chocolate paste, the conventional-looking package looks the same as the traditional plastic jar since bioplastic and traditional plastic are mostly visually consistent. The ecological-looking package was created by replacing the texture of a traditional plastic jar with a matte brown paper texture. For both conventional-looking and ecological-looking packages, the label background consists of the brand logo, an illustration of chocolate paste on bread, and a text description "chocopasta", which is the Dutch word for chocolate paste. When replacing the brand logos, other visual elements remain unchanged. Red is chosen to be the background color for the conventional appearance to stay in line with the most classical packaging designs of Tony's Chocolonely and Nestle since they both frequently use red background color in their chocolate products. For cereal bars, similarly, the conventional-looking package looks identical to the traditional glossy plastic wrapper. The ecological-looking package was created by applying a brown paper texture that looks matte and rough. For both conventional-looking and ecological-looking packages, the packaging background includes a picture of cereal bars, the brand logo, a text description "notenreep" (the

Dutch word for nut bar), and a description of the ingredients "oat & mixed nuts". For the conventional-looking plastic packaging, yellow was selected as the background color since it was used by both Zonnatura and Hero b'tween and represents a common choice for cereal products. The stimuli pictures are shown in Appendix 1 and Appendix 2.

Measurement

The measurement of consumers' sustainability perception of packaging can be adapted from a former study performed by Krah, Todorovic, and Magnier in 2019 ($\alpha = 0.96$), which involves three questions: (1) This package is environmentally friendly; (2) This package is a good example of sustainable packaging; (3) This package is made from environmentally responsible materials. Consumers' purchase intention can be measured by adapting three 7-point Likert statements from previous research (Wang, Minor & Wei, 2011; $\alpha = 0.89$). (1) If I want to buy chocolate paste/cereal bars, I am likely to buy this product. (2) If I want to buy chocolate paste/cereal bars, I would consider buying this product. (3) If I want to buy chocolate paste/cereal bars, my willingness to buy this product would be high. Two existing measure scales are synthesized to measure the perceived quality of chocolate paste and cereal bars. The first one was developed by Sprott and Shimp in 2004 for their study on the quality evaluation of raisins and chocolate bars ($\alpha = 0.76$). The second set of scales came from a study by Chan and Mukhopadhyay in 2010 about the product evaluation of chocolate bars. Based on these two studies, the scales for quality evaluation in this research include both the general term "quality" and the emotive terms "delicious" and "great taste", which are: (1) This chocolate paste/cereal bar looks delicious. (2) This chocolate paste/cereal bar has excellent quality. (3) I expect this chocolate paste/cereal bar to have a great taste.

For manipulation check, brand ethicality needs to be measured. The following measurement is adapted from a prior study on corporate social responsibility by Wagner, Lutz, and Weitz in 2009 ($\alpha = 0.90$). (1) This brand is socially responsible. (2) This brand is concerned to improve the well-being of society. (3) This brand follows high ethical standards. The visual typicality of packaging needs to be measured as well for manipulation check. The following measurement is adapted from previous literature (Blijlevens et al., 2017; Schnurr, 2017) and modified based on the packaging topic. (1) This package is typical for chocolate paste/cereal bars. (2) This is a representative package for chocolate paste/cereal bars. The impact of brand ethicality also depends on whether consumers are sensitive to brands and perceive brands as important information. To gain a deeper understanding of participant characteristics, consumers' brand sensitivity will be examined using the following scales adapted from Kapferer and Laurent in 1992. (1) When I buy chocolate paste/cereal bars, I always pay attention to the brand. (2) Generally, the brand of chocolate paste/cereal bars tells a lot about its quality. (3) For me, the brand of chocolate paste/cereal bars is very important information. Consumers' environmental concern is strongly connected to their perception of sustainable products and the corresponding purchase behaviors. Therefore, it is a dimension to further filter and stratify the participants and examine the difference between consumer groups with different characteristics. The environmental concern regarding food shopping can be measured through three items adapted from Cervellon's research in 2012. (1) I normally make a conscious effort to limit my use of products that are made of scarce resources. (2) I have switched products for ecological reasons. (3) When I have a choice between two equal products, I always purchase the one that is less harmful to other people and the environment. Brand strength is also measured in this study as a supplement to brand ethicality and to further investigate the relationship between brand ethicality and brand strength. It can be measured with the following scale used by Zhou, Yang, and Hui in 2010 about the degree to which a person is aware and knowledgeable of a brand ($\alpha = 0.90$). (1) I'm familiar with this brand. (2) I'm very knowledgeable about this brand. (3) I have seen many advertisements about this brand in mass media. In addition, we use one question with a seven-point Likert scale to measure consumers' liking of the given brand: "I like this brand". For either Tony's Chocolonely or Nestle, the chocolate paste is currently not its business focus. For this assumed brand extension, consumers' perceived fit between the brand and the new product needs to be tested. The scale used in this experiment was adapted from a previous study by Roehm and Roehm in 2011 ($\alpha = 0.86$). It measures the general fit between two things, which means how well a person believes two things are consistent and coordinated with each other. (1) This brand is well-suited for chocolate paste/cereal bars. (2) The chocolate paste/cereal bar is consistent with this brand. (3) The chocolate paste/cereal bar is well aligned with this brand.

Participants

The questionnaire was distributed via the online platform Prolific among Dutch consumers. The participants were asked to fill in the English questionnaire on a laptop or computer. After finishing the task, they received a small compensation on Prolific. People with allergies were excluded from the sampling since they may not be the consumers of our testing products which contain ingredients like milk, nuts, and sugar. Finally, we had 260 valid responses with an average age of 27 ranging from 18 years to 63 years old. Of the participants, 59% were male, 40% were female, and 1% were other. The participants were diversified in terms of educational background, including all the categories within the Dutch education system. A one-way ANOVA was performed in each category to check whether participants under different experimental conditions (8 per category) differ in age, gender, education level, environmental concern, and brand sensitivity. For the cereal bar category, the result revealed that there was no significant difference in age ($F(7, 205) = 1.40$, $p = .21$), no

significant difference in gender (F(7, 205) = .97, p = .45), no significant difference in environmental concern (F(7, 205) = .47, p = .86), no significant difference in education level (F(7, 205) = .89, p = .52), and no significant difference in brand sensitivity (F(7, 205) = .15, p = .99). For the chocolate paste category, the result revealed that there was no significant difference in age (F(7, 230) = .10, p = 1.00), no significant difference in gender (F(7, 230) = .66, p = .71), no significant difference in environmental concern (F(7, 230) = 1.91, p = .07), no significant difference in education level (F(7, 230) = 1.16, p = .33), and no significant difference in brand sensitivity (F(7, 230) = .65, p = .71).

Procedure

Each participant was first asked about the purchase frequency of chocolate paste and presented with one of the eight chocolate paste stimuli with questions regarding it (by order: product evaluation, brand evaluation, brand sensitivity), then asked about the purchase frequency of cereal bars and presented with one of the eight cereal bar stimuli with questions regarding it (by order: product evaluation, brand evaluation, brand sensitivity), finally tested on the overall environmental concern and asked several demographic questions. At the end of the questionnaire, we gave participants a chance to comment on this research. Both the eight chocolate paste stimuli and the eight cereal bar stimuli were evenly distributed among participants.

RESULT OF THE CEREAL BAR CATEGORY

Reliability analysis

Reliability analysis was conducted on the measurement scales used in this experiment. The scales for purchase intention (α=0.96) and quality evaluation (α=0.84) were both proved to be reliable. Regarding sustainability perception, the scale in this experiment was indicated to be of high reliability (α=0.97). The result showed high reliability of scale for brand sensitivity (α=0.94) as well as brand ethicality (α=0.91). The scale for visual typicality was indicated to be reliable (α=0.86). The scale for environmental concern was proven to be of high reliability as well (α=0.83).

