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Appliance Energy Efficiency Labels in Costa Rica

Interactive Qualifying Project

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Abstract

Despite Costa Rica's goal to become carbon neutral by 2021, the country burns increasing amounts of imported fuel to meet its energy demands. This creates a need for measures to reduce the amount of energy consumed in the country. The goal of this project, sponsored by the Cámara de Industrias de Costa Rica (CICR), was to develop an energy efficiency label to inform consumers of the energy consumption of household appliances. To do this, we surveyed consumers to assess their opinions on labels and to evaluate features of labels. We next met with organizations involved in the implementation of labels to understand the current process and develop recommendations of improvements. We created a new label that can be used in Costa Rica to help consumers make informed appliance purchasing decisions. This label can be implemented and standardized through the collaboration of all related organizations. Our research furthermore identified several flawed aspects of the current implementation process, which led to recommendations of standardization, communication, and education.

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Authorship Page

The content and information provided in the following IQP report represents the knowledge and understanding of all members of the team. Everyone gave input on the organization and material of each section. Also, the strengths of our team warranted an unusual paper-writing system: Syed Asaad Hussain wrote general ideas that were then clarified by Hanna Schmidtman. Finally, continuity and clarity were ensured by Benjamin Fletcher, who also translated selected material to Spanish. Christopher Keane meanwhile was responsible for all of the data analysis. A more detailed breakdown of authorship is found in the following table:

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RECOMMENDATIONS: 7.2 Final Label	Chris	Hanna
APPENDICES	Chris	All

Table of Contents

Abstract	i
Acknowledgements	ii
Authorship Page	iii
Definitions of Commonly Used Terms	xi
Executive Summary	xiii
Resumen Ejecutivo en Español	xvi
Chapter 1: Introduction	19
Chapter 2: Literature Review	21
2.1 Cámara de Industrias de Costa Rica	21
2.2 Electricity Demands and Energy Efficiency in Costa Rica	21
2.3 Energy Efficiency Labels	24
2.3.1 United States	24
2.3.2 European Union	30
Chapter 3: Objectives	33
Chapter 4: Methodology	34
4.1 Consult Implementation Bodies	34
4.2 Comparative Analysis	35
4.3 Assess Local Perspectives	35
4.3.1 Survey Consumers	36
4.3.2 Survey Sales Representatives:	38
4.3.3 Analysis	38
4.4 Label Designs and Evaluation	39
Chapter 5: Analysis and Results	41
5.1 Consult Implementation Bodies	41
5.1.1 The Law LEY 7447	41
5.1.2 Current Process of Certification	43
5.1.3 Flaws within the Current Implementation Process	48
5.2 Comparative Analysis	52
5.2.1 Results of Case Studies	52

5.2.2 Correlations from Survey Data Regarding Label Drafts	53
5.2.3 Explanation of Error and Bias	60
5.3 Assess Local Opinions	61
5.3.1 Public Opinions of Appliance Features	61
5.3.2 Sales Representative Data	64
5.4 Implementation of Label	66
5.4.1 Final Design Drafts.....	66
5.4.2 Evaluation of Drafts.....	68
Chapter 6: Conclusions	71
Chapter 7: Recommendations	73
7.1 Steps for Future Implementation of an Efficiency Label in Costa Rica	73
7.1.1 Collaboration	73
7.1.2 Standardized Mandatory Label System	75
7.1.3 Education	76
7.1.4 Government Involvement.....	78
7.2 Standardized Label based on Consumer Input and Ley 7447	80
Resumen de Recomendaciones en Español	82
Appendix A: ENERGY STAR Refrigerator Standards	86
Appendix B: Consumer Awareness and Comparative Analysis Survey	87
Demographic Data.....	87
Part 1 – Buying Tendencies	89
Part 2 – International Label Comparison	98
Part 3 – Label features.....	105
EnergyGuide (Etiqueta A) Features	107
European Union Energy Efficiency Label (Etiqueta B) Features	109
ENERGY STAR Question	111
ENERGICE Question	111
Correlation Matrix.....	113
Appendix C: Survey of Sales Representatives.....	116
Appendix D: Draft Label Designs	126

Appendix E: Survey for Label Features and Designs.....	132
Demographic Data.....	132
Part 1 – Importance of Energy Efficiency.....	132
Part 2 – Classification System.....	134
Part 3 – Label Title.....	135
Part 4 – Label Color	138
Part 5 – Label Arrangement	140
Part 6 – Draft Label Designs	142
References.....	144

Table of Figures

Figure 1: Energy Source Distribution in Costa Rica	23
Figure 2: Example of Energy Efficiency Label in the US: ENERGY STAR Label	26
Figure 3: Annotated EnergyGuide Label.....	28
Figure 4: Transitional EnergyGuide Label	29
Figure 5: The European Union Energy Label.....	32
Figure 6: Example of Current Label that Meets Legal Requirements	42
Figure 7: Flow Chart of the Inter-Relationships of Label Implementation Organizations.....	44
Figure 8: The ENERGICE Label.....	46
Figure 9: Example of Refrigerator with Multiple Energy Efficiency Labels in Store.....	52
Figure 10: Recognition of International Labels in Costa Rica	54
Figure 11: Percentages of Purchase Preference Based on International Label.....	56
Figure 12: Most Visually Appealing Example Label	56
Figure 13: Number of Times EnergyGuide and EU Label Features Were Misunderstood.....	57
Figure 14: Average Usefulness rating of six of the EnergyGuide Label Features	58
Figure 15: Average Usefulness Rating of Six of the European Union Energy Label Features....	59
Figure 16: Percentage of Participants Who Had Seen Energy Efficiency Labels	61
Figure 17: Average Rate of Importance for Seven Appliance Features	62
Figure 18: Rating of Importance of Energy Efficiency When Not Compared to Other Features	63
Figure 19: Influence on Label Preference Based on Information or Design	64
Figure 20: Recognition of International Labels between the General Public and Sales Reps.....	65
Figure 21: Six Possible Label Designs (A – F) Used in Evaluations of Consumer Preference ...	67
Figure 22: i) Net Selection of Possible Scaling Systems, ii) Favorite Scaling Option.....	68
Figure 23: i) Net Selection of Possible Titles, ii) Favorite Title Option.....	69
Figure 24: i) Net Selection of Possible Label Designs, ii) Favorite Label Design Option.....	70
Figure 25: Final Recommended Label Design	81
Figure 26: Average Importance Rating of Factors when Shopping for Home Appliances	90
Figure 27: Number of Times Each Factor was Rated as Most Important	90
Figure 28: Average Importance of Factors when Shopping for Home Appliances vs. Gender ...	91
Figure 29: Average Importance of Factors when Shopping for Home Appliances vs. Income ...	91
Figure 30: Importance of Energy Efficiency when Rated on a Scale of 1 to 5	92
Figure 31: Importance of Energy Efficiency on a Scale of 1 to 5 vs. Age of Respondent.....	93
Figure 32: Those Surveyed who Had and Had Not Seen Energy Efficiency Labels	94
Figure 33: Locations where Consumers Obtain Information when Shopping for Appliances.....	96
Figure 34: Those who Would Pay More for a Product if it was Recycled	97
Figure 35: Those who Knew that Products can be Returned to Manufacturers to be Recycled... 98	
Figure 36: Example of International Energy Efficiency Labels Compared in Part 2.....	98
Figure 37: Those Who Recognized At Least One of the International Labels.....	99
Figure 38: Distribution of International Labels that Were Recognized During Our Survey.....	99

Figure 39: Distribution of International Labels that Grabbed the Respondent’s Attention First	100
Figure 40: International Labels That Consumers Thought were Most Visually Appealing.....	101
Figure 41: Most Visually Appealing Label vs. Sex of Respondent.....	101
Figure 42: Participants that Found Information or Design of the Label Most Important.....	102
Figure 43: Preferences of Design or Information on a Label vs. Sex of Respondent.....	102
Figure 44: Distribution of International Labels that Participants Found Most Informative	103
Figure 45: Distribution of International Labels that Participants Found Most Understandable.	103
Figure 46: International Labels that Participants Thought Displayed the Most Information	104
Figure 47: International Labels for Which Participants Would Buy the Product.....	104
Figure 48: International Labels which Participants Considered their Favorite Label Type	105
Figure 49: Specific Characteristics of Energy Efficiency Label Features Examined.....	106
Figure 50: EnergyGuide Features Participants Found Useful	107
Figure 51: Number of Times a Feature of EnergyGuide was Not Understood	108
Figure 52: Number of Times Each Feature of EnergyGuide was Rated as Most Useful	108
Figure 53: Usefulness of European Union Label Features	109
Figure 54: Number of Times a Feature of the European Union Label Was Not Understood	110
Figure 55: Number of Times Each Feature of the European Label Was Rated Most Useful.....	110
Figure 56: Consumers Who Would Buy an Appliance with ENERGY STAR.....	111
Figure 57: The ENERIGICE Label Developed by ICE	111
Figure 58: Distribution of Participants Who Had and Had Not Seen the ENERIGICE Label	112
Figure 59: Important of Energy Efficiency to Consumers According to Sales Reps.....	119
Figure 60: Sales Reps that Use Energy Efficiency to Persuade Consumers to Buy Appliances	120
Figure 61: Sales Reps that Think a Standardized Energy Efficiency Label Would be Useful...	121
Figure 62: Sales Reps that Think a Energy Efficiency Label Would Promote Products?.....	123
Figure 63: Draft Label A, Minimalist and Highly Informative Law Complaint Except Title....	126
Figure 64: Draft Label B, Designed to be Informative and Simple, but Not Law Compliant....	127
Figure 65: Draft Label C, Designed to Test Extremely Simple Label, but Not Law Compliant	128
Figure 66: Draft Label D, Designed to Test Unique Label Shapes, butNot Law Compliant	129
Figure 67: Draft Label E, Incorporate as Many Colors as Possible andFully law compliant.....	130
Figure 68: Draft Label F, Official and Fully Law Compliant Except for Label Title	131
Figure 69: Response Count of Each Level of Energy Efficiency Importance.....	133
Figure 70: Those Who had Seen Energy Efficiency Labels Before	133
Figure 71: Visual aid for Energy Efficiency Comparison Scale Systems for Survey Two.....	134
Figure 72: Number of Responses for Best and Worst Scale System.....	135
Figure 73: Net Response to Each Type of Scale System.....	135
Figure 74: Visual aid for Potential Label Titles for Second Survey.....	136
Figure 75: Number of Responses for Best and Worst Label Title.....	137
Figure 76: Net Response to Each Label Title	137
Figure 77: Visual Aid for Potential Label Colors for Second Survey	138
Figure 78: Number of Responses for Best and Worst Label Color	139

Figure 79: Net Response to Each Possible Label Color	139
Figure 80: Visual Aid for Potential Label Content Arrangements for Second Survey	140
Figure 81: Number of Responses for Best and Worst Label Arrangements.....	141
Figure 82: Net Response to Each Label Layout	141
Figure 83: Number of Responses for Best and Worst Draft Label Designs.....	142
Figure 84: Net Response to Each Example Draft Label	143

Table of Tables

Table 1: Locations Where Surveys were Conducted in San José, Costa Rica	36
Table 2: Suggested Committee Members, Roles, and Responsibilities.....	74
Table 3: ENERGY STAR Energy Efficiency Criteria for Residential Fridges and Freezers	86
Table 4: Percentage of Survey Respondents by Age Range.....	87
Table 5: Percentage of Survey Respondents by Average Monthly Income	88
Table 6: Percentage of Survey Respondents by Sex.....	88
Table 7: Average Importance of Energy Efficiency when Rated on a Scale from 1 to 5.....	92
Table 8: Those who Found the Information from Energy Efficiency Labels Helpful.....	94
Table 9: Those whose Buying Decisions were Influenced by Energy Efficiency Labels	94
Table 10: Locations where Consumers Obtain Information when Shopping for Appliances	96
Table 11: Where do you Find Information when Looking for Buy an Appliance?.....	97
Table 12: Example Data Entry Columns for Equation (1)	113
Table 12: Factors that Sales Representatives Believe are Most Important to Consumers.....	116
Table 13: Word Count for Responses for Factors Most Important to Consumers	117
Table 14: Feature of Products That Sales Reps Use to Persuade Consumers	117
Table 15: Word Count of Features of Products That Sales Representatives Use to Sell.....	118
Table 16: Statistical Averages for the Importance of Energy Efficiency to Consumers	118
Table 17: Information that Sales representatives Use to Market Efficient Products.....	120
Table 18: Word Count for Responses to Information that Sales reps Use to Market Efficiency	121
Table 19: Info in Labels that Will Persuade Consumers to Purchase Efficient Appliances	122
Table 20: Word Count in Response to the Information of Labels that Will Persuade	123
Table 21: Sales Representative Responses of Information Which Would be Useful on Label..	124
Table 22: Word Count in Response to Information Which Would be Useful on Energy Label	124
Table 23: Where Sales Representatives Find Information that they Use to Sell Products	125
Table 24: Word Count for Where Sales Reps Find Information that they Use to Sell Products	125
Table 25: Sex of those Surveyed in Survey Two.....	132
Table 26: Average Importance of Energy Efficiency	132
Table 27: Word Count for Why Favorite Label was Chosen	143

