A Sustainable Alternative within the Dry Cleaning Industry: Consumer Knowledge, Perception, Demography and Behavior

Tara R. Yavorsky

ABSTRACT

The dry cleaning industry has been criticized for its widespread use of Perchloroethylene (PCE) due to its adverse effects. Public concern for these effects created impetus for the development of GreenEarth Cleaning, which utilizes D5-based solvents. While more sustainable D5-based solvents help to mitigate environmental and health effects commonly associated with conventional cleaning methods, a limited range of consumer knowledge on its characteristics can lead to altered perception and purchasing behavior within the industry. In this study, I surveyed customers of a GreenEarth cleaner, relaxx Dry Cleaning, in San Diego, California to identify statistically significant relationships between knowledge, demography, perception, and purchasing behavior. My results show that customers have a limited knowledge of the GreenEarth process. My analysis also shows a significant relationship between gender and customer perception in five categories (sustainability, cost, customer health, worker health, cleaning effectiveness) with p-values of 9.58e-05, 1.73e-05, 5.21e-05, 6.19e-06, and 0.000794 respectively, which may indicate that green cleaners need to aim different marketing strategies at male and female customers. Overall, my study highlights the potential for green companies to both expand their customer base and be better promoters of environmental responsibility by improving corporate sustainability initiatives.

KEYWORDS

Percholoethylene (PCE), decamethylcyclopentasiloxane (D5), consumer education, corporate sustainability, environmental responsibility

INTRODUCTION

Consumer knowledge of environmental pollutants remains a key issue in the development and branding of modern industries. With a lack of consumer education, the establishment of green companies within an industry may prove difficult (Griffith and Johnson 1996). The dry cleaning industry provides an example of an industry where environmental knowledge may affect the marketing of a product. In this industry, widespread use of a chemical known as Perchloroethylene (PCE) has been widely critiqued. Chronic exposure to PCE residues poses many potential health risks to both workers and the general public (Weiss 1995). Studies have shown increased risks of carcinomas and decreased organ functionality in exposed individuals (Weiss 1995, Liteplo and Meek 2008). Primary routes of human exposure that present high risks include inhalation, ingestion of contaminated water, and dermal exposure (DHHS 2011). Increased environmental risks have created public concern and led to the development of other solvents (Maxwell 2011). Adverse effects of PCE residues have increased attention towards alternative solvents, such as Decamethylcyclopentasiloxane (D5).

D5 represents an emerging dry cleaning solvent, as it helps to mitigate environmental and health effects commonly associated with dry cleaning methods. D5 is a silicone-based solvent used in the GreenEarth process, which has recently been adopted by an expanding "green" sector of the dry cleaning industry (Morris and Wolf 2006). GreenEarth cleaning incorporates the same techniques as traditional dry cleaning, but substitutes PCE with liquid silicone that "safely breaks down into natural elements [sand (SiO_2), water, and CO_2]…that are safe for the air, water, and soil," (GreenEarth 2011). This process remains fairly new within the dry cleaning industry, however it has become more common. Dry cleaning businesses have incorporated D5 as a sustainable business practice to entice a new consumer-base. Businesses market D5 as more sustainable due to decreased bioaccumulation, biomagnification, and ecotoxicity impacts (Board of Review 2011). Lower risk of D5-based solvents proves their potential as an alternative to PCE. Although many businesses have converted to D5 as a PCE alternative, a lack of consumer knowledge on the difference between green and conventional dry cleaning methods persists (Honabarger 2011). A lack of consumer knowledge of GreenEarth presents a problem for businesses and, more broadly, for the diffusion of 'green' dry cleaning techniques, as this lack of knowledge may lead to altered perception and consumer behavior (Bohlen et al. 1996).

Lack of adequate consumer knowledge about the characteristics of D5 can potentially affect both consumer perception and purchasing behavior in the dry cleaning industry. Though many green companies attempt to entice environmentally conscious consumers with sustainable products, these efforts prove inadequate if marketing methods do not effectively educate the customer on the benefits (Honabarger 2011, Andersen 1998). Green dry cleaning businesses need to better develop campaigns for increasing environmental concern and effectively educating customers on what separates green from conventional options (Bohlen et al. 1996, Martin and Simintiras 1995). Consumer knowledge directly relates to consumer perception of an industry as well. Perception of a particular industry is the "most consistent predictor of pro-environmental purchasing behavior" and is most affected by the extent of consumer knowledge of the product (Bohlen et al. 1996). In developing awareness for the green option, companies can expand consumer knowledge of the product and can increase favorable purchase behavior through perception (Martin and Simintiras 1995). Purchasing behavior can also be affected by demographic factors such as ethnicity, income level, age, and political orientation (Chai and Chen 2010). There is an inadequate understanding of how purchasing behavior within the dry cleaning industry is affected by demographic factors, consumer knowledge, and perception.

In this study, I attempt to understand purchasing behavior within the dry cleaning industry by asking a central research question: How does consumer knowledge of the GreenEarth process, perception, and demography correlate with purchasing behavior within the dry cleaning industry? In particular, I examine: 1) whether there is a discrepancy between customers knowledge of GreenEarth cleaning and conventional dry cleaning, 2) the extent to which consumer knowledge about dry cleaning methods affects consumer perception of green dry-cleaning and traditional dry cleaning, and 3) how consumer demography affects consumer perception of the industry and consumer purchasing behavior. I hypothesize that there is a knowledge gap surrounding green dry cleaning, an altered perception of the industry due to this lack of knowledge, and specific demographic factors that all affect consumer purchasing behavior.