Manipulation check

T-tests were performed to check if the manipulations of material appearance (ecological vs. conventional) and brand ethicality were perceived as intended. For the cereal bar category, the results indicated the successful manipulation of ecological appearance (M(ecological)= 4.83 vs. M(conventional)= 3.55; t(258)= -6.59, p<.001), and the successful manipulation of visual typicality (M(ecological)= 5.78 vs. M(conventional)= 6.04; t(258)= 2.23, p<.05). However, the manipulation of brand ethicality was not successful (M(ethical)= 4.21 vs. M(unethical)= 4.16; t(258)= -.49, p=.62). The average score Zonnatura got was only slightly higher than Hero b'tween on brand ethicality. Therefore, the brand ethicality of cereal bars will be excluded in the regression analysis and the following discussion.

Regression analysis

Since the manipulation of brand ethicality didn't succeed in the cereal bar category, brand ethicality was removed from the research model of cereal bars. **Thus, hypotheses related to brand ethicality (H1, H4, H5) could not be tested in the cereal bar category**. After removing the brand ethicality, the regression analysis was performed under model 7 in the PROCESS macro of SPSS developed by Andrew F. Hayes. The independent variable is material appearance. The moderating variable is eco-label, the mediating variable is sustainability perception, and the dependent variables are quality evaluation and purchase intention. Before analysis, the participants who (almost) never eat cereal bars were excluded from the total 260 responses. Since they don't belong to the target consumer group of cereal bars, they don't have enough knowledge and experience to evaluate the products and they will feel less engaged when answering the questionnaire. Thus, these people are better excluded from the analysis. After excluding these participants, there are 213 valid responses left for the cereal bar category.

Main effects and interaction effects regarding sustainability perception (H2, H3)

The overall regression was statistically significant (R^2 = .35, F(3, 209) = 45.98, p < .001). It was found that eco-label has a significant main effect on sustainability perception (b=1.33, p<.001), which indicates that the p presence of eco-label triggers higher sustainability perception, **supporting H2 in the cereal bar category**. Meanwhile, a significant interaction effect between material appearance and eco-label was found (p<.01). As indicated in Figure 3, the eco-label has a more positive impact on consumers' sustainability perception when it's applied to conventional-looking (bioplastic) packaging rather than ecological-looking (paper-based) packaging. **Thus, H3 was supported in the cereal bar category.**

Material	Eco-label	Mean	N	SD
Conventional	No eco-label	2.57	47	1.15
	With eco-label	4.58	55	1.62
	Total	3.66	102	1.74
Ecological	No eco-label	4.57	54	1.25
	With eco-label	5.28	57	1.31
	Total	4.94	111	1.32
Total	No eco-label	3.64	101	1.56
	With eco-label	4.94	112	1.51
	Total	4.32	213	1.66

Table 1. Conditional means table: sustainability perception (cereal bar category).

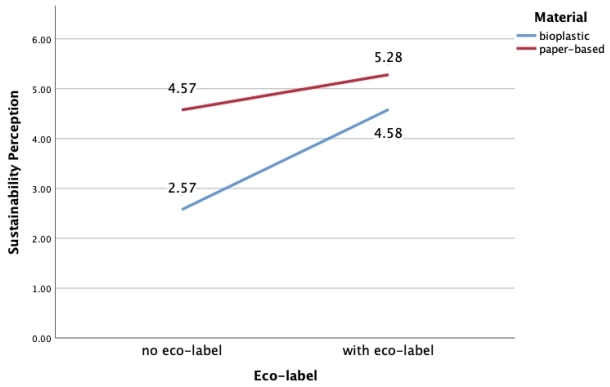

Figure 3. Interaction graph: material appearance and eco-label.

Main effects on quality evaluation and purchase intention

Besides the main effects on sustainability perception, we can also infer the main effects of eco-label, material appearance, and brand ethicality on purchase intention and quality evaluation from the regression analysis. In the cereal bar category, there is no significant main effect of material appearance on purchase intention (R^2 = .00, F(1, 211) = .00, p = .96) or quality evaluation (R^2 = .00, F(1, 211) = .16, p = .69) indicated. The effects of eco-label on purchase intention (R^2 = .00, F(1, 211) = .40, p = .53) and quality evaluation (R^2 = .00, F(1, 211) = .01, p = .92) are not statistically significant either. The means tables are as follows.

	Mean	N	SD
Material			
Conventional	4.90	102	1.12
Ecological	4.96	111	1.24
Eco-label			
No eco-label	4.92	101	1.22
With eco-label	4.94	112	1.15
Total	4.93	213	1.18

Table 2. Means table: quality evaluation (cereal bar category).

	Mean	N	SD
Material			
Conventional	4.51	102	1.38
Ecological	4.52	111	1.62
Eco-label			
No eco-label	4.45	101	1.49
With eco-label	4.58	112	1.53
Total	4.52	213	1.51

Table 3. Means table: purchase intention (cereal bar category).

Mediation effects (H6, H7)

In the cereal bar category, eco-label and material appearance both don't have significant effects on quality evaluation and purchase intention, which doesn't meet the premise of mediation effects. **Thus, H6 and H7 were not supported in the cereal bar category.**

Analysis of brand fit and design aesthetics

We also checked consumers' perceived brand fit and packaging aesthetics. The mean value of brand fit is 5.34 for the unethical brand, 5.16 for the ethical brand, and 5.25 on average (out of a seven-point scale). This demonstrated that consumers think the products and brands match well in the cereal bar category. The result of one-way ANOVA shows that there is no significant difference between the two brands regarding brand fit (F(1, 211) = 1.74, p = .27). The average score of perceived aesthetics is 4.95 out of 7, which indicates that the designed stimuli for this category are visually appealing to most consumers. The result of one-way ANOVA shows that there is no significant difference between eight experimental conditions regarding aesthetics (F(7, 205) = 1.47, p = .18), which eliminates the possible bias caused by aesthetic issues.

Correlation between brand ethicality and brand strength

We also did a correlation analysis to see the relationship between brand ethicality and brand strength. Based on the value of Pearson correlation, we can tell that for the cereal bar category, brand ethicality, and brand strength are significantly but not strongly correlated (r=.41, p<.01).

RESULT OF THE CHOCOLATE PASTE CATEGORY

Reliability analysis

The scales for purchase intention (α=0.94) and quality evaluation (α=0.88) were both proved to be reliable. The scale for sustainability perception was indicated to be of high reliability as well (α=0.94). The result showed high reliability of the scale for brand sensitivity (α=0.91) as well as the scale for brand ethicality (α=0.97). The scale for visual typicality was indicated to be reliable (α=0.93).

Manipulation check

T-tests were performed to check if the manipulations of material appearance (ecological vs. conventional) and brand ethicality were perceived as intended. For chocolate paste, the results indicated the successful manipulation of brand ethicality (M(ethical)= 5.15 vs. M(unethical)= 3.10; t(258)= -11.90, p<.001), the successful manipulation of ecological appearance (M(ecological)= 5.05 vs. M(conventional)= 4.31; t(258)= -4.22, p<.001), and the successful manipulation of visual typicality (M(ecological)= 3.13 vs. M(conventional)= 5.71; t(258)= 13.38, p<.001).