Definitions of Commonly Used Terms

ASEGIRE	Company that promotes the responsible management of electronic waste (Asociación de Empresarios para la Gestión Integral de Residuos Electrónicos)
CICR	Chamber of Industry of Costa Rica (Cámara de Industrias de Costa Rica) unites the industrial sector and works to improve industrial and economic conditions for their member businesses
Decreto 29751	Costa Rican decree that requires specific information to be listed on the label
DOE	Department of Energy of the United States
ECA	Costa Rican Entity of Accreditation (Ente Costarricense de Acreditación) is internationally recognized to accredit processes within Costa Rica
ENERGICE	Seal of approval developed by ICE that demonstrates an appliance complies with the energy efficiency standards by placing stars for the percentage of improvement over the baseline-standard
ENERGY STAR	Program in the United States that places the blue seal-of-approval to indicate that a product is among the 10% of energy efficiency
EnergyGuide	Energy efficiency label required by law to be placed on all appliances. Can be recognized by its yellow background and bold black lettering
EPA	Environmental Protection Agency of the United States
EPCA	The Energy Policy Conservation Act of the United States that established a minimum energy conservation standard
EU	European Union (Unión Europea)
EU label	Appliance label created in the European Union that ranks products on a colorful “A+++” to “D” scale
FTC	Federal Trade Commission of the United States
ICE	Costa Rican Institute of Electricity (Instituto Costarricense de Electricidad) is a large multifunctional corporation that is involved in the distribution of electricity, and testing of energy efficiency, maintenance of water, transportation, and telecommunications throughout the country

INTECO	Institute of Technical Norms of Costa Rica (Instituto de Normas Técnicas de Costa Rica) is responsible for organizing the creation of technical standards for Costa Rica
LEY 7447	Costa Rican law that mandates the clear display of energy efficiency labels on appliances
MEIC	Ministry of Economy, Industry, and Commerce (Ministero de Economía, Industria, y Comercio)
MINAE	Ministry of Environment and Energy (Ministerio de Ambiente y Energía)
Producers	In our paper, we simplified the group that includes “manufacturers,” “importers,” and “distributors” to be known simply as “producers”

Executive Summary

The majority of Costa Rica's electricity is provided by renewable resources. Although these means are less detrimental to the environment, they can be an unreliable source of energy. Currently, 75% of the country's power is supplied through hydroelectric plants. Unfortunately, in 2013, Costa Rica has experienced less rainfall than expected, which increases the demand for imported fuels for electricity production (Rico, 2014). The use of these fuels is more expensive for the consumer, and thus the price of electricity has been increasing, a situation that stresses the need for alternative methods to reduce energy consumption.

Our sponsor, the Cámara de Industrias de Costa Rica, requested the development of an informative label to display information about power consumption of home appliances. It is hoped this label will encourage consumers to purchase more energy-efficient appliances, reduce household electricity consumption, and create a demand that promotes competition in the domestic market. To accomplish this, we set four objectives: 1) consult implementation bodies to understand the existing label process, 2) compare existing labels, 3) assess local perspectives on labels, and finally, 4) design a label and implementation process for Costa Rica.

In order to complete these objectives, we gathered feedback from executives in the implementation process, Costa Rican consumers, and appliance sales representatives. To understand the current label processes in Costa Rica, we interviewed employees at the Instituto Costarricense de Electricidad (ICE), the Ente Costarricense de Acreditación (ECA), the Instituto de Normas Técnicas de Costa Rica (INTECO), and the Dirección de Apoyo al Consumidor del Ministerio de Economía, Industria, y Comercio (MEIC). ICE is a semi-privatized, large corporation involved in the distribution of electricity; we consulted with an engineer at its Energy Efficiency Lab to understand the testing of appliances. ECA is the main body that

accredits testing and certification bodies in Costa Rica, which includes ICE's testing laboratory and INTECO. INTECO creates standards for the energy efficiency of appliances, in addition to the certification of appliances. The Department of Consumer Protection of MEIC works with the Ministerio de Ambiente y Energía (MINAE) to regulate labels and enforce regulations.

To identify the importance of energy efficiency and the viability of a label, we surveyed 190 participants in two separate sets of surveys. The first survey revealed general views pertaining to the importance of energy efficiency and general ideas about label design. We visited local appliance stores, where we gained perspectives about consumer priorities when purchasing appliances, and obtained recommendations from sales representatives. The results found from the second survey led to the final design of a label.

Using the data collected, as well as our personal observations, we were able to identify improvements that could be made to the label implementation process. These suggested improvements are:

Collaboration of implementation bodies

- Improve communication across implementation process to unify current labeling projects
- Form an advisory committee comprised of government and industry representatives to establish a standardized label implementation process

Mandate and standardize a label system

- Update regulations to clarify the responsibility of the enforcement of labels
- Mandate a standard testing procedure to determine the information on labels
- Standardize the format and design of labels

Educate consumers about energy efficiency

- Conduct a mass media campaign for TV, radio, internet, product advertisements, as well as child enrichment programs
- Train sales representatives to promote energy-efficient appliances to consumers
- Provide in-store graphics to educate consumers about the availability of energy efficiency labels and how to use them in order to make informed decisions

Government involvement

- Establish a program that mandates that the government purchase only appliances that meet certain energy efficiency standards
- Create tax exemptions for producers that obtain energy efficiency certifications and utilize renewable resources in manufacturing

Resumen Ejecutivo en Español

La mayoría de la electricidad de Costa Rica viene de los recursos renovables. Aunque estos recursos hacen menos daño al medio ambiente, a veces no son fiables como fuentes de energía. Actualmente, setenta y cinco por ciento de la energía del país es suministrado por las fábricas hidroeléctricas. Lastimosamente, en el año 2013, Costa Rica recibió menos lluvia que fue previsto, y la demanda por los combustibles importados fue aumentado por su uso en la producción de electricidad (Rico, 2014). El uso de estos combustibles es más caro para el consumidor, y también el costo de electricidad sigue aumentando. Esta situación crea una necesidad de métodos alternativas para reducir el consumo doméstico.

Nuestro patrocinador, la Cámara de Industrias de Costa Rica, pidió el desarrollo de un etiquetado informativo para mostrar información sobre el consumo de los electrodomésticos. Es esperado que esta etiqueta anime a los consumidores a comprar electrodomésticos más eficientes. También espera reducir el consumo de electricidad de los hogares y crear una demanda que promueve la competición entre los fabricantes costarricenses en el mercado. Para cumplir con estas expectativas, fijamos cuatro objetivos primarios: 1) consultar con las organizaciones de implementación para entender el proceso de etiquetados actual, 2) comparar las etiquetas que ya existen, 3) evaluar las perspectivas locales sobre etiquetas, y 4) diseñar una etiqueta y un proceso de implementación para Costa Rica.

Para cumplir con estos objetivos, coleccionamos opiniones de los ejecutivos en el proceso de implementación de las etiquetas, los consumidores costarricenses, y las representantes de ventas para los electrodomésticos. Para entender el proceso actual de etiquetados en Costa Rica, entrevistamos a unos empleados del Instituto Costarricense de Electricidad (ICE), el Ente Costarricense de Acreditación (ECA), el Instituto de Normas

Técnicas de Costa Rica (INTECO), y la Dirección de Apoyo al Consumidor del Ministerio de Economía, Industria, y Comercio (MEIC). ICE es una corporación grande que está involucrada en la distribución de electricidad, y hablamos con una ingeniera en su Laboratorio de Eficiencia Energética para entender las pruebas de los electrodomésticos. ECA es la empresa primaria que acredita las organizaciones de pruebas y certificación en Costa Rica. Estas incluyen el laboratorio de pruebas de ICE y la certificación de INTECO. INTECO crea las normas para la eficiencia energética de los electrodomésticos, además de llevar a cabo la certificación. La Dirección de Apoyo al Consumidor de MEIC trabaja con el Ministerio de Ambiente y Energía (MINAE) para regular las etiquetas y poner en ejecución las leyes sobre las etiquetas.

Para identificar la importancia de la eficiencia energética y la viabilidad de una etiqueta, conducimos 190 encuestas de consumidores costarricenses en dos encuestas separadas. Los resultados de la primera encuesta demostraron perspectivas generales sobre la importancia de la eficiencia energética y nos dio opiniones sobre el diseño de las etiquetas. Visitamos unas tiendas locales para aprender sobre las prioridades de los consumidores cuando compran los electrodomésticos. También hablamos con las representantes de ventas de estas tiendas para obtener sus recomendaciones sobre las etiquetas. Los resultados de nuestra segunda encuesta nos dirigieron al diseño final de la etiqueta.

Usamos los datos coleccionados en adición a nuestras observaciones personales para identificar los mejoramientos que son necesarios para el proceso de la implementación de las etiquetas. Estos mejoramientos sugeridos son descritos abajo:

Colaboración de las organizaciones de implementación

- Mejorar la comunicación en todas partes del proceso de la implementación para unir los proyectos actuales de etiquetados

- Formar un comité que consiste de representantes de gobierno e industria para trabajar a establecer un proceso normalizada de implementación de las etiquetas

Imponer y estandarizar un etiquetado

- Actualizar las regulaciones para clarificar la responsabilidad de la aplicación de las etiquetas
- Imponer un procedimiento estándar de pruebas para determinar la información en las etiquetas
- Estandarizar el formato y el diseño de un etiquetado

Educar los consumidores sobre la eficiencia energética

- Campaña en los medios de comunicación de los anuncios
- Programas para educar a los niños sobre la eficiencia y el ahorro de energía
- Capacitación para representantes de ventas para promover los electrodomésticos eficientes a los consumidores en las tiendas
- Carteles en las tiendas para educar los consumidores sobre la disponibilidad de las etiquetas de eficiencia energética y el uso de estas para ayudarles a hacer decisiones informados de compras

Participación del gobierno

- Establecer un programa para requerir que todos los electrodomésticos comprados por el gobierno cumplan con ciertas normas para la eficiencia energética
- Crear exenciones para los productores que obtienen las certificaciones de eficiencia energética y que utilizan los recursos renovables en la fabricación

Chapter 1: Introduction

Costa Rica is a small, geologically diverse country nestled in Central America. This geographical diversity allows the country to rely heavily upon renewable resources. Approximately 91% of Costa Rica's electricity is generated from these renewable resources, including geothermal, hydroelectric, and wind power plants (Mainieri, Alfredo 2000). Use of these sources is considered an important step for the country to achieve carbon neutrality. In June of 2007, President and Nobel Laureate Óscar Arias started a green initiative to make Costa Rica 100% carbon neutral by 2021.

One major source of carbon emissions is from domestic power consumption. While most of Costa Rica's electricity comes from renewable energy, these sources cannot keep up with consumer demands. Hydroelectric plants are responsible for producing 75% of Costa Rica's energy (Mainieri, Alfredo 2000). However, hydroelectric power generation is also highly dependent on weather conditions. In 2013, Costa Rica experienced significantly less rainfall than expected, which causes the hydroelectric power plants to be less productive (Rico, 2014). This, in turn, increased the amount of energy generated by imported fuels up to 13% in the last year, which simultaneously increased electricity prices. Also, the national electrical distribution system tripled in size in 14 years (Chavez, 2013). All these factors have resulted in an exponential growth of power consumption. As the gross domestic product of Costa Rica rises, so will energy consumption (Chavez, 2013). To meet the demand the remaining 9% of power is supplemented from burning imported oil during peak power times.

Many government and private agencies have attempted to reduce electricity consumption. Corporativo del Instituto Costarricense de Electricidad (ICE), the government operated electricity and telecommunications provider, has taken steps to educate the public about energy

usage and cost. Electricity providers have raised prices to discourage excessive use of power. Despite these efforts, renewable resources alone have yet to meet the power consumption demands. An alternative approach to solving the energy crisis involves reducing the amount of energy used via households.

Our sponsor, the Cámara de Industrias de Costa Rica (CICR), is a private organization that represents the industrial sector and works to improve the competitiveness of its member businesses. One of the recent objectives of the CICR is to reduce energy consumption and create sustainable business practices. The CICR hopes to promote the use of energy-efficient appliances to reduce national energy consumption by implementing a standardized energy label in Costa Rica. This label intends to educate and inform residential consumers about efficient appliances.

Chapter 2: Literature Review

In the following section, we provide background information to create a context for our project. We will explain Costa Rica's electrical consumption issues, as well as attempts to reduce consumption by proposing an effective energy labeling system for major electric appliances. This section will also cover data collection that is necessary for the comparative analysis of existing energy label systems.

2.1 Cámara de Industrias de Costa Rica

The Cámara de Industrias de Costa Rica (CICR), founded in 1943, is an organization that works to unite the industrial sector of Costa Rica and improve industrial and economic conditions. Similar to the Better Business Bureau in the United States, the CICR has many member institutions. The CICR's goal is to increase each member's competitiveness in the modern marketplace (Cámara de Industrias de Costa Rica, 2009).

In recent years, the CICR has begun to expand its work to create sustainable business practices. Faced with a need to change practices to preserve the environment, the CICR has started a new initiative to develop renewable energy and energy-saving methods. One recent program is the "Energy Manager" training program. This program is used to teach business employees about energy efficiency and ways to manage energy use (Cámara de Industrias de Costa Rica, 2012). Specifically, it supports the CICR's goals to increase business competitiveness and to promote sustainable industry.

