

# Consumer Evaluation Trade-off: Sustainability Liability and Role of Centrality of Green Attributes.

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**Abstract** In recent years, we have seen the rise of environmental problems, both in numbers and severity. These issues are gaining traction on news outlet, social media, and there's not a day goes by that we don't see them on our devices: rising sea level, warming of the ocean and atmosphere... With the rise of these global problems, so too is the rise of global consumer awareness on sustainability and their power to contribute to the cause by purchasing more environmentally green products.

From a business perspective, this sustainability trend serves as a great opportunity, and has led to remarkable growth in the global market for environmentally friendly products. In fact, we have seen the birth of many successful multinational companies whose mission is to alleviate these environmental issues. Two great examples are Impossible Foods and Beyond Meat, which are founded to combat the environmental impacts related to livestock farming. Older companies such as H&M or Unilever have also adapted to the trend by launching new sustainable product lines. The decision by companies to improve their corporate social responsibilities through being more sustainable has been shown to increase firm performance and financial performance. Going further than firm performance metrics, companies can use their CSR as a form competitive advantage. In other words, if a company can afford to improve their CSR, it should. This is easier said than done, however, because not all companies have enough resources like Unilever or H&M to invest in sustainability, or have their company identities so closely linked to sustainability like Beyond Meat and Impossible Foods. For such companies with limited resources, one popular way to respond to the sustainability trend is to introduce components made with materials that are less harmful to the environment. This creates a problem for companies because there are no guidelines for choosing the right component that would benefit them the most, which leads to the main problem of this study: How can companies, with their limited resources, get the highest value for their sustainability investment?

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**Keywords** Sustainability, Green products, Sustainability Liability, Centrality of Green Attributes

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## 1. Introduction:

The purpose of this thesis is to improve our understanding of how consumers evaluate green products by examining the relationship between the theory of centrality of green products and the theory of sustainability liability. To the best of my knowledge, this thesis is the first to study the interaction between these theories. With the findings of this research, practitioners can make better decisions on how they can get the most value out of their green investments. The thesis begins with a short background on the importance of this topic for real life applications, as well as for academic advancements. Next, I will review relevant literature which serves as the foundation for this thesis to form research hypotheses. Afterwards, I will cover the research methodology and the steps I took to test my hypotheses. Finally, I will discuss the results and how they affect our current understanding on green products evaluation, and how companies can make use of them.

### 1.1 Research Background:

This decade has seen the rise of environmental problems, both in numbers and severity, whether they'd be global warming, pollution, rising sea level... These issues are being covered in major news outlets such as the Time Magazine (Worland, 2018) and Wall Street Journal (Trentmann, 2018) on a regular basis. In light of these global issues, people around the world are working together to take global actions. In 2019, during the 20<sup>th</sup> – 27<sup>th</sup> September, more than 6 million people across 150 countries took to the streets to protest climate change (Taylor and Watts, 2019).

From a business perspective, this sustainability trend serves as a great opportunity. Because consumers have become increasingly attentive to social and ethical considerations in areas such as energy consumption, animal husbandry, and trade (Chen, 2001; Crane, 2001). This increased concern and feeling of responsibility for society has led to remarkable growth in the global market for environmentally friendly products (Hunt and Dorfman, 2009). In fact, we have seen the birth of many successful companies whose mission is to alleviate these environmental issues. Two examples in recent memories are Impossible Foods and Beyond Meat, which are founded to combat the environmental impacts related to livestock farming. Regarding already existing companies, they've found new business opportunities through launching new sustainable product

lines, as with the case of H&M (Young, 2018), or through launching new sustainable brands, as with the case of Unilever (Roosblad, 2017). The decision by companies to improve their corporate social responsibilities (CSR) through being more sustainable has been shown to increase firm performance (Ramanathan, 2016) and financial performance (Hasan et al., 2016 and Wong et al., 2016). Going further than firm performance metrics, companies can use their CSR as a form competitive advantage (Porter and Kramer, 2006), even though achieving this balance can be difficult (Fish and Wood, 2017). In other words, if a company can afford to improve their CSR, it should. This is easier said than done, however, because not all companies have enough resources like Unilever or H&M to invest in sustainability, or have their company identities so closely linked to sustainability like Beyond Meat and Impossible Foods. For such companies with limited resources, one popular way to respond to the sustainability trend is to introduce components made with materials that are less harmful to the environment (Delmas and Burnano, 2011). This creates a problem for companies because there are no guidelines for choosing the right component that would benefit them the most, which leads to the main research problem: How can companies, with their limited resources, get the highest value for their sustainability investment?

## 1.2 Research Gap:

Previous researchers have looked at the relationship between firm CSR and value maximization, and the concern of misallocating scarce resources into CSR (Margolis and Walsh, 2003; Garriga and Melé, 2004). Some researchers have looked at the link between environmental performance and firm performance (Beurden and Gössling, 2008; Waddock and Graves, 1997; Konar and Cohen, 2001). Other researchers have approached the topic of sustainability through the perspectives of consumers by studying their purchasing preferences and patterns (Aarts & Dijksterhuis, 2003; Mai et al., 2017). Whether it'd be through the perspectives of companies or consumers, these research serve to answer the question: why should companies invest in green/sustainable products? And while the literature stream on answering the why question is abundant, few researchers have focused on the question: how can companies invest their limited resources into making their products more sustainable? It's important to answer this question because firstly, not much research has been conducted for this purpose, and secondly, because it can help researchers answer the why question. If companies are more knowledgeable in

sustainability investment, the concern of misallocating resources will decrease, the link between environmental performance and firm performance will be strengthened, and consumers will be more willing to purchase their products. All of which will likely change the results of the current literature on why companies should, or should not invest in sustainability.

One of the few research done to answer the how question has looked at how consumers perceive the greenness of products, using the theory of centrality of green attributes (Gershoff and Frels, 2015). However, since the application of the theory of centrality in the context of consumer products is relatively new, there aren't many studies examining the potential dynamics between this theory and other theories in the sustainability field, namely the theory of sustainability liability. While the theory of centrality of green attributes can help companies build a greener product in the eyes of consumers, this increased perception level of sustainability doesn't necessarily translate into a more attractive product. This is where the interaction with the theory of sustainability liability is meaningful, since the theory of sustainability liability deals with the potential drawbacks of green products in terms of attractiveness.

### 1.3 Research Objective and Questions:

Based on the research gap, this study's main research objective is to understand the interaction between the theory of centrality of green attributes and the theory of sustainability liability. For this research objective, this study has two main research questions:

Q1: Under what conditions would allow the theory of centrality of green attributes and the theory of sustainability liability to interact with each other?

Q2: Under such conditions, how will the theory of centrality of green attributes and the theory of sustainability liability interact with each other?

### 1.4 Definitions of Key Concepts:

**Theory of centrality:** Theory of centrality suggests that some attributes and features are more important than others in people's definitions of concepts and categories. The centrality of a feature

represents “the degree to which the feature is integral to the mental representation of an object, the degree to which it lends conceptual coherence” (Sloman, Love and Ahn, 1998).

**Theory of centrality of green attributes:** The theory of centrality of green attributes is an extension of the theory of centrality. According to Gershoff and Frels (2015), because the presence of central (vs. peripheral) features is more important to the identification of an object, modifying central (vs. peripheral) features to offer a green benefit will have a greater influence on perceptions of the greenness of the entire product.

**Theory of sustainability liability:** “We show in this research that though sustainability can be a marketing asset in categories in which gentleness is especially valued, it can be a liability in categories in which strength is especially valued.” (Luchs et al., 2010).

## 2. Review Of Previous Literature:

This literature review is divided into two parts. The first part covers the literature leading up to the theory of centrality of green attributes and how the research stream can be advanced further. The second part covers the theory of sustainability liability and how it can be used to advance the research on the theory of centrality of green attributes.

For the first part, we begin with the research on how people form categories and concepts, which is prevalent in the field of consumer research, marketing, and psychology. Next, we look at the role of feature centrality in this research stream. Then, we focus specifically on how feature centrality is applied in the context of sustainable/green product’s perception, which leads us to the theory of centrality of green attributes. Finally, we examine how we can advance our understanding of the theory of centrality of green attributes with other theories.

For the second part, we begin with an overview of the theory of sustainability liability. Afterwards, we look at the potential ways the two theories would interact with each other, from which we would form our hypothesis.



## 2.1 Theory of centrality of green attributes:

### 2.1.1 Categories and concepts formation:

In order to understand the theory of centrality of green attributes, we first need to trace its roots back to the field of psychology. This research stream begins with the simple question of how do people form categories and concepts. For example, how do we know something is a table or not? How can we differentiate a table from a chair? More abstractly, how can we know that tables and chairs fall into the category furniture, and not food?

We know to differentiate things because one of the basic functions of living organisms is to cut up the world into non-identical stimuli that can be treated as equivalent (Rosch et al. 1976). Interestingly, prior to the 1970s, psychologists and anthropologists often considered our mental segmentation of the world as inherently arbitrary and carries no structure or reasoning. A typical statement supporting this position would be: "...the physical and social environment of a young child is perceived as a continuum. It does not contain any intrinsically separate 'things.' The child, in due course, is taught to impose upon this environment a kind of discriminating grid which serves to distinguish the world as being composed of a large number of separate things, each labeled with a name" (Leach, 1964, p.34). As a result, the answer to the previous question of how do people know something is a table is simply: because it just is. Since then however, researchers argued that contrary to earlier beliefs, human's perception *is* structured (Garner, 1974), and that the world *does* contain intrinsically separate "things" (Rosch et al. 1976). Moreover, us humans only possess a finite number of these separate "things", and some principles of their combinations. This view has since been shared by nearly all researchers, regardless of their theoretical disagreement in other areas (Connolly et al., 2007). This is because the only way for humans to have infinite thoughts in a resource-limited brain is by acknowledging that big thoughts are comprised of smaller ones. This shift in the way we view our own perception has sparked myriad of further studies on how different things, concepts and categories are formed (Eimas and Quinn, 1994; Needham, Dueker and Lockhead 2005).