Regression analysis

The regression analysis was performed under model 11 in the PROCESS macro of SPSS. The independent variable is material appearance, the moderating variables are brand ethicality and eco-label, the mediating variable is sustainability perception, and the dependent variables are quality evaluation and purchase intention. Same as the cereal bar category, the participants who (almost) never eat chocolate paste were excluded from the total 260 responses because they lack knowledge and experience for evaluating products from this category. After excluding these participants, there are 238 valid responses left for the chocolate paste category.

Main effects and interactions effects regarding sustainability perception (H1, H2, H3, H4, H5)

The overall regression was statistically significant (R^2 = .19, F(7, 230) = 8.61, p < .001). It was found that the effect of brand ethicality on sustainability perception was not statistically significant (b=.16, p=0.35), **thus not supporting H1 in the chocolate paste category**. It was found that eco-label has a significant main effect on consumers' sustainability perception (b=0.92, p<.001), which indicates that the presence of eco-label triggers higher sustainability perception. **Thus, H2 was supported in the chocolate paste category**. Meanwhile, the result indicated no significant interaction between material appearance and eco-label (p=.75), **not supporting H3 in the chocolate paste category**. No significant interaction was found between eco-label and brand ethicality (p=.18), **not supporting H4 in the chocolate paste category**. No significant interaction was found between material appearance and brand ethicality either (p=.44), **not supporting H5 in the chocolate paste category**.

	Mean	N	SD
Material			
Conventional	4.31	119	1.40
Ecological	5.06	119	1.38
Eco-label			
No eco-label	4.22	123	1.38
With eco-label	5.17	115	1.33
Brand ethicality			
Ethical	4.77	115	1.31
Unethical	4.60	123	1.55
Total	4.68	238	1.44

Table 4. Means table: sustainability perception (chocolate paste category).

Main effects on quality evaluation and purchase intention

In the chocolate paste category, material appearance has a significant main effect on both quality evaluation (R^2 = .04, F(1, 236) = 10.33, p < .01; M(ecological)= 4.05 vs. M(conventional)= 4.62) and purchase intention (R^2 = .02, F(1, 236) = 4.88, p < .05; M(ecological)= 3.70 vs. M(conventional)= 4.14). Compared to ecological-looking material, conventional-looking material brings higher quality evaluation and higher purchase intention. Eco-label doesn't have a significant main effect on quality evaluation (R^2 = .00, F(1, 236) = .01, p = .93; M(no-label)= 4.34 vs. M(with-label)= 4.32) or purchase intention (R^2 = .00, F(1, 236) = .18, p = .67; M(no-label)= 3.88 vs. M(with-label)= 3.97). Brand ethicality has a significant main effect on both quality evaluation (R^2 = .14, F(1, 236) = 37.36, p < .001; M(ethical)= 4.87 vs. M(unethical)= 3.83) and purchase intention (R^2 = .11, F(1, 236) = 28.60, p < .001; M(ethical)= 4.45 vs. M(unethical)= 3.42). Higher brand ethicality brings higher quality evaluation and higher purchase intention.

	Mean	N	SD
Material			
Conventional	4.62	119	1.36
Ecological	4.05	119	1.38
Eco-label			
No eco-label	4.34	123	1.36
With eco-label	4.32	115	1.44
Brand ethicality			
Ethical	4.87	115	1.25
Unethical	3.83	123	1.35
Total	4.33	238	1.40

Table 5. Means table: quality evaluation (chocolate paste category).

	Mean	N	SD
Material			
Conventional	4.14	119	1.58
Ecological	3.70	119	1.53
Eco-label			
No eco-label	3.88	123	1.56
With eco-label	3.97	115	1.58
Brand ethicality			
Ethical	4.45	115	1.43
Unethical	3.42	123	1.53
Total	3.92	238	1.57

Table 6. Means table: purchase intention (chocolate paste category).

Mediation effects (H6, H7)

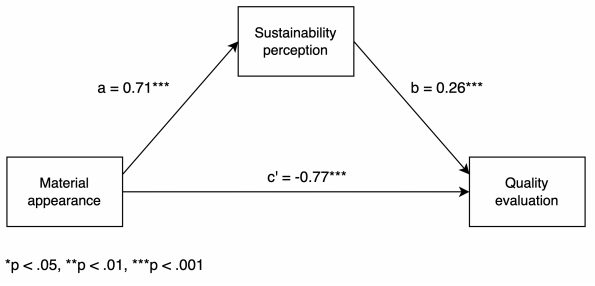

Figure 4. Mediation analysis (quality evaluation).

When not incorporating sustainability perception in the model, material appearance predicts consumers' product quality evaluation (b=-.57, p<.01), which is the total effect of material appearance on quality evaluation. Under model 11 incorporating sustainability perception, material appearance predicts consumers' sustainability perception (b=.71, p<.001), which corresponds to the path a in Figure 4. Meanwhile, consumers' sustainability perception predicts quality evaluation (b=.26, p<.001), which corresponds to the path b in Figure 4. In the presence of sustainability perception, material appearance predicts consumers' quality evaluation of the product (b=-.77, p<.001), which is the direct effect of material appearance on quality evaluation corresponding to the path c' in Figure 4. However, the indirect effect via sustainability perception is not significant (95%CI = (-.59, .19)). Therefore, sustainability perception doesn't mediate the effect of material appearance on quality evaluation, **not supporting H6 in the chocolate paste category.**

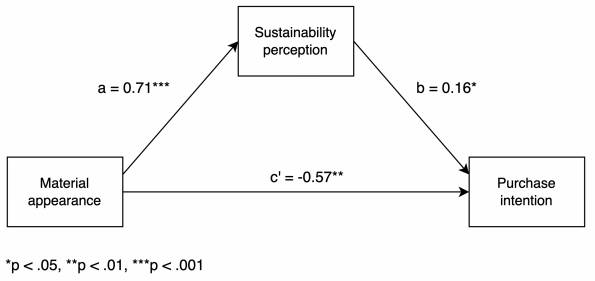

Figure 5. Mediation analysis (purchase intention).

Material appearance has a significant effect on consumers' purchase intention (b=-.45, p=<.05), which is the total effect of material appearance on purchase intention. Under model 11 incorporating sustainability perception, material appearance predicts consumers' sustainability perception (b=.71, p<.001), which corresponds to the path a in Figure 5. Meanwhile, consumers' sustainability perception predicts purchase intention (b=.16, p<.05), which corresponds to the path b in Figure 5. In the presence of sustainability perception, material appearance predicts consumers' purchase intention (b=-.57, p<.01), which is the direct effect of material appearance on purchase intention corresponding to the path c' in Figure 5. However, the indirect effect via sustainability perception is not significant (95%CI = (-.40, .13)). Therefore, sustainability perception doesn't mediate the effect of material appearance on purchase intention, **not supporting H7 in the chocolate paste category.**

Analysis of brand fit and design aesthetics

For the chocolate paste category, we also checked consumers' perceived brand fit and packaging aesthetics. The mean value of brand fit is 5.00 for the unethical brand, 5.46 for the ethical brand, and 5.22 on average (out of a seven-point scale). This demonstrated that consumers think there is a good match between products and brands in the chocolate paste category. The result of one-way ANOVA shows that there is a significant difference between the two brands regarding brand fit (M(ethical)= 5.46 vs. M(unethical)= 5.00; F(1, 236) = 10.18, p <.01). This indicates that consumers think the chocolate paste category fits more with Tony's Chocolonely rather than Nestle. In addition, an interesting finding is that brand fit has a significant effect on consumers' perceived packaging sustainability (F(1, 236) = 5.42, p <.05). When consumers sense a higher fit between a product and a brand, their perceived packaging sustainability increases accordingly. Meanwhile, brand fit also significantly affects both quality evaluation (F(1, 236) = 50.24, p <.001) and purchase intention (F(1, 236) = 55.21, p <.001). Higher brand fit triggers higher quality evaluation and purchase intention. This additional finding will also be discussed in the subsequent discussion section. The average score of perceived aesthetics is 3.30 out of 7, which indicates that the designed stimuli for this category are not visually appealing enough to consumers. The result of one-way ANOVA shows that there is a significant difference between ecological-looking material and conventional-looking material (M(ecological)= 2.85 vs. M(conventional)= 3.74; F(1, 236) = 18.57, p < .01), which indicates that consumers think the bioplastic packaging is prettier than the paper-based packaging.