2.2 Electricity Demands and Energy Efficiency in Costa Rica

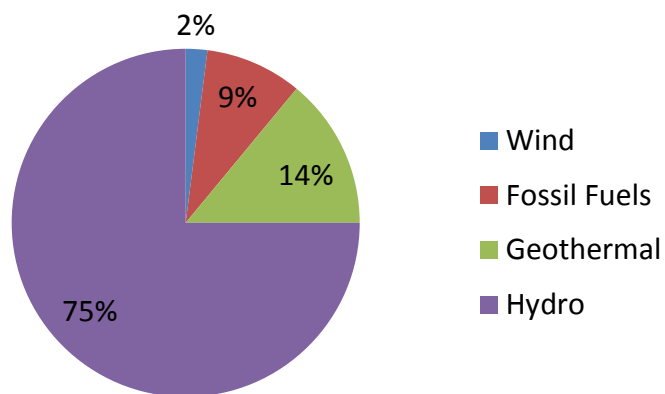
Costa Rica is a country that prides itself on efficiency and the use of sustainable practices. Electricity costs are lower in Costa Rica than in most other Latin American countries (Chavez, 2013). Its national electrical distribution system tripled in size from 1985 to 1999 due

to a steady growth in gross domestic product (GDP). The national grid system expanded to 40,000 kilometers (Chavez, 2013). This has resulted in an exponential growth of power consumption. Presently, Costa Rica is attempting to reduce electrical costs and become more efficient. Óscar Arias, a previous president of Costa Rica launched a “Peace with Nature” green initiative that requires the country to become carbon neutral by 2021 (Dobles, 2007). As the gross domestic product of Costa Rica rises, so will energy consumption (Chavez, 2013). Without clear conservation efforts, Costa Rica will continue to burn fossil fuels to satisfy electrical demand.

The current cost of energy in Costa Rica is significantly higher than the United States and other industrialized nations. It currently costs 81 colones (approximately \$0.16 US) per kilowatt hour (kWh) for the first 200 kWh of consumption. After 200 kWh, the rate nearly doubles to 146 colones (\$0.29 US) per kWh (“Current Residential Rates”, *ICE*). In 2012, the national average price of electricity in the United States was \$0.11 per kWh (U.S. Energy Information Administration, 2013). After 200 kWh, Costa Ricans pay nearly three times more for electricity than the average American. Due to this high electrical cost, consumers in Costa Rica are very conscientious of their power usage. Even though electricity is in heavy demand, Costa Rica continues to stay persistent in its use of renewable resources.

Costa Rica uses many resources to produce power. In 2000, the country produced approximately 91% of its electricity via renewable resources. As of 2009, this number is closer to 94% (Becroft, 2009). Major resources include geothermal, wind, and hydroelectric energy, as shown in **Error! Reference source not found.** During peak times these resources are insufficient and Costa Rican electrical power plants must burn imported fossil fuels. This accounts for the remaining 9% of energy generation (Mainieri, Alfredo 2000). Instituto

Costarricense de Electricidad, (ICE) has considered building more hydroelectric and wind power plants to replace the fossil fuels. The development of more renewable energy power plants



will take a toll on the environment (Becroft, 2009).

Figure 1: Energy Source Distribution in Costa Rica
(Mainieri, Alfredo 2000)

More of Costa Rica's rivers will need to be dammed to build additional hydroelectric power plants. This will likely restrict the natural water flow. Consequently, it has the potential to alter the habitats of the rivers, rendering them unsuitable to support life (Clarkson, 2000). Building more wind or hydroelectric power plants may cause deforestation of Costa Rica's land. This can destroy the biodiversity hotspot that exists in Costa Rica. It is argued that the country cannot afford to build more power plants. These resources can also be highly dependent on the climate and weather. For example, a significant portion of Costa Rica's electricity is generated via hydroelectric plants. The energy production of these plants is variable depending on the weather. Costa Rica has experienced much less rainfall than expected in recent years. This has resulted in higher electricity prices for the consumers especially during dry seasons. It must seek alternative ways to lower the demand for electricity (Becroft, 2009).

To discourage unnecessary use of electricity, electricity providers raised their prices dramatically (Becroft, 2009). "In Costa Rica, 250 kWh would be enough to satisfy the monthly needs of low- and middle-income households" (Chavez 2013). The majority of Costa Rican citizens fall in this category. Examining residential information provided by ICE, "the average

domestic consumption in 2009 was slightly above 224 kWh (Chavez, 2013)”. The demand for power dictates the prices of electricity. Looking at this information the average worker must dedicate 14.6% of his/her salary to pay for electrical costs (Chavez 2013). The Costa Rican government and power suppliers have worked to reduce the amount of electricity used by their consumers.

Industrial and household energy conservation efforts by Costa Ricans could significantly lower the demand for electricity in Costa Rica in the aggregate. Even simple measures, such as buying more efficient appliances, would lower electricity demands. This could be encouraged by introducing a standardized labeling system that displays energy efficiency information (Sammer & Wüstenhagen, 2006). Currently, Costa Rica has no standardized labeling system for appliances.

2.3 Energy Efficiency Labels

Other areas, including the United States and the European Union, have encouraged the production of energy-efficient products. In order to create a standardized labeling system that will be effective in Costa Rica, we will examine the success of these systems.

2.3.1 United States

There are nearly twenty labeling programs that evaluate a broad variety of products in the US (Banerjee & Solomon, 2003). Four appliance labels are Green Seal, Scientific Certification Systems, EnergyGuide, and ENERGY STAR. Green Seal and Scientific Certification Systems are independent organizations, and thus have a nearly insignificant effect on the market, according to Banerjee and Solomon. Therefore, this analysis of the labels used in the United States will focus primarily on the government-regulated ENERGY STAR and EnergyGuide systems.

ENERGY STAR

In 1993, ENERGY STAR was created by the Environmental Protection Agency (EPA) “to promote high-efficiency office equipment” (Webber, Brown, & Koomey, 2000). It originally began by labeling computers, monitors, and printers. Many of these devices already had energy saving features, but the features were not default settings. ENERGY STAR simply suggested enabling these energy-saving settings. President Bill Clinton issued Executive Order 12845, which required all federal microcomputers, monitors, and printers to comply with ENERGY STAR standards. This created a large demand, and manufacturers volunteered to participate in the program (Webber, Brown, & Koomey, 2000). The EPA then allied with the Department of Energy (DOE) in 1996. The DOE expanded the ENERGY STAR label to be used for refrigerators, room air conditioners, washing machines, and dishwashers. ENERGY STAR now saves homeowners expenses for heating, cooling, water heating, appliances, lighting, electronics, and other household products (“Where Does My Money Go?” 2009).

In order to promote the most efficient appliances, the DOE and EPA launched the ENERGY STAR Most Efficient program. This label includes the standard ENERGY STAR logo, the words “MOST EFFICIENT,” and the year that the appliance met the top tier of energy efficiency. The DOE regulates all testing and determines the energy usage of appliances. The EPA then sets the ENERGY STAR energy efficiency requirements. For example, current ENERGY STAR standards for residential refrigerators can be found on the EPA’s website and Appendix A: ENERGY STAR Refrigerator Standards (EPA Office of Air and Radiation, 2014a, 2014b). These requirements are periodically updated when fifty percent of appliances in the market share meet them. If an appliance adheres to the ENERGY STAR requirements, it then is able to display the emblem (EPA Office of Air and Radiation, 2014a, 2014b).

As seen in Figure 2, the ENERGY STAR label is not very informative. Instead of listing pertinent facts about the energy usage of an appliance, like EnergyGuide, ENERGY STAR relies on brand identification to promote its energy goals. In 2012, the Consortium of Energy Efficiency (CEE) surveyed consumers to determine their awareness of the ENERGY STAR program. The results were published by the EPA on the ENERGY STAR website as the “National Awareness of ENERGY STAR for 2012” publication.



Figure 2: Example of Energy Efficiency Label in the US: ENERGY STAR Label (EPA, 2014)

In summary, a significant population of the United States (87%) is able to identify the ENERGY STAR logo. Large percentages (82%) of respondents were able to state the logo’s purpose, while fewer were able to relate it with energy efficiency. Those that did buy ENERGY STAR labeled appliances were at least aware of the ENERGY STAR qualities. Finally, 18% of households that knowingly purchased ENERGY STAR labeled products had a financial incentive, though many of them stated they would purchase the product without the financial incentive (EPA Office of Air and Radiation, 2013). Although the logo does not display information, it is effective at communicating ENERGY STAR’s goal. The same cannot be said about effectiveness of EnergyGuide’s very detailed, informational logo.

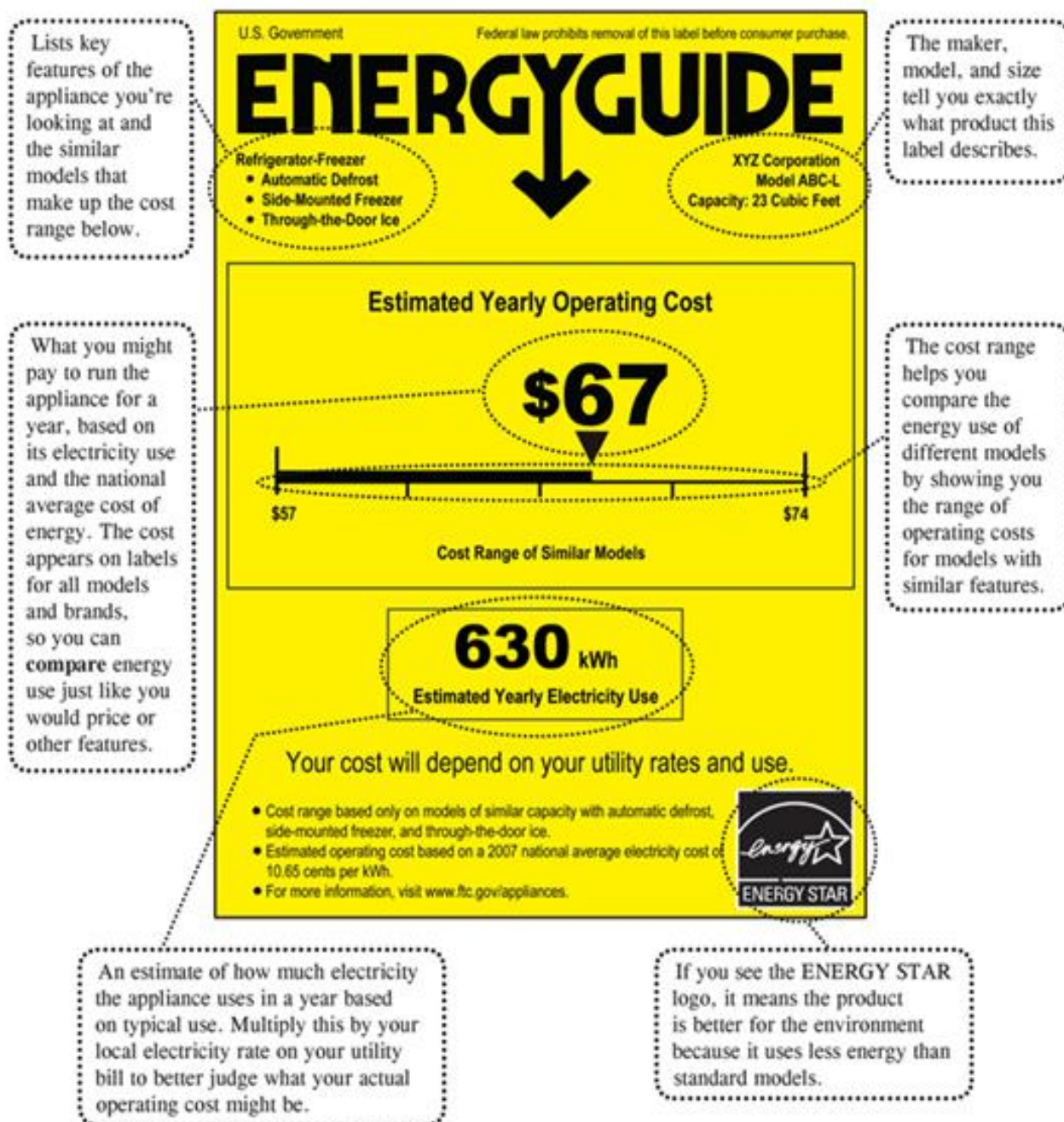
EnergyGuide

The United States began regulating energy usage in the 1970s. The Energy Policy and Conservation Act (EPCA), created in 1975, established a minimum energy conservation standard. The EPCA primarily focuses on conserving energy by reducing fuel consumption. It required the Federal Trade Commission (FTC) to prescribe the test procedures and applicable labeling standards (Energy Policy and Conservation Act, 1975). Although the initial act specified

standards for petroleum waste, the idea expanded to include many other devices and services. This mandate is the predecessor of EnergyGuide. Subsequent acts have established and expanded the standards for many household appliances.

According to the DOE, the Appliance and Equipment Standards program includes approximately ninety percent of home energy use (U.S. Department of Energy, 2013). This evolution of energy efficiency standards is advertised to the public through energy efficiency labels. This creates quantifiable energy savings. “The cumulative energy savings of standards phased in through 2012 will be about seventy quadrillion British thermal units (quads) of energy through 2020, and will amount to one hundred twenty quads through 2030. (The US consumes a total of about one hundred quads of energy per year.) The cumulative utility bill savings to consumers from these standards are estimated to be over nine hundred billion dollars by 2020, growing to over \$1.6 trillion through 2030” (U.S. Department of Energy, 2013).