The study of categorization and concept formation has then found its way into the field of consumer research. Researchers have studied the categorization and concept formation by examining brand categories (Barone & Miniard, 2002; Boush et al., 1987; Cowley & Mitchell, 2003), attribute based categories (Hutchinson, Raman, & Mantrala, 1994), product user categories

(Pechmann & Knight, 2002), and product categories (Herr, 1989; Meyers-Levy & Tybout, 1989; Sujan, 1985; Viswanathan & Childers, 1999). Overall, in the context of consumer research, we can understand categories as groupings of “products, services, brands or other marketing entities, states or events that appear, to the consumer, related in some way” (Loken, Barsalou, and Joiner, 2008). These categories are then used to identify, classify and differentiate one object from another (Cohen and Basu 1987, Rosch and Mervis 1975).

These early studies have mainly focused on how we form categories, which served to answer questions such as: how do consumers differentiate between brands like McDonald and Burger King? However, the study of categorization was since then used to answer other questions relating to inferences and inductions such as: if Coca Cola were to announce a new product extension tomorrow called Coca Cola Pineapple (hypothetically), how would consumers react to the new drink, and how would it affect the Coca Cola brand? Here, the study of categorization and concept formation is useful because we form judgements on new things based on their similarities with already known category information, with the degree of similarity being the determinant for inferences (Loken, Barsalou, and Joiner, 2008). In the case of our hypothetical product called Coca Cola Pineapple, consumers may logically infer that the drink share similarities with the traditional Coca Cola drink (tasty, happy, social...) and general pineapple drinks (tropical, refreshing, sweet...). As seen from this short example, using categories to study inferences and evaluations of other objects is of high interest for marketing practitioners, particularly for those in branding. Even though there are other marketing categories, branding categories have been given the most attention due to how prevalent branding is to a company’s operation. This is because companies often divide their product as brand categories, companies themselves are often organized by brands, and the number of new products launched with brand names continue to increase.

While knowing how consumers would react to brand extension or product extension is valuable for marketing practitioners, studies on inferences and inductions are also valuable for the area of marketing research since they signify the extension from simple identifying/classifying categories (observable) to forming evaluations about other categories or objects’ characteristics (unobservable). Research focusing on inferences and inductions have found that inferences occur among product categories (Rajagopal and Burnkrant, 2009), expertise (Czellar and Luna 2010), categorization level in memory (Redden, 2008), and feature centrality (Gershoff and Frels, 2015).

In the next part, we will focus on one of the latest addition to the study on categorization and concept formation in marketing research, which is feature centrality.

#### 2.1.2 Feature centrality in categorization and concept formation:

Although feature centrality in marketing research is relatively new, it has had a rich research history in the field of psychology. Indeed, among researchers studying how people form categories and concepts (Medin and Ortony, 1989; Rips, 1989), many have utilized feature-based models in similarity analysis (Tversky, 1977), metaphor (Ortony, 1993), and memory (Muddock, 1993). Studies using feature-based models have a common assumption, which is that concepts can be meaningfully broken down into sets of features, parts or attributes, which are then treated as independent entities. However, these features are not independent in the sense that their importance to the network can be determined by the interactions with other features. As a result, in these studies, different features have varying level of importance to the model's output. In other words, among these features, some are more central to the identification of the object than others (Sloman, Love, and Ahn, 1998). For example, in the practical study by Sloman, Love and Ahn (1998) which looked at an apple's features' mutability. In it, they found that the features "grows on trees" and "has a core" (most immutable) are more central to the concept of an apple than features such as "is sweet" or "has a stem" (most mutable). As such, while an apple can have all those features of "grows on trees", "has a core", "is sweet" and "has a stem", it is much easier for people to imagine an apple that grows on trees, has a core but isn't sweet and doesn't have a stem, than for them to imagine an apple that doesn't grow on trees, doesn't have a core but is sweet and has a stem. Overall, the centrality of a feature represents "the degree to which the feature is integral to the mental representation of an object" (Sloman, Love and Ahn, 1998 p.190). This type of studies is useful for classifying purposes (what constitutes an apple) by examining an object's features (grows on trees, has a core, is sweet...) and our reaction to the absence of those features. However, like we have established earlier, the study of features, or the study of categorization in general, can be used beyond simple classification/identification to study the effect of inferences and inductions.

Research focusing on the effect of feature inferences and inductions can be divided into two categories: object-level to attribute-level inferences, and attribute-level to object-level inferences. For the first category being object-level to attribute-level inferences, researchers like Connolly et al. (2007) have examined how statements or descriptors that modify entire objects can influence

inferences about characteristics of specific features in those objects. More specifically, the authors examined whether “Baby ducks”, “Baby Peruvian ducks” or “Quacking ducks” is more likely to have “webbed feet”; or whether “Feathered ravens”, “Jungle ravens” and “Young jungle ravens” (descriptors) is more likely to be “black” (feature). This study was a response to previous ideas that the combination of concepts/categories carry with it the features of each individual concept/category. Connolly et al. (2007) contributed to existing literature by arguing that when concepts are complex, they do not inherit the stereotypes of their compositional parts. Examples of this can be seen in everyday life, a *former athlete* is not an *athlete*, *decoy ducks* are not *ducks*. The issue with classical compositional thinking runs deeper than just these niche cases. Consider when you think of a *red apple*, *red hair* and *red balloon*, you imagine different hues of the color red in your mind, even though they all share an identical characteristic of being red. This shows that the traditional way of thinking about concept formation is too rigid, and allows little room for interpretative possibilities. In terms of real business applications, these new findings raised many questions for marketing practitioners, and warned them not to be too simple minded. Relating this back to the example of our new hypothetical drink Coca Cola Pineapple, there’s a chance that the new drink does not carry features of a typical “Coca Cola” drink, or a typical “Pineapple” drink, or any of those two drinks. And if they do carry those features, different consumers may have different interpretation of the associated features.

Extending the research stream on inferences from object-level to attribute-level, Hampton, Passanisi, and Jonsson (2011) examined the interactions between the modifier effect found by Connolly et al. (2007) and the notion of mutability developed by (Sloman, Love and Ahn, 1998). In their research, Hampton, Passanisi and Jonsson (2011) and argued that the modifying effect would be greater for a central property such as “have wings” than for a peripheral property such as “are white” for the concept of “Brazilian doves”. More specifically, participants in the study judged the statement “Brazilian doves are white” as less likely to be true than the statement “Brazilian doves have wings” because being white is not as important as having wings for the concept “Brazilian doves”. Similarly, the participants judged the statement “Handmade saxophones are made of brass” as less likely to be true than the statement “Handmade saxophones require air to produce sound” because requiring air to produce sound is more central than being made of brass for the concept “Handmade saxophones”. However, it is noteworthy that this study only provides support for the relationship between the modifier effect and statements concerning

mutability (feature centrality), and not statements concerning categories. Furthermore, the researchers were only able to find significant interaction supporting the relationship between the modifier effect and the notion of mutability in one out of six experiments. The catalyst that helped them find significance in the relationship were the paragraphs of context accompanying the modified statements, which helped to establish them as non-idiomatic (instead of using “Tibetan pigeons are birds”, they used a paragraph describing the life of Tibetan pigeons taken from Google). And even though the context given to participants did not give direct answers to the researchers’ questions, they could be a bias affecting the results.

While the object-level to attribute-level inferences using feature centrality have had mixed support from current studies, the attribute-level to object-level inferences have found stronger backings (albeit with the number of studies being one). The latest study by Gershoff and Frels (2015) has demonstrated this effect by examining circumstances under which modifying an object’s central versus peripheral attributes (modifying a CPU versus a sound card so that it provides similar environmental benefits) influences evaluations of the entire object (How green is the computer?), which introduced us to the theory of centrality of green attributes. The study by Gershoff and Frels (2015) filled in the research gap for the attribute-level to object-level inferences, and was the first to bring the notion feature centrality into the field of marketing research.

In the next part, I will discuss more in details about the study by Gershoff and Frels (2015) and the theory of centrality of green attributes, which served as the foundational step to answering the question of how companies can make sound sustainability investments.

### 2.1.3 Theory of centrality of green attributes:

The theory of centrality of green attributes is an extension of the theory of centrality by Sloman, Love, and Ahn (1998), applied in the context of green products. According to Gershoff and Frels (2015), because the presence of central (vs. peripheral) features is more important to the identification of an object, modifying central (vs. peripheral) features to offer a green benefit will have a greater influence on perceptions of the greenness of the entire product. In the study, the researchers measured and found that a CPU motherboard (central feature) made from recycled materials had a bigger impact on the computer’s perceived greenness, compared to when the sound card (peripheral feature) was made from recycled materials. These findings mean that if a computer manufacturer has the choice between investing in a green mother board and a green sound card,

the manufacturer might want to choose the green mother board because the computer would be perceived by consumers as more environmentally friendly. This provides us with the much needed knowledge on how to prioritize our investments to maximize perceived greenness/sustainability. The good news extends beyond just computer manufacturers, since Gershoff and Frels (2015) have also found the same effect of centrality of green attributes for panini makers, waffle makers, mattresses, and even for a fictitious PM monitor (a tool used in the plastic molding industry). This spread suggests that the effect is likely to occur in other multi-component products outside of the previously mentioned products.

