

Article

Green Intentions: Field Research and Data-Driven Analysis of Customers' Purchasing Patterns

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Abstract: Sustainability and sustainable consumption have become key factors in the battle with global warming in general and environmental pollution in particular. To motivate consumers to make sustainable purchasing decisions, it is necessary to understand consumers' attitudes and purchasing behavior towards green products. This study analyzed if the environmental impact of select products had measurable effects on consumers' purchasing behavior by analyzing purchasing data from a large retail store in Iceland spanning two years. To gain insight into consumers attitude and intentions towards green products, a survey was conducted which received 166 responses, and will be used in comparison with the purchasing data analysis and testing. The main goal of this study is to analyze the gap between consumers' intent to consumers' actual green purchasing. The results of this study will demonstrate that there is an actual difference in this field.

Keywords: sustainability; purchasing behavior; data analysis; green products; green purchase intention



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1. Introduction

In recent years, environmental issues have escalated significantly, including increased carbon emission which further enhances global warming, as well as excessive pollution, due to toxic emissions and massive amounts of garbage [1]. As one means to counteract this evolution, there has been a surge in the invention and production of so-called “green products”, which are often made of recycled or low-polluting materials.

Despite this, one of the most important parts for managing the imminent environmental challenge, is consumers' awareness rooted in individual dedication and commitment towards the solution [2,3]. The motivation for green purchasing should begin with the consumer [2,4]. The most common motivations behind the increasing demand for sustainable production and products are compliance and avoiding negative effects; these two factors are the most frequent drivers of companies to act sustainably [4].

As the environmental issues grow, it becomes vital to make plans for the future. Sustainability poses multiple challenges and opportunities for businesses [1]. Consequently, tremendous benefits lie ahead for businesses who develop sustainable products and services. It is, therefore, important to study how consumers are responding to products' lowered environmental impact to be able to adjust green marketing strategies accordingly, and for manufacturers to see value in moving towards sustainable manufacturing processes.

In this paper, we study consumers' attitudes towards green products and compare them to actual purchases of such goods. Our approach is two-fold. On the one hand, we study consumers' attitudes and intentions towards green products through a survey. The survey presents a direct response from the consumer and gives us the opportunity to study their views and intentions to choose environmentally friendly products. On the other hand, we take a data-driven approach to consumers' purchasing behavior, specifically focusing on products that have gone through a ‘green’ transition towards decreasing

their environmental impact. The data were provided by a large retail store in Iceland. Analysis of the purchasing data allows us to investigate the consumers' actual responses to the introduction of green products and whether this introduction actually affects their purchasing behavior.

Our research is based on the following two research questions, in which the first one is oriented towards survey data analysis, while the second one is oriented towards purchasing data analysis:

- i *What type of attitudes do consumers have when it comes to green purchases?*
- ii *Does the environmental impact of products have an effect on consumers' purchasing behavior?*

The main contribution of this paper is the conceptualization of consumers' green purchases. We show through our survey data that consumers in general have high maturity when it comes to environmental awareness and would like to make green purchases; however, through the purchasing data, we show that there is a low follow-through. The purchases are generally not green. This calls for new types of initiatives that can support consumers in their in-store decision-making processes, since the consumers want to act in a more sustainable manner, but are, to a large extent, unable to do so.

The rest of this paper is organized as follows: In the next section, we present literature related to our research, focusing on green products and green purchasing. Section 3 explains the research approach and the methods used. Section 4 presents the results and their interpretation. Finally, Section 5 presents the discussion about this research and Section 6 presents the conclusions and direction for future work.

2. Literature Review

Nowadays, there is a growing popularity of 'green' products to increase sustainability and decrease the carbon footprint. To date, there is no unified definition of the concept 'green products'. One definition of green products is "when its environmental and societal performance, in production, use and disposal, is significantly improved and improving in comparison to conventional or competitive products offerings" [5].

More simply put, green products are products that have a lower environmental impact compared either to other products, or to prior versions of the same product. Producing a product with a low environmental impact means ensuring that, throughout the complex life cycle (from extraction of raw materials to disposal as waste (or recycling)), the contribution to environmental change, in at least one of its matrices, e.g., air, water and soil, is reduced. A reduction in environmental impact can be achieved by those who make the product through improvements in production processes or technologies, either directly managed or influenced upstream or downstream of their position in the production chain.

From a purchasing perspective, with increasing threats to the environment, an increasing number of people have started to pay attention to sustainable development to protect the environment and society. The concepts of green purchase and green marketing have gradually become popular [6,7]. Theories such as the Theory of Reasoned Action and Theory of Planned Behavior underline the research in consumers' purchasing behavior [8–10]. These models aim to explain volitional behaviors and have been used to predict behavioral intentions and behaviors [11], and identify strategies for changing behavior. These theories have been used, to a large extent, to shed light on the sustainability debate. Green purchase intention (GPI) is the concept of consumers' willingness and probability to give preference to products which have environmentally friendly features over other products in their purchase intention. Regarding consumers' experiences with green products, it plays an influential role in their green purchase decisions [12]. In relation to consumers' inquisitiveness to gain knowledge on the environmental aspects and features of green products, the consumers strive to gain knowledge on their ingredients, the environmental impact, and their functionality [7]. This further influences consumers' purchasing decisions, enabling them to make the right informed purchasing decisions and develop their willingness to pay more for green products [13,14]. Purchasing decisions are in a form of purchasing green products, supporting green companies [15,16], and adopting sustainable consumption [7].

Green consumers are those who take the environmental impact of their consumption pattern into consideration and intend to modify their purchasing and consumption patterns to reduce their environmental impact [6]. It is interesting to understand what the difference is between consumers' perception of their actions towards sustainable purchases and what their behavior is, by studying purchasing patterns [17,18]. There has already been other studies that compare consumers' attitudes and their actual behavior towards green products, such as the study in South Africa that compared female attitudes and purchase intentions towards green cosmetics [19]. That study demonstrated that there is a positive correlation between women's intention and their purchasing behavior. However, other research shows that consumers are inclined to buy green products only when there are immediate and tangible benefits, as well as being more environmentally friendly [20].

3. Materials and Methods

This research study relied on a quantitative data analysis approach, as the research focuses on a numerical analysis of purchase data and analysis of survey results. The quantitative approach is structured for numerical and statistical analysis where prearranged processes, questions, and design pose certain flexibility issues [21].

To answer the research question "*Does the environmental impact of products have an effect on consumers' purchasing behavior?*", data are obtained by two methods.