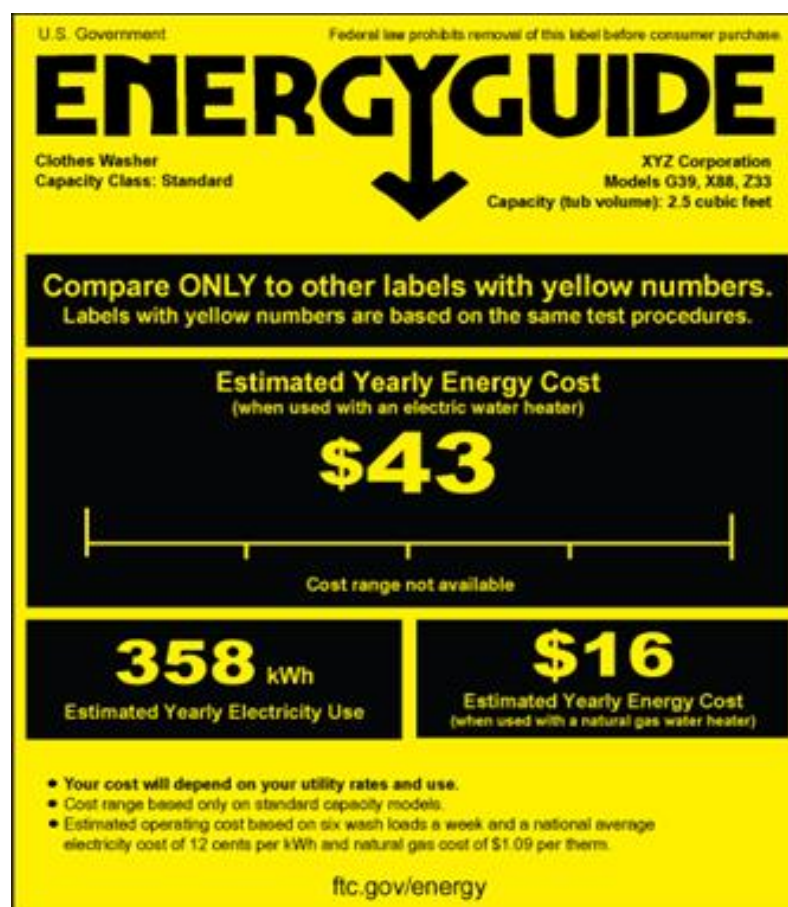
Unlike ENERGY STAR, EnergyGuide participation is federally required. Many domestic appliances are mandated by the EPCA to display the EnergyGuide label (FTC, 2014). EnergyGuide also displays much more information than the seal-of-approval ENERGY STAR logo. Figure 3 is an annotated illustration that identifies the variety of information presented on the label. The facts displayed are determined by standard testing procedures regulated by the DOE. The EnergyGuide label attempts to provide a neutral factual reference. This allows consumers to make informed decisions when purchasing appliances.



**Figure 3: Annotated EnergyGuide Label
(FTC, 2014)**

Following two years of market research, the current EnergyGuide label was designed in 2007. This new design integrated a streamlined look and displayed estimated operating costs. The purpose of EnergyGuide is to provide a reference for consumers to compare appliance

energy efficiencies. This allows consumers to consider the trade-offs of energy efficiency and the initial cost of appliances (Federal Trade Commission, 2007). It should also be noted that not all EnergyGuide labels are the same. In 2014, a new edition of the label was released, as seen in Figure 4. It now features information as yellow text on a black background and a new testing system (FTC, 2014). The FTC notes that appliances should only be compared to those with similar labels (FTC, 2014). For example, if a consumer considers a refrigerator with the standard yellow EnergyGuide label and another with the transitional label, the information will not directly correlate. The transitional label could potentially cause consumer confusion.



**Figure 4: Transitional EnergyGuide Label
(FTC, 2014)**

Several studies have questioned the effectiveness of the EnergyGuide label. In a 1999 Wisconsin survey, 70% of the responses claimed they had seen or heard of the label. When asked to provide the information on the label, only 49% were able to describe important details (Banerjee & Solomon, 2003). In another survey, the respondents were given an option of five variations of the EnergyGuide label. Each had the standard yellow background and the same header, but the information format was rearranged. Only 12% of the respondents were able to correctly identify the current label (Banerjee & Solomon, 2003). “More recently, American Council for an Energy-Efficient Economy conducted research that indicated that for some consumers, comprehension is problematic, but that a more overarching problem is that consumers perceive the current label to be ‘boring, overly technical and un motivating’ (Banerjee & Solomon, 2003).” Although EnergyGuide is a non-biased display of information, many consumers do not understand its importance or cannot use its information.

2.3.2 European Union

The European Union (EU) has also made efforts to inform consumers about the efficiency of their appliances. Europe obtains the majority of its electrical power from nonrenewable sources. Approximately 55% of all of the power comes from combustible fuels including coal, natural gas and petroleum (European Commission, 2014). The average cost of household electricity is currently 0.19 Euro, or \$0.26 per kilowatt hour (European Commission, 2014). It is also important to note that individual household energy use in the EU has increased by 15% in the last four years. This increase is credited to low replacement rates of inefficient equipment. The European Commission suggests that convincing consumers to switch to efficient appliances will reduce the environmental impact and energy cost (European Commission, 2014).

The need for an energy labeling system was recognized in 1992 when the EU established the “EU Energy Label” (Council Directive 92/75/EEC, 1992). This label must be displayed on goods including cars, light bulbs, and appliances. The EU uses a system of classes, lettered “A” through G, to indicate the efficiency of the product. The letter “A” marks the most efficient devices. In addition to this information, labels are also required to include the model of the product, the product’s power consumption, and the noise levels it produces when operating. There are standards for each type of product to determine the letter grade each should receive. For example, washing machines are rated in kilowatt hour per kilogram of washed material at 60 degrees Celsius (Energy Labeling of products, 2013). As more efficient products were introduced, the product rating scale expanded to include “A+,” “A+,” and “A+++” (Directive 2010/30/EU, 2010). This can be seen in Figure 5. Unfortunately, this change has been determined to actually reduce the effectiveness of the label rather than enhance it. It occurred because consumers considered all “A” grade appliances to be equal regardless of the plus system (Heinzle & Stefanie Lena, 2012).

There have been several comparative studies of the EU label and its success in the market. One of these was a discrete choice analysis of buying washing machines (Sammer & Wüstenhagen, 2006). In this study, various washing machines were proposed to consumers with and without the energy label. The consumer was then given a choice to “buy” his or her favorite product. The study found that seventy-four percent of the consumers were able to recall the energy label of the product. Among those consumers, fifty-four percent of them considered energy efficiency in their choice of product. With the energy label in place, consumers were significantly more willing to buy a more expensive product for energy savings. For the example product, there was a thirty percent initial cost increase to go from a C level energy rating to an A

level. The savings over the lifetime of the product did not make up for this premium. Yet there was still a forty percent increase in choice of the high-efficiency product with the label versus without the label (Sammer & Wüstenhagen, 2006). This German study shows that the use of a labeling system influences consumers to purchase energy-efficient appliances.

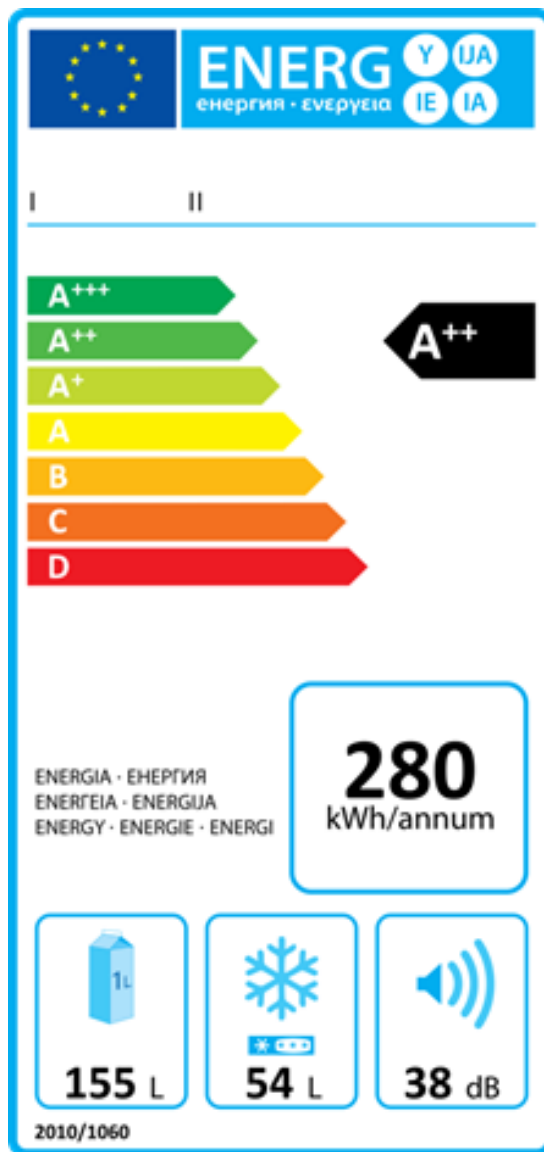


Figure 5: The European Union Energy Label
(CECED, 2014)

Chapter 3: Objectives

Our overall goals for this project were to develop a standardized energy efficiency labeling system and to create recommendations to improve the implementation process of this system. We formulated four main objectives in order to achieve these goals for appliance labels in Costa Rica. These are as follows.

1. Consult Implementation Bodies

We gathered information pertaining to the process that would constitute a successful implementation of energy efficiency labels in Costa Rica by interviewing executives of implementation bodies.

2. Comparative Analysis of Existing Labels

We identified and analyzed efficiency labeling systems from other countries and their effectiveness in encouraging consumers to purchase energy-efficient appliances.

3. Assess Local Perspectives

We gathered information about public knowledge of energy efficiency labels in Costa Rica through surveys and summarized the analysis of the surveys.

4. Implementation of Label

We designed a label to be used in Costa Rica and suggested a process for its implementation.

The approach we pursued to accomplish our objectives will be discussed in detail in the next chapter.

Chapter 4: Methodology

The objectives aided us in our effort to accomplish our overall goals. The following chapter explains how we carried out these objectives to develop a standardized efficiency label and generate recommendations for the label implementation process in Costa Rica. The chapter is divided into four sections that explain the methods that were used to accomplish each objective.

4.1 Consult Implementation Bodies

To understand the current labeling system in Costa Rica, we interviewed businesses involved in implementing and regulating a labeling system. Specifically, we interviewed employees at the Instituto Costarricense de Electricidad (ICE), the Ente Costarricense de Acreditación (ECA), the Instituto de Normas Técnicas de Costa Rica (INTECO), and the Dirección de Apoyo al Consumidor del Ministerio de Economía, Industria, y Comercio (MEIC). ICE is a semi-privatized, large corporation involved in the distribution of electricity. We consulted with an engineer at its Energy Efficiency Lab to understand the testing of appliances. ECA is the main body that accredits testing and certification bodies in Costa Rica. This includes ICE's lab and INTECO. INTECO creates standards for the energy efficiency of appliances, in addition to certifying appliances. The Department of Consumer Protection of MEIC works with the Ministerio de Ambiente y Energía (MINAE) to regulate labels and enforce regulations. We researched the goals of each individual company to understand which goals contributed to the implementation of a standardized appliance labeling system. It was important for us to understand 1) the current processes used by each institution, 2) how the institutions contributed to the implementation of the label, and 3) any problems and suggestions regarding the current system.

4.2 Comparative Analysis

Several countries around the world have implemented energy efficiency standards and labels. To determine which labeling system was most effective, we examined various case studies of implemented systems. Several case studies have been conducted to determine how consumers react to the information conveyed by these labels. In section 2.4.2, we briefly explained the results of the studies conducted on the ENERGY STAR, EnergyGuide, and European Union labels.

Data collected from previous case studies was used to determine features of appliance labels consumers found most useful. For example, although the ENERGY STAR label does not display any information, its brand name and easily identifiable logo helps the consumer understand its significance. The case studies determined particular features that are the most easily understood.

We used information from these case studies to develop questions for our consumer surveys. The information helped us gain knowledge on how Costa Ricans' will understand energy labels and their specific features. These case studies showed that years of exposure and understanding of the purpose of energy efficiency labels have made these labels successful. However, consumers in Costa Rica have not been exposed to these labels for extended periods of time. Our survey questions provided us with information about the comprehension of label features with little or no prior education about the labels.

4.3 Assess Local Perspectives

In addition to interviews with implementation bodies, we surveyed consumers using questions developed from case studies of international labels. We used our surveys to assess the knowledge and awareness of energy efficiency in Costa Rica. ENERGY STAR, EnergyGuide,

and European Union labels were used to gain perspective on consumer knowledge and label feature comprehension. We also interviewed sales representatives at appliance stores to understand the information that is used to influence the decisions of consumers when purchasing appliances.

4.3.1 Survey Consumers

Our goal from surveying was to understand features of energy efficiency labels which Costa Rican consumers find important when purchasing appliances. We also determined the type of labeling system that is most useful for consumers. Our survey sample consisted of consumers at appliance stores and public areas. This provided a variety of demographic information. In order to do this, we conducted 140 surveys in appliance stores and parks in San José listed in Table 1: Locations. These locations were chosen with the help of Laura Cornejo, the director of ASEGIRE. ASEGIRE is a company that promotes the responsible management of electronic waste, and that has close ties with the CICR. They work with many local companies, including Grupo Monge, a local group of appliance stores. She was able to help us gain access to these locations for our surveys.