METHODS

Study system

To conduct a study investigating knowledge, perception, and purchasing behavior in the dry cleaning industry, I surveyed customers of a GreenEarth cleaner called relaxx Dry Cleaning. I chose relaxx Dry Cleaning because its operation has used D5 solvents since its establishment. Relaxx is located in a subset of San Diego, California called Linda Vista. The company has a customer base with over 2,000 customers, which allotted a large sample population for survey distribution. The median age of the Linda Vista neighborhood in San Diego, California, in which relaxx Dry Cleaning is located, was 34.1 years of age for males and 37.2 years for females as of 2011. The population contained about 45% of both Asian and Hispanic individuals and about 55% white individuals (City Data, 2011). The median household income (as of 2011) was estimated to be $58, 061. The gender distribution indicates 49.9% of individuals living in Linda Vista are male and 50.2% are female (City Data, 2011).

Data collection

To accurately test my hypotheses, I surveyed customers from relaxx Dry Cleaning through data collection using the web-based survey method called Surveymonkey. I surveyed customers about their knowledge of dry cleaning processes, perception of the dry cleaning industry, and motives for their preference in dry cleaning options. I collected customer email addresses from the customer database of relaxx. I distributed the survey electronically through emails that contained links to my survey on Surveymonkey, which were sent to the entire customer database of each operation. To incentivize customers to take my survey, I offered a $5 credit for individuals who completed the survey, which helped to alleviate potential response bias.

I collected qualitative responses using Likert scale, ranking, and multiple-choice questions. These questions resulted in nominal, ordinal, and categorical data responses for use in my data analysis. Following data collection, I converted some of the Likert scale responses to a numerical scale to enable ANOVA and t-test analysis. I began the survey with a section on customer demographics, including income, gender, and age group, which represented categorical data. I then included questions to study the relationship between consumer knowledge (i.e. the difference

between GreenEarth cleaning and traditional dry cleaning) and consumer perception. To test consumer perception of both GreenEarth, traditional, and dry-cleaning in general, I used survey questions that involved ranking and rating on a scale. For example, I asked customers how they perceived relaxx in terms of sustainability on a scale from 1 to 5 (1 being very negative and 5 being very positive). I also administered open-ended questions at well that asked for further customer elaboration on previous statements regarding purchasing behavior.

Data analysis

Overview

To summarize the data, I used a variety of descriptive statistics, including histograms and pie charts, using MS Excel and the R statistical software package. To summarize the demographic data, for example, I used Excel to prepare histograms of age, income, political orientation, and gender to accurately display which demographics were most prevalent within each group of customers. I also summarized the perception, knowledge, and purchasing behavior responses within histograms that displayed which consumer responses were most common. I ran one-way ANOVAs to determine if statistically significant relationships existed in regards knowledge, perception, and behavior. I also conducted linear regression models to determine if there was evidence of linear correlations among knowledge, perception, behavior, and demographics.

Consumer Knowledge and Perception

To test for differences in knowledge and perception among relaxx customers, I first coded survey responses. I coded my survey responses for two key questions: customer perception of green dry-cleaning versus traditional in multiple categories and their knowledge of which chemicals are used in each. For my codes, I paired each customer's knowledge with a number between 0 and 3 based on how many of the three chemicals (D5, Hydrocarbon, and PCE) they correctly matched with either green or convention cleaning. I also used a scale from 1-5 for perception of conventional versus green dry cleaning based on their responses to their belief of each method's sustainability, cost, customer health, worker health, and cleaning effectiveness.

Following the coding of these survey responses, I ran a one-way ANOVA test for each of the five perception categories to determine the relationship between knowledge and various perception categories. Specifically, these statistical tests determined if there was a difference of customer perception rankings between knowledge levels. In order to further investigate a potential relationship between knowledge and perception, I conducted a linear regression model. I ran a linear regression for each of the perception categories to determine if there was a linear relationship between the two factors. For the one-way ANOVAs and linear regressions, my x-variable was knowledge and my y-variable was perception.

Consumer Knowledge and Behavior

To test for a relationship between knowledge and purchasing behavior, I used the coded survey response data previously created to allow me to conduct a one-way ANOVA. This statistical test determined if there was a significant difference of behavior between knowledge levels. The knowledge data was the same coded survey data based on chemical knowledge of customers. I used two different behavior survey questions to test against customer knowledge. One question asked customers the length of time they had used relaxx Dry Cleaning. The other question asked customers to rank factors (environmental effect, chemicals used, price, convenience, personal health) by importance in their initial decision to use relaxx Dry Cleaning. Based on these rankings, each customer was given a green behavior score from 1-5 (1 being the least environmentally conscious customer and 5 being the most). For example, customers that received a score of 5 would be more environmentally conscious and hence would report the list of factors as follows: environmental effect, chemicals used, personal health, price, and convenience in order of importance. Each of these questions was used for a separate one-way ANOVA. For these ANOVAs, the x-variable was knowledge and the y-variable was purchasing behavior, either length of use of green behavior score. I also ran a linear regression model for each of the two behavior identifiers to determine if a linear relationship existed between knowledge and behavior. For these regressions, the x-variable was knowledge and the y-variable was purchasing behavior, either length of use or green behavior score.

Consumer Demographics and Perception

To test the effect of customer demographics on perception, I conducted one-way ANOVA tests and linear regressions for each of the five perception categories using R-commander to create a comparison across each demographic characteristic. The purpose of the ANOVAs was to determine if there were differences of perception ratings between demographic groups. For example, I completed a one-way ANOVA for race, gender, age, political orientation, and income level for each of the perception categories (sustainability, cost, consumer health, worker health, and cleaning effectiveness). My x-variables for these tests were race, gender, income, political orientation, and age. My y-variables were the perception ratings (1-5).