Correlation between brand ethicality and brand strength

Based on the value of Pearson correlation, we can tell that for the category of chocolate paste, brand ethicality and brand strength are significantly but not strongly correlated either (r=.28, p<.01).

DISCUSSION

Theoretical implications

Main effect of material appearance

In both categories, ecological-looking material has a positive impact on sustainability perception, which further supports the prior research findings that consumers consider organic materials of a cardboard-like appearance to have a higher sustainability level (Magnier & Schoormans, 2015; Krah et al., 2019).

Meanwhile, in the chocolate paste category, the result indicates that ecological material appearance has a negative impact on consumers' product quality evaluation. In terms of the controversial relationship between sustainability perception and consumers' evaluation of product functional attributes, this result further supported the negative correlation relationship. However, this effect only appeared in the chocolate paste category but not in the cereal bar category. We conjecture that it might be due to the situation that compared to the paper package for cereal bars, the paper jar for chocolate paste is more novel and rarer in the marketplace, which can be supported by the difference in their perceived typicality. Out of a seven-point Likert scale, cereal bars with paper packaging got a mean score of 5.8 while the chocolate paste with paper packaging scored 3.2. Meanwhile, because chocolate paste is viscous but cereal bars are solid and paper seems to be inherently incompatible with viscous fluids, consumers may hold more skepticism toward the physical protective capabilities (like anti-permeability) of the paper packaging of chocolate paste, as a participant commented on the paper jar "I'd be too afraid the packaging would break down before the paste ran out". This may give an explanation of the difference between the two categories regarding quality evaluation.

Main effect of eco-label

The result shows that in both categories, eco-label has a positive effect on sustainability perception, but has no significant effect on quality evaluation and purchase intention. Regarding the effect on sustainability perception, this study further supports the prior research result that the perception of sustainability is positively affected by explicit cues like eco-labels or environmental claims (Granato et al., 2022). This positive effect shows that although the skepticism toward the validity of eco-labels is in growth because of the misuse of eco-labels for greenwashing, most consumers still tend to trust the information in eco-labels and believe the green statements are honest. In addition, the eco-labels in this study were designed as companies' self-made labels instead of well-known authorized labels by third-party organizations, which may be perceived to be of less credibility. However, there is still a positive effect indicating that consumers tend to give enough trust in these self-made labels that they have never seen before.

Main effect of brand ethicality

Since the manipulation of brand ethicality didn't succeed in the cereal bar category, the discussion on brand ethicality will only be based on the result of the chocolate paste category. Brand ethicality has no significant effect on consumers' perceived sustainability, but has a positive effect on both quality evaluation and purchase intention. The insignificance of the effect on sustainability perception might be based on the following reason. As indicated in the result, the ethical brand and unethical brand scored 5.15 and 3.10 respectively in brand ethicality. There is indeed a large gap between the two scores. However, based on a seven-point scale, 3.10 can be defined as a relatively neutral brand instead of a highly unethical brand. Thus, consumers may also give enough trust in the unethical brand in the experiment and believe this brand will conduct sustainable practices with honesty and integrity, which makes the difference between the two brands not significant. This result brings implications in two aspects. First, regarding perceived sustainability, brand is not of high priority when consumers evaluate packaging sustainability. Consumers tend to judge packaging sustainability more relying on the elements directly indicating packaging physical attributes (eg, material) instead of the established image of a brand. The second aspect is related to the correlation analysis, which indicated that brand ethicality was not strongly correlated with brand strength in both categories. The combination of these two analyses demonstrates that brand ethicality is possibly regarded as another perspective isolated from the general brand strength to evaluate the impact of brand on consumers' purchase behaviors. In previous research, ethicality was seldom taken as an individual aspect to evaluate a brand and the brand's influence on consumer responses. This study broadens the possible research scope and angles regarding the relationship between brand and consumer perception.

Interaction effect

In the cereal bar category, it was demonstrated that both ecological-looking material and eco-label have a positive effect on consumers' sustainability perception. However, when these two sustainable design cues are combined, these two positive effects mitigate each other. The result shows a significant interaction between material appearance and eco-label, which is, compared to paper-based packaging, the eco-label on bioplastic packaging has a more positive impact on consumers' sustainability perception. To be blunter, when these two sustainable elements co-exist in one package, these two elements still have a positive impact on perceived sustainability, but not as positive as when they were applied individually. This indicates that the combination of two sustainable design cues makes consumers' perception of sustainability reach a certain threshold, thus making the joint effect not a "1+1=2" situation but a "1<1+1<2" situation. However, for the category of chocolate paste, this interaction is not significant. The reason for this difference needs to be further investigated by future research with more product categories, to identify the patterns of situations where this "1<1+1<2" phenomenon occurs or not.

Managerial implication

Designers can use the results of this paper to positively influence consumers' evaluations of sustainable packaging.

Main effect of material appearance

In the chocolate paste category, ecological material appearance has a positive impact on sustainability perception but a negative impact on consumers' product quality evaluation. Therefore, regarding the chocolate paste category, companies need to find a balance

between perceived sustainability and perceived product quality since they both influence the overall evaluation of a product, consequently influencing product sales. For packaging designers, more scientific user research and testing before product launch would help to better judge the overall influence because this trade-off between perceived sustainability and product quality may depend on particular target consumer sectors and product categories.

Main effect of eco-label

The result shows that eco-label has a positive effect on sustainability perception, but has no significant effect on quality evaluation and purchase intention. This result implies that some companies' misuse of eco-labels to serve the purpose of "greenwashing" may not achieve the intended goals to promote sales since eco-labels don't significantly increase consumers' purchase intention. Eco-label is not directly associated with good quality or better performance in consumers' established cognition. The lack of knowledge of eco-label might be one of the reasons that eco-label doesn't have a significant impact on purchase intention. Prior research found that consumers' knowledge about eco-labels is positively associated with pro-environmental consumer behavior (PECB), which implies that firms and organizations can educate consumers about eco-labels to achieve the purpose of facilitating the positive effect of eco-labels on purchase intention (Taufique et al., 2017). Therefore, to better translate sustainable product traits into competitive market advantages, companies may try to more fully convey the meaning and value of their eco-labels to consumers via multiple channels like advertisement, campaigns, or just packaging design.

Main effect of brand ethicality

The positive effect that brand ethicality has on quality evaluation and purchase intention indicates that a business return regarding sales can be expected from a higher brand ethicality, which further strengthens the necessity for companies to put the establishment of brand ethicality in a more important position. Meanwhile, previous research demonstrated that customers' perceived brand ethicality also has a positive impact on brand equity (Iglesias et al., 2019), which shows that efforts at the level of brand ethicality will also contribute to the overall brand strength, bringing more comprehensive improvement to the added value that a brand may have on its products. Brand ethicality didn't have a significant impact on sustainability perception. As stated in the theoretical implication, consumers tend to judge packaging sustainability more by relying on the elements explicitly indicating packaging physical attributes (eg, material) instead of the established image of the brand. This brings suggestions to both established ethical brands and traditional brands. For the brands that are currently well-known for ethicality, they should be aware that consumers' evaluation of product sustainability is fair and direct. To maintain the leading position regarding ethicality, they need to constantly fulfill their promise of sustainability with actual practices instead of excessively relying on the brand image built by prior accomplishments. Meanwhile, for traditional brands that haven't put much effort into packaging sustainability, there shouldn't be much concern that the "latecomer disadvantage" will not prevent consumers from fairly judging their efforts regarding sustainability, since consumers evaluate product sustainability more based on what a brand is doing, not what a brand has done.