Table 1: Locations Where Surveys were Conducted in San José, Costa Rica

Name	Category	Location
Importadora Monge	Appliance Store	San Pedro
Importadora Monge	Appliance Store	Multiplaza del Este
Importadora Monge	Appliance Store	Multiplaza de Escazú
Play	Appliance Store	Zapote
Plaza Juan Mora Fernández	Public Area	Centro de San José
Plaza de la Cultura	Public Area	Centro de San José

Our survey was divided into three sections and consisted of two types of questions, multiple choice and ranking questions. This allowed us to collect numerical data. Numerical data is easy to analyze statistically. Also, we attempted to ensure that our surveys were simple to complete, in order to encourage consumers to participate (Fowler 2014).

Through the first section of the survey, we gathered information about which appliance features are important to Costa Ricans in the purchasing process. Responses included ranking features such as price, size, color, and efficiency in order of importance to the consumer. We also asked where consumers find information about appliances. This helped us determine information that should be included on an energy efficiency label and the importance of energy efficiency to consumers.

The second section of the survey focused on label design. We tested the EnergyGuide, ENERGY STAR, and European Union labeling systems to compare different types of labeling systems. This gave us information about the label design that is the most visually appealing and easily understood for consumers. The example labels are shown in Appendix B: Consumer Awareness and Comparative Analysis Survey. During this part of the survey, we showed participants images of the three international labels. We asked them questions regarding prior knowledge, visual appearance, information, and comprehensibility of these labels.

In the third section of the survey, we asked consumers questions to determine the usefulness and comprehensibility of individual label features. We showed participants images of the EnergyGuide and European Union labels with important features circled. This can be seen in Appendix B: Consumer Awareness and Comparative Analysis Survey. We then asked them to rank the features in order of importance. We supplemented this by asking participants to mark specific features that they did not understand at all. This information helped us identify specific

features to be included in a standardized label for Costa Rica. This ensured the usefulness and clarity of features selected. The complete survey used is found in Appendix B: Consumer Awareness and Comparative Analysis Survey.

4.3.2 Survey Sales Representatives:

While surveys helped us acquire quantitative data, qualitative data was also valuable information for our recommendation and label design. Appliance sales representatives have direct contact with consumers and influence purchase decisions. Through surveys with sales representatives at Grupo Monge appliance stores in San José, we gained insight into consumers' priorities when purchasing appliances. Using this information, we designed a label that sales representatives can use to encourage consumers to purchase energy-efficient appliances. Sales representatives were asked about their sales pitch, impressions of consumer opinions, and training programs. The full list of survey questions asked to sales representatives can be found in Appendix C: Survey of Sales Representatives.

4.3.3 Analysis

Once we gathered information from certification bodies, consumers, and sales representatives, we analyzed the results. The majority of our surveys consisted of quantitative data used to generate graphs and tables. Analysis of the survey data was completed using Excel worksheets and common statistical methods. The data was transformed into numerical values and a standard correlation function was applied to all of the survey responses. The correlations indicated areas for further review and investigation. Specific results and more details of the numerical analysis are found in section 5.2.2.

Information from interviews with sales representatives was also considered to develop a clear and useful label. Perspectives from appliance store employees were useful in designing a

label that is helpful to consumers. This would also help representatives to promote energy-efficient appliances. This was also used to supplement our data from consumer surveys to demonstrate which information is most important to consumers on energy efficiency labels, and ways to create a label that is easy to use and interpret.

Surveys with consumers and sales representatives gave us information about consumer's top priorities when purchasing appliances, useful label features, and overall label design. However, our interviews with implementation bodies gave us information about the existing energy efficiency labeling process in Costa Rica. This information helped us to understand the role of each company in the process of implementing labels. We also gathered opinions from employees about the flaws in the current implementation systems. This data was considered in the development of our recommendations for the implementation of a standardized energy efficiency label in the future.

4.4 Label Designs and Evaluation

We used the results of the comparative analysis, the survey data, and the interview data to draft several label designs. From the analysis of the survey data, we identified the most important information to consumers, label features that are clear and understandable, and the most appealing visual designs to encourage consumers to purchase energy-efficient appliances. These features were included in several possible label designs. We designed the labels in Adobe Illustrator. Illustrator is software that is commonly used in design and graphics in large businesses. It will allow our design to be transferred to professionals within Costa Rica.

We evaluated label designs based on perspectives from consumers and businesses involved in the implementation of energy efficiency labels. We surveyed 50 consumers with our

label designs in a similar process as the initial consumer survey. We developed questions to test separate elements of our label design. These include layout, title, color, rating system, and overall design. Our survey asked consumers to identify the most and least useful labels features out of the options provided. This survey can be found in Appendix E: Survey for Label Features and Designs. Using the results of this survey, we designed a final draft to be recommended. This was done by using the most popular option in each of the questions and combining these elements into one final design.

Chapter 5: Analysis and Results

The methodology described in Chapter 4 was used to accomplish our four objectives for this project. This chapter presents the results that we developed to meet each of our objectives. Specifically, they were: 1) to interview businesses involved in labeling implementation, 2) to analyze existing labels and their usefulness in Costa Rica, 3) to survey consumers and sales representatives about energy efficiency awareness and useful label features, and 4) to create a final label design based on findings and evaluation of drafts.

5.1 Consult Implementation Bodies

5.1.1 The Law LEY 7447

During an interview with ICE, we learned that a law exists in Costa Rica that requires manufacturers to display information related to energy efficiency on appliances. LEY 7447 is the Law Regulating the Rational Use of Energy (Ley N° 7447, 1996). The objective of this law is to promote the rational use of energy, establish mechanisms to achieve the efficient use of energy, and replace these mechanisms as needed. The law, along with subsequent regulations and amendments, requires that manufacturers, importers, and distributors provide clear information about the energy usage of their products. It also specifies that the label must be easily visible on the product. In particular, Decreto 29751 enumerates the required aspects for the label. This executive order mandates features such as average energy usage in kilowatt-hours (kWh) per year, maximum energy usage due to volume, legal documentation, brand, model, and other physical features of the household appliance to be clearly presented on the label. A label showing these features and which complies with LEY 7447 is shown in Figure 6.

ETIQUETA ENERGETICA

CARACTERISTICAS DEL EQUIPO

MARCA: [REDACTED] MODELO: F28, RAF28

TIPO: REFRIGERADOR - CONGELADOR

TIPO DESCONGELACION: AUTOMATICO

VOLUMEN DEL EQUIPO

CONGELADOR: 71,2 L AJUSTADO: 321,7 L

ENFRIADOR: 204,2 L TOTAL: 275,4 L

CONSUMO DE ENERGIA

PARA ESTA UNIDAD 482,1 kW-h/AÑO

MAXIMO RECOMENDADO PARA ESTE TIPO DE UNIDAD 536,7 kW-h/AÑO

PERSONA FISICA O JURIDICA QUE COLOCO ESTA ETIQUETA

[REDACTED]

La información contenida en esta etiqueta es para que usted compare el desempeño energético de este refrigerador con otros similares que se ofrecen en el mercado nacional. Dichas características han sido determinadas mediante métodos controlados en laboratorio, por lo tanto podrán variar según las condiciones y los hábitos de uso y el estado del equipo.

PARA CONSULTAS A LA DIRECCION SECTORIAL DE ENERGIA DEL MINAE.

ENERG 04

IMPORTANTE: REMOVER ESTA PLACA ANTES DE SU COMPRA POR EL CONSUMIDOR FINAL ES UNA VIOLACION A LA LEY N° 7447.

DETERMINADO COMO SE ESTABLECE EN LA PN INTE 28-01-04-09

Figure 6: Example of Current Label that Meets Legal Requirements Found in Wal-Mart Zapote, Costa Rica

5.1.2 Current Process of Certification

Each organization that we interviewed contributes to the implementation of a standardized energy label. Our research discovered that the process of implementation is a complex interaction of a number of organizations. These interactions can be so complex, that some organizations have overlapping responsibilities and unclear tasks. These relationships are summarized in the flow chart seen in Figure 7.

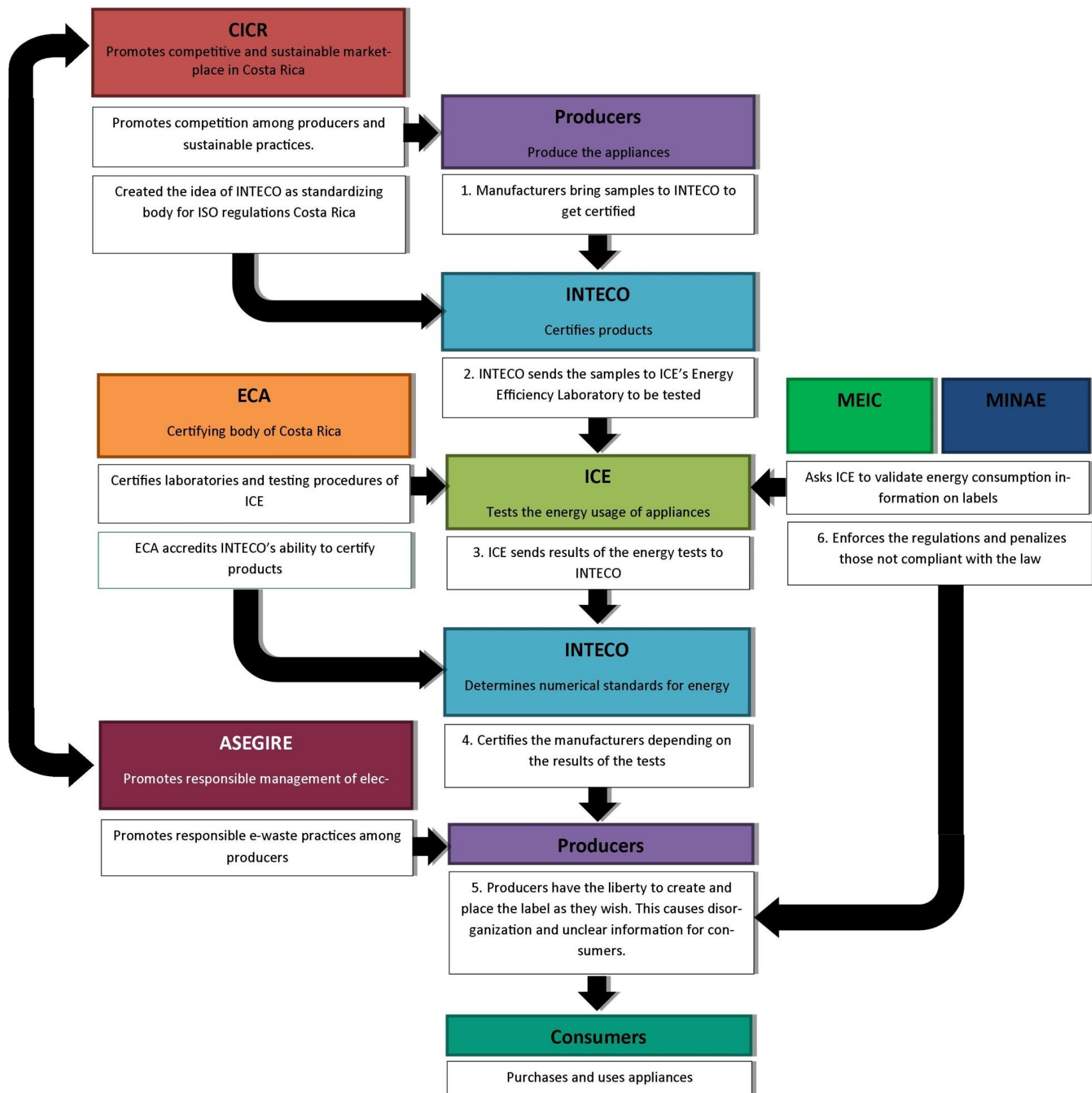


Figure 7: Flow Chart of the Inter-Relationships of Label Implementation Organizations and Their Roles

It is instructive to analyze how the label implementation is carried out. The sequence of steps is as follows:

1. Producers bring samples to INTECO.

Manufacturers, importers, and distributors send three samples of a product to INTECO to be tested and certified. It is not mandatory to be certified by INTECO, although it is beneficial for manufacturers to announce the quality of a product. If manufacturers do not wish to be specifically certified by INTECO, displaying information pertaining to the energy consumption is still required by LEY 7447.

2. INTECO sends the samples to be tested.

INTECO is a company that was created by the CICR to coordinate the creation of technical standards for Costa Rica. INTECO inspects standards developed by the International Organization for Standardization (ISO). It then organizes a meeting with technical experts to decide if the standards are achievable in Costa Rica. If they are not, it devises a reasonable, attainable standard for the country. After developing standards, INTECO can ask MINAE to begin the process of developing a regulation that enforces their use. INTECO also has the power to certify products and processes of other companies.

3. Examinations are completed at the ICE Energy Efficiency Laboratory.

Samples are next sent to ICE's Energy Efficiency Laboratory, where they are tested and their energy usage characteristics are compared to INTECO's standards. ICE is a large multifunctional corporation that is involved in the distribution of electricity, maintenance of water, transportation, and telecommunications throughout the country. For our project, we were

specifically concerned with the facility responsible for testing electrical products: ICE's Energy Efficiency Laboratory.

We visited the Energy Efficiency Laboratory in Pavas, San José and spoke with Heyleen Villalta Maietta, a Testing Engineer for the laboratory. She provided us with valuable information including products that are currently tested, products that can be tested in the future, and information that is used to create a standardized label for appliances. ICE currently has the ability to test the efficiency of compact fluorescent light bulbs, street lights, refrigerators, electric motors, and electric ranges. At present, manufacturers bring products to ICE voluntarily, and ICE works to accommodate the testing of all products it receives. The product testing could be expanded in the future based on requested testing, but is limited by available equipment.