Consumer Demographics and Behavior

To test the effect of consumer demographics on purchasing behavior, I conducted one-way ANOVA tests using R-commander to create a comparison of behavior across each demographic characteristic. I used both behavioral identifiers used in the knowledge and behavior ANOVAs to test against each demographic category. The purpose of these ANOVAs was to determine if there were differences between demographic groups and their behavior in terms of the two customer behaviors: length of use and the green behavioral score. The green behavior score that was used for these ANOVAs was the same as those used for the ANOVA for testing knowledge versus behavior. My x-variables for these two tests were race, gender, income, political orientation, and age. My y-variables were the behavioral score and length of use. I also conducted a linear regression model for each of the behavior factors and demographic categories to identify a potential linear relationship between behavior and customer demographics.

RESULTS

Sample population demographics

Through my data collection of consumer surveys, I found that the sample population possessed its own set of unique characteristics. I found that the surveyed relaxx customers has relatively equal proportions of male and female individuals, consisting of 52% female and 48% male (Figure 1).

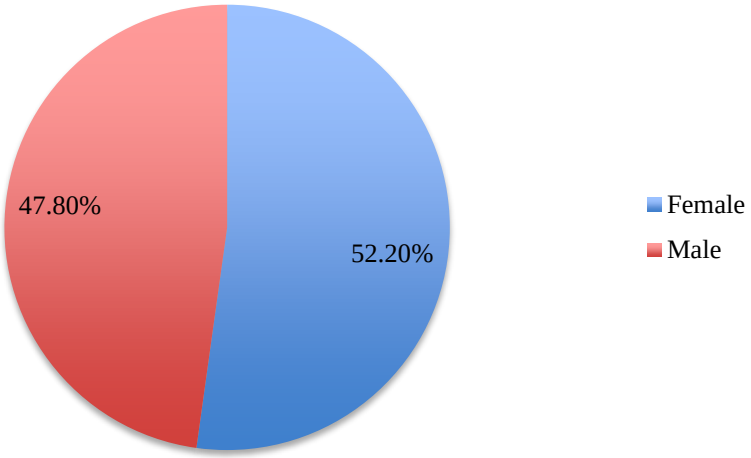

Figure 1. Gender distribution of sample population.

The sample population's age distribution consisted of a large portion of individuals, 46%, between the ages of 31-45, followed by 24% below the age of 20 and 20% between the ages of 46 and 60 (Figure 2).

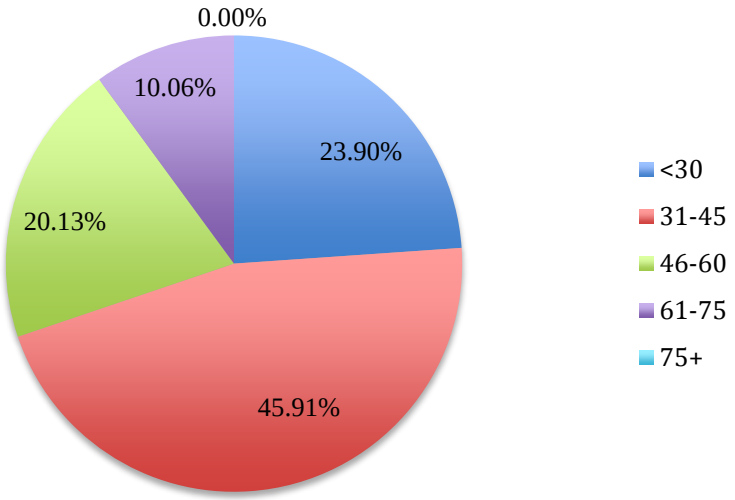

Figure 2. Age distribution of sample population.

The income distribution consisted of a majority of individuals either between $100,00-150,000 or above $150,000 income annually (Figure 3).

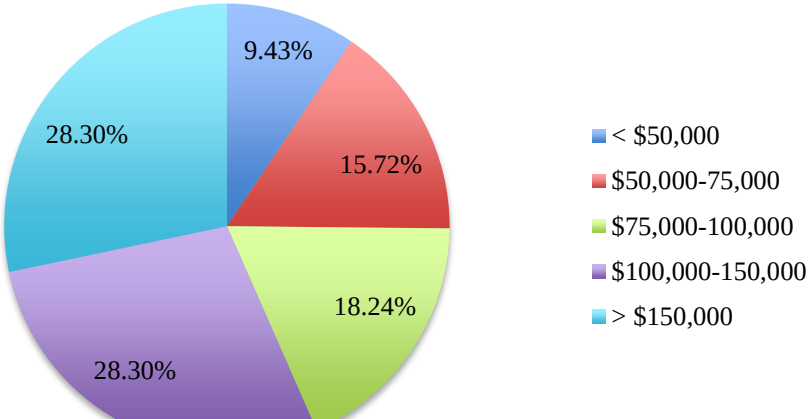

Figure 3. Income distribution of sample population.

The identified race/ethnicity of the sample population were as follows: 82% white, 9% Asian, 6% Latino, 2% African American, and 1% Native American (Figure 4).

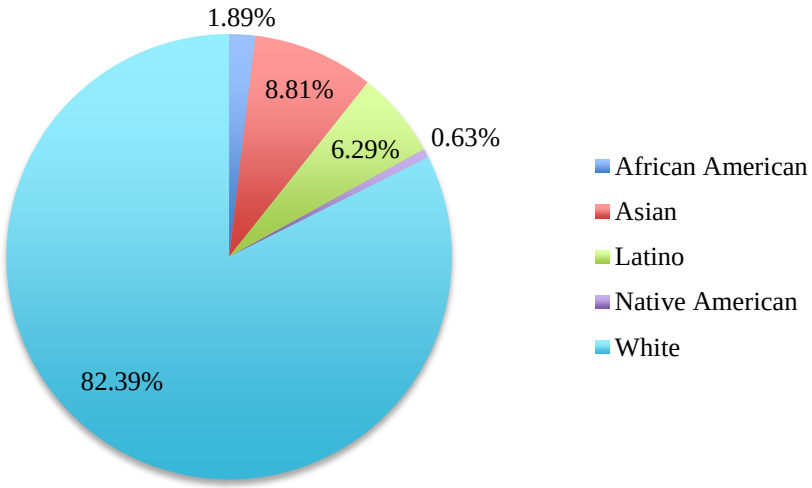

Figure 4. Race/ethnicity distribution of sample population.