First we conducted a survey which provided data directly from the consumer and gave a perspective on their purchasing attitudes and intentions towards green products, and secondly, we gathered consumers' purchasing data from a large retail store on selected products. The purpose of the purchasing data analysis is to study how consumers react to products with a lowered environmental impact. The results are then compared to research on how consumers' attitudes and intentions differ from their actual purchasing behavior.

All the analyses were conducted in an abductive manner [22].

3.1. Purchasing Attitude

3.1.1. Survey Methodology

To answer our first research question, we created a survey in a web- and email-based configuration. The web-based section was distributed to consumers using social media. This proves beneficial in reaching large number of respondents with a quick turnaround time. To conduct the email-based survey, the Reykjavik University (RU) email service was utilized. The respondents are students and faculty in the university.

For the structure of the survey, we used a 5-point Likert scale. The possible answers were: *Strongly agree*, *Agree*, *Neither agree nor disagree*, *Disagree*, and *Strongly disagree*.

Each possibility was given a corresponding number for Statistical Package for the Social Sciences (SPSS) analysis, ranging from 5 to 1, with 5 representing strongly agree, and 1 representing strongly disagree. These options should represent a symmetric and balanced choice selection with the position of the neutrality exactly between the two extremes of strongly disagree and strongly agree [23]. Figure 1 shows the research process of the present study.

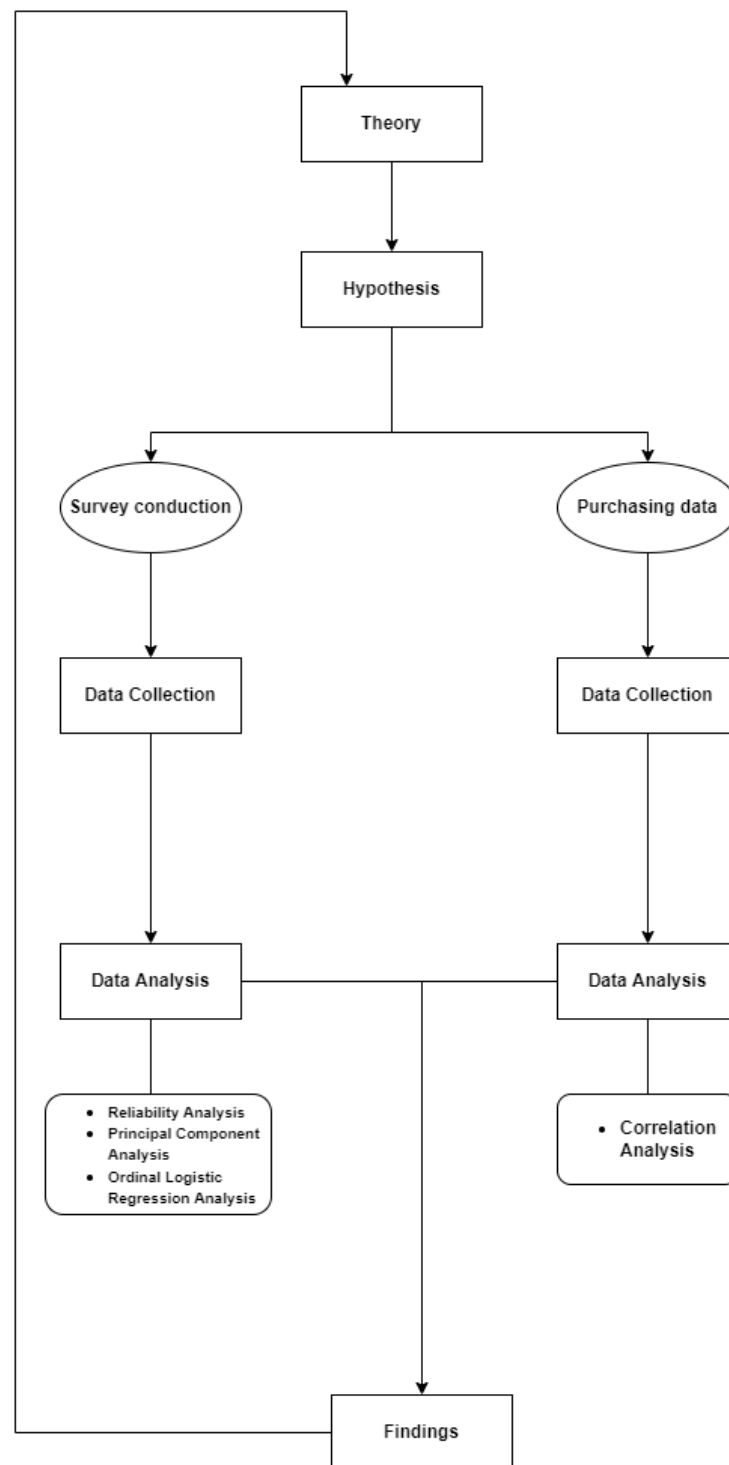


Figure 1. Research process.

3.1.2. Survey Questions

The questions in the survey were derived from a number of studies on similar topics [10,12,24,25], but structured in a way to fit this research more adequately. Table 1 shows the survey questions.

The survey was sent by email to the students of Reykjavik University and by social media on 30 March 2021 and ended on 6 April 2021. The survey contained ten questions, took two minutes to complete, and participants were encouraged to answer all questions consciously. Anonymity and confidentiality was also guaranteed.

Table 1. Survey questions.

Description Frequency (Percentage)	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1. What is your age?					
2. What is your gender?					
3. I read the products label before deciding on purchasing the product.	27 (16)	88 (53)	34 (20)	9 (5)	8 (<5)
4. I am an environmentally friendly consumer.	17 (10)	81 (49)	57 (34)	11 (7)	0 (0)
5. I would change my purchasing behavior because of social pressure.	6 (4)	70 (42)	49 (30)	31 (19)	10 (6)
6. I think that the environmental impact of products is stated clearly enough on product packaging.	1 (1)	18 (11)	43 (26)	75 (45)	28 (17)
7. I would consider using an app with informations on products' environmental impact.	29 (17)	67 (40)	29 (17)	25 (15)	16 (10)
8. I know my carbon footprint.	4 (2)	22 (13)	31 (19)	57 (34)	52 (31)
9. I have taken measures to reduce my carbon footprint.	20 (12)	71 (43)	32 (19)	32 (19)	10 (6)
10. I want manufacturers to offset their carbon footprint through Kolviður or other similar platforms.	40 (24)	69 (42)	47 (28)	7 (4)	3 (2)

3.1.3. Survey Analysis

Survey analysis is used to answer the first research question. The survey questions are analysed through Reliability Analysis, Principal Component Analysis (PCA), and Ordinal Logistic Regression Analysis (OLRA). This procedure is necessary to study the reliability of the scale used and how questions correlate with each other for guidance on classifying the questions in components.