When speaking with Ms. Villalta, we also discovered that ICE developed its own seal-of-approval label named "ENERGICE." This label is shown in Figure 8. It is currently not used widely in the market and can only be found on fluorescent lights. The label uses a star system to rate the energy efficiency of appliances, using the minimum standards for energy efficiency generated by INTECO for specific appliances. If an appliance uses less energy than the standard by a certain amount, it gains stars on the label. One star is 5% above the minimum efficiency, two stars is 10% above the standard, three stars is 15% above the standard, and four stars is 20% or more above the standard. This is a standardized label



Figure 8: The ENERGICE Label (ICE, 2008)

currently in development. Interestingly, as we discovered through our interviews many of the other implementation bodies are unaware of its existence. Obviously, this hinders the labeling system from being expanded to other products.

We also spoke with Johanna Acuña Loría, the director of ECA, which is the organization that accredits ICE's Energy Efficiency Laboratory, as well as INTECO's ability to certify products. ECA works with ICE to accredit the testing processes used to determine the energy efficiency information shown on labels, including the ENERGICE label.

4. The results from the tests are then returned to INTECO.

INTECO sets the minimum standards for energy efficiency and determines the efficiency rating of a product based on the information it receives from ICE's testing laboratory. Irrespective of whether or not the product has been certified, INTECO releases the information obtained by ICE about the product's energy consumption to the manufacturers.

5. Manufacturers are responsible for displaying the information on their appliances in stores.

LEY 7447 specifies that manufacturers are required to display information on their appliances. However, the law does not explicitly state the arrangement and format of this information. Manufacturers receive information about the energy efficiency of their products. They then have creative freedom to display the required information in any manner they choose. This information can be received from INTECO if the manufacturers choose, and can include the ENERGICE label if the appliance meets the specified efficiency standards.

6. Regulatory bodies ensure validity of information displayed on products.

We visited the Department of Consumer Protection of the Ministry of Economy, Industry, and Commerce (MEIC) to find more information about the regulatory process of LEY 7447. Generally, the Department of Consumer Protection completes investigations within the market and determines how products affect consumers. This office works with the Ministry of Environment and Energy (MINAE) to ensure that the energy consumption information displayed by manufactures is correct. However, MINAE can only act, if a complaint is filed; they will then investigate to determine the validity of the information on the labels. MINAE and MEIC have the ability to penalize those not complying with the law with a fine. According to Yorlenny Rojas, the Head of the Administrative Department of Procedures, the penalty is the equivalent to \$4,000. They inspect each level of the chain of production to discover who is responsible for the misinformation and who must pay the fine. At the time of writing this report, only one investigation has been conducted by MEIC. The investigation was successful in identifying the lack of consistent labeling on appliances in stores. The investigation gave a recommendation to ensure that the mandated information on labels is displayed clearly. However, according to Yorlenny Rojas, the Department of Consumer Protection appears to have insufficient resources to carry out this recommendation to enforce the mandatory label information in LEY 7447.

5.1.3 Flaws within the Current Implementation Process

From the contacted organizations, we learned that there is a process of implementing energy efficiency labels in Costa Rica. This system has yet to standardize testing procedures or label format. Our interviews helped us to identify the weaknesses in the current system and how the procedural issues could be fixed. The five major problems we have found are:

1. Consumers are not always well informed
2. Regulations have not been updated recently
3. Responsibility of a governmental body to enforce LEY 7447 and the certification of appliances is unclear
4. There is little communication within the implementation process
5. A standardized format to display information about energy efficiency on a product has not yet been developed or mandated

Informed consumers create a demand for energy-efficient appliances. Many consumers do not possess the knowledge that energy-efficient appliances will save them money over the lifetime of the appliance. These appliances can have environmentally friendly effects by reducing electrical consumption of the residential sector within Costa Rica. This knowledge is often needed to persuade consumers to purchase energy-efficient appliances. With little demand for efficient products, manufacturers are not encouraged to supply more efficient products. To create this encouragement, consumers should be informed about energy efficiency labels and how they can be used to select products that will save them money in the long term.

Currently there are regulations in place that require manufacturers to display specific information about their appliances, as stated in LEY 7447. This requires manufacturers to test their products and display energy efficiency information on labels. Both MINAE and MEIC currently collaborate to enforce the regulation of energy efficiency labels. Unfortunately, neither government department has a clearly defined responsibility. According to Yorleny Rojas, MEIC and MINAE are in the process of defining the precise roles for label regulation.

From the ambiguity in responsibility stems the problem of enforcement. Currently the process to be certified, for example through INTECO, is voluntary. With no specific organization taking responsibility of the regulation of product certification and label enforcement, manufacturers are not encouraged to comply with LEY 7447. Without this, a standardized label system is limited because of manufacturers' reluctance to have products certified. Products that are not certified have not been tested using the same standards as other appliances. Since the information from different testing protocols is not directly comparable, it limits the success of the entire standardized labeling system. For a standardized label, similar products must go through the same verification process, to generate equal information to be clearly displayed for comparison. In the current system, certification of appliances is not required. Thus the displayed information on different labels is not comparable, leaving consumers highly confused and unable to properly compare.

The fourth major issue we found was that there appeared to be little communication between organizations involved in the implementation of efficiency labels. Many of these organizations were not aware of the projects that were being led by other organizations. For example, ENERGICE is an energy efficiency label created by ICE in 2008, but many other organizations were not aware of its existence. When the CICR organized its own project in 2014 to develop a standardized energy efficiency label in Costa Rica, its executives were unaware of ICE's efforts. While each organization operates independently, the lack of communication creates the duplication of efforts and lax oversight. Also, the existence of ENERGICE was not known to MEIC. This body responsible for the regulation of labels was unaware of a labeling project developed by another organization in the implementation process. Without the enforcing body being aware of labeling projects, these labels will not be successful.

Along with little communication, there is currently no standard format to display the information acquired from testing. Manufacturers have the ability to display the information in a manner they choose. This leads to a variety of label formats, displaying similar information in different ways. Without a standard display of information, it is more difficult for consumers to make informed purchase decisions based on energy efficiency between multiple products.

As a case in point, when visiting appliance stores in Costa Rica, we noticed that most refrigerators did not have clearly displayed energy efficiency labels. For instance, we discovered that out of 40 refrigerators in one store, only four had easily viewed labels. Upon further investigation, 31 refrigerators had labels that were obscured by advertisements or were hidden inside the product. Moreover, of the four refrigerators with clear labels, two had multiple labels showing different numerical information because of differing testing procedures. This is shown in Figure 9: Example of Refrigerator with Multiple Energy Efficiency Labels in Store. Five of the refrigerators had no efficiency labels, and several labels did not match the model of refrigerator to which they were attached. This inconsistency of labeling makes it difficult, perhaps impossible, for consumers to make informed decisions when comparing the energy efficiency of appliances.



Figure 9: Example of Refrigerator with Multiple Energy Efficiency Labels in Store

In addition to a magnitude of labels in stores, many are just variation of EnergyGuide labels or European Union Energy Labels. This supports that many of the implemented label designs have entered the market without testing consumer preference. Manufacturers are using international energy-efficient labels in Costa Rica without consideration that whether or not they will be understandable or useful. A label tested by consumers could be helpful in order to develop a standard label that is accepted by the general public in Costa Rica.

5.2 Comparative Analysis

5.2.1 Results of Case Studies

In order to complete the Comparative Analysis section, it was necessary to analyze labels from around the world. The three international labels, EnergyGuide, ENERGY STAR, and the European Union Energy Label, had been tested within their country of origin. These studies found that EnergyGuide and ENERGY STAR were easily recognizable in the United States,

although some participants did not necessarily understand their significance. EnergyGuide in particular was found to be ineffective. To prove this point, a study was conducted where shoppers were shown five labels with different information, and were then required to select the official label. Only 12% were able to correctly identify the actual label. Meanwhile, the study of the European Union label found that consumers were able to recall the energy label of the product. Both studies showed approximately 40% increase in selection for more expensive energy-efficient appliances, when energy-efficient labels were provided. These studies showed the success of labels in their respective countries, but this does not necessarily apply to the Costa Rican community.

5.2.2 Correlations from Survey Data Regarding Label Drafts

As described in section 4.2, we used the results of case studies of existing labels to determine the questions for our consumer surveys. These were used to understand the features of labels that are most useful in Costa Rica.

We surveyed a total of 140 participants in public areas and appliance stores. Although this number appears low in light of the fact that the greater San José metropolis features about 900,000 residents, it nonetheless is sufficient to reveal important trends. Once all the data was collected, we analyzed it via statistical methods. The data was transformed into numerical values and a standard correlation function was applied to all of the survey responses. The correlation matrix generated from this step was then used to further investigate the relations between question responses and demographic data. In order to investigate specific relationships, the surveyed population was broken down by one factor of the correlation and then compared to the other, as shown in Appendix B. For discrete data this was done using the conditional COUNTIF function in Excel, while statistical means for a population were determined using the

AVERAGEIF function. Analysis of non-correlated data was completed with simple mean, median and mode analysis (Albright, 2011), and the standard deviation of data subsets was also investigated. With these analysis tools, we were able to generate useful results for our study.

One of the first questions we asked consumers in Costa Rica was whether or not they recognized the international labels. ENERGY STAR proved to be the most recognized of the labels with slightly over half of those surveyed indicating they had previously seen it. EnergyGuide was the second most recognized label, and finally the European Union label was the least recognized of the example labels. This is shown in Figure 10. It should be noted that during our investigation of labels in stores, it became apparent that this reflected the Costa Rican appliance market well. There were no official European Union labels found within stores, but there were various labels which were similar in design. EnergyGuide was found on several refrigerators, and the ENERGY STAR label was even found in some advertisements for appliances. From a study obtained from MEIC (Estudio Comparativo de Etiquetas Energéticas en Refrigeradores en el Comercio Nacional), it was shown that the EnergyGuide label was relatively prevalent in Costa Rican stores.

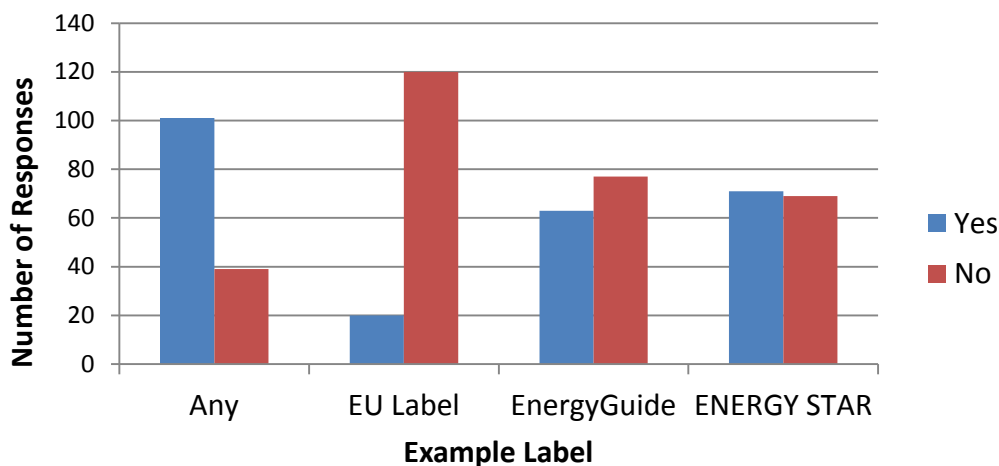


Figure 10: Recognition of International Labels in Costa Rica

After determining which international labels have been seen by consumers, we investigated responses to compare the three label types. EnergyGuide uses specific numerical information about energy efficiency. ENERGY STAR is a seal of approval label placed only on appliances that meet certain standards. The European Union (EU) label uses a ranking scale to compare the efficiency of appliances. It was found that of the 140 consumers surveyed, 53% preferred EnergyGuide over the other label types. The European Union label was the second most preferred label (33%), and finally ENERGY STAR came in last with only 14% of the responses. Of those surveyed, 80% said they would purchase the appliance with their preferred type of energy efficiency label. However those who thought that ENERGY STAR was the best type of label did not follow this trend as closely. This occurred because as a seal of approval style label, consumers felt that it did not contain sufficient information to make a buying decision. Figure 11 shows that 59% of those surveyed would purchase a refrigerator with the EnergyGuide label over a similar appliance with the other international labels. This was the largest percentage difference for any question that compared EnergyGuide, ENERGY STAR, and the EU label. Surprisingly, consumers preferred information, and were not put off by denser text.

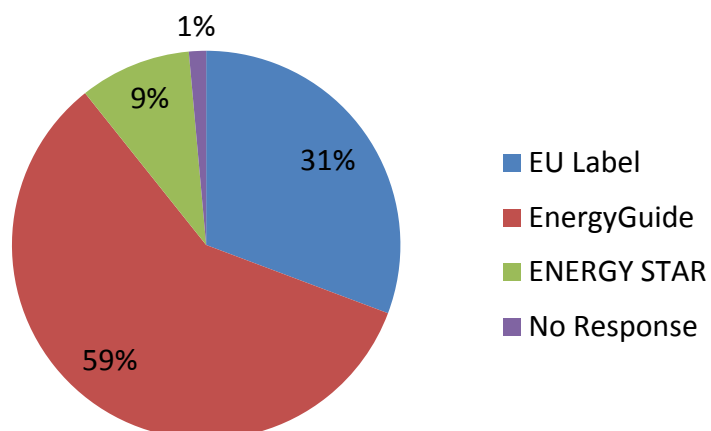


Figure 11: Percentages of Purchase Preference Based on International Label

Although the majority of consumers chose EnergyGuide as their preferred label type, it was not the most visually attractive in the opinions of the participants. 39% of those surveyed felt that the EU label was the most attractive. Participants in the survey would often cite the bright rainbow colors of the rating system, clean layout, and minimal writing as attracting their attention. Figure 12 demonstrates this.