The political orientation distribution of surveyed customers were as follows: 39% moderate, 30% moderately liberal, 18% moderately conservative, 8% very liberal, and 6% very conservative (Figure 5).

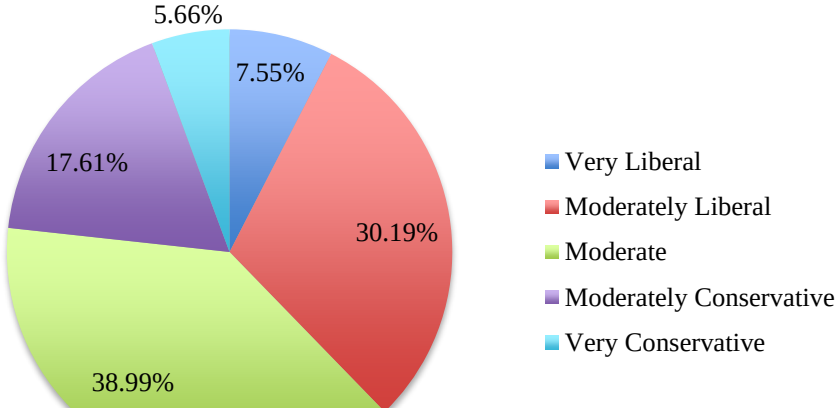

Figure 5. Political orientation distribution of sample population

Consumer knowledge and perception

The survey responses for customer chemical knowledge of hydrocarbon, D5, and PCE show that a majority (73%) of surveyed individuals correctly paired PCE with conventional dry cleaning, while smaller percentages correctly placed D5 with green or correctly paired PCE and D5, 10% and 11% respectively (Figure 7).

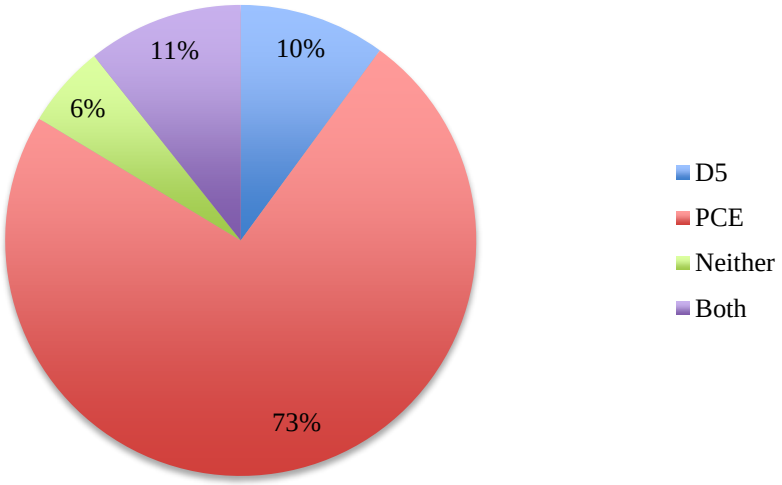

Figure 7. Customer chemical knowledge distribution.

Through a one-way ANOVA for customer perception ratings, I found that there is no statistically significant difference between the perception ratings for each of the five perception categories for the knowledge levels (p-values > .05). The p-values of all five one-way ANOVAs conveyed that there was no significant difference between knowledge levels and their perception ratings in each of the five categories (Table 1).

Table 1. Knowledge vs. perception ANOVA results. (no significant results).

Perception Category	Df	F value	Pr (>F)
Sustainability	3	1.155	0.329
Cost	3	1.266	0.288
Consumer Health	3	0.422	0.737
Worker Health	3	0.236	0.871
Cleaning Effectiveness	3	0.651	0.583

Through a linear regression analysis for each of the perception categories, I found that there were no significant linear relationships between the five perception categories and the sampled population's chemical knowledge base. The p-values of all five linear regression models were above the statistically significant level of 0.05, signifying no statistically significant relationships. Also, the R^2 values of the five linear regression models were too low to indicate the relationship as representing enough of the data change in the perception categories (Table 2).

Table 2. Knowledge vs. perception linear regression results. (no significant results).

Perception Category	F-value	P-value	R^2 value
Sustainability	0.04904	0.825	0.0003122
Cost	0.4065	0.5247	0.002582
Consumer Health	7.211e-06	0.9979	4.593e-08
Worker Health	0.5192	0.4723	0.003296
Cleaning Effectiveness	0.1334	0.7154	0.0008492

Consumer knowledge and behavior

Through a one-way ANOVA for knowledge and each of the two behavior identifiers (green behavior score and length of use), I found that there was no statistically significant difference for behavior between the different levels of consumer chemical knowledge (p-values > .05). For green

behavior versus knowledge, the f-value was 0.303 and p-value was 0.823. For customer length of use between knowledge levels, I also found that there was no statistically significant difference for behavior between the different levels of consumer chemical knowledge with an f-value of 0.932 and p-value of 0.427.

Through a linear regression for customer knowledge versus green behavior, I found that the R^2 value of 0.002502 signifies that only .25% of the variance in behavior can be explained by customer chemical knowledge. Overall, there is no statistical evidence to support a relationship between knowledge and behavior (p=0.5312). For the linear regression investigating a relationship between knowledge and use behavior of customers, I found that the R^2 value of 0.0135 signifies that only 1.36% of the variance in use behavior can be explained by customer chemical knowledge. Overall, there was no statistical evidence to support a linear relationship between knowledge and use behavior (p=0.1433).