Reliability analysis allows to study the properties of measurement scales and the items that compose the scales [26]. As parameters for the analysis, we used corrected item-to-total correlation (CITC), Cronbach's alpha, variance, and standard deviation. The Cronbach's alpha coefficient is a commonly used indicator of internal consistency and a measure of the underlying construct [27]. A Cronbach's alpha of 0.7 or higher is considered acceptable [28]. However, since the survey contained fewer than ten questions, low Cronbach's values are commonly found [27]. The CITC value depicts how each question correlates to all other questions in the analysis.

The Principal Component Analysis (PCA) method transforms variables into a set of new composite variables (principal components) that are not directly correlated [29]. This approach is useful to reduce the number of related variables to smaller dimensions to explore the underlying structure of the set variables [27]. The questions were then classified in sections depending on the joint components between questions.

Ordinal Logistic Regression Analysis (OLRA) is a statistical analysis method used in this research to answer the first research question. PCA analysis in Section 4.1.4 was used to analyze both GPI and Environmentally Convern (EC), and a mean value was calculated.

3.2. Purchasing Behavior

3.2.1. Purchasing Data

To study the actual purchasing behavior, we analyzed time series data on the quantities of daily product purchases provided by a major Icelandic supermarket. We had information about the daily number of quantities sold of each product, spanning over two years, from 1 January 2019 until mid March 2021.

As the goal of this research is to study the consumption of green products, we narrowed the dataset to products that met the following requirements:

- 1 The product underwent changes to lower its environmental impact;
- 2 The product has been on the market for longer than the period which the retrieved data covers;
- 3 The product has information on the lowered environmental impact on its exterior or packaging.

Among all the brands and products available in the dataset, the Tresemmé products satisfied all the above mentioned conditions; therefore, this research will focus on the Tresemmé product line. Their products had undergone a transition on its environmental impact in the time frame that this research is focusing on, with information on these changes clearly stated on the product container. Moreover, they launched a marketing campaign, stating that their new packaging was more environmental friendly. That, in addition to the noticeable information clearly stated on the product container about the lower carbon footprint, rendered the product feasible. While the Tresemmé containers are comprised of plastic, they are recyclable but have been indistinguishable by the sorting machine at the recycling center. To sort this issue, Tresemmé developed a new detectable pigment for the plastic containers which allows them to be detected by sorting machines at the recycling centers. According to Tresemmé, these changes will save up to 2.500 tonnes of black plastic going to waste each year. These changes have already been implemented to Tresemmé products with hopes to decrease black plastic waste. At this point, we would like to highlight that the products illustrated specifically (for instance, Tresemmé) are used for illustrative purposes, and as such, it is not the product per se that we focus on, instead, the focal point is on the impact that the product represents.

The purchasing data cover over two years, and depicts ten different Tresemmé products bought from 28 stores from early January in 2019, until middle of March in 2021. The data are split in three sections: Tresemmé regular (REG), Tresemmé recyclable (REC), and the comparison products (NORM). REG are the Tresemmé products which have not experienced any changes in their containers in terms of recycling and REC are the Tresemmé products that have undergone the pigment modifications. NORM are the Tresemmé products used for direct comparison with REG and REC in terms of correlation between 2019 and 2020.

3.2.2. Analysis of Purchasing Data

The data was analyzed by conducting a correlation analysis between Tresemmé NORM, Tresemmé REC, and Tresemmé REG, comparing with the correlations of the same sections from a period before the lowered environmental impact of the Tresemmé products. This allowed us to study consumer reactions towards these changes. A Pearson correlation analysis for 2019/2020 was conducted after normalizing the data and ANOVA linearity testing was established.

To study the significance of correlation coefficients between 2019 and 2020, calculations of correlations between NORM20Q2 and REC20Q2, and NORM19 and REC19 will be conducted by the following equation:

$$Z_{obs} = \frac{Z_1 - Z_2}{\sqrt{\frac{1}{N_1-3} + \frac{1}{N_2-3}}} \quad (1)$$

N_1 and N_2 are respectively the total usable days for 2019–2020 and for 2020 Q2–2021 Q1.

Using Correlation Coefficient Table in [27] and considering NORM20Q2 and REG20Q2 as r_1 and NORM19 and REG19 as r_2 , inserting $r_1 = 0.125$ and gaining a corresponding Z_1 value of 0.126 and same for the $r_2 = 0.212$ with a Z_{obs} value of 0.213, the equation gives with $N_1 = 348$ and $N_2 = 363$ a Z_{obs} value of 1.154. If the Z_{obs} value is between -1.96 and $+1.96$, there is not a statistically significant difference between the two correlation coefficients [27].

Same procedure is done for NORM20Q2 and REG20Q2 using $r_1 = 0.283$ and NORM19 and REG19 with $r_2 = 0.270$, the results give a Z_{obs} value of 0.212, which is also between the -1.96 and $+1.96$ range, signifying that there is not a statistically significant difference between the two correlation coefficients.

4. Results

The results of the present research work are divided into survey results and data results. All analyses were conducted using SPSS.

4.1. Survey Results

First of all, we present the main characteristics (gender, age) of the survey participants. Then, we describe the results of the analysis and testing.

4.1.1. Participants Characteristics

The target audience for the survey were people 18 years or older, since the subject of sustainability and Environmentally Friendly Products (EFP) may be difficult to comprehend for minors [30]. A total of 166 people responded to the survey, of whom 93 were male (56%), 71 were female (43%), and two individuals (1%) self-identified as other. The participant age range was from 20 to 69 years old, with 92 (55%) aged between 20–29 years old. the respondents' origin were predominantly from Iceland, 161 (97%), and the email-based survey accounted for 118 (71%) of the participants. The participation ratio from the email-based survey was around 5.5%, but the ratio is uncertain from the social media survey. Table 2 shows the survey's participant characteristics.

Table 2. Survey's participant characteristics.

Variables	Categories	Frequency	Percentage
Gender	Male	93	56
	Female	71	43
	Other	2	1
Age	20–29	92	55
	30–39	38	23
	40–49	20	12
	50–59	10	6
	60–69	6	4
Origin	Iceland	161	97
	Other	5	3
	E-mail	118	71
Survey	Facebook	46	28
	Google	1	<1
	Other	1	<1

4.1.2. Reliability Analysis

The internal scale consistency is one of the main concerns, or the degree by which the questions that make up the scale “hang together”.