In the study, in order to make sure centrality is the main mechanism driving the results, Gershoff and Frels (2015) have taken precautions against other two other mechanisms. The first mechanism was the manufacturer's perceived motivations, which was ruled out by informing the participants that the green benefits come from the manufacturer's suppliers, and are unknown to the manufacturer. This is necessary because when a product's green benefits are due to the manufacturer's motivations, consumers are more likely to think that the manufacturer has sacrificed quality in other attributes, and are less likely to purchase the item (Newman, Gorlin, and Dhar 2014). The second mechanism in question was the importance of the target attribute to consumers, which was ruled out by manipulating the level of importance on a fictitious product. This is necessary because under certain circumstances (especially for mature product categories), consumer will make decisions based on the peripheral attributes (Gershoff and Frels, 2015).

Aside from the main findings on how modifications to features of an object can affect people's perception of the object, the research also contributed in other ways. In terms of enriching the literature stream on centrality, the study also contributed by exploring two moderators for the attribute-level to object-level inferences. The first moderating effect can be seen when a product's category is manipulated, which changes people's perception on the selected attribute's centrality, and changes how they judge the overall product as a result. The second moderating effect can be seen when people are shown how other attributes are dependent on the selected attribute, which increases the selected attribute's perceived centrality. In other words, a green peripheral attribute can be made more central by describing other attributes that are dependent on it, thus, improves the overall perceived greenness of the product. The second moderating effect further confirms the

idea by Sloman, Love, and Ahn (1998), stating that an attribute's centrality is determined by the interactions with other features.

From the findings by Gershoff and Frels (2015), there are three practical takeaways for companies and policy makers. The main findings on the role of feature centrality provide companies with valuable guidelines for maximizing a product's greenness perception: identify the product's central feature and have it carry green benefits. Regarding the findings on the moderating effects, they can be utilized in marketing/communication strategies to improve the greenness perception. For example, the study showed that by informing consumers that the green attribute is "structurally important" for the product, they will more likely judge the entire product as greener. Companies can also improve the product's perceived greenness by showing how other features are dependent on the green feature. For example, in an electric car, the battery itself might not be considered inherently central, but it is central considering how many other features of the car would have to change if the car did not have the battery (Gershoff and Frels, 2015). As a result, in cases where the product's green attribute is not preconceived by consumers as central, companies can inform consumers about how the green attribute contributes to the structural importance of the whole product, or how other features depend on the green feature to function properly.

#### 2.1.4 Improvement in the theory of centrality of green attributes:

Even though the study by Gershoff and Frels (2015) has given us many useful insights into how manufacturers can maximize their sustainability investment, there are still nuances with this theory's practical applicability. Of course, this is to be expected, given the limited research being done on feature centrality in marketing research.

The first way we can advance the theory is by testing the interaction on more products. While the results have been positive on products such as mattresses, panini makers, waffle makers and computers, they are not representative for all product categories. If we test the theory on more products or across more product categories, companies and manufacturers will be more confident in making their sustainability investments.

The second way we can advance the theory is to combine it with other theories. The findings by Gershoff and Frels (2015) help us find out which computer is perceived as greener in the eyes of the consumers. However, being greener or more sustainable does not necessarily translate to being more attractive. This phenomenon is encapsulated in the sustainability liability theory (Luch et al.,



2010), which explain how under certain conditions, green products are less desirable than non-green products. In such circumstances, is it still more beneficial for companies and manufacturers to invest in a green central feature, or should they settle for a green peripheral feature and sacrifice their perceived greenness? Knowing this is important because even though all companies enjoy being thought of as sustainable, not all, if any of them are willing to sacrifice profit and product attractiveness for it.

In the next part, I will focus on the theory of sustainability liability. I will begin by looking at the literature leading up to the theory of sustainability theory. When discussing the theory of sustainability liability, I will also examine the potential interaction between it and the theory of centrality of green attributes to form hypotheses to answer our research questions.

## 2.2 Theory of sustainability liability:

### 2.2.1 Ethicality on product preference:

To begin, the theory of sustainability liability draws its roots from the literature on ethicality. Ethicality attributes are attributes that reflect moral principles (Ehrich and Irwin, 2005; and Irwin and Naylor, 2009). These ethical attributes are related to social and environmental issues, which include sustainable products or sustainability in general. By extension, sustainable/green products are products that carry positive ethical attributes.

Many researchers have studied the effects of positive ethicality on product preferences. Researchers studying the halo effect (Nisbett and Wilson, 1977; Thorndike, 1920), the affect heuristic (Finucane et al., 2000), and schema-consistent judgements (Fiske and Pavelchak, 1986) have found that when a product has a positive attribute, its positivity can extend to other attributes as well. These findings suggest that when positive ethicality is valued, other attributes of green or sustainable products will be viewed more positively. On the other hand, some researchers have found that positive ethicality can have an opposite effect on the perception of other product attributes. For example, Chernev and Carpenter (2001) found that when products have a superior attribute, consumers might infer that the remaining attributes will be inferior.

These findings by researchers might explain consumers' attitude towards sustainable/green products. Given the amount of publicity on environmental issues in recent decades, one would



assume that the consumers' inclination towards sustainable products to be overwhelmingly positive. There are some grounds to this assumption, as most U.S consumers would choose a product from companies with better CSR, if price and quality being equal to the less sustainable alternatives (BBMG, 2007). In reality, however, sales of sustainable products only represent a small fraction of total demand. More precisely, although 40% of consumers report that they are willing to purchase green products, only 4% of them actually do so, according to United Nations Environment Programme (2005). One might argue that this disconnect between intention and action is due to the higher price of sustainable products. However, higher prices might not be the answer, since the survey by Trudel and Cotte (2008) shows that consumers are willing to pay premium for sustainable products. A more likely explanation to this phenomenon is due to consumers' inferences about sustainable products. Consumers know companies operate on limited resources (assumption of efficient markets). As a result, when a product has a positive attribute – in this case being sustainable - consumers assume that companies have sacrificed quality in other attributes (Chernev and Carpenter, 2001).

Research on halo effects, schema-consistent judgements, or the beliefs on trade-offs required in efficient markets can be used as powerful tools to explain/predict product preferences. However, they do not provide us with the context in which they are applicable. For example, under what circumstances would the halo effect take place instead of the beliefs on trade-offs, and why. While there are no definite answers to these questions as of now, researchers like Luchs et al. (2010) have given us some hints by examining a new factor that influences consumers' preferences for sustainable products. Luchs et al. (2010) have found that whether the halo effect or the trade-off effect would take place depends on the type of benefit that consumers want from the product. More specifically, ethicality is valued when the desired benefits from the products fall under the gentleness category, and is not valued when the desired benefits from the products fall under the strength category. In the next part, I will further discuss the association between ethicality and the notion of gentleness/strength, upon which the theory of sustainability liability is heavily based on.

#### 2.2.2 Association between ethicality and gentleness (strength):

There is a positive association between ethicality and gentleness, which can be seen from scientific research, and sociocultural messages. Firstly, researchers in the field of organizational behavior and human relations like Luthans and Youssef (2007), and Sisodia, Sheth, and Wolfe (2014) have

found that a defining characteristic of ethicality is compassion and caring. As a result, ethicality carries with it an association of being “gentle” and “weak”. On the other hand, a lack of ethicality carries an association with strength and “getting the job done”, which may come at a cost to others. These findings are consistent with the results of consumer surveys, in which the participants associate positive ethicality with being “safe”, “more gentle”, “friendly”, and “protective” (Gildea, 2001, and Luchs et al., 2010).

Not only can we see the association between ethicality and gentleness (strength) in the research, we can also spot it in sociocultural messages. These messages come in the form of common expressions such as “to make an omelet, you have to break some eggs” or “nice guys finish last”, which suggests that a lack of ethicality is positively associated with strength and being able to get the job done. Aside from common expressions, we can also see the association between ethicality and gentleness (strength) in movies and books through the “rugged individualist” character archetype, which is prevalent in American culture (Gini, 2006). These sociocultural messages slowly develop an unconscious connection between concepts and ideas (ethicality and gentleness) in people’s minds, which strongly influences people’s behaviors (Raghunathan, Naylor, and Hoyer 2006).

### 2.2.3 Theory of sustainability liability:

The study by Luchs et al. (2010) applied the relationship between ethicality and gentleness (strength) in the context of consumer preference for sustainable/green products. There are three major takeaways from this research. Firstly, the findings support the idea that consumers associate ethicality with gentleness attributes, and a lack of ethicality with strength attributes. Secondly, the findings showed that being sustainable/green can be a liability for products that are valued for their strength related attributes. This liability was demonstrated across multiple product categories such as laundry detergent, car tires and liquid hand sanitizer. Thirdly, the findings gave us hints on how the sustainability can be mitigated. The study demonstrated that when ethical attributes are present, giving consumers explicit information about the sustainable/green product’s strength can subvert their preconceived expectations.

In terms of practical contribution, the theory of sustainability liability provides guidance on whether or not companies should start investing in sustainability, or change their strategy if they have already invested in sustainability. For example, if a company’s product categories are valued

for their strength related attributes, that company should emphasize on the products' strength to counteract the association between sustainability and being weak (Luchs et al., 2010). This can be done by providing information on packaging (similar to how the study was conducted), promotions, or even by cooperating with other brands that are associated with strength.