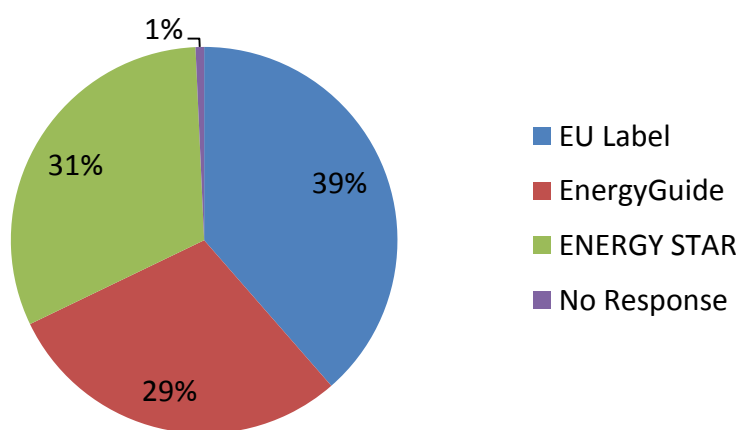


Figure 12: Most Visually Appealing Example Label

Although the majority of consumers found the European Union (EU) label the most visually attractive, their comprehension of the label's information was limited. This was reflected in two survey results. When consumers were asked to choose the most comprehensible label, only 19% chose the EU label, while the EnergyGuide was chosen by an overwhelming 64% percent of participants. In the next section of the survey, consumers were asked to identify features of each label (EU and EnergyGuide) and rank their importance. Participants were also asked to indicate features they did not understand on each label. There are six features per label, so that when 140 participants respond there are a total of 840 data points. There were 125 out of 840 instances in which those surveyed did not understand a feature of EnergyGuide (approximately 15% of the time). In comparison, the features of the EU label were not understood 254 times out of 840 (approximately 30% of the time). Figure 13 displays this.

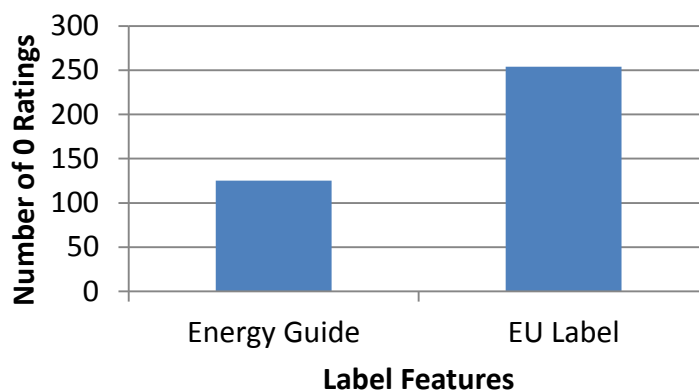


Figure 13: Number of Times EnergyGuide and EU Label Features Were Misunderstood

When reviewing the individual features of each of the labels, several significant trends emerged. The first trend was that stating a yearly cost to operate was very well received. Only 8 of the 140 consumers surveyed found the cost of operation per year difficult to understand. It was rated the most useful of all of the EnergyGuide label features. On a scale from 1 to 6, with 6

being the most useful feature, cost of operation received an average rating of 5.68 out of 6. The second most useful label feature was the energy usage per year. Finally, as can be seen in Figure 14, the various other features of the EnergyGuide label were considered less important, with an average rating of 4.0. While EnergyGuide is a bit more complex, Costa Ricans preferred it for its detailed information, and found it more comprehensible while translated into Spanish.

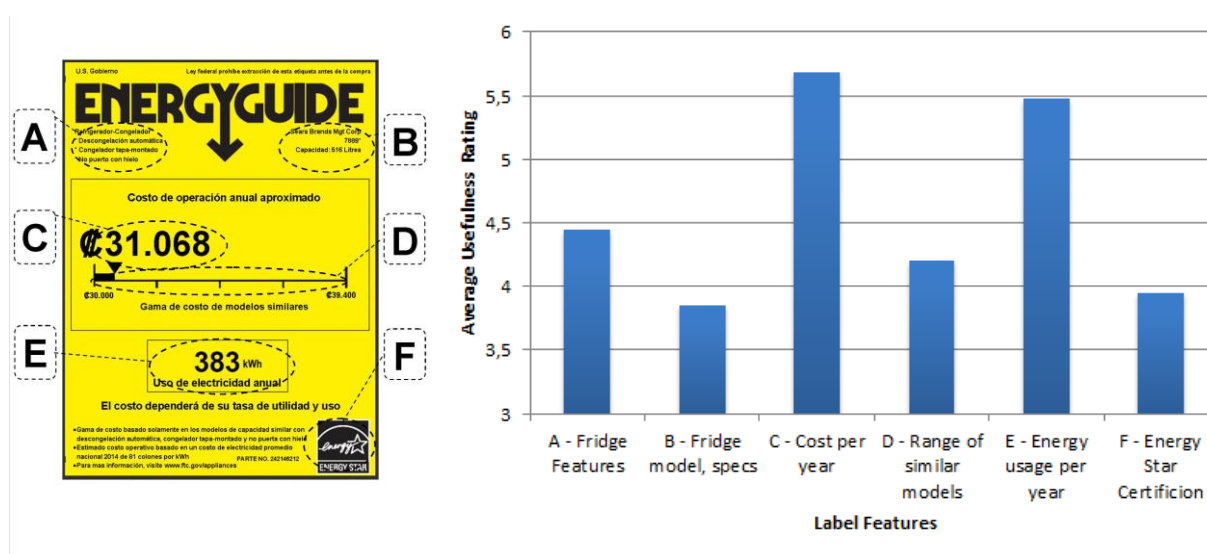


Figure 14: Average Usefulness rating of six of the EnergyGuide Label Features

The European Union label showed similar trends as the EnergyGuide label. The EU label does not display yearly cost of operation. Energy usage per year was the most important feature to consumers, with an average rating of 5.08 out of 6, with 6 being the most important. The most surprising result from this section of the survey was the significant lack of comprehension of the grade rating and scale system (features A and B in Figure 15). Although respondents found that the color of the scale attracted their attention, 40% of those surveyed did not understand the meaning of the scale. Those who did understand the scale, did not rate it very highly. The letter

grade rating (feature B) was the lowest rated of any feature of either label. It had an average rating of 3.32 out of 6. This likely occurred because in Costa Rica, letter grading systems are not used, and therefore an “A” rating would have little meaning to the average consumer. Features D, E, and F for the EU label were also rated poorly for their usefulness to participants. These three features were misunderstood a total of 117 times across 140 surveys. These three features use symbols to convey information, and Costa Rican consumers are likely unfamiliar with these symbols. While the EU label was created to be universal, for Costa Ricans, more written information is preferred.

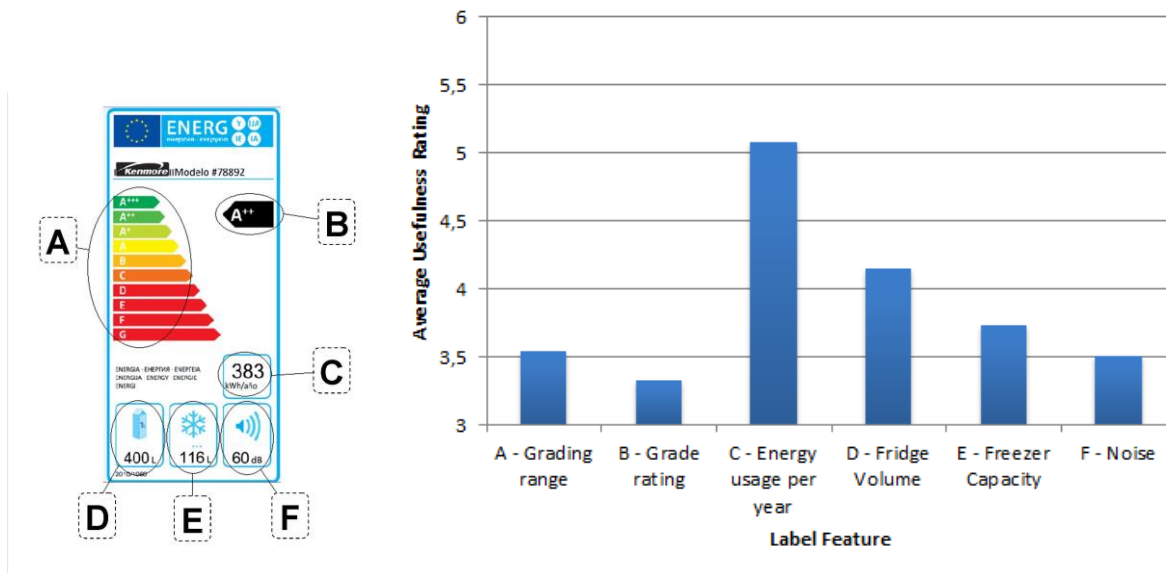


Figure 15: Average Usefulness Rating of Six of the European Union Energy Label Features

We determined features that conveyed information well, in addition to features that were not helpful to consumers. We learned that respondents prefer a label with bright colors and that also includes detailed numerical information. A complete summary of the data found from our initial surveys can be found in Appendix B: Consumer Awareness and Comparative Analysis

Survey. As will be discussed below, using the data gathered in this section, we designed a second set of surveys to evaluate our own label design drafts.

5.2.3 Explanation of Error and Bias

There were several sources of error that could have affected our survey. The greatest challenge we encountered while performing this survey was explaining questions using a ranking system to participants. Several of the respondents only filled in their favorite or least favorite selections, and did not rank the other categories. This data could still be included in the final data set without significantly affecting the results. Non-responders lowered the overall number of data points collected.

We also encountered the possibility of nonresponse bias in our survey. Several of the respondents selectively did not reply to certain questions. However, this was very minimal and only occurred once or twice on each question out of 140 respondents. This did not significantly affect the overall outcome of each question. We recalculated averages needed for our results with and without response errors. The difference between the averages was insignificant.

Finally, the largest error that may exist in this survey is that from inconsistency in the way in which the survey was presented and explained. During the first surveying session, two separate teams of two members were created to survey separately for time and efficiency. Unfortunately, there was no predefined method of whether to read the survey to the consumer or to hand it to them and allow them to read and interpret the survey separately. After approximately twenty surveys, this problem was addressed and corrected with a standard surveying method and explanation.

The most recent population size of Costa Rica is 4.8 million residents. Based on our survey sample size of 140 residents, our confidence level was 85%, with a confidence interval of

+/- 6.0% (Albright, 2011). This confidence interval is a reasonable size and was considered when reviewing data from the survey.

5.3 Assess Local Opinions

5.3.1 Public Opinions of Appliance Features

In addition to questions about specific label features, we asked questions about the opinions of consumers during the process of purchasing appliances to understand what is important to them.

When we asked the general public whether or not they had seen energy efficiency labels, 68% of those surveyed reported they had seen energy efficiency labels in stores. Of this 68% percent, 82% of participants found information on labels useful, and 78% percent reported that the labels affected their buying decision. However, 32% of those surveyed had not seen energy efficiency labels, and were not aware of their availability. This leads us to believe that consumers could be more informed about energy efficiency. This is depicted in Figure 16.

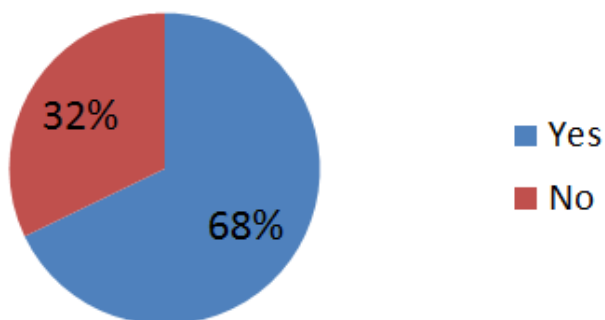


Figure 16: Percentage of Participants Who Had Seen Energy Efficiency Labels

Consumers were next asked to rate seven product characteristics, including price, size, and visual appearance, in order of importance on a scale from one to seven; seven being the most

important. It was found that the most important feature of a given appliance is the initial price of the product. This held true across demographic lines. A total of 27 out of 140 participants selected price as the most important feature. The energy usage of a product lies approximately in the middle of the data set in terms of importance to consumers. Finally, the cost of use of products was consistently rated the least important feature. This data is shown in Figure 17.