Question 6 (Q6) showed a negative CITC value of -0.052 which may have indicated that the question was negatively worded and was moving in a different direction compared with other questions. To adjust for this, a re-coding process was conducted where each value in the 1–5 Likert scale was reversed to correlate with the other questions [31]. After re-coding Q6, the CITC value was positive at 0.052 but still too low [27], and was, therefore, excluded from further analysis. Table 3 depicts the reliability analysis.

All CITC values were within the acceptable range of 0.3 [27], apart from Q5, which was then revised. Additionally, the Cronbach's alpha value was above 0.7, which was acceptable, with the mean inter-item correlation factor of 0.288, which was within the range

of 0.2–0.4 [27]. These questions were used in a Principal Component Analysis for guidance on forming the Environmental Concern (EC) and Green Purchase Intention (GPI) sections.

Table 3. Reliability Analysis.

Question	Corrected Item-to-Total Correlation	Cronbach's (Alpha)	Var	Std.dev
Q3	0.397	0.736	19.612	4.429
Q4	0.462			
Q5	0.264			
Q7	0.520			
Q8	0.384			
Q9	0.623			
Q10	0.525			

4.1.3. Principal Component Analysis

Table 4 shows the correlation matrix of the PCA, i.e., how each question relates to one another. This should not be directly compared to the CITC value explained above, as the CITC value compares each question and the other questions are a total corrected value.

Table 4. Correlation Table about the Survey's Questions.

Question	Q3	Q4	Q5	Q7	Q8	Q9	Q10
Q3	1	0.240	0.092	0.262	0.314	0.375	0.239
Q4	0.240	1	0.172	0.287	0.275	0.377	0.424
Q5	0.092	0.172	1	0.290	0.064	0.188	0.243
Q7	0.262	0.287	0.290	1	0.240	0.454	0.423
Q8	0.314	0.275	0.064	0.240	1	0.398	0.201
Q9	0.375	0.377	0.188	0.454	0.398	1	0.491
Q10	0.239	0.424	0.243	0.423	0.201	0.491	1

As per the literature, the correlation values should preferably be 0.3 or above for the majority of the matrix [27]. Here, of the 21 values, 8 are above 0.3 and 7 are close to the 0.3 value, and are used in further analysis.

Figure 2 demonstrates how the variance is distributed among the components graphically.

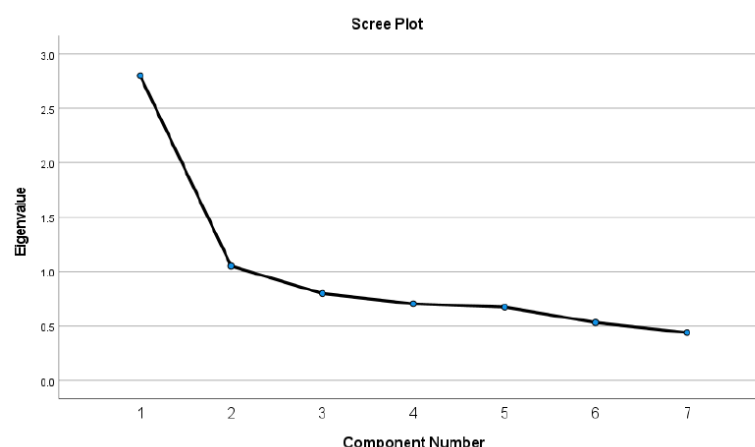


Figure 2. Plot of variance distribution.

For the principal components (labelled component) shown on the x-axis, the corresponding eigenvalue is plotted on the y-axis [32]. Since component one and two have eigenvalues greater than one, two components are used to divide the questions into components, with component one and two accounting for 55% of the total variance. The Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO) value is required to be 0.6 or higher, and the

Bartlett's Test of Sphericity value is required to be significant ($p < 0.05$) [27]. These values are crucial for verification before proceeding with the Principal Component Analysis, and both of these requirements are met with the KMO of 0.806 and Bartlett's Test of Sphericity significant value of ($p < 0.01$).

Table 5 shows the Communalities matrix, Component matrix, and the Pattern matrix. The table depicts how questions Q3, Q8, and Q9 fit in component one, which represents that they have commonalities or underlying traits, and will be classified together to represent Green Purchase Intention (GPI). This is the same for Q5, Q7 and Q10; their values favor component two, and will be classified together to represent the Environmental Concern (EC) section. As seen in the pattern matrix, Q4 is closely related to both sections but will be classified in the EC section, since the wording of the question adheres more to that section.

Table 5. Pattern and Component Matrix for PCA with Oblimin Rotation.

	Communalities		Component Matrix		Pattern Matrix	
	Initial	Extraction	C1	C2	C1	C2
Q9	1	0.631	0.785	−117	0.597	0.378
Q10	1	0.570	0.717	0.235	0.261	0.636
Q7	1	0.534	0.689	0.245	0.234	0.627
Q4	1	0.411	0.641	0.007	0.402	0.395
Q3	1	0.493	0.562	−0.421	0.707	−0.017
Q8	1	0.578	0.556	−0.519	0.784	−0.104
Q5	1	0.635	0.399	0.690	−0.318	0.829

4.1.4. Reliability Analysis on PCA

Table 6 depicts the sectioning of questions to EC and GPI. A reliability analysis reveals the CITC values are all above the acceptable limit of 0.3 [27], and the Cronbach's values are above 0.6. As discussed in Section 4.1.2, the Cronbach's values may be low when there are fewer than 10 questions.

Table 6. Reliability analysis on GPI and EC classified questions.

Section	Q	Corrected Item-to-Total Correlation	Cronbach's	Var	Std.dev
GPI	Q3	0.412	0.630	5.834	2.415
	Q8	0.432			
	Q9	0.478			
EC	Q4	0.386	0.628	7.277	2.698
	Q5	0.318			
	Q7	0.465			
	Q10	0.508			

4.1.5. Ordinal Logistic Regression Analysis

Before conducting the OLRA, a normality test of the data was carried out; this depicted a goodness-of-fit value for Pearson's chi-square values of 159.479 with a significance value of 0.850, and a deviance chi-square value of 148.285 with a significant value of 0.955. See Table A5. A test of normality under Kolmogorov–Smirnov was carried out, and it showed a significance value of ($p < 0.05$), which indicates that the data are not normally distributed. See Table A6. Additionally, there was a model-fitting chi-squared value of 42.149 with a significant value of ($p < 0.01$). See Table A7.