Interaction effect

In the cereal bar category, the result shows a significant interaction effect between material appearance and eco-label, indicating that these two sustainable visual cues mitigate each other when combined. Therefore, for companies, more in-depth thinking and testing are needed when trying to simultaneously use multiple eco-elements for better communicating sustainable traits since the added values of the second and subsequent elements are limited as indicated in this research. Companies should make case-by-case design decisions instead of blindly stacking sustainable design elements.

Effect of brand fit

Besides the relationships proposed in the hypotheses, there is an additional finding that when consumers sense a higher fit between a product and a brand, their perceived packaging sustainability, quality evaluation, and purchase intention all increase accordingly. This result implies that when consumers feel a stronger coherence between the product and the brand, they incline to give higher trust in multiple aspects of this product such as packaging sustainability and product quality. For both Tony's Chocolonely and Nestle, the chocolate paste is a line extension since it's currently not in their product portfolios. Therefore, when conducting a line extension, companies should be aware that if the new product deviates from the existing product portfolio too much, there might be a decrease in consumers' evaluation of both packaging sustainability and product quality, thus resulting in lower purchase intention. Line extension needs to be conducted in a relatively cautious and conservative manner.

LIMITATION AND FUTURE RESEARCH

This research is limited in the following aspects. First, money as an important determinant of consumers' choices between sustainable and conventional products, was not included in this research. In our questionnaire, we gave participants a chance to comment on this research. Nearly one-third of the comments we got were about the budget issue, like "my choices also depend on how much money I have to spend on food"; "I always try to buy a more sustainable brand, but money is also a consideration"; "there were no questions about price. For me, that's the biggest factor for choosing a product". Therefore, when evaluating people's environmental concerns and purchase decisions regarding sustainable products, future research may take money or budget as part of the study for more holistic and insightful findings. Second, the research was conducted among Dutch consumers, which may not be representative enough

because of Dutch people's generally higher environmental concern. According to the survey result of U.S. News in 2021, the Netherlands ranked No.8 among all the countries for caring most about the environment. In another survey by the Environmental Performance Index (EPI) about the environmental performance of 180 countries in 2022, the Netherlands ranked No.11. Therefore, for generalizing the result of this research into a broader consumer scope, supplementary research is needed to test the people living in regions of different levels of environmental awareness. Third, there are two types of eco-labels in the current marketplace, which are the labels authorized by third-party organizations and the labels made by companies themselves. In this research, only the latter type was studied. In future research, the comparison between authorized labels and companies' self-made labels would be an interesting topic to investigate since this comparison is related to the trust issue regarding greenwashing. Fourth, in this research, the manipulation of brand ethicality didn't succeed in the cereal bar category. This problem can be compensated in future research with a more appropriate selection of brands to further test the role of brand ethicality in consumers' product evaluation.

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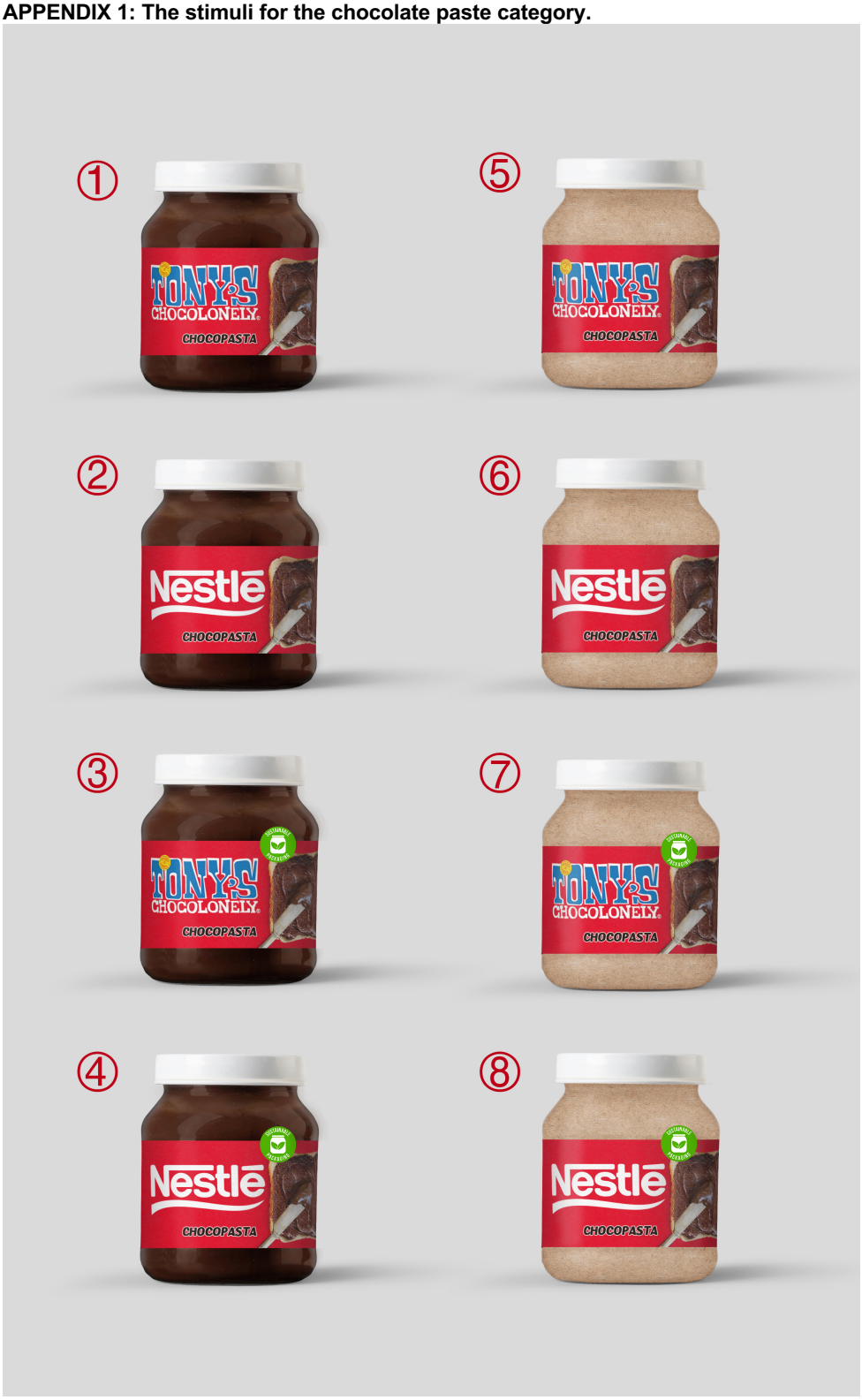
Ye, N., Morrin, M., & Kampfer, K. (2019). From Glossy to Greasy: The Impact of Learned Associations on Perceptions of Food Healthfulness. *Journal of Consumer Psychology*, *30*(1), 96–124. https://doi.org/10.1002/jcpy.1126

Zabaniotou, A., & Kassidi, E. (2003). Life cycle assessment applied to egg packaging made from polystyrene and recycled paper. *Journal of Cleaner Production*, *11*(5), 549–559. https://doi.org/10.1016/s0959-6526(02)00076-8

Zhou, L., Yang, Z., & Hui, M. K. (2010). Non-local or local brands? A multi-level investigation into confidence in brand origin identification and its strategic implications. *Journal of the Academy of Marketing Science*, *38*(2), 202–218. https://doi.org/10.1007/s11747-009-0153-1

APPENDIX 1: The stimuli for the chocolate paste category.