### 2.3 Combining theory of centrality of green attributes and theory of sustainability liability:

Although the two theories focus on sustainable products, the conditions in which they are present differ from each other. For the theory of centrality of green attributes by Gershoff and Frels (2015), the core condition is the product being multi-component. This is necessary because the theory of centrality of green attributes is based on the concept of centrality, and the only way for a product to have different centrality is to have different features, or multi-component. For the theory of sustainability liability by Luchs et al. (2010), the core condition is the product being under the strength category. Because the prerequisites for the two theories are not mutually exclusive, a logical deduction would be that the conditions for the two theories to interact with each other are the product being multi-component and under the strength category. In the research by Luchs et al. (2010), it has already been shown that the theory of sustainability liability is applicable on multi-component products. After all, almost all products are multi-component. On the other hand, the research by Gershoff and Frels (2015) is not clear about whether the theory would work for all multi-component products. Furthermore, in the research by Gershoff and Frels (2015), the test products such as mattresses, panini makers, waffle makers and computers have not been tested for their product category (strength versus gentle). Because of this, we need to test whether the theory of centrality of green attributes is applicable for multi-component products under the strength category. Under this set of conditions, I predict that the product with a green central component will be more sustainable, meaning that the main effect of the theory of centrality of green attributes will be present. Although the theory of centrality of green attributes has not been tested for the distinction between gentleness/strength, I believe the theory will be applicable because the theory of centrality of green attributes is based on the fundamental ways in which humans categorize and form concepts, which will likely apply to all products regardless of their categorization in gentleness or strength. With that, I propose the first hypothesis of this study:

H1: The theory of centrality of green attributes is applicable for multi-component products under the strength category.



*Hypothesis 1: Product centrality and Perceived greenness in strength-category products*

With the potential conditions for the interaction between the two theories established, the actual interaction between the two theories can be hypothesized. By using the theory of centrality of green attributes, the test products can be manipulated to have different level of greenness through changes in centrality (Sloman, Love and Ahn, 1998; Gershoff and Frels, 2015). Because the two products have different level of greenness, and are under the strength category, the sustainability liability can be observed. and make the product with a central green component less desirable (Luchs et al., 2010). Here, I hypothesize that the product with a central green component will elicit a stronger effect under the assumption that the first hypothesis won't be rejected. With that, I propose the second hypothesis of this study:

H2: The product with the central green component will elicit a stronger sustainability liability effect, making that product less desirable.



*Hypothesis 2: Perceived greenness and Product desirability in strength-category products*

Overall, the rationale behind the study can be condensed as: by changing the centrality through manipulation of central/peripheral components, we can change the products' perceived greenness. Products of different greenness level will then affect consumer preference according to the sustainability liability.

In the next part, I will move on to the research design and methodologies, where I will explain the steps I have taken to test these two hypotheses.

### 3. Research Design and Methodologies:

In this section, I will focus on the research design for the study, as well as the chosen research method and justifying the decision. First of all, I will briefly discuss the research process and selection of the topic. Secondly, the survey method is introduced and justified. Third, I will describe the data collection procedures, the validity and reliability of each of the two surveys being conducted.

#### 3.1 Quantitative research approach:

The aim of the research is to find out how consumers evaluate the attractiveness of products based on the products' sustainability. This study is based on the notions of centrality and sustainability liability. Previous researchers studying the topics of centrality and sustainability liability (Sloman, Love and Ahn, 1998; Gildea, 2001; Luchs et al., 2010; Gershoff and Frels, 2015) often adopt a quantitative research approach, which is usually the survey method. Regarding the survey, the specific methodology ranges from internet surveys (Gershoff and Frels, 2015), to face-to-face survey (Sloman, Love and Ahn, 1998), to computer assisted forms (Luchs et al., 2010).

In my research, I have decided to use the internet survey method. The biggest reason for this decision is due to its high practicality. Because previous researchers have predominantly chosen this method, there are many existing materials such as scales and models for me to make use of. As a result, using the internet survey method in this research context is easy to set up, quick, and reliable. Furthermore, looking at this decision in hindsight of the current virus outbreak, the survey method is a good choice since any other method that requires close human interaction is off limit.

For the study, I used Google Form to set up two surveys to test the two hypotheses of this research. The first survey is to choose a product that falls into the strength category, and pinpoint its central/peripheral components. The second survey's first purpose is find out whether a multi-component under the strength category is a suitable condition for the two theories to exist or not.

The other purpose of the second survey is to test whether the effect of the sustainability liability will cause the product with a green central component (versus green peripheral component) to be less attractive or not. In the next parts, I will discuss more on the specific procedures of the two surveys.

### 3.2 First survey:

As mentioned earlier, the first survey's main purpose is to pick a multi-component product that fall under the strength category and find out its central and peripheral components. In order to do so, we need to first find a suitable product for the survey. In my study, I chose an example of a car shampoo bottle. A car shampoo bottle has four main components of container, bottle cap, cleaning solution (cleaning liquid), and company stickers. The example of a car shampoo bottle satisfies the condition of being multi-component, as well as the condition of being in the strength category (Luchs et al., 2010).

Other than the specific product, I also need to choose two components to represent a central component and a peripheral component of the car shampoo. In the study by Gershoff and Frels (2015), product components are chosen randomly. However, in consideration of real life practicality, I have chosen components that are more likely to be used to market car shampoo's sustainability, which are the bottle cap and the cleaning solution (cleaning liquid).

#### 3.2.1 Scales being used:

For the first survey, I will use the four-question scale developed by Sloman, Love and Ahn (1998). These questions are set on a seven point Likert Scale, anchored by "Not at all" and "Extremely" on each extremity. The Likert scale is a common tool used by researchers to measure opinions, attitudes and views of respondents (Likert, 1932). For scales in both surveys, I have chosen a seven-point scale instead of a five-point or nine-point scale because I believe data from a five-point scale is not accurate enough to detect nuances in the answers. On the other end of the spectrum, the scales in a nine-point scale are very narrow, making it difficult for the participants to rate the answer correctly. Therefore, I felt that it was unnecessary to include that many levels.

The set of four questions is asked twice for each component (bottle cap and cleaning solution) of the car shampoo bottle. Here, I have adapted these questions to fit with the product and product components being used in the study. Below are the explanations for each question in the scale:

The first question being asked focuses on surprise: “How surprising would it be to find a car shampoo bottle without a bottle cap/cleaning solution (cleaning liquid)?”. This question serves to measure the degree of surprisedness of an instance missing the target feature. The less surprised one is upon learning about the missing feature, the more mutable the feature. This is based on the assumption that surprise is related to the difficulty of adapting an object representation to a concept (Sloman, Love and Ahn, 1998). Therefore, adaptation should be easy if the object is missing a mutable feature, but hard if it is missing an immutable feature.

The second question being asked focuses on ease of imagining: “How easily can you imagine a real car shampoo bottle without a bottle cap/cleaning solution (cleaning liquid)?”. This question serves to measure people’s ability to construct a mental image of an object that is missing the targeted feature. Because a mutable feature is less structurally important to the definition of an object, it can be easily removed from the representation of that object. On the other hand, an immutable feature is harder to remove from the representation of an object because you have to mentally transform many other features that are dependent on that immutable feature. Thus, imagining an object without a mutable feature is easier than imagining the same object without an immutable feature.

The third question being asked focuses on goodness of example: “How good of an example of a car shampoo bottle would you consider one that does not have a bottle cap/cleaning solution (cleaning liquid)?”. This question serves to measure how the transformation of features change. If the mutability of an object’s feature is reflected by its structural coherence, when we transform that feature, the degree of typicality rating of that object is changed. In other words, transformations of mutable features should affect the typicality less than the transformations of immutable ones. One standard measure of typicality is goodness-of example, hence the wording in this question.

Finally, the fourth question focuses on similarity to an ideal: “How similar is a car shampoo bottle without a bottle cap/cleaning solution (cleaning liquid) to an ideal car shampoo bottle?”. In this context, ideal is understood as having all the features, both mutable and immutable. Therefore,

transforming any feature would violate the perception of an ideal product. When removing a feature, the less a product to its ideal, the more central and immutable the feature.

### 3.2.2 Data collection and procedure:

The first survey was created with the use of Google Forms and was distributed via link sharing. The link was shared to 86 of my friends via Facebook and email. Among the 86 people that were given the link to the survey, a total of 79 responded. For this survey, I used a convenience sample because the survey tests for human perception on a fundamental level, therefore unlikely to be biased by nationality, profession, education level, or other demographic factors.

At the beginning of the survey, I explained to the respondents that the purpose of the survey was to study the importance of a car shampoo bottle's components to the concept of a car shampoo bottle. Then, I showed them a picture of a real car shampoo bottle taken from the internet. Because the picture being shown is real, I have removed information on the brand, or any other easily recognizable features that might give clues to what the car shampoo's brand is. This is to prevent respondents from answering the questions with biases associated with that real car shampoo brand. Afterwards, I briefly explained that: "Car shampoo is used to clean the exterior of cars. A good car shampoo removes dirt and grime easily and help water flow off the bodywork to avoid smears when you come to dry it." This short paragraph was taken from Google when I searched for the definition of a car shampoo bottle. I also explained that a typical car shampoo bottle has four components, which are bottle cap, container, cleaning solution (cleaning liquid), and company stickers. The main purpose of showing a picture and a brief description of a car shampoo bottle is to provide visual and verbal cues for respondents who are unfamiliar with car shampoos, since respondents might not have a car, or have never washed a car themselves.

### 3.2.3 Test of assumptions:

Firstly, I check for independence of observations. The observations making up our data cannot be influenced by another observation or measurement, meaning that our observations must be independent of one another (Pallant, 2007). Because the link for my survey was distributed by through Facebook, email...to each individual respondent, and it's highly unlikely that they were doing the survey together as a group, I believe that the condition for independence of observations was met.



Among the 79 participants, there are no missing data entries nor data input mistakes. I first begin my data analysis by recoding the second, third, and fourth question of each set of questions. Afterwards, I run descriptive statistics for the items, as seen below (Table 1).