These factors indicate that the model fits the data well but since the data do not satisfy the normally distributed condition, the Spearman's correlation coefficient is used in answering the first research question [27].

Table 7 shows the correlation between EC, GPI, age, and gender. Age proves not to be statistically significant to either EC or GPI. However, gender depicts a positive correlation

to EC; the gender of participants was categorized and females were given a value of two and males were given a value of one. This correlation is positive, which indicates that females have more correlation with EC than males, with the correlation value indicating the strength of the relationship between the two variables. According to [33] in [27], the range for a medium correlation value is $Rho = 0.30$ to 0.49 . The correlation value between EC and GPI is $\rho = 0.465$, which is then considered as a medium positive correlation value. With the significance level of ($p < 0.01$) for EC and GPI, the result of the first research question is that there is a positive correlation between consumers EC and GPI.

Table 7. OLRA Correlations.

Nonparametric Correlations			Correlations			
			EC	GPI	Age	Gender
Spearman's Rho	EC	Correlation Coefficient	1	0.465 **	−0.152	0.228 **
		Sig (2-tailed)	.*	<0.001	0.050	0.003
		N	166	166	166	166
	GPI	Correlation Coefficient	0.465 **	1	0.002	0.065
		Sig (2-tailed)	<0.001	.*	0.977	0.404
		N	166	166	166	166
	Age	Correlation Coefficient	−0.152	0.002	1	−0.101
		Sig (2-tailed)	0.050	0.977	.*	0.195
		N	166	166	166	166
	Gender	Correlation Coefficient	0.228 **	0.065	−0.101	1
		Sig (2-tailed)	0.003	0.404	0.195	.*
		N	166	166	166	166

*. Symbol “.” indicates the number 0. **. Correlation is significant at the 0.01 level (2-tailed).

4.2. Purchasing Behavior Results

In this section, we first present the trend analysis of Tresemmé purchasing products through the entire time period (2019–2021), then we analyze the correlation between comparison products (NORM), Tresemmé REC, and Tresemmé REG, for 2019 and 2020–2021 separately.

Trend Analysis

The purchasing of all the Tresemmé products through the time period is depicted in Figure 3.

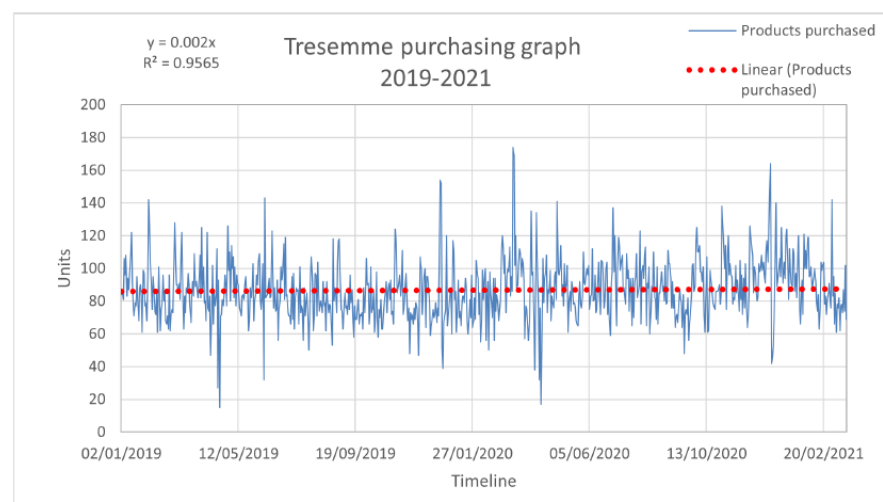


Figure 3. Purchasing of all Tresemmé products.

A linear trend line fits the data well with a R squared value of $R^2 = 0.9565$, indicating a slight increase in quantity bought. This purchasing graph is comprised of the cumulative purchasing of both REC and REG Tresemmé products, which is then separated and analyzed separately in Tables 8 and 9.

Figure 4, with a linear trend line with a R squared value of $R^2 = 0.9429$, shows the purchasing data of the 45 different products which are used for a comparison with Tresemmé REG and Tresemmé REC; the data are shown in Figure 3.

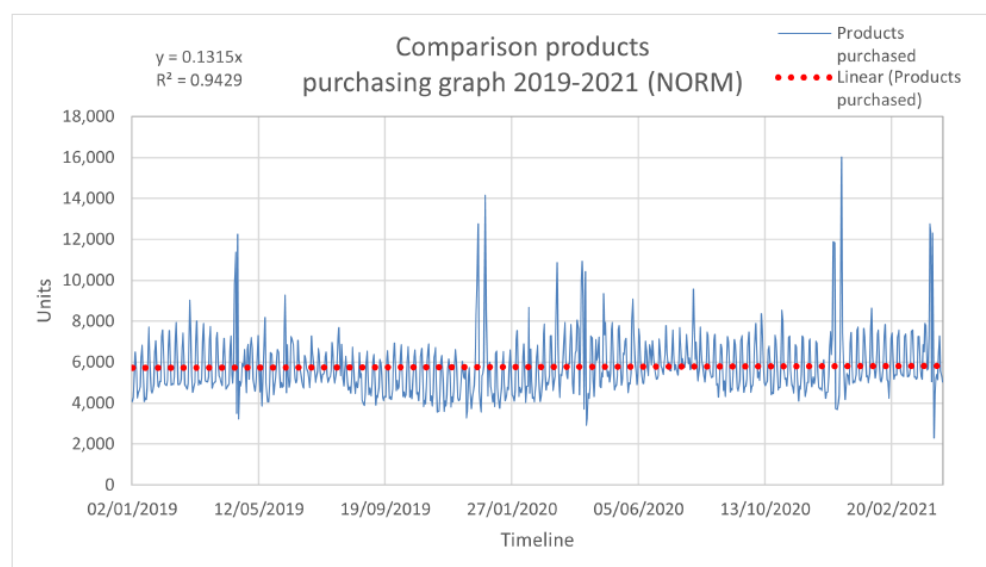


Figure 4. Purchasing of comparison products.

Analyzing the correlation between the comparison products (NORM), Tresemmé recyclable products (REC), and Tresemmé regular products (REG), and comparing with the correlations of the same sections from a period before the lowered environmental impact of the Tresemmé products, enabled us to research the consumers' reactions towards these changes. A Pearson correlation analysis for 2019 was conducted after normalizing the data and ANOVA linearity testing to check differences between different groups, respectively: NORM/REC and NORM/REG for 2019 and NORM/REC NORM/REG for 2020. See Tables A1 and A2 for 2019, and Tables A3 and A4 for 2020.