Consumer demographics and perception

Through one-way ANOVAs for each of the demographic characteristics and perception categories, I found that for gender there was a statistically significant difference of perception rankings between gender groups (p = 9.58e-05) (Table 3). This p-value signifies a statistically significant difference between males and females in their perception based on all five perception categories (p-value < .05).

Table 3. Gender vs. perception ANOVA results. (no significant results).

Perception Category	Df	F value	Pr (>F)
Sustainability	1	16.03	9.58e-05***

Cost	1	19.66	1.73e-05***
Consumer Health	1	17.31	5.21e-05***
Worker Health	1	21.65	6.91e-06***
Cleaning Effectiveness	1	11.71	0.000794***

For age, I found that there is no statistically significant difference of perception rankings between age groups (Table 4). These p-values for each of the five ANOVAs signify no statistically significant difference between the four age groups (<30, 31-45, 46-60, 61-75) in their perception based on all five perception categories (p-values > .05).

Table 4. Age vs. perception ANOVA results. (no significant results).

Perception Category	Df	F value	Pr (>F)
Sustainability	3	2.166	0.0942
Cost	3	0.613	0.608
Consumer Health	3	2.257	0.084
Worker Health	3	0.519	0.67
Cleaning Effectiveness	3	2.657	0.0504

For political orientation, I found that there is no statistically significant difference of perception rankings between orientation groups (Table 5). The p-values for each of the five ANOVAs signify no statistically significant difference between the five political orientation groups (very liberal, moderately liberal, moderate, moderately conservative, very conservative) in their perception based on all five perception categories.

Table 5. Political Orientation vs. perception ANOVA results. (no significant results).

Perception Category	Df	F value	Pr (>F)
Sustainability	4	0.818	0.515

Cost	4	0.393	0.814
Consumer Health	4	0.793	0.531
Worker Health	4	0.72	0.58
Cleaning Effectiveness	4	0.919	0.455

For race, I found that there is no statistically significant difference of perception rankings between customer race groups (Table 6). These p-values for each of the five ANOVAs signify no statistically significant difference between the five political race categories (African American, Asian, Latino, Native American, White) in their perception based on all five perception categories.

Table 6. Race vs. perception ANOVA results. (no significant results).

Perception Category	Df	F value	Pr (>F)
Sustainability	4	0.916	0.456
Cost	4	1.026	0.396
Consumer Health	4	0.91	0.46
Worker Health	4	0.106	0.98
Cleaning Effectiveness	4	0.844	0.499

For income level, I found that there is no statistically significant difference of perception rankings between customer income levels (Table 7). These p-values for each of the five ANOVAs signify no statistically significant difference between the five income levels (above $150,000, $100,000-150,000, $75,000-100,000, $50,000-75,000, below $50,000) in their perception based on all five perception categories.

Table 7. Income Level vs. perception ANOVA results. (no significant results)

Perception Category	Df	F value	Pr (>F)

Sustainability	4	2.172	0.0747
Cost	4	1.781	0.135
Consumer Health	4	0.82	0.514
Worker Health	4	0.673	0.611
Cleaning Effectiveness	4	0.919	0.455

Through a linear regression model for gender and perception, I found that there are statistically significant linear relationships for all of the gender and perception categories. All of the R^2 values are large, which suggests strong relationships between gender and customer perception. The p-values are all smaller than a 0.05 significance level, indicating statistical significance (Table 8).

Table 8. Gender vs. perception linear regression results.

Perception Category	F-value	P-value	R^2 value
Sustainability	16.03	9.579e-05	0.09266
Cost	19.66	1.733e-05	0.1113
Consumer Health	17.31	5.207e-05	0.09932
Worker Health	21.65	6.911e-06	0.1212
Cleaning Effectiveness	11.71	0.0007944	0.06939

For age, I found that although the p-values appeared statistically significant (p-values < .05), the R^2 values indicated that only a small percentage of the changes in customer perception could be explained by age (Table 9).

Table 9. Age vs. perception linear regression results.

Perception Category	F-value	P-value	R^2 value

Sustainability	2.977	0.0864	0.01861
Cost	0.007081	0.933	4.51e-05
Consumer Health	4.466	0.03615	0.02766
Worker Health	0.5208	0.4716	0.003307
Cleaning Effectiveness	7.028	0.008848	0.04285

For political orientation, I found small R^2 values for each of the perception categories. This signifies that only a small portion of the variance in perception can be explained by customer political orientation (Table 10). Overall, there is no statistical evidence to support a linear relationship between political orientation of customers and their perception of relaxx Dry Cleaning.

Table 10. Political Orientation vs. perception linear regression results.

Perception Category	F-value	P-value	R^2 value
Sustainability	0.9204	0.3389	0.005828
Cost	0.809	0.3698	0.005126
Consumer Health	0.04505	0.8322	0.0002869
Worker Health	0.8493	0.3582	0.005381
Cleaning Effectiveness	0.8254	0.365	0.00523

For race, I found small R^2 values for each of the perception categories. This signifies that only a small portion of the variance in perception can be explained by customer race/ethnicity (Table 11). In addition, the calculated p-values are all above a 0.05 significance level. Overall, there is no statistical evidence to support a linear relationship between race of customers and their perception of relaxx Dry Cleaning.

Table 11. Race vs. perception linear regression results.

Perception Category	F-value	P-value	R^2 value
Sustainability	0.8582	0.3557	0.005436
Cost	2.189	0.141	0.01375
Consumer Health	1.034	0.3108	0.006541
Worker Health	0.06375	0.801	0.0004059
Cleaning Effectiveness	0.4013	0.5273	0.002549

For income, I found small R^2 values for each of the perception categories. This signifies that only a small portion of the variance in perception can be explained by customer income (Table 12). In addition, the calculated p-values are all above a 0.05 significance level. Overall, there is no statistical evidence to support a linear relationship between income of customers and their perception of relaxx Dry Cleaning.

Table 12. Income vs. perception linear regression results.