APPENDIX 2: The stimuli for the cereal bar category.

APPENDIX 3: The regression analysis result (Cereal bar category; DV: quality evaluation; Model 7).

Run MATRIX procedure:

**** PROCESS Procedure for SPSS Version 3.1 ****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com

Documentation available in Hayes (2018). www.guilford.com/p/hayes3

****

Model : 7

Y : cereal_q

X : Material

M : cereal_s

W : Eco_labe

Sample

Size: 213

****

OUTCOME VARIABLE:

cereal_s

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.590	.348	1.824	45.979	3.000	209.000	.000

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	4.316	.093	46.383	.000	4.132	4.499
Material	1.316	.187	7.035	.000	.947	1.684
Eco_labe	1.330	.184	7.207	.000	.966	1.693
Int_1	-1.301	.371	-3.509	.001	-2.031	-.570

Product terms key:

Int_1 : Material x Eco_labe

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

	R2-chng	F(HC3)	df1	df2	p
X*W	.038	12.316	1.000	209.000	.001

Focal predict: Material (X)

Mod var: Eco_labe (W)

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

Eco_labe	Effect	se(HC3)	t	p	LLCI	ULCI
-.526	2.000	.241	8.294	.000	1.524	2.475
.474	.699	.281	2.483	.014	.144	1.254

Data for visualizing the conditional effect of the focal predictor:

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

```
DATA LIST FREE/
  Material   Eco_labe   cereal_s   .
BEGIN DATA.
     -.521     -.526     2.574
      .479     -.526     4.574
     -.521      .474     4.582
      .479      .474     5.281
END DATA.
GRAPH/SCATTERPLOT=
 Material WITH     cereal_s BY       Eco_labe .
```

****

OUTCOME VARIABLE:

cereal_q

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.163	.027	1.370	2.331	2.000	210.000	.100

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	4.396	.269	16.359	.000	3.866	4.925
Material	-.094	.164	-.573	.567	-.416	.229
cereal_s	.124	.058	2.159	.032	.011	.238

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

Direct effect of X on Y

Effect	se(HC3)	t	p	LLCI	ULCI
-.094	.164	-.573	.567	-.416	.229

Conditional indirect effects of X on Y:

INDIRECT EFFECT:

Material -> cereal_s -> cereal_q

Eco_labe	Effect	BootSE	BootLLCI	BootULCI
-.526	.248	.116	.027	.487
.474	.087	.057	.003	.217

Index of moderated mediation (difference between conditional indirect effects):

	Index	BootSE	BootLLCI	BootULCI
Eco_labe	-.162	.086	-.353	-.015

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

Level of confidence for all confidence intervals in output:

95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:

5000

NOTE: A heteroscedasticity consistent standard error and covariance matrix estimator was used.

NOTE: The following variables were mean centered prior to analysis:

Eco_labe Material

NOTE: Variables names longer than eight characters can produce incorrect output.

Shorter variable names are recommended.

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

APPENDIX 4: The regression analysis result (Cereal bar category; DV: purchase intention; Model 7).

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Version 3.1 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com

Documentation available in Hayes (2018). www.guilford.com/p/hayes3

****

Model : 7

Y : cereal_p

X : Material

M : cereal_s

W : Eco_labe

Sample

Size: 213

****

OUTCOME VARIABLE:

cereal_s

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.590	.348	1.824	45.979	3.000	209.000	.000

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	4.316	.093	46.383	.000	4.132	4.499
Material	1.316	.187	7.035	.000	.947	1.684
Eco_labe	1.330	.184	7.207	.000	.966	1.693
Int_1	-1.301	.371	-3.509	.001	-2.031	-.570

Product terms key:

Int_1 : Material x Eco_labe

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

	R2-chng	F(HC3)	df1	df2	p
X*W	.038	12.316	1.000	209.000	.001

Focal predict: Material (X)

Mod var: Eco_labe (W)

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

Eco_labe	Effect	se(HC3)	t	p	LLCI	ULCI
-.526	2.000	.241	8.294	.000	1.524	2.475
.474	.699	.281	2.483	.014	.144	1.254

Data for visualizing the conditional effect of the focal predictor:

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

```
DATA LIST FREE/
  Material   Eco_labe   cereal_s   .
BEGIN DATA.
     -.521     -.526     2.574
      .479     -.526     4.574
     -.521      .474     4.582
      .479      .474     5.281
END DATA.
GRAPH/SCATTERPLOT=
 Material WITH     cereal_s BY       Eco_labe .
```

****

OUTCOME VARIABLE:

cereal_p

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.127	.016	2.257	1.508	2.000	210.000	.224

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	3.979	.319	12.459	.000	3.350	4.609
Material	-.150	.219	-.686	.493	-.581	.281
cereal_s	.125	.072	1.734	.084	-.017	.266

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

Direct effect of X on Y

Effect	se(HC3)	t	p	LLCI	ULCI

-.150 .219 -.686 .493 -.581 .281

Conditional indirect effects of X on Y:

INDIRECT EFFECT:

Material -> cereal_s -> cereal_p

Eco_labe	Effect	BootSE	BootLLCI	BootULCI
-.526	.249	.147	-.028	.546
.474	.087	.068	-.010	.252

Index of moderated mediation (difference between conditional indirect effects):

	Index	BootSE	BootLLCI	BootULCI
Eco_labe	-.162	.102	-.384	.017

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

Level of confidence for all confidence intervals in output:

95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:

5000

NOTE: A heteroscedasticity consistent standard error and covariance matrix estimator was used.

NOTE: The following variables were mean centered prior to analysis:

Eco_labe Material

NOTE: Variables names longer than eight characters can produce incorrect output.

Shorter variable names are recommended.

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

APPENDIX 5: The regression analysis result (Chocolate paste category; DV: quality evaluation; Model 11).

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Version 3.1 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com

Documentation available in Hayes (2018). www.guilford.com/p/hayes3

****

Model : 11

Y : choco_qu

X : Material

M : choco_su

W : Eco_labe

Z : Brand_et

Sample

Size: 238

****

OUTCOME VARIABLE:

choco_su

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.431	.185	1.731	8.612	7.000	230.000	.000

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	4.685	.087	53.604	.000	4.513	4.857
Material	.710	.175	4.064	.000	.366	1.055
Eco_labe	.922	.175	5.276	.000	.578	1.266
Int_1	.110	.349	.314	.754	-.579	.798
Brand_et	.162	.174	.931	.353	-.181	.506
Int_2	-.268	.349	-.769	.443	-.955	.419
Int_3	-.469	.348	-1.346	.180	-1.156	.218
Int_4	-.590	.697	-.847	.398	-1.963	.783

Product terms key:

Int_1 : Material x Eco_labe

Int_2 : Material x Brand_et

Int_3 : Eco_labe x Brand_et

Int_4 : Material x Eco_labe x Brand_et

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

	R2-chng	F(HC3)	df1	df2	p
X*W*Z	.003	.718	1.000	230.000	.398

Focal predict: Material (X)

Mod var: Eco_labe (W)

Mod var: Brand_et (Z)

Data for visualizing the conditional effect of the focal predictor:

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

```
DATA LIST FREE/
  Material   Eco_labe   Brand_et   choco_su   .
BEGIN DATA.
     -.500      -.483      -.483      3.727
      .500      -.483      -.483      4.376
     -.500      -.483       .517      4.108
      .500      -.483       .517      4.774
     -.500       .517      -.483      4.678
      .500       .517      -.483      5.722
     -.500       .517       .517      4.885
      .500       .517       .517      5.356
END DATA.
GRAPH/SCATTERPLOT=
 Material WITH     choco_su BY       Eco_labe /PANEL   ROWVAR=  Brand_et .
```

****

OUTCOME VARIABLE:

choco_qu

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.332	.110	1.754	13.189	2.000	235.000	.000

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	3.102	.338	9.183	.000	2.436	3.767

```
Material     -.767      .179    -4.278      .000    -1.121     -.414
choco_su      .263      .068     3.877      .000      .129      .397

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

Direct effect of X on Y
    Effect    se(HC3)         t         p      LLCI      ULCI
     -.767      .179    -4.278      .000    -1.121     -.414

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 Material    ->    choco_su    ->    choco_qu

  Eco_labe   Brand_et     Effect     BootSE   BootLLCI   BootULCI
     -.483     -.483      .171      .105     -.019      .397
     -.483      .517      .175      .105      .010      .415
      .517     -.483      .275      .118      .073      .540
      .517      .517      .124      .101     -.053      .344

    Index of moderated moderated mediation
    Index     BootSE   BootLLCI   BootULCI
    -.155      .194     -.585      .186

    Indices of conditional moderated mediation by W
  Brand_et      Index     BootSE   BootLLCI   BootULCI
    -.483      .104      .137     -.146      .398
     .517     -.051      .131     -.334      .199
---

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

Level of confidence for all confidence intervals in output:
 95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
 5000

NOTE: A heteroscedasticity consistent standard error and covariance matrix estimator was used.

NOTE: The following variables were mean centered prior to analysis:
```

Eco_labe Brand_et Material

NOTE: Variables names longer than eight characters can produce incorrect output.

Shorter variable names are recommended.

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

APPENDIX 6: The regression analysis result (Chocolate paste category; DV: purchase intention; Model 11).

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Version 3.1 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com

Documentation available in Hayes (2018). www.guilford.com/p/hayes3

****

Model : 11

Y : choco_pu

X : Material

M : choco_su

W : Eco_labe

Z : Brand_et

Sample

Size: 238

****

OUTCOME VARIABLE:

choco_su

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.431	.185	1.731	8.612	7.000	230.000	.000

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	4.685	.087	53.604	.000	4.513	4.857
Material	.710	.175	4.064	.000	.366	1.055
Eco_labe	.922	.175	5.276	.000	.578	1.266
Int_1	.110	.349	.314	.754	-.579	.798
Brand_et	.162	.174	.931	.353	-.181	.506
Int_2	-.268	.349	-.769	.443	-.955	.419
Int_3	-.469	.348	-1.346	.180	-1.156	.218
Int_4	-.590	.697	-.847	.398	-1.963	.783

Product terms key:

Int_1 : Material x Eco_labe

Int_2 : Material x Brand_et

Int_3 : Eco_labe x Brand_et

Int_4 : Material x Eco_labe x Brand_et

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

	R2-chng	F(HC3)	df1	df2	p
X*W*Z	.003	.718	1.000	230.000	.398

Focal predict: Material (X)

Mod var: Eco_labe (W)

Mod var: Brand_et (Z)

Data for visualizing the conditional effect of the focal predictor:

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

```
DATA LIST FREE/
  Material   Eco_labe   Brand_et   choco_su   .
BEGIN DATA.
     -.500      -.483      -.483      3.727
      .500      -.483      -.483      4.376
     -.500      -.483       .517      4.108
      .500      -.483       .517      4.774
     -.500       .517      -.483      4.678
      .500       .517      -.483      5.722
     -.500       .517       .517      4.885
      .500       .517       .517      5.356
END DATA.
GRAPH/SCATTERPLOT=
 Material WITH     choco_su BY       Eco_labe /PANEL   ROWVAR=  Brand_et .
```

****

OUTCOME VARIABLE:

choco_pu

Model Summary

R	R-sq	MSE	F(HC3)	df1	df2	p
.203	.041	2.377	4.523	2.000	235.000	.012

Model

	coeff	se(HC3)	t	p	LLCI	ULCI
constant	3.153	.371	8.502	.000	2.422	3.884

```
Material      -.567      .212     -2.683      .008      -.984      -.151
choco_su       .164      .077      2.125      .035       .012       .316

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

Direct effect of X on Y
     Effect    se(HC3)         t         p       LLCI       ULCI
      -.567       .212     -2.683      .008      -.984      -.151

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 Material    ->    choco_su    ->    choco_pu

   Eco_labe   Brand_et     Effect     BootSE   BootLLCI   BootULCI
      -.483      -.483       .106       .082      -.015       .299
      -.483       .517       .109       .077      -.004       .288
       .517      -.483       .171       .103       .009       .408
       .517       .517       .077       .074      -.029       .262

     Index of moderated moderated mediation
     Index     BootSE   BootLLCI   BootULCI
     -.097       .131      -.400       .133

     Indices of conditional moderated mediation by W
   Brand_et      Index     BootSE   BootLLCI   BootULCI
      -.483       .065       .097      -.105       .287
       .517      -.032       .086      -.222       .138
---

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

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

NOTE: A heteroscedasticity consistent standard error and covariance matrix estimator was used.

NOTE: The following variables were mean centered prior to analysis:
```

Eco_labe Brand_et Material

NOTE: Variables names longer than eight characters can produce incorrect output.

Shorter variable names are recommended.

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

APPENDIX 7: Project brief.

DESIGN FOR our future

6175

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Wang
initials: R. given name: Runlang
student number: 557702[redacted]
street & no.: [redacted]
zipcode & city: [redacted]
country:
phone: [redacted]
email: [redacted]

Your master programme (only select the options that apply to you):
IDE master(s): ( ) IPD ( ) DfI (★) SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ( ) Honours Programme Master
specialisation / annotation: ( ) Medisign ( ) Tech. in Sustainable Design ( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Marielle Creusen dept. / section: MCR (DDS)
** mentor: Rick Schifferstein dept. / section: DA (HCD)
2nd mentor:
organisation:
city: country:
comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Procedural Checks - IDE Master Graduation

TU Delft

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Marielle Creusen date 18 - 1 - 2023 signature

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 15 EC

Of which, taking the conditional requirements into account, can be part of the exam programme 15 EC

List of electives obtained before the third semester without approval of the BoE

(X) YES all 1st year master courses passed

( ) NO missing 1st year master courses are:

name Robin den Braber date 20 01 2023 signature RdB

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (d s)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: (V) APPROVED ( ) NOT APPROVED

Procedure: (V) APPROVED ( ) NOT APPROVED

comments

name Monique von Morgen date - KE 7/2/2023 signature MvM

Initials & Name R. Wang Student number 5577020

Title of Project Brand strength and visual typicality in sustainable packaging perception

Personal Project Brief - IDE Master Graduation

TU Delft

Brand strength and visual typicality in sustainable packaging perception project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 10 - 01 - 2023 24 - 06 - 2023 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

This research project looks into the relationship between the visual typicality of sustainable packaging and the corresponding consumer preference as well as the moderating role of brand strength within this relationship. An experimental study will be designed, executed, and analyzed to test the hypotheses on this research question generated from extensive literature review. This research project aims at providing added values and insights about sustainable packaging design, consumer preference regarding visual typicality, and the role of brand in product evaluation from both theoretical and managerial perspectives.