Table 8 depicts the correlation in 2019 for:

- 1 NORM19 and REG19 as $r = 0.270$;
- 2 NORM19 and REC19 as $r = 0.212$;
- 3 REG19 and REC19 as $r = 0.215$.

All of these correlations have a significant value of ($p < 0.01$).

According to Tresemmé in [34], the containers' pigment changes and recyclable labeling entered the consumer market in 2019. However, Nathan & Olsen, the Tresemmé product distributor in Iceland, states that the recyclable labeled containers would have entered the Icelandic market in Q2 of 2020 [35]. Table 9 accounts for this and depicts the correlation between:

- 1 REC20Q2 and NORM20Q2 as $r = 0.125$ with a significance level of ($p < 0.05$);
- 2 REG20Q2 and NORM20Q2 is $r = 0.283$ with a significance level of ($p < 0.01$);
- 3 REG20Q2 and REC20Q2 as $r = 0.199$ with a significance level of ($p < 0.01$).

Table 8. Correlation analysis for 2019.

	Correlations		
	NORM19	REC19	REG19
NORM19			
Pearson Correlation	1	0.212 **	0.270 **
Sig. (2-tailed)		<0.001	<0.001
N	363	363	363
REC19			
Pearson Correlation	0.212 **	1	0.215 **
Sig. (2-tailed)	<0.001		<0.001
N	363	363	363
REG19			
Pearson Correlation	0.270 **	0.215 **	1
Sig. (2-tailed)	<0.001	<0.001	
N	363	363	363

**. Correlation is significant at the 0.01 level (2-tailed).

Table 9. Correlation analysis Q2 2020 to Q1 2021.

	Correlations		
	NORM20Q2	REC20Q2	REG20Q2
NORM20Q2			
Pearson Correlation	1	0.125 *	0.283 **
Sig. (2-tailed)		0.019	<0.001
N	348	348	348
REC20Q2			
Pearson Correlation	0.125 *	1	0.199 **
Sig. (2-tailed)	0.019		<0.001
N	348	348	348
REG20Q2			
Pearson Correlation	0.283 **	0.199 **	1
Sig. (2-tailed)	<0.001	<0.001	

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

5. Discussion

The current food system neither works for all habitats of the planet, nor does it work for the environment. Changing our food system to a system based on the principles of a circular economy to a larger extent, would be one of the utmost important steps towards building biodiversity on the one hand, and tackling climate change on the other [36]. One small step towards building a more sustainable food system, one that could over time lead to a regenerative food production and in turn lead to more stable soil, improved biodiversity, better air and water quality with both local and global benefits, would be to change the way each individual makes their individual choices [37]. Although eliminating food waste and shifting towards the principles of circular economy are the ultimate target, the individual choice, and follow-through, is where we are contributing to the change. Reaching towards the sustainability goals and analyzing aspects of managing the grand challenge related to the environmental impact of our actions is a vital way forward in studying how consumers react to products' attributes and environmental impact [37].

The survey's results in Section 4.1 show how consumers' Environmental Concern and their Green Purchase Intention are positively correlated by a value of 0.465, a medium correlation value. Thus, for the first research question, the results show that although consumers may be concerned about the environment and intend to purchase green products, their actions do not reflect these concerns and intentions. Additionally, Table 7 shows how female consumers correlate more with Environmental Concern than males. This

indicates that women have a higher tendency towards environmental concern. However, when analyzing the purchasing behavior of consumers, through actual purchasing data, the findings do not indicate a high environmental concern in action, as consumers do not seem to have responded with Tresemmé's products' lowered environmental impact.

We would like to highlight that the products highlighted specifically in the purchasing data are used for illustrative purposes, and as such, it is not the product per se that we focus on, instead, the focal point is on the impact that the product represents. As depicted in Table 9, the correlation is lower for Tresemmé recyclable and the comparison data than for Tresemmé regular and comparison data. With Tresemmé recyclable products in this period now displaying the recyclable label, it can be assumed that with a lower correlation than Tresemmé regular and comparison data, consumers may be responding to Tresemmé's recyclable labeling. However, as Section 3.2.2 depicts, the difference between correlations in 2019 and 2020 does not reach statistical significance. Consequently, for the second research question, the results indicate that even though consumers are aware of their purchasing behavior, they do not react to products' lowered environmental impact.

The results are in accordance with the findings by [38], where the results indicated that the perception of green products, labels, packaging, and ingredients did not influence consumers' perception. Other product attributes played an important role in the consumer purchasing process, such as price and quality [39,40].

The results of this research can be deepened and used for further psychological and economic studies to understand how to influence consumers towards the purchase of green products. In addition, the use of data-driven analysis was useful to understand the difference between consumers' perceptions of their actions and their actual behavior. As pointed out earlier, our aim was not to link specific individuals' perceptions of their actions and their behavior, but instead, we used the two-fold analysis to shed light on the views of the general public, and the purchasing behavior of a wide range of shoppers within the general public too. We did that to illustrate the intentions and actions of the general public, but not to pinpoint the intentions and actions of certain individuals.

Limitations and Future Work

The present research has certain limitations. The sample data are limited in two ways; firstly, the survey had a limited sample of 166 participants, and secondly, the purchasing data were collected from a single retail store with a limited selection of suitable products for consumers' purchasing data analysis. Additionally, part of the data was related to the COVID-19 period, so the purchasing data results may be skewed because of the restrictions.

Then, the two parts of our analysis, i.e., on the purchase intention and the actual purchase, did not include the same participants, and we do not know if they are from the same social groups. Additionally, the survey more broadly examined the environmental impact, while our purchasing data shows purchasing patterns for specific product categories. This could potentially affect the results in some way. Since our intention was to shed light on the gap between attitude and intent versus consumers' green purchasing behavior, and not to draw specific conclusions, the data are suffice for that purpose.

Additionally, before conducting a survey of a similar nature to this research, it would be wise to use a control group for testing the preliminary results in conducting a quantitative analysis to ensure the suitability for its purpose in the research. Furthermore, there are multiple purchase considerations in the consumers' decision process. Bias towards the author of this study may be present in the survey participants from Reykjavik University or through social media. Additionally, the author of this study had previously encountered the products used in the study, which may have influenced the decision process in search of suitable products for data analysis. Measures should be taken by future researchers to minimize such bias if possible, or take the bias into consideration when interpreting the results.