Perception Category	F-value	P-value	R^2 value
Sustainability	1.08	0.3003	0.006833
Cost	0.8	0.3725	0.00507
Consumer Health	0.0514	0.8209	0.0003273
Worker Health	0.7093	0.401	0.004498
Cleaning Effectiveness	0.789	0.3758	0.005

Consumer demographics and behavior

Through one-way ANOVAs for each of the demographic characteristics and two different behavioral factors (use behavior and green behavior score), I found that there is no statistically significant difference of either of the two behaviors between demographic categories (gender, age, political orientation, race, income) (Table 13 and 14). These p-values for each of the ANOVAs

signify no statistically significant difference within each demographic category in consumer behavior in relation to the initial choice of relaxx Dry Cleaning or the length of use of relaxx.

Table 13. Demographics vs. green behavior ANOVA results. (no significant results).

Demographic Category	Df	F value	Pr (>F)
Gender	1	3.862	0.0511
Age	3	0.113	0.952
Political Orientation	4	0.899	0.466
Race	4	0.994	0.44
Income Level	4	0.429	0.787

Table 14. Demographics vs. use behavior ANOVA results. (no significant results).

Demographic Category	Df	F value	Pr (>F)
Gender	1	1.199	0.275
Age	3	1.332	0.266
Political Orientation	4	1.32	0.265
Race	4	1.156	0.332
Income Level	4	1.722	0.148

Through the linear regression model for each demographic category and both behavior factors, I found small R^2 values. This signifies that only a small portion of the variance in behavior, both use behavior and green behavior scores, can be explained by customer demographics (Table 15 and 16). Overall, there is no statistical evidence to support a relationship between demographics and behavior.

Table 15. Demographics vs. green behavior linear regression results.

Demographic Category	F-value	P-value	R^2 value
Gender	3.862	0.05115	0.02401
Age	0.003829	0.9507	2.438e-05
Political Orientation	1.629	0.2037	0.01027
Race	2.747	0.09946	0.1719
Income Level	0.004582	0.9461	2.918e-05

Table 16. Demographics vs. use behavior linear regression results.

Demographic Category	F-value	P-value	R^2 value
Gender	1.199	0.2752	0.007578
Age	0.9292	0.3366	0.005884
Political Orientation	0.3663	0.5459	0.002328
Race	3.653	0.0578	0.02274
Income Level	0.2094	0.6479	0.001332

DISCUSSION

The fact that I found only a small range of customer knowledge on GreenEarth Cleaning as compared to traditional dry cleaning suggests that green dry cleaning companies should focus on consumer knowledge through both marketing techniques and purely educational methods. My survey results collected with respect to customer chemical knowledge of the GreenEarth process (i.e., the majority of customers failed to link D5 solvents to green dry cleaning) highlighted the

limited range of customer knowledge. My analysis also demonstrated the importance of gender on customer perception, which may indicate that green cleaners, and more broadly green companies, should aim different marketing strategies and educational methods to male versus female customers. Overall, my results suggest that green companies need to improve marketing and education to their desired consumer base, which can help lead to more informed purchasing decisions by industry customers. If done efficiently, there may be a potential for green companies to both expand their customer base and be better promoters of environmental responsibility.

Inadequate consumer knowledge: potential for expansion

Although there were no statistically significant relationships between customer perception, behavior and knowledge levels, my survey results suggest a deficiency in customer knowledge about the GreenEarth and traditional dry cleaning processes. Customer knowledge of the process involving D5-based solvents proved inadequate when compared to knowledge on PCE-based processes, as only 10% knew D5 was used in GreenEarth Cleaning. This may indicate that marketing methods currently employed by relaxx Dry Cleaning do not efficiently educate its current customer base. A customer's willingness to pay more for a green product has been linked to the extent of consumer knowledge of the product as well as the perception of the company providing the product (Cordell 1997). In other words, by better educating consumers on both the process of GreenEarth and relaxx itself, relaxx Dry Cleaning could likely increase their current customer base, as their final dry cleaning product often costs more compared to traditional dry cleaning. Previous research suggests that consumers with negative perceptions of green cleaning may also be the same individuals with lower levels of knowledge about the process (Sujan 1985). In developing customer awareness of the green option, companies can increase knowledge of the product and increase the likelihood of purchasing behavior in favor of the green product, as consumer knowledge is thought to affect consumer evaluation of products and decision-making (Barbaro-Forleo, Bergeron, and Laroche 2001).

Green business responsibilities and improvements

While it is important to increase customer knowledge of chemical processes, my results also suggest that green corporations, like relaxx, could more widely promote the idea of environmental responsibility to achieve both improvements in corporate sustainability initiatives and increases in customers. My survey results show that more relaxx customers were more motivated by convenience and cost than the chemicals used or the effect to their personal health and environment. By reinforcing green behavior and motivating less environmentally conscious existing customers to behave in a more conscious manner, green companies could promote environmental responsibility among populations who might otherwise be disinterested. By increasing potential dry cleaning customers' education about green companies and their products, green companies can further create a foundation for themselves within the marketplace. Also, due to the usual price increase for green products, it remains important for green companies to reinstate their purpose of corporate sustainability. Studies have suggested that consumers who are willing to spend more for green products "believe that firms do not act responsibly toward the environment," (Barbaro-Forleo, Bergeron, and Laroche 2001).

One technique for reinforcing a green cleaner's current customer base is to produce popular, positive slogans that help to portray individuals making a difference with the environment by choosing GreenEarth cleaning over traditional methods (Barbaro-Forleo, Bergeron, and Laroche 2001). Increasing research on the profile of potential green dry cleaning customers can serve as a foundation for increasing company knowledge on how to better market to these individuals. However, it has also been suggested that there remains a large segment of undecided individuals who may be persuaded to purchase green products. This highlights a key opportunity for marketers to successfully create different strategies to "convert some of the undecided to move to the green segment," (Barbaro-Forleo, Bergeron, and Laroche 2001). Furthermore, marketing of a green product should focus on demonstrating the specific beneficial qualities, rather than just highlighting the product as 'green' and not actively engaging the consumer (Baumann and Rex 2007). In this case, green companies should allot marketing funds to both advertising and purely educational materials as well as other means of customer engagement (e.g. seminars, pamphlets, etc.).