	Count	Min	Max	Mean	Standard deviation	Skewness	Kurtosis
Surprise bottle cap	79	2	7	4.86	1.034	1.136	1.136
Example bottle cap	79	3	7	5.23	.905	-.236	-.236
Imagine bottle cap	79	1	7	4.37	1.443	-.700	-.700
Ideal bottle cap	79	3	7	5.33	.930	-.137	-.137
Surprise cleaning liquid	79	4	7	6.22	.842	-.518	-.518
Example cleaning liquid	79	5	7	6.52	.677	-.029	-.029
Imagine cleaning liquid	79	3	7	5.68	1.032	-.765	-.765
Ideal cleaning liquid	79	5	7	6.56	.712	.245	.245

*Table 1: Descriptive statistics for first survey items*

To check the normality assumption, I measured the skewness and kurtosis of the data (Pallant, 2007). The skewness value is used as an indication of the symmetry of the distribution. A positive value indicates that the data points are clustered at low values, while a negative value indicates that the data points are clustered at high values. The kurtosis value provides an indication about whether the scores are clustered or spread out. A positive kurtosis value indicates that the distribution is clustered in the center and when the value is negative, the distribution is likely flat. Generally, when the skewness and kurtosis values are between -2 and 2, the scores are normally distributed. And when they are 0, the data points are perfectly normally distributed. When dealing with a large sample size, skewness does not make a substantive difference in the analysis. Kurtosis can result in underestimation of variance, but the risk is reduced with a large sample. As for how many samples is considered large enough, Tabachnick and Fidell (referenced in Pallant, 2007, p. 56) suggest that a large enough sample size is at least 200, while others have suggested that the sample is large enough when N is at least 30.

For my first survey, standard deviation for all items fall within +/- 2, meaning that there are no outliers in the dataset. The values for skewness and kurtosis also fall within the range of +/- 2, which means that all items are normally distributed.

I then run an Exploratory Factor Analysis (EFA) for the eight items. EFA was conducted with principal axis factoring extraction method and direct oblimin rotation for all items. Correlation for eight items and their determinant of correlation matrix all fall within accepted values (Table 2 in the appendix). Furthermore, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.790) and the Bartlett's test of sphericity (.000) show that the results of the factor analysis is significant, and useful with my data. The 4-factor measurement model provided a good fit to the data and explained a 63.62% of the variance in the final model. Finally, all items are loaded correctly into their respected scales (Table 3 in the appendices).

Next, I run a reliability assessment test for the scale used in the first survey, with the reliability assessed using the Cronbach's alpha. The car shampoo bottle with a sustainable bottle cap (Cronbach's  $\alpha = .783$ ), and the car shampoo bottle with sustainable cleaning solution (Cronbach's  $\alpha = .796$ ) both have acceptable Cronbach's Alpha value for theory testing of over 0.7.

#### 3.2.4 First survey results:

I averaged the four responses for each component to form measures of centrality, with the last three items reverse-coded to make interpreting the mean value more intuitive (higher mean value equals higher level of centrality). The results show that participants perceived the cleaning solution (cleaning liquid) as more central to a car shampoo bottle ( $M = 6.24$ ,  $SD = .652$ ) than the bottle cap ( $M = 4.95$ ,  $SD = .855$ ). This is to be expected, because the cleaning solution is responsible for the main purpose of the product, which is to clean off dirt.

#### 3.3 Second survey:

The purpose of the second survey is to two-fold. Firstly, it measures the level of perceived sustainability for car shampoo bottle with a green bottle cap (versus green cleaning solution). Combining this with the result of the first survey will allow us to test whether the theory of centrality of green attributes is present among products under the strength category. Here, it is expected that a car shampoo bottle with the green cleaning solution will have a higher level of

perceived sustainability due to its higher centrality (Gershoff and Frels, 2015). Secondly, the second survey measures people's preference for sustainable products. Assuming that the result for this survey is consistent with previous research by Luchs et al. (2010), the participants' preferences are expected to be in favor of the car shampoo with the green bottle cap due to the sustainability liability.

### 3.3.1 Scales being used:

For the second survey, participants are asked two different sets of questions. The first set of question serves to measure the participants' perceived greenness of each product version. To measure the extent to which participants evaluated the two versions of car shampoo as environmentally friendly, I asked for their level of agreement with the following four statements: "This car shampoo bottle deserves to be labeled "environmentally friendly".", "Purchasing this car shampoo bottle is a good environmental choice.", "A person who cares about the environment would be likely to buy this car shampoo bottle.", and "How environmentally friendly or green is this car shampoo bottle?" using a seven-point scale anchored by "not at all" and "extremely" environmentally friendly. This scale is used twice in the survey to measure each of the two product versions. These questions are taken and adapted to this research from the study by Gershoff and Frels (2015). This four-question scale utilizes two techniques to measure the participants' perceived greenness. The first technique is to ask participants from a personal point of view, which is the "Purchasing this car shampoo bottle is a good environmental choice" question. The second technique is to ask the participants from the other point of view, which is the "A person who cares about the environment would be likely to buy this car shampoo bottle" question. Both versions are included because it is generally believed that the other point of view is more reflective of their true preferences, due to social desirability bias. The underlying assumption is that people might respond more honest if the question is not regarding themselves.

The second set of questions, which is comprised of two different items, serves to measure the participants' preference of the two car shampoo versions. These two questions measure *choice* and *anticipated success* in the market. In other words, the first question measures preference from a personal point of view, while the second question measures preference from the other point of view. The rationale behind this decision is similar to the first set of questions. For the first question measuring choice (personal point of view), participants are asked: "Please rate the likelihood that

you would choose brand A's car shampoo/brand B's car shampoo if you were in need to clean a car.". The question is anchored by "Not likely at all" and "Very likely" on a seven point Likert scale. This measure is based upon an item from the study of Newman et al. (2014). For the second question measuring anticipated success in the market (other point of view), participants are asked: "Please rate the likelihood that brand A's car shampoo/brand B's car shampoo will be a success in the market.". This is measured on a seven-point Likert scale, and is anchored by "Not a success at all" and "Major success". This last measurement is based on Luchs' et al. (2010) measurement of preference and has been adapted to better fit this research.

### 3.3.2 Data collection and procedure:

For the second survey, I used Google Forms and shared the links on Facebook and email. Similar to the first survey, the sampling method for this one is also convenience sampling. Because Google Forms did not have the option to randomize which set of questions participants would do, I created two survey links, one that leads to brand A's product, and the other to brand B's product. Aside from the different specific brand descriptions, the two surveys are identical. When posting about the survey, I have instructed participants to choose only one of the two links. The data gathered from the two survey versions will be combined afterwards for analysis. Dividing the survey into two versions is important because it will eliminate potential biases coming from presentation order. In other words, participants might answer differently if they are shown descriptions about brand A first, and vice versa. The method of dividing the survey into two versions is good for controlling biases, but has a drawback of not being able to ensure equal participation between the two versions. Indeed, while the survey for brand A's car shampoo had 64 respondents, the survey for brand B's car shampoo only had 52 respondents.

Overall, there were 116 respondents to the survey, with age ranging from 16 to 33 years old ( $M = 21.11$ ,  $SD = 3.151$ ). Among them, 55.2 percent were male, 41.4 percent were female, with the remaining 3.4 percent registered as "Other". In the sample, 69 percent had a Bachelor's Degree, and 26.7 percent had a Master's Degree as their highest completed degree or current degree. In the study, information on age, education and gender were included to control for different effects that could affect our results, giving us the opportunity to focus on the main relationship between the independent and dependent variables.

At the beginning of the survey, I explained to the respondents that the purpose of the survey was to study how consumers judge products as sustainable, and their preference for sustainable products, and that the survey uses car shampoo bottle as an example. I also explained the three sections of the survey: product description (car shampoo bottle), questionnaires on perception and preference, and demographic questions. Because I'm asking for the participants' personal information and personal opinions on sustainability, I made sure to explain that all their answers and personal information collected in the survey would be kept anonymous, and would only be used for the purpose of this study. This is necessary because it reassures the respondents that they are under not under any pressure to give socially desirable answers. Indeed, it can be difficult for researchers to reveal people's true attitudes about certain subjects since people tend to say what they think is expected of them, and not what they really mean (Gittelman et al., 2015). This is especially applicable if the topic relates to a delicate subject such as political, moral or environmental questions. The phenomenon described above is popularly known as social desirability bias, which is the tendency among participants to describe themselves in favorable terms by adhering to sociocultural sanctioned norms (de Jong, Pieters and Fox, 2010).

Afterwards, I showed them a picture of a car shampoo bottle taken from the internet, with the same descriptions and procedure as the first survey. I included a product description in the second survey with the same rationale as before, which was to provide visual and verbal cues for respondents who are unfamiliar with car shampoo products.

In the following section of the survey, respondents were introduced to one of the two car shampoo brands (brand A and brand B) with short paragraphs. For brand A, which has the sustainable cleaning solution, the introduction was "Green formula for cleaning solution (cleaning liquid) which reduces dangerous chemical usage by 17,000 gallons per year (1 gallon = 3.8 litre)." and "Aside from the cleaning solution (cleaning liquid), all components are industry standards". For brand B, which has the sustainable bottle cap, the introduction was "Newly redesigned bottle cap that reduces manufacturing chemical waste by 17,000 gallons per year. (1 gallon = 3.8 litre)" and "Aside from the bottle cap, all components are industry standards". The descriptions of the environmental benefits for the two car shampoo brands were equally quantified in order to control for any assumptions participants might make about the size or degree of environmental benefit. These statements mimic the messaging commonly used by Wal-Mart, which claimed, for example:

“If every Wal-Mart customer bought just one compact laundry detergent, we’d reduce packaging waste by as much as 50 million pounds” (Sustainableisgood.com, 2007). Quantified environmental benefits are also commonly used by Nike, who claimed that their recycled shoebox saves 200,000 trees every year (Gabriel, 2012). The second part of the product description was to inform participants that all remaining components of the car shampoo bottle are of industry standard. This made sure any positive or negative perception that participants might have will stem from the cleaning solution/bottle cap being environmentally friendly. By isolating the sustainable component in each brand’s car shampoo, and by equally quantifying their environmental benefits, any meaningful difference between the two brand’s perceived greenness should be a result from changes in centrality.