For further research in this area, it could be interesting to conduct a more complete analysis and include purchasing patterns of a larger assortment of products that meet the requirements discussed in Section 3.2. Additionally, future research could emphasize

other relevant factors, such as environmental, health, personal, and social benefits of better aligning environmental intentions with purchasing actions. This could, furthermore, be extended to situations where more emphasis is on consumers' behavior towards the environment, whereby conducting in-depth interviews with consumers could be explored to hopefully gain an enriched understanding of green consumer purchasing behavior.

6. Conclusions

This study presents a two-fold analysis of survey data and purchasing data in Iceland. In terms of a theoretical contribution, our analysis shows that there is a discrepancy between consumers' concern for the environment and their intention to purchase green products, and actual purchasing green products. Based on the findings from the survey and the purchasing data analysis, the answer to the research question is that despite high environmental concern detected within the general population, there is low concern detected from purchasing data from consumers when grocery shopping. Ergo, consumers have a difficulty translating their intentions into purchasing behavior based on the environmental impact of the products available to them. Based on this, we conclude that there is a discrepancy between consumers' intentions and their actions; this discrepancy can be defined as a gap related to how consumers perceive their purchasing behavior versus how they actually conduct their purchasing. They see themselves as environmentally responsible, but when analyzing purchasing patterns, there is less impact to be detected. In terms of a practical contribution, we suggest that there is a need for a change in the way grocery stores line up their products in order to nudge consumers to align intentions with actions. This could be done by more visibly portraying products with a lower environmental impact so they are in eyesight. It is clear that consumers want to make an impact, so allowing them to more easily grab green products compared and less easily products with a higher carbon footprint would be beneficial for the environment.

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Abbreviations

The following abbreviations are used in this manuscript:

EFP	Environmentally Friendly Product
GPI	Green Purchase Intention
EC	Environmentally Concern
SPSS	Statistical Package for the Social Sciences
PCA	Principal Component Analysis
OLRA	Ordinal Logistics Regression Analysis
CITC	Corrected Item-to-Total Correlation
CCM	Component Correlation Matrix value
REG	Regular Tresemme products
REC	Recyclable Tresemme products
NORM	Comparison products

Appendix A

Table A1. ANOVA correlation test of Linearity for 2019 NORM/REC.

			Sum of Squares	df	Mean Square	F	Sig.
REC2019O NORM2019O	Between Groups	(Combined)	50,784.001	332	152.964	0.872	0.723
		Linearity	2512.934	1	14.319	0.831	0.782
		Deviation from Linearity	48,271.067	331	145.834	0.831	0.782
Within Groups			5264.875	30	175.496		
Total			56,048.876	362			

Table A2. ANOVA correlation test of Linearity for 2019 NORM/REG.

			Sum of Squares	df	Mean Square	F	Sig.
REG2019O NORM2019O	Between Groups	(Combined)	11,939.868	332	35.963	0.883	0.707
		Linearity	957.319	1	957.319	23.502	<0.001
		Deviation from Linearity	10,982.549	331	33.180	0.815	0.804
Within Groups			1222.000	30	40.733		
Total			13,161.868	362			

Table A3. ANOVA correlation test of Linearity for 2020 NORM/REC.

			Sum of Squares	df	Mean Square	F	Sig.
REC20_Q2 NORM20_Q2	Between Groups	(Combined)	89,634.670	331	270.800	1.194	0.358
		Linearity	1465.859	1	1465.859	6.461	0.022
		Deviation from Linearity	88,168.810	330	267.178	1.178	0.371
Within Groups			3630.167	16	226.885		
Total			93,264.836	347			

Table A4. ANOVA correlation test of Linearity for 2020 NORM/REG.

			Sum of Squares	df	Mean Square	F	Sig.
REG20_Q2	Between Groups	(Combined)	12,376.083	331	37.390	2.055	0.047
NORM20_Q2		Linearity	1013.343	1	1013.343	55.685	<0.001
		Deviation from Linearity	11,362.740	330	34.433	1.892	0.068
Within Groups			291.167	16	18.198		
Total			12,667.250	347			

Table A5. Goodness-of-Fit.

	Chi-Square	df	Sig.
Pearson	159.479	179	0.850
Deviance	148.285	179	0.955

Link function: Logit.

Table A6. OLRA normality test.

Kolmogorov–Smirnov *				Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
GPI_N	0.131	166	<0.001	0.968	166	<0.001
EC_N	0.096	166	<0.001	0.984	166	0.046

*. Lilliefors Significance Correction.

Table A7. OLRA model fitting.

Model	−2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	316.099			
Final	237.950	42.149	1	<0.001

Link function: Logit.