Gender and perception: diversified marketing

The statistically significant relationships between gender and perception of relaxx Dry Cleaning suggests that gender is a key factor to address when marketing to customers. Females and males recorded statistically significant differences in the mean value (1-5 scale) for each perception category (sustainability, cost, consumer health, worker health, cleaning effectiveness), suggesting the need for green companies to target each gender individually rather than collectively. Currently, most green dry cleaning companies market to green consumers as one segment while it may benefit profits and expand customer bases to market to each gender separately. This may allow for a more cohesive marketing plan that can increase both genders' perceptions of green dry cleaning in general and reinforce favorable purchasing behavior by increasing consumer knowledge.

My research also suggests that, for some unidentified reasons, males and females perceive relaxx Dry Cleaning, and potentially green companies in general, differently. Although my study did not specifically investigate the reasoning behind gender differences of perception of relaxx Dry Cleaning, literature suggests some common reasons that may cause this discrepancy. In terms of environmental effects and risks, gender differences in perception of green products often results because of social roles, traditional gender roles, sociopolitical factors, and economic roles (Gustafson 1998). Green companies can use demographic statistics and other measures of these listed factors to better understand how to target each gender respectively in order to expand their consumer base and influence purchasing behavior.

Another key point for green companies to consider when organizing an educational marketing campaign is the importance of 'gender role attitudes.' An individual's gender role attitudes reflect beliefs about the roles of males and females. Generally, these attitudes help to categorize socially acceptable behaviors for men and women (Arnold and Fischer 1998). Gender role attitudes can be as important as predictors of consumer perception and behavior as gender identity itself (Arnold and Fischer 1998). Market segmentation based on both gender identification and role attitudes represent two key factors for green companies to consider. Based off of my findings, marketers may be more inclined to apply gender-based marketing techniques, however some may reinforce existing negative beliefs about a consumer's gender identity. More specifically, advertising may need to be more cognizant of marketing messages that imply a "stereotypical gendered brand image" because, as it may be an effective tool for convincing some consumers, it may deter others from converting to green cleaning (Ye 2008).

Unexpected results: potential for expansion

While my study suggests potential opportunities for green businesses, many of the results proved opposite to my expectations when beginning my research project. While I did find a deficient range of consumer knowledge on GreenEarth cleaning as suspected, I found no statistically significant relationships between consumer knowledge levels and their perception and/or purchasing behavior. The relationship between these factors within the dry cleaning industry still remains unclear. Additionally, I hypothesized that there was a relationship between demography, perception, and purchasing behavior. Although I identified gender as a factor affecting consumer perception of green dry cleaning, I did not find a clear relationship between the other demographic characteristics (income, age, ethnicity, political orientation) and consumer perception. While these unexpected results did not entirely support my original hypotheses, they lead to areas for continued research in the future. Also, the significant results that were found suggest room for improvement in the marketing strategies of green companies.

Limitations and future research

While my results suggest that limited consumer knowledge and gender provide key marketing implications for green dry cleaners, there were some limitations to my study. Certain survey questions may have produced confusion within the sample population, as the wording and chemical names were more scientific than common. This may have produced response bias within the responses for the chemical knowledge of the surveyed customers. Due to relaxx Dry Cleaning being situated within a more suburban area, my survey results might not be applicable to an urban dry cleaner population, as the customers may prove different in terms of demographics, knowledge, perception, and/or behavior. Future researchers should attempt to survey customers of both green and non-green operations to get a more complete picture of the differences between the two customer bases. Additionally, intervention studies could be used with relaxx and traditional customers to test the effectiveness of different marketing techniques in increasing consumer knowledge and altering perception. Furthermore, a study that attempts to determine the underlying

reasons for differences between male and female perceptions can help to suggest further opportunities for green companies and marketing techniques.

Broader implications and conclusions

The primary results of my study suggest that inadequate consumer knowledge of GreenEarth cleaning exists and that gender influences consumer perception in the dry cleaning industry. These results present marketing opportunities for green companies within the industry to further expand customer bases and promote environmental responsibility. Some evidence in my study suggests a lack of range within consumer knowledge on chemicals used in green versus traditional cleaning, however it remains unclear the effect this result has upon both perception and consumer purchasing behavior within the industry. While my results were unexpected, this study leads to broader implications about further improving marketing strategies by green dry cleaning companies to better educate consumers and suggests room for future research in the relationships between knowledge, perception, and behavior. Not only does this present an opportunity for green companies to better market to customers about sustainability, but also highlights the potential profitability involved with corporate responsibility. My study's results suggest that, along with relaxx owner's motives, green customers are more motivated by price and convenience than environmental responsibility of a company. My study serves as a good case study depicting that pricing and responsibility may be linked, however the customer needs to be made aware of the connection. Green companies can use these results towards research on a desired consumer base to better target new individuals and create favorable, more informed consumer decisions within the dry cleaning industry.