#### 4. Results:

##### 4.1 Test of assumptions:

First, I check for independence of observations. Similar to the first test, because the links for my survey was distributed by through Facebook and email, and it’s highly unlikely that the respondents were doing the survey together as a group, I believe that the condition for independence of observations was met.

In the sample of 116 participants, there are no missing data entries nor data input mistakes. I first begin my data analysis by running a descriptive statistics analysis for all items, as seen below (Table 4).

	Count	Min	Max	Mean	Standard deviation	Skewness	Kurtosis
Deserved to be labeled environmentally friendly	116	1	7	5.05	1.250	-.969	1.623
Good environmental choice	116	1	7	5.03	1.292	-.804	1.112
Person cares about environment likely to buy	116	1	7	5.23	1.267	-.919	1.407
How green is the product	116	1	7	4.84	1.215	-.715	1.313
Likelihood of purchase	116	1	7	4.53	1.067	-.463	.699
Success in market	116	1	7	4.24	1.076	-.029	.940

Table 4: Descriptive statistics for second survey items

To check the normality assumption, I measure the skewness and kurtosis of the data (Pallant, 2007). For my second survey, standard deviation for all items fall within +/- 2, meaning that there are no outliers in the dataset. Next, I look at the skewness and kurtosis values for all items to see if they fall within +/- 2, in which range the items are normally distributed. In my sample, although all values are within the acceptable range, the kurtosis value for the first item is fairly high (1.623), which can cause an underestimation of variance. There are a number of possible explanations for the high value. The first explanation could be due to the discrepancy of participants between the two survey versions. The second explanation might be that the sample size of 116 is not large enough. Nevertheless, because the descriptive statistics all fall under acceptable ranges, I will continue with the analysis without making any changes.

Next, I run an Exploratory Factor Analysis (EFA) on all items measuring perceived greenness. Like before, the EFA was conducted with principal axis factoring extraction method and direct oblimin rotation for all items. The results show that the correlation for the scale items and their determinant of correlation matrix all fall within accepted values (Table 5 in the appendices). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.864) and the Bartlett's test of sphericity (.000) show that the results of the factor analysis is significant, and useful with my data. The 4-factor measurement model provided a good fit to the data and explained 81.645% of the variance in the final model. All items are loaded correctly into their respected scale (Table 6 in the appendix).

The reliability test returned a Cronbach's Alpha value of .944, which was suitable for theory testing.

Finally, the data fulfilled all the assumptions for regression analysis. I found that no relationship between the independent variable and the dependent variable was better explained by a nonlinear equation, and that error terms were normally distributed and homoscedastic. It is important to note that in the data, I spotted four potential outliers using the Mahalanobis distance. In this study, I did analysis using the data with and without the outliers, but unless the outliers made a big difference in the results, I will only report the results using the data with the outliers. This way, the results of the study would be strengthened, as they are more resistant to outliers in the system.

#### 4.2 Second survey results:

I averaged the four items to create a summated scale measuring perceived greenness (M= 5.038, SD= 1.162). Regarding the measures of product preference, it is interesting to see that on average, participants judge the sustainable product as less attractive when being asked from the other's point of view (M= 4.24, SD= 1.076) than when being asked from their own point of view (M= 4.53, SD= 1.067). This scoring discrepancy between the two is also present when looking at individual car shampoo brands. For example, the measure of preference from self's point of view (M= 4.88, SD= .951) is higher than that of the other's point of view (M= 4.48, SD= 1.113) in brand A. Similarly, the measure of preference from self's point of view (M= 4.12, SD= 1.06) is higher than that of the other's point of view (M= 3.94, SD= .958) in brand B.

#### 4.3 Hypothesis testing:

*H1: The theory of centrality of green attributes is applicable for multi-component products under the strength category.*

For the first hypothesis, which tests whether the theory of centrality of green attributes is applicable for strength related product, I conducted a one-way ANOVA. The ANOVA was conducted to compare the effect of product centrality on perceived greenness in high centrality and low centrality conditions. As such, in this test, the perceived greenness measured in the second survey was used as the dependent variable, with independent variables for whether the green component was more central (brand A) or less central (brand B) to the car shampoo.

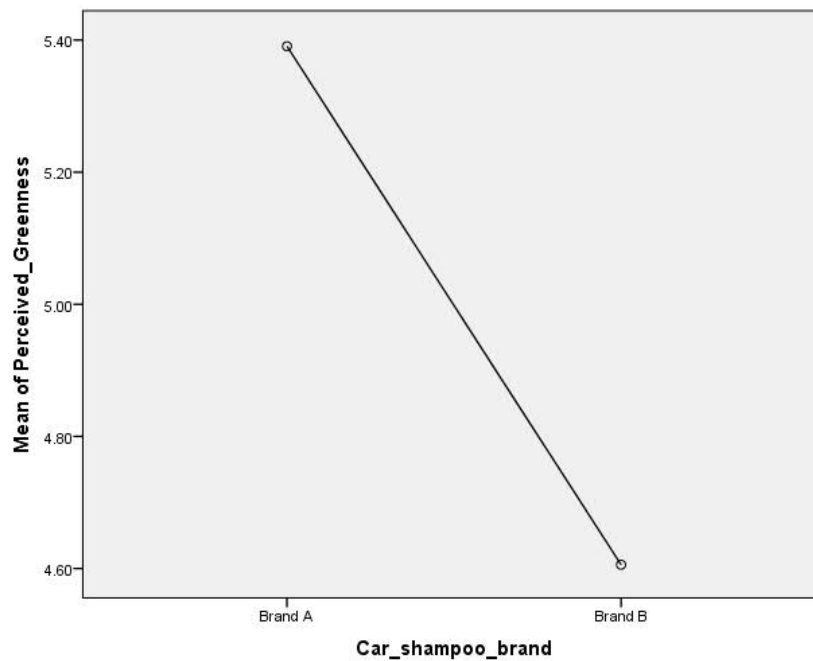
	Sum of Squares	df	Mean Square	F	Significance
Between groups	17.673	1	17.673	14.636	.000
Within groups	137.653	114	1.207		
Total	155.325	115			

*Table 7: ANOVA results for centrality and perceived greenness*

As seen from Table 7 and Figure 3, results from the analysis showed that the difference in means between the two brands was significant. This result was further supported by the Welch and



Brown-Forsythe tests, which were both significant at the  $p < 0.001$  level. In other word, in the high product centrality condition of brand A, participants rated the car shampoo component as greener ( $M = 5.39$ ,  $SD = 1.06$ ) than the low product centrality condition of brand B ( $M = 4.60$ ,  $SD = 1.15$ ;  $F(1, 114) = 14.636$ ,  $p < .001$ ).



*Figure 3: Perceived greenness of product by brand*

The ANOVA results supported the first hypothesis of the theory of centrality of green attributes being applicable among strength related products.

*H2: The product with the central green component will elicit a stronger sustainability liability effect, making that product less desirable.*

To test the second hypothesis, which looked at how the theory of centrality of green attributes and the theory of sustainability liability interacts with each other, I conducted a simple regression

analysis. In the regression analysis, I included the basic demographic information such as age, gender and education as control variables due to their potential influence on the results. The product's perceived greenness was used as the independent variable, while the consumer preference was used as the dependent variable. Regarding the consumer preference, the measure from the other's point of view was selected instead of the point of view measure. The other's point of view was selected because I suspected the score reflected the participants' true preferences more accurately. This was hinted at by the lower preference score for both car shampoo versions when participants were asked if they would purchase the product (M= 4.53, SD= 1.067) versus when they were asked how well the car shampoo would do in the market (M= 4.24, SD= 1.076) (table 4 in the appendices). This was consistent with what previous research had found on social desirability bias (de Jong, Pieters and Fox, 2010).

	Step 1	Step 2
<i>Dependent variable: Success in the market (OPV)</i>		
Age	-0.21	-0.17
Education	0.135	0.184
Gender	0.537**	0.330*
Perceived greenness		0.500**
R <sup>2</sup>	0.078	0.353
Δ R <sup>2</sup>		0.276

Statistical significance is based on a two-tailed test. Results are tested and interpreted using unstandardized regression coefficients.

\*p <.05 \*\*p<.01

*Table 8: Regression results*

The first model which included the three independent variables managed to explain 7.8% of the variance. The second model which further included the product's perceived greenness as a predictor managed to explain 35.3% of the variance in product preference, which was a 27.6% increase in variance explained. The fit for the both models were good, with the first model at the

$p < 0.05$  level, and the second model at the  $p < 0.001$  level. In the first model, although the overall effect of the three constant variables was significant, upon closer inspection, only Gender had a significant interaction with green product preference. The Gender interaction showed that females are more likely to find greener products more attractive and more likely to succeed in the market. In the second model, the Gender variable had similar interaction with product preference. This finding was consistent with previous research on the effect of gender on sustainable product preference, which has been well studied (Brough et al., 2016; Sreen, Purbey and Sadarangani, 2018).

As for the main relationship, the interaction term ( $\beta = .500, p < .001$ ) showed that the perceived greenness had a positive and significant effect on product preference. Contrary to the hypothesized relationship, the product with the central green component did not elicit a stronger sustainability liability effect and made the greener product less desirable. In fact, since the interaction term was positive, there were no observed sustainability liability that was expected to be present among products in the strength category. In this study, the greener the product, the more attractive it is to participants. Therefore, the second hypothesis was rejected.

## 5. Discussions:

This section concludes the research with a summary of the main findings, followed by a discussion on managerial implications, limitations of the study and suggestions for further research.