References

- Charter, M.; Tischner, U. (Eds.) *Sustainable Solutions: Developing Products and Services for the Future*; Taylor and Francis Group: Sheffield, UK, 2001.
- Divyapriyadharshini, N. Consumer Awareness towards Green Products and Its Impact. *Int. J. Res. Innov. Soc. Sci. (IJRISS)* **2019**, *3*, 2454–6186.
- Vazifehdoust, H.; Taleghani, M.; Esmailpour, F.; Nazari, K.; Khadang, M. Purchasing green to become greener: Factors influence consumers' green purchasing behavior. *Manag. Sci. Lett.* **2013**, *3*, 2489–2500. [\[CrossRef\]](#)
- Vörösmarty, G.; Dobos, I.; Tátrai, T. Motivations behind sustainable purchasing. In *Environmental Management Accounting and Supply Chain Management*; Burritt, R., Schaltegger, S., Bennett, M., Pohjola, T., Csutora, M., Eds.; Springer: Dordrecht, The Netherlands, 2011; pp. 41–54.
- Baumann, H.; Boons, F.; Bragd, A. Mapping the green product development field: Engineering, policy and business perspectives. *J. Clean. Prod.* **2002**, *10*, 409–425. [\[CrossRef\]](#)
- Zhang, X.; Dong, F. Why do consumers make green purchase decisions? Insights from a systematic review. *Int. J. Environ. Res. Public Health* **2020**, *17*, 6607 [\[CrossRef\]](#)
- Laroche, M.; Bergeron, J.; Barbaro-Forleo, G. Targeting Consumers Who Are Willing to Pay More for Environmentally Friendly Products. *J. Consum. Mark.* **2001**, *18*, 503–520. [\[CrossRef\]](#)
- Vallerand, R.; Deshaies, P.; Cuerrier, J.-P.; Pelletier, L.; Mongeau, C. Ajzen and fishbein's theory of reasoned action as applied to moral behavior: A confirmatory analysis. *J. Personal. Soc. Psychol.* **1992**, *62*, 98–109. [\[CrossRef\]](#)
- Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [\[CrossRef\]](#)
- Paul, J.; Modi, A.; Patel, J. Predicting green product consumption using theory of planned behavior and reasoned action. *J. Retail. Consum. Serv.* **2016**, *29*, 123–134. [\[CrossRef\]](#)
- Madden, T.; Ellen, P.; Ajzen, I. A comparison of the theory of planned behavior and the theory of reasoned action. *Personal. Soc. Psychol. Bull.* **1992**, *18*, 3–9. [\[CrossRef\]](#)
- Kumar, P.; Ghodeswar, B. Factors affecting consumers' green product purchase decisions. *Mark. Intell. Plan.* **2015**, *33*, 330–347. [\[CrossRef\]](#)
- Zhao, H.-H.; Gao, Q.; Wu, Y.-P.; Wang, Y.; Zhu, X.-D. What affects green consumer behavior in china? a case study from qingdao. *J. Clean. Prod.* **2014**, *63*, 143–151. [\[CrossRef\]](#)
- Nelson, B.; Taylor, D.; Strick, S. Wine consumers' environmental knowledge and attitudes: Influence on willingness to purchase. *Int. J. Wine Res.* **2009**, *1*, 59–72. [\[CrossRef\]](#)
- Albayrak, T.; Aksoy, S.; Caber, M. The effect of environmental concern and scepticism on green purchase behavior. *Mark. Intell. Plan.* **2013**, *31*, 27–39. [\[CrossRef\]](#)
- Schlegelmilch, B.; Bohlen, G.M.; Diamantopoulos, A. The link between green purchasing decisions and measures of environmental consciousness. *Eur. J. Mark.* **1996**, *30*, 35–55. [\[CrossRef\]](#)
- Lisnawati, H.; Sinaga, A. Data Mining with Associated Methods to Predict Consumer Purchasing Patterns. *Int. J. Mod. Educ. Comput. Sci. (IJMECS)* **2020**, *12*, 16–28. [\[CrossRef\]](#)
- Fedushko, S.; Ustyianovych, T. E-Commerce Customers Behavior Research Using Cohort Analysis: A Case Study of COVID-19. *J. Open Innov. Technol. Mark. Complex* **2022**, *8*, 12. [\[CrossRef\]](#)
- Shimul, A.S.; Cheah, I.; Khan, B.B. Investigating Female Shoppers' Attitude and Purchase Intention toward Green Cosmetics in South Africa. *J. Glob. Mark.* **2022**, *35*, 37–56. [\[CrossRef\]](#)
- Chomova, K. Evolution of Sustainability in Marketing. In *Proceedings of the Central and Eastern Europe in the Changing Business Environment*, Bratislava, Slovakia, 19–20 May 2022. [\[CrossRef\]](#)
- Charter, M.; Tischner, U. (Eds.) *A Step-by-Step Guide for Beginners*, 5th ed.; Sage Publications: Thousand Oaks, CA, USA, 2019.

22. Gregory, R.; Muntermann, J. Theorizing in Design Science Research: Inductive versus Deductive Approaches. In Proceedings of the International Conference on Information Systems 2011, ICIS 2011, Shanghai, China, 4–7 December 2011.
23. Joshi, A.; Kale, S.; Chandel, S.; Pal, D. Likert scale: Explored and explained. *Br. J. Appl. Sci. Technol.* **2015**, *7*, 396–403. [\[CrossRef\]](#)
24. Roberts, J.A. Green consumers in the 1990s: Profile and implications for advertising. *J. Bus. Res.* **1996**, *36*, 217–231. [\[CrossRef\]](#)
25. Kilbourne, W.; Pickett, G. How materialism affects environmental beliefs, concern, and environmentally responsible behavior. *J. Bus. Res.* **2008**, *61*, 885–893. [\[CrossRef\]](#)
26. Reliability Analysis Statistics. IBM. (n.d.). Available online: <https://www.ibm.com/docs/en/spss-statistics/25.0.0?topic=analysis-reliability-statistics> (accessed on 27 June 2022).
27. Pallant, J. *SPSS Survival Manual: Step by Step Guide to Data Analysis Using SPSS*; Allen & Unwin Book Publishers: Sydney, Australia, 2010.
28. Tay, L.; Jebb, A. The SAGE Encyclopedia of Industrial and Organizational Psychology. In *Scale Development*; SAGE Publications: Thousand Oaks, CA, USA, 2016; Volume 2.
29. Gan, C.; Wee, H.Y.; Ozanne, L.; Kao, T. Consumers' purchasing behavior towards green products in new zealand. *Innov. Mark.* **2008**, *4*, 93–102.
30. Chan, R. Determinants of chinese consumers' green purchase behavior. *Psychol. Mark.* **2001**, *18*, 389–413 [\[CrossRef\]](#)
31. Kyriazos, T.; Stalikas, A. Applied psychometrics: The steps of scale development and standardization process. *Psychology* **2018**, *9*, 2531–2560. [\[CrossRef\]](#)
32. Landau, S.; Everitt, B.S. *A Handbook of Statistical Analyses Using SPSS*; Chapman & Hall/CRC Press LLC: Boca Raton, FL, USA, 2003.
33. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed.; Taylor & Francis Group: Abingdon, UK, 1988.
34. Einarsson Reynis E.T. (University of Reykjavik, Reykjavik, Iceland). Personal communication, February 2021.
35. Einarsson Reynis E.T. (University of Reykjavik, Reykjavik, Iceland). Personal communication, April 2021.
36. Norström, L.; Ganesh, S.; Preeti, M.; Lindman, J.; Islind, A.S. Beyond Social Auditing: Towards Self-governance and Empowerment of Textile Workers. In Proceedings of the 45th Information Systems Research Seminar in Scandinavia, Helsingør, Denmark, 14–17 August 2022.
37. Islind, A.S.; Norström, L. Learning sustainable work through critical design: A case study of a hackathon to prepare the future workforce. *J. Workplace Learn.* **2020**, *32*, 641–651. [\[CrossRef\]](#)
38. D'Souza, C.; Taghian, M.; Lamb, P.; Peretiatkos, R. Green products and corporate strategy: An empirical investigation. *Soc. Bus. Rev.* **2006**, *1*, 144–157. [\[CrossRef\]](#)
39. Johri, L.M.; Sahasakmontri, K. Green marketing of cosmetics and toiletries in thailand. *J. Consum. Mark.* **1998**, *15*, 265–281. [\[CrossRef\]](#)
40. Peattie, K. *Environmental Marketing Management: Meeting the Green Challenge*; Pitman Publishing: London, UK, 1995.