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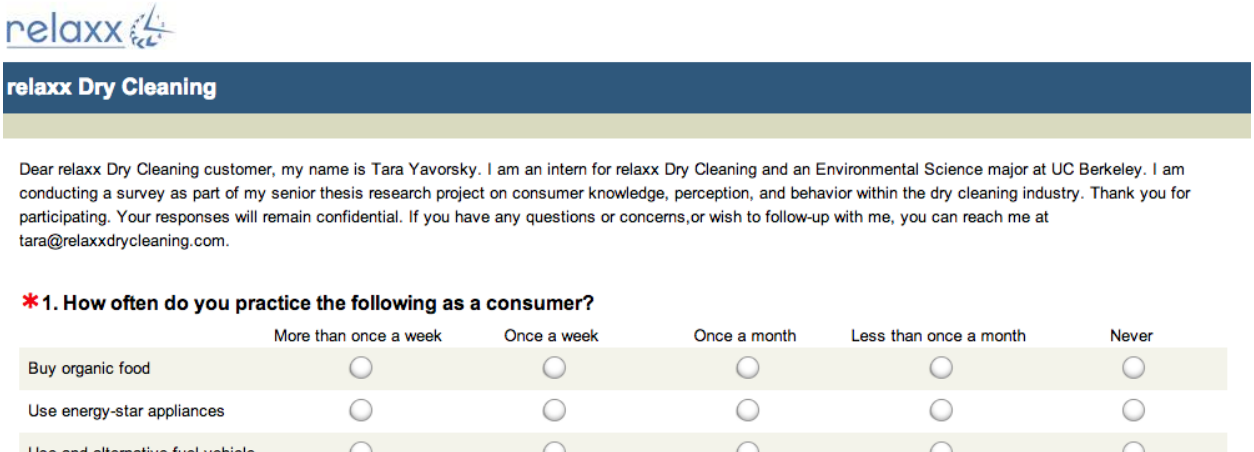
APPENDIX A: Surveymonkey® Survey



relaxx

relaxx Dry Cleaning

Dear relaxx Dry Cleaning customer, my name is Tara Yavorsky. I am an intern for relaxx Dry Cleaning and an Environmental Science major at UC Berkeley. I am conducting a survey as part of my senior thesis research project on consumer knowledge, perception, and behavior within the dry cleaning industry. Thank you for participating. Your responses will remain confidential. If you have any questions or concerns,or wish to follow-up with me, you can reach me at tara@relaxxdrycleaning.com.

***1. How often do you practice the following as a consumer?**

	More than once a week	Once a week	Once a month	Less than once a month	Never
Buy organic food	○	○	○	○	○
Use energy-star appliances	○	○	○	○	○
Use and alternative fuel vehicle	○	○	○	○	○

***2. What chemicals are used in conventional versus green dry cleaning? Check the one that best fits each.**

	Green	Conventional
Decamethylcyclopentasiloxane (D5)	☐	☐
Percholorethylene (PCE)	☐	☐
Hydrocarbon	☐	☐

***3. How did you first hear about relaxx dry cleaning?**

- ○ Friends/peers
- ○ Media/online advertisements
- ○ Business flyers or promotions
- ○ Other (please specify)

***4. What was your first impression about relaxx dry cleaning versus other green businesses?**

	Completely negative	Partially negative	Neither positive nor negative	Partially positive	Completely positive
relaxx Dry Cleaning	○	○	○	○	○
green businesses	○	○	○	○	○

***5. Which features of sustainable businesses do you believe relaxx Dry Cleaning incorporates? Please check all that apply.**

	relaxx Dry Cleaning
Non-hazardous conditions for workers	☐
Non-hazardous chemical residues for customers and general public	☐
Low environmental impacts	☐
Use of recycled materials	☐
Limited waste	☐

content.

	relaxx Dry Cleaning (1-5)	Prior Cleaner (1-5)
Chemical use	⇕	⇕
Cost	⇕	⇕
Image	⇕	⇕
Worker health	⇕	⇕
Consumer health	⇕	⇕
Quality	⇕	⇕

***7. Please rank relaxx Dry Cleaning versus conventional on a scale from 1 to 5 (1 being most negative and 5 being most positive).**

	relaxx dry cleaning	Conventional
Sustainability (1-5)	⇕	⇕
Cost (1-5)	⇕	⇕
Worker Health (1-5)	⇕	⇕
Consumer Health (1-5)	⇕	⇕

***10. How often do you use relaxx?**

- ○ Less than once per month
- ○ Once per month
- ○ Twice per month
- ○ More than twice per month

***11. Do you use dry cleaners other than relaxx? If so, please specify.**

***12. How satisfied are you with relaxx Dry Cleaning services?**

Completely dissatisfied	Partially dissatisfied	Neither satisfied nor dissatisfied	Partially satisfied	Completely satisfied
○	○	○	○	○

***13. Do you plan to continue using relaxx Dry Cleaning?**

- ○ Yes
- ○ No

14. If yes, why?

- ☐ Price
- ☐ Consumer health
- ☐ Delivery
- ☐ Chemicals
- ☐ Decreased environmental impacts
- ☐ Quality
- ☐ Convenience

Other (please specify)

15. If no, why?

- ☐ Price
- ☐ Service
- ☐ Consumer health
- ☐ Environmental effects

Other (please specify)

16. Do you have any suggestions for improved service, etc.? Please feel free to elaborate below.

***17. What race/ethnicity are you?**

- ○ African American
- ○ White
- ○ Asian
- ○ Latino
- ○ Native American

Other (please specify)

***18. What is your gender?**

- ○ Male
- ○ Female

Other (please specify)

***19. What age are you?**

○ <30 ○ 31-45 ○ 46-60 ○ 61-75 ○ 76+

***20. How would you characterize your political orientation? Please choose the one that most describes your views.**

Very liberal	Moderately liberal	Moderate	Moderately conservative	Very conservative
○	○	○	○	○

***21. What is your annual household income?**

○ Below $50,000 ○ $50,000-75,000 ○ $75,000-100,000 ○ $100,000-150,000 ○ Above $150,000

Figure A1. Distributed survey to relaxx Dry Cleaning customers. I distributed this survey to all relaxx Dry Cleaning customers through the span of three months by using relaxx's customer database of customer email addresses. Emails were distributed, each containing a link to the survey. I received a total of 161 responses from customers.