This thesis was motivated by the lack of research on how green products are perceived as sustainable, or how companies can make their products appear greener in the eyes of the consumers. As stated before, previous research on how products are judged as green has been limited to the study of product features and centrality by Gershoff and Frels (2015). However, since the theory of centrality of green attributes is relatively new, not many research has been conducted to examine its connection to existing theories. This research adopts this approach and look at how the theory of centrality of green attributes interacts with the theory of sustainability liability. This interaction is meaningful because a more sustainable product does not necessarily translate into more market success, as pointed out by Luchs et al. (2010). Drawing from the two studies, the main research problem for this study is to understand the relationship between the two theories. In order to answer this research problem, two following research questions are devised:

1. Under what conditions would allow the theory of centrality of green attributes and the theory of sustainability liability to interact with each other?
2. Under such conditions, how will the theory of centrality of green attributes and the theory of sustainability liability interact with each other?

This study contributed to the existing literature on sustainable product as well as the literature on centrality by connecting the two together through the interaction of theories from each field. On a more practical side, the study contributed by helping to develop much needed guidelines and support for companies working with sustainable products.

#### 4.1 Theoretical implications:

There are two main findings in this study, which correspond to the two research questions mentioned earlier. Along with the two main findings, there are a number of other interesting findings.

The first main finding concerns the condition under which the theory of centrality of green attributes and the theory of sustainability liability interact with each other. Through researching previous literature, the study finds that two potential conditions have to be met in order for the two theories to interact with each other. The first required condition is multi-component product, which relates to the theory of centrality of green attributes (Gershoff and Frels, 2015). This is necessary because differences in centrality only exist if the product has multiple components. The second condition is the product being in the strength category, which is the prerequisite for the sustainability liability to take effect (Luchs et al., 2010). In order to know whether a product belongs to the strength/gentle category, companies and researchers can conduct an IAT, a tool for measuring implicit association between concepts (Greenwald, McGhee, and Schwarz, 1998). When running the IAT test, companies and researchers should be careful in generalizing the results because the test can be susceptible to cultural differences. In this research, I didn't run the IAT because the example of a car shampoo bottle was already established as being in the strength category in the research by Luchs et al. (2010). In order to test whether these two conditions (multi-component and strength-category) product are satisfactory, I tested whether the car shampoo with the green central component was perceived as more sustainable than the car shampoo with the green peripheral component or not. In this test, I only checked to see if the theory of centrality of

green attributes was present and not the theory of sustainability liability. This is because Gershoff and Frels (2015) never tested their theory specifically for strength/gentle categories, and the theory of sustainability liability has already been shown to be present in multi-component strength category products (Luchs et al.,2010). Results of the survey showed that the car shampoo with the green central component was perceived as more sustainable, which confirmed the two conditions as being critical for the two theories to interact with each other.

The second main finding focuses on the interaction between the two theories. In the study, by applying the theory of centrality of green attributes, the perceived greenness of the car shampoo can be manipulated. The survey was designed so that only the perceived greenness of the car shampoo was changed, while the actual environmental benefits did not. With the perceived greenness isolated, I measured the preference of the consumers between the two product versions. The results showed that participants preferred the car shampoo with the higher perceived greenness, or the car shampoo with the green central component. This meant that while the conditions were suitable for the sustainability liability to take effect, there were no observed liability for the more sustainable product. Therefore, the result of this study did not support the findings by Luchs et al. (2010). Interestingly, another recent study focusing on the sustainability liability effect among consumers in Norway also concluded that there was no support for the liability effect among strength-category products (Bjorvatn and Bjarnadottir, 2018). Although there have been conflicting findings against the sustainability liability, that does not necessarily mean that the theory is incorrect. One potential explanation for the difference in result could be the difference in the sample used by the researchers. Indeed, closer inspection into this study, the study by Bjorvatn and Bjarnadottir (2018), and the study by Luchs et al. (2010) shows that participants have varying cultural backgrounds. In my study, because I sent the survey to my personal social groups, participants were either Finnish or Vietnamese. In the study by Bjorvatn and Bjarnadottir (2018), the participants were Norwegian university students. And all three of these cultures are drastically different from that of the United States, which is what the study by Luchs et al. (2010) was based on. I suspect cultural difference being the reason behind the difference in results because sociocultural messages are one of the key driver of sustainability liability (Luchs et al., 2010). In the U.S, prevalent sociocultural messages such as “nice guys finish last” or “to make an omelet, you have to break some eggs” suggest a conflict between ethicality with strength. While I cannot speak for the Finnish and Norwegian culture, I can confidently say

that the notion of conflict between ethicality or gentleness with strength does not exist in Vietnamese culture. Of course, the conflicting result does not mean that the theory of sustainability liability is incorrect, it just means that the appropriate usage of this theory is nuanced, and might be inapplicable in certain situations.

Other than the two main findings, there are three other smaller, yet interesting findings. The first of three relates to the role that gender plays in consumer preference for sustainable products. In this study, female participants were more likely to find greener products more attractive and more likely to succeed in the market. This finding is consistent with previous research on the effect of gender on sustainable product preference, which has been well studied (Brough et al., 2016). The rationale behind this phenomenon could be attributed to the role that women usually take, which is the main caregiver for children and household activities (Sreen, Purbey and Sadarangani, 2018).

The second smaller finding is related to the theory of centrality of green attributes. Because the theory is relatively new, the number of product or product category that it has been tested on is limited. For example, in the study by Gershoff and Frels (2015), products such as mattress, computer and panini/waffle maker have been tested. This study contributed further to the literature by testing the theory on a new product (car shampoo), as well as testing the theory based on product category (gentle/strength).

The third smaller finding of this study is about the disparity of the participants' answers on their preference between the other point of view and the personal point of view. More specifically, when being asked if they would purchase the car shampoo themselves, participants rated much higher on the scale than when being asked if the product would perform well in the market. In the study, although the participants were explained from the beginning that all their answers and personal information would only be used for the purpose of this research, they still exhibited the social desirability bias documented by de Jong, Pieters and Fox (2010). This finding emphasizes the importance of asking participant questions from the other point of view because even with the promise of confidentiality, participants might still give answers that would portray them in a better light.

## 4.2 Managerial Implications:

This study has many practical implications for company executives, the biggest of which serves to answer the question of how should companies prioritize their resources to make their products more attractive for consumers. With the research by Gershoff and Frels (2015), we know that companies can improve a product's degree of perceived greenness by focusing the sustainability effort in the more central component of that product. However, we also know that being sustainable does not necessarily translate to being more attractive (Luchs et al., 2010). As a result, companies working with strength category products should think carefully before investing in sustainability, as it might prove to be unprofitable and unwise despite the good intention. However, with the addition of this research, companies operating with strength category products can have more confidence in their sustainability investment because the results showed that consumers prefer the more sustainable product, even though the product belongs in the strength category. In this study, there's a big difference between how participants judged the two green products, with  $M = 4.48$  for products with central green component, and  $M = 3.94$  for products with peripheral green component (other point of view). This difference could be the difference between a product being average or attractive in the eyes of consumers. Because of this difference, companies should choose to make their products' central components green when possible.

The second implication for businesses is to pay attention to the culture that they are operating in and adjust their sustainability investment accordingly. If the country you are operating in has sociocultural messages that contradict ethicality and strength, such as that of North America (Luchs et al., 2010), making the strength products more sustainable can make them less attractive. On the other hand, if you're operating in countries such as Vietnam, it might be beneficial to make your products more sustainable. Consumers in Finland and Norway could potentially feel the same way about sustainable products, but since I'm not a native nor cultural experts on either countries, more research needs to be done in order to have proper conclusions. The second business implication does not come from the main findings of this study, but rather from the comparison between this study and others on the same topic of sustainability liability.

### 4.3 Limitations and Suggestions for Further research:

#### 4.3.1 Limitations:

The first limitation of this research lies in its survey design. In the second survey, I did not use an appropriate survey tool that allowed an equal distribution of the number of participants between the two survey versions. As a result, the survey for brand A's car shampoo had 64 participants, while the survey for brand B only had 52 participants. Although there were no apparent problems when doing the data analysis, an imbalance in the sample could potentially create inaccuracy in the result.

The second limitation for this study is the uncertainty on the consumer's familiarity with the test product. When you imagine a typical person who's familiar with car shampoo, that person is likely a car owner and someone who washes his/her own car. When comparing this description to the population sample of this study, there are disconnects. With the study sample having an average age of roughly 21, it is likely that only a small portion of them owns a car. Indeed, when I shared the surveys online, there were four participants who told me that they have never seen or used car shampoos before, and that it was difficult for them to judge accurately on something they had no knowledge of. In the survey, I included a picture and descriptions about car shampoos in case participants had little knowledge about the product, but a brief description and a picture are not perfect substitutes for firsthand experience with the product. Consequently, the results of the survey might not be as accurate as it could have been because some participants had limited understanding of the test product. In hindsight, I could improve this situation by adding a question at the beginning of the survey to filter those who had used car shampoo or were familiar with it from those who hadn't used it or had no knowledge on it.

#### 4.3.2 Suggestions for further research:

The first suggestion for further research is the study of nationality or cultural backgrounds and their effect on the sustainability liability. It would be interesting to have a research that compares the level of sustainability liability incurred between different cultures. Ideally, these cultures would include ones that associate ethicality with strength, ones that associate ethicality with being weak, and everything in between. Equipped with this knowledge, companies would have a better understanding on which market to manipulate product centrality to maximize product attractiveness, and minimize the sustainability liability effect.



The second suggestion for further research is to study the interaction between the two theories on more products. To the best of my knowledge, this study is the first to connect the theory of centrality of green attributes and the theory of sustainability liability together. Consequently, the extent of research on their interaction is much limited. Indeed, car shampoo bottle is just one product under the strength category, which leaves room for many more products under the strength category.