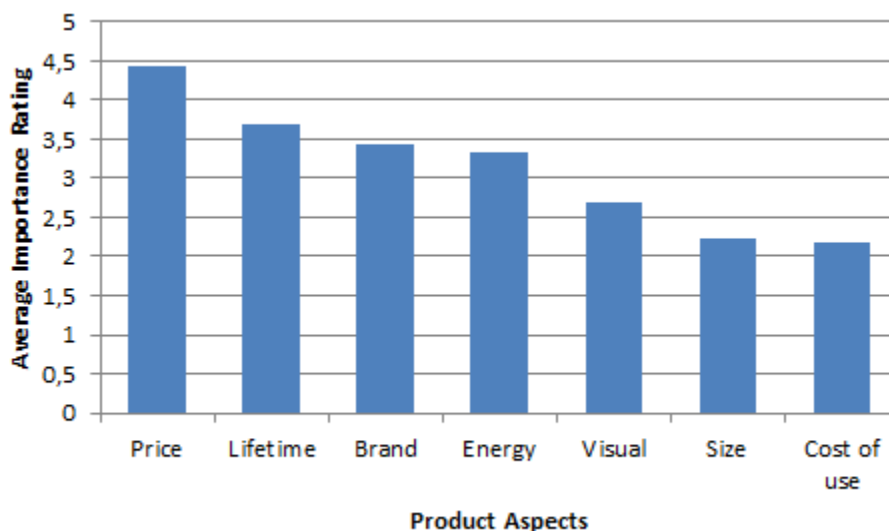


Figure 17: Average Rate of Importance for Seven Appliance Features with 7 Being Most Important

Respondents were asked how important energy efficiency was to them, independent from other appliance features. Many of those who had ranked energy efficiency of low importance in the previous section rated it much higher here. On a scale from 1 to 5, with 1 being the most important, 80 of the respondents rated efficiency “1”. Figure 18 shows how consumers’ ratings of the importance of energy efficiency increase greatly when not compared to other product features.

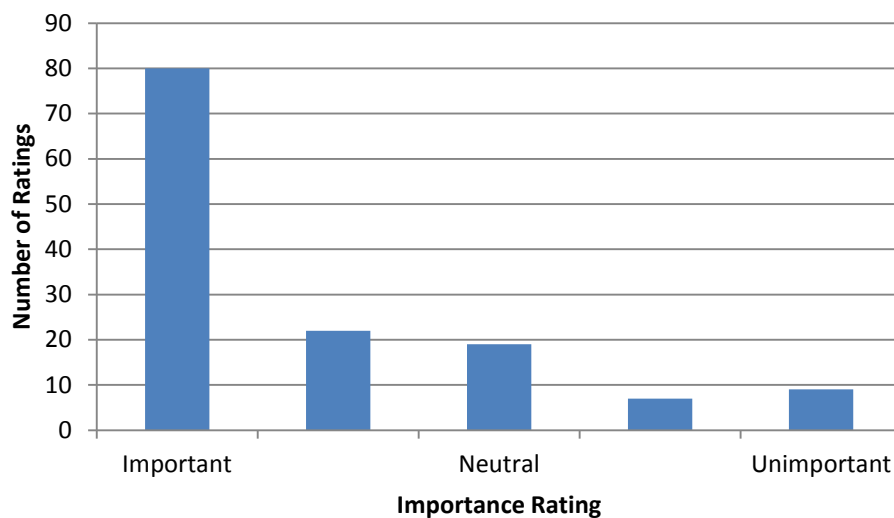


Figure 18: Rating of Importance of Energy Efficiency When Not Compared to Other Appliance Features

From this section of the survey, it is clear that consumers were very enthusiastic about energy efficiency when asked directly about this feature. When compared to other product features, energy efficiency is no longer within the top priorities of most consumers when buying appliances.

Finally, participants were asked to indicate a preferred label from the three international labels. Once selected, we asked whether the information or design of the label influenced their decision more. Of the consumers surveyed, 54% selected information as more important, while 46% selected design. Figure 19 displays this data.

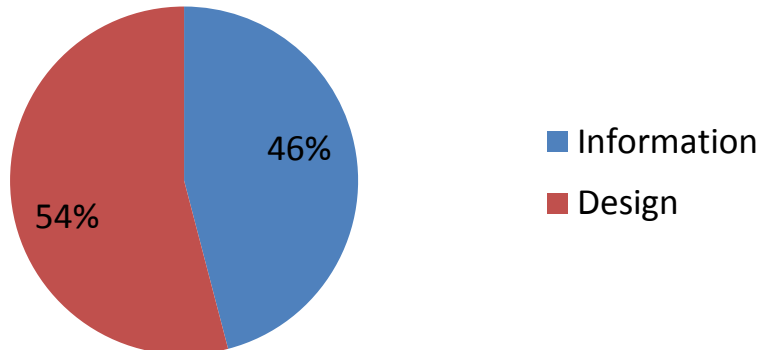


Figure 19: Influence on Label Preference Based on Information or Design

From these results we determine consumer awareness and gained their opinions about energy efficiency. With one third of consumers unaware of labels, and respective decrease in importance of energy efficiency compared to other appliance features, we have grounds for educational campaigns. We have better insight into their top priorities such as Price and Lifetime, and can use these to help us in our design.

5.3.2 Sales Representative Data

Appliance sale representatives were asked all of the questions above in addition to a qualitative feedback section which specifically asked about how they present products to customers. A total of 22 sales representatives were surveyed. Even though this is a small sample, we emphasize this groups experience in the field to indicate important trends and insight. They have firsthand experience with consumer buying appliance. The first piece of data that stood out regarding the sales representatives was that they rated the importance of energy efficiency lower than any other group surveyed. On a scale from 1 to 5 (1 being the most important) the general public rated energy efficiency at an average of 1.75, while sales representatives rated it with an average importance of 2.13. This result was very surprising, indicating energy efficiency is less

of a priority to sales representatives. Ideally, we would want those selling appliances to hold energy efficiency above other features.

When we asked appliance sales representatives whether they had seen energy efficiency labels, 3 of the 22 (13%) surveyed reported that they did not recall seeing them at all. However, when shown the example labels from other countries, sales representatives responded significantly more positively than the general public. Of the sales representatives, 91% recognized at least one of the labels, 20% more than the general public. This data is shown in Figure 20. As a disclaimer, the sample size of sales representatives was much smaller than that of our general public. This data may not represent the total population of sales representatives in Costa Rica.

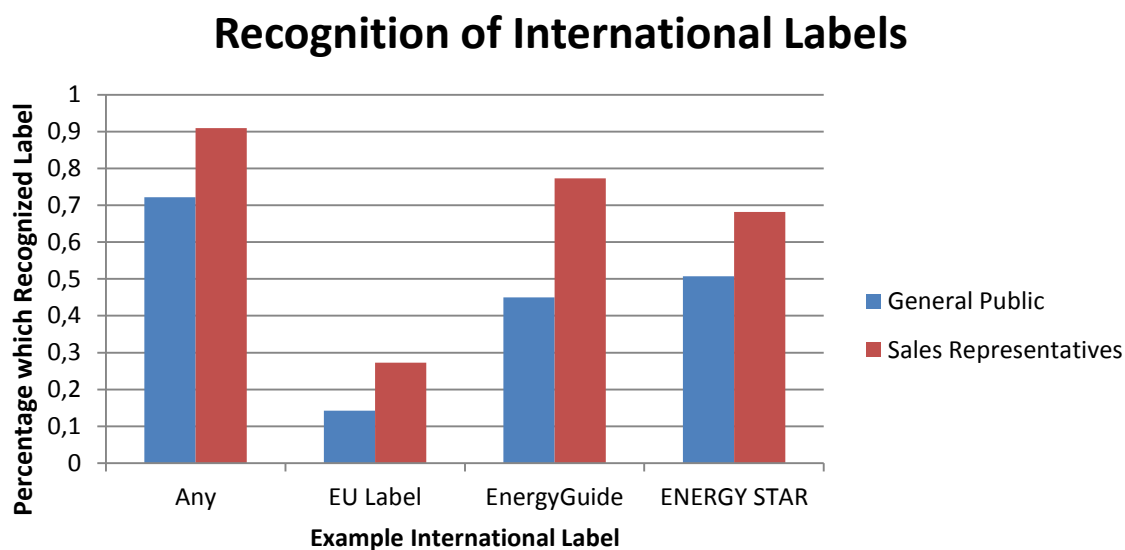


Figure 20: Recognition of International Labels between the General Public and Sales Representatives

In the additional open response section for sales representatives, there were some clear trends in the information they use to persuade consumers to purchase appliances. The most

common selling point was price, with 68% of the sales representatives mentioning price during the related open-response question. The second most common word mentioned through all of the open response-questions was consumption. This word was often included in the phrase “consumption of energy,” or electricity. Between all 18 open-response surveys, consumption was mentioned a total of 53 times. The specific phrase “energy efficiency” was only mentioned once across all of the open-response question results. The complete data gather from sales representatives can be found in Appendix C: Survey of Sales Representatives.

5.4 Implementation of Label

5.4.1 Final Design Drafts

Based on the responses from the initial consumer surveys, six label drafts were created to test label design and comprehension for a final recommended label that has in our opinion the highest appeal for Costa Rican residents. The data included in these label drafts was determined by the survey results in Section 5.2. These labels attempted to include all of the information found useful by the consumers in Section 5.3.1, as well as create a simple design. This specifically led us to include the numerical cost of operation per year and energy consumption per year.

In addition to incorporating the findings of our initial surveys, several of the labels were designed to conform with LEY 7447 pertaining to energy efficiency labeling. This law requires 13 label features to be displayed, including a specific name, appliance volume, and two forms of energy usage per year. Label drafts were created with and without this data to determine if it made the label too visually busy. The six draft labels are seen in

Figure 21, and larger versions can be reviewed in Appendix D.

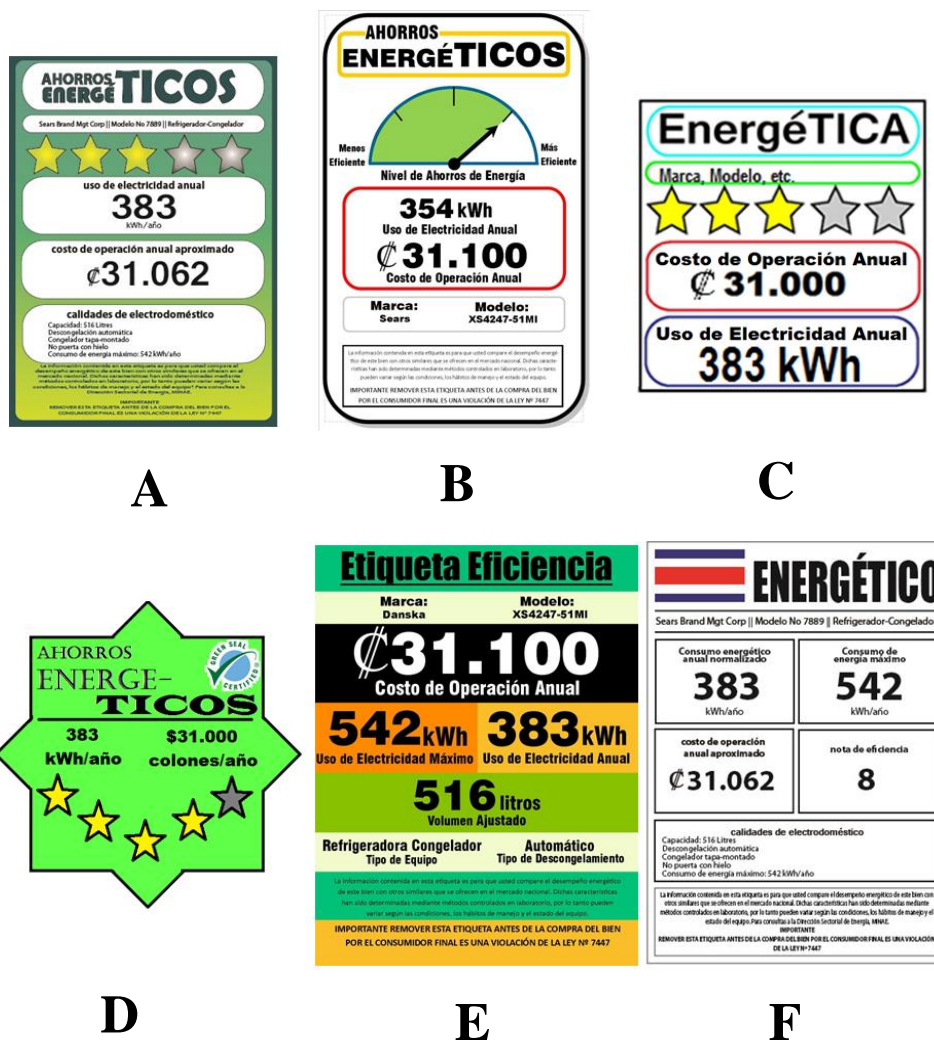


Figure 21: Six Possible Label Designs (A – F) Used in Evaluations of Consumer Preference

We wanted to create a variety of designs to test among consumers. These six designs were inspired by observations we made while surveying, and strong trends in the results from our initial survey. Many of the features chosen in these possible designs options were things we associated with energy efficiency. For variety, we added un-orthodox features to some designs. This ensured that we didn't leave out possible ideas that Costa Rican may like. The star design of option "D" and the gauge scale in option "B" are example of un-orthodox features but can appeal to Costa Ricans.

5.4.2 Evaluation of Drafts

The draft labels shown in Figure 20 were tested with 50 consumers as part of a public survey. This survey covered five major elements of our recommended labels. Four of these were specific label features and the final section included responses to the complete draft labels. For each of these questions, participants were asked to choose the best and worst options based on their opinions. All of the question choices can be found in Appendix E.

Different visual scaling systems were the first label features tested. This label feature provides a visual means for consumers to understand how efficient an appliance is without having to read the numerical data. This also allows consumers to easily compare products based on their energy efficiency. Of the five scaling systems tested the most well-received feature was an analog gauge system, similar to a fuel gauge in a vehicle. Of those who participated, 40% chose the gauge as the best scale system. Figure 22 shows the net responses for each of the surveyed scales, and the chosen scale type. The net response count is the number of times the example label was chosen as the best label minus the number of times it was chosen as the worst label.