Theoretical implications: First, this research is a further investigation of visual typicality's influence on consumer preference under the background of sustainable packaging. Different kinds of visual cues in sustainable packaging design are taken into consideration. Second, this research aims at testing the brand's moderating role in visual typicality's influence on consumer preference, which is currently missing in the field of sustainable packaging. Third, not limited by overall brand equity, this research particularly pays extra attention to brand ethicality and perceives it as a crucial factor that may have an impact on the relationship between the visual typicality of sustainable packaging and consumer preference.

Managerial implication: First, this research seeks to gain insights into how to align visual design and brand characteristics to enhance consumers' preferences for environment-friendly packages. Second, developing sustainable packaging often requires companies to make monetary investments. In this context, it's not acceptable that sustainable packaging doesn't impose any positive impact on consumers' purchase intentions or even brings a negative influence. This research can provide some guidance for designers on how to give an appropriate appearance to sustainable packaging to make it simultaneously contribute to both environmental protection and corporate profits.

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introduction (continued): space for images

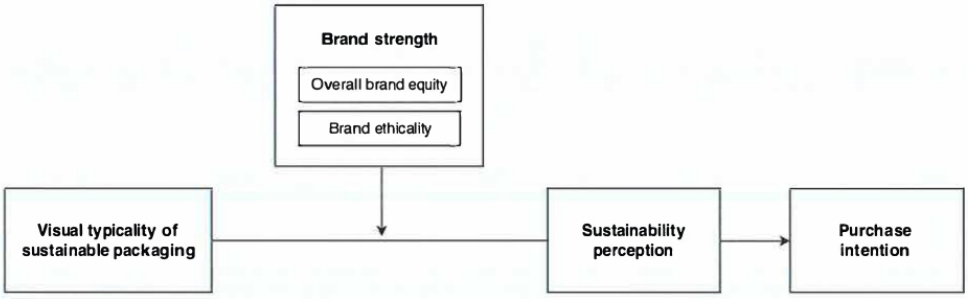


image / figure 1: Research model

TO PLACE YOUR IMAGE IN THIS AREA:
- SAVE THIS DOCUMENT TO YOUR COMPUTER AND OPEN IT IN ADOBE READER
- CLICK AREA TO PLACE IMAGE / FIGURE

PLEASE NOTE:
- IMAGE WILL SCALE TO FIT AUTOMATICALLY
- NATIVE IMAGE RATIO IS 16:10
- IF YOU EXPERIENCE PROBLEMS IN UPLOADING, COVERT IMAGE TO PDF AND TRY AGAIN

image / figure 2:

Personal Project Brief - IDE Master Graduation

TU Delft

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

Visual elements are perceived as important cues that consumers rely on to evaluate the quality and performance of products. In some cases, consumers are found to infer better product performance from an atypical package design and show higher purchase intention, while in other cases consumers tend to choose a more typical-looking product based on the consideration of avoiding unnecessary risks. Meanwhile, Brand strength plays a role in visual typicality's influence on consumer perception. Previous studies have shown that compared to weak brands, atypical-looking products from strong brands always get stronger acceptance and preference from consumers in the category of durable products. Thus, the relationship between visual typicality and consumer purchase intention needs to be further investigated by taking the effect of brand strength into account.
With the increasing emphasis on sustainability in society, sustainable packaging innovations are also becoming increasingly available in the marketplace. Sustainable packaging seems to be a technological task, but in reality, it is closely related to consumer perception. The success of sustainable packages is highly dependent on consumers' understanding and acceptance of these packages. However, current products with sustainable packages generally fail to adequately communicate sustainable characteristics to consumers. This results in a disappointing situation where investments in sustainable packaging can't be translated into commercial returns and competitive advantages, which dampens companies' enthusiasm and hinders them from further developing sustainable packaging. However, on the other hand, the atypical appearance brought by sustainable visual cues may bring reduced consumer acceptance because of the perceived risk and doubt about quality and reliability. Therefore, how to properly utilize visual cues to better communicate sustainable information is a key problem for both researchers and designers.
Combining the two angles mentioned above, the investigation of the relationship between visual typicality and consumer preference as well as the moderating effect of brand strength will be framed in the area of sustainable packaging of fast-moving consumer goods.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Research question: How and why does brand strength affect consumers' purchase intention toward atypical sustainable packaging design?

Based on the literature review, an experiment will be conducted in the realm of sustainable packaging to further investigate the relationship between visual typicality and consumer perception as well as the moderating role of brand strength within this relationship.
Brand strength will be studied regarding both overall brand equity and brand ethicality. Meanwhile, the visual typicality of sustainable packaging will be examined in terms of materials, color, typeface, natural images, texture, etc. Previous studies have suggested that an increased perception of sustainability can have a positive spillover effect on other functional attributes such as health and taste. Similarly, research has shown that signaling sustainability positively influences the perception of product quality. Therefore, the mediating effect of sustainability perception on the relationship between visual typicality and purchase intention will be tested. Meanwhile, quality evaluation and perceived risk will also be measured as a complement to purchase intention to evaluate consumers' responses more holistically.
The variables within the research model are set as follows:
Independent variable: Visual typicality of sustainable packaging.
Moderator variable: Brand strength.
Mediator variable: Sustainability perception.
Dependent variable: Purchase intention, quality evaluation, and perceived risk.

Initials & Name R. Wang Student number 5577020

Title of Project Brand strength and visual typicality in sustainable packaging perception

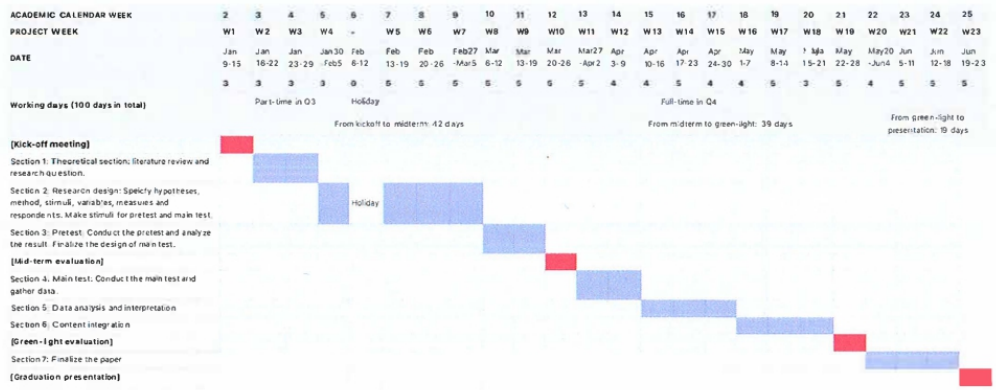
Personal Project Brief - IDE Master Graduation

TU Delft

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 10 - 1 - 2023 24 - 6 - 2023 end date



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MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

First, last semester in spd research, my team's project about the influence of brand strength and visual typicality on the perceived quality of FMCG helped me establish the fundamental research methodology and knowledge related to product perception, and also aroused my curiosity and interest in this field. Limited by time, the project has much room for improvement in terms of depth of thinking and completeness of experiment, so I hope to continue the exploration in this direction with my graduation project. Second, last semester in BPC's brand design project for a spirulina juice start-up company, when evaluating different possible brand visual and packaging designs, I strongly felt the practical value of product perception research, which can indeed help to reduce the uncertainty in concept development and testing. Based on this experience, I believe that the ability to conduct product perception research will greatly contribute to the rationale of my product and brand design. Therefore, in my graduation project, I hope to further build up my research ability, thereby enabling research and design to promote each other in my future work.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.