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## Appendices:



*Hypothesis 1: Product centrality and Perceived greenness in strength-category products*



*Hypothesis 2: Perceived greenness and Product desirability in strength-category products*

	Count	Min	Max	Mean	Standard deviation	Skewness	Kurtosis
Surprise bottle cap	79	2	7	4.86	1.034	1.136	1.136
Example bottle cap	79	3	7	5.23	.905	-.236	-.236
Imagine bottle cap	79	1	7	4.37	1.443	-.700	-.700
Ideal bottle cap	79	3	7	5.33	.930	-.137	-.137
Surprise cleaning liquid	79	4	7	6.22	.842	-.518	-.518
Example cleaning liquid	79	5	7	6.52	.677	-.029	-.029
Imagine cleaning liquid	79	3	7	5.68	1.032	-.765	-.765
Ideal cleaning liquid	79	5	7	6.56	.712	.245	.245



Table 1: Descriptive statistics for first survey items

		<b>Correlation Matrix<sup>a</sup></b>							
		Surprise bcap	Example bcap	Imagine bcap	Ideal bcap	Surprise cliquid	Example cliquid	Imagine cliquid	Ideal cliquid
Correlatio n	Surprise bcap	1.000	.555	.602	.621	.270	.288	.162	.211
	Example bcap	.555	1.000	.406	.458	.338	.432	.174	.139
	Imagine bcap	.602	.406	1.000	.377	.219	.262	.131	.248
	Ideal bcap	.621	.458	.377	1.000	.269	.255	.203	.262
	Surprise cliquid	.270	.338	.219	.269	1.000	.611	.581	.525
	Example cliquid	.288	.432	.262	.255	.611	1.000	.513	.430
	Imagine cliquid	.162	.174	.131	.203	.581	.513	1.000	.400
	Ideal cliquid	.211	.139	.248	.262	.525	.430	.400	1.000
Sig. (1- tailed)	Surprise bcap		.000	.000	.000	.008	.005	.076	.031
	Example bcap	.000		.000	.000	.001	.000	.062	.111
	Imagine bcap	.000	.000		.000	.026	.010	.126	.014
	Ideal bcap	.000	.000	.000		.008	.012	.036	.010
	Surprise cliquid	.008	.001	.026	.008		.000	.000	.000
	Example cliquid	.005	.000	.010	.012	.000		.000	.000
	Imagine cliquid	.076	.062	.126	.036	.000	.000		.000
	Ideal cliquid	.031	.111	.014	.010	.000	.000	.000	

a. Determinant = .051

Table 2: Correlation matrix for first survey

**Pattern Matrix<sup>a</sup>**

	Component	
	1	2
Surprise bottle cap	.910	
Imagine bottle cap	.762	
Ideal bottle cap	.756	
Example bottle cap	.724	
Surprise cleaning liquid		.849
Imagine cleaning liquid		.840
Example cleaning liquid		.751
Ideal cleaning liquid		.713

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser

Normalization.

a. Rotation converged in 6 iterations.

*Table 3: Factor loading for first survey*

	Count	Min	Max	Mean	Standard deviation	Skewness	Kurtosis
Deserved to be labeled environmentally friendly	116	1	7	5.05	1.250	-.969	1.623
Good environmental choice	116	1	7	5.03	1.292	-.804	1.112
Person cares about environment likely to buy	116	1	7	5.23	1.267	-.919	1.407
How green is the product	116	1	7	4.84	1.215	-.715	1.313
Likelihood of purchase	116	1	7	4.53	1.067	-.463	.699
Success in market	116	1	7	4.24	1.076	-.029	.940

*Table 4: Descriptive statistics for second survey items*

**Correlation Matrix<sup>a</sup>**

		Deserves to be labeled environmentally friendly	Good environment al choice	Person cares about environment likely to buy	How green is this product
Correlation	Deserves to be labeled environmentally friendly	1.000	.871	.788	.824
	Good environmental choice	.871	1.000	.776	.823
	Person cares about environment likely to buy	.788	.776	1.000	.764
	How green is this product	.824	.823	.764	1.000
Sig. (1- tailed)	Deserves to be labeled environmentally friendly		.000	.000	.000
	Good environmental choice	.000		.000	.000
	Person cares about environment likely to buy	.000	.000		.000
	How green is this product	.000	.000	.000	

a. Determinant = .021

*Table 5: Correlation Matrix for second survey scale items*

### Component Matrix<sup>a</sup>

	Component 1
Deserves to be labeled environmentally friendly	.942
Good environmental choice	.939
Person cares about environment likely to buy	.897
How green is this product	.922

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 6: Component Matrix for second survey scale items

	Sum of Squares	df	Mean Square	F	Significance
Between groups	17.673	1	17.673	14.636	.000
Within groups	137.653	114	1.207		
Total	155.325	115			

Table 7: ANOVA results for centrality and perceived greenness

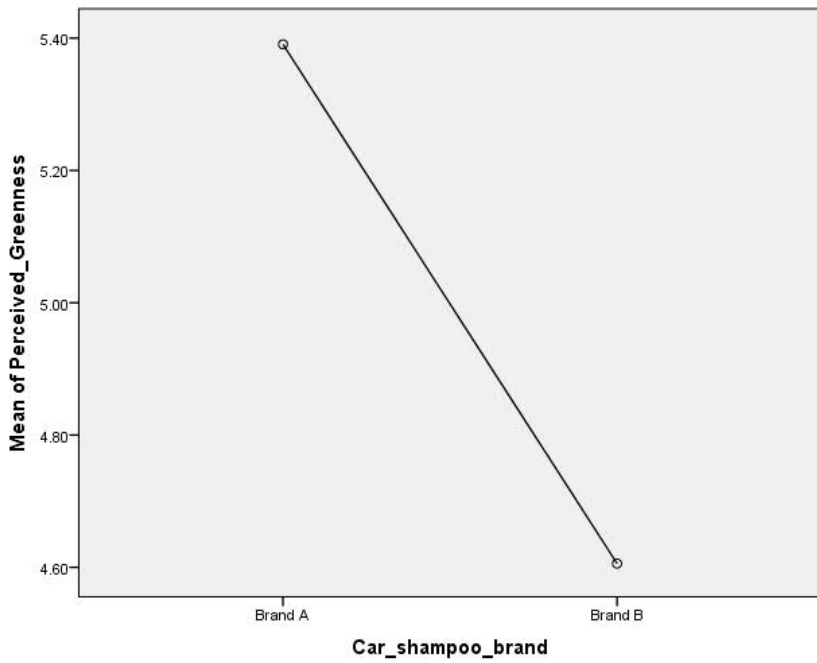


Figure 3: Perceived greenness of product by brand

	Step 1	Step 2
<i>Dependent variable: Success in the market (OPV)</i>		
Age	-0.21	-0.17
Education	0.135	0.184
Gender	0.537**	0.330*
Perceived greenness		0.500**
R <sup>2</sup>	0.078	0.353
Δ R <sup>2</sup>		0.276

Statistical significance is based on a two-tailed test. Results are tested and interpreted using unstandardized regression coefficients.

\*p < .05 \*\*p < .01

Table 8: Regression results





6. How good of an example of a car shampoo bottle would you consider one that does not have the cleaning solution (cleaning liquid)? \*

Mark only one oval.

	1	2	3	4	5	6	7	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

7. How easily can you imagine a real car shampoo bottle without the cleaning solution (cleaning liquid)? \*

Mark only one oval.

	1	2	3	4	5	6	7	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

8. How similar is a car shampoo bottle without the cleaning solution (cleaning liquid) to an ideal car shampoo bottle? \*

Mark only one oval.

	1	2	3	4	5	6	7	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

**This is the end of the survey. Thank you for your response!**

If you have any questions regarding the survey, please contact [chung.tran@aalto.fi](mailto:chung.tran@aalto.fi)



## Second survey

# Perception of sustainability

This survey studies how consumers judge products as sustainable, and their preference for sustainable products. This survey uses car shampoo bottle as an example.

First, you will be shown a brief description of a typical car shampoo bottle.

Next, you will be shown brief descriptions of two brands of car shampoo, and will be asked to answer questions relating to their sustainability and your preferences.

Finally, you will be asked some basic demographic questions.

All of your answers and personal information will be kept anonymous. Your contribution is much appreciated!

### Brief description of a car shampoo bottle

Car shampoo is used to clean the exterior of cars. A good car shampoo needs to be chemically strong to remove dirt and grime easily, and help water flow off the bodywork to avoid smears drying. A typical car shampoo bottle has four components: 1. cleaning solution (cleaning liquid), 2. bottle cap, 3. container, 4. company sticker.









11. How environmentally friendly or green is this car shampoo bottle?

*Mark only one oval.*

	1	2	3	4	5	6	7	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

12. Please rate the ability of brand B's car shampoo to clean cars.

*Mark only one oval.*

	1	2	3	4	5	6	7	
Low ability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	High ability

13. Please rate the likelihood that you would choose brand B's car shampoo if you were in need to clean a car.

*Mark only one oval.*

	1	2	3	4	5	6	7	
Not likely at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely likely

14. Please rate the likelihood that brand B's car shampoo will be a success in the market.

*Mark only one oval.*

	1	2	3	4	5	6	7	
Not a success at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Major success

Demographic information

15. What is your gender?

*Mark only one oval.*

Male

Female

Other

16. Please select your highest education level.

*Mark only one oval.*

Middle school

High school

Bachelor's Degree

Master's Degree

Doctor's Degree

Not applicable

17. How old are you?

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**This is the end of the survey. Thank you for participating!**

If you have any questions regarding the survey, please contact me at [chung.tran@aalto.fi](mailto:chung.tran@aalto.fi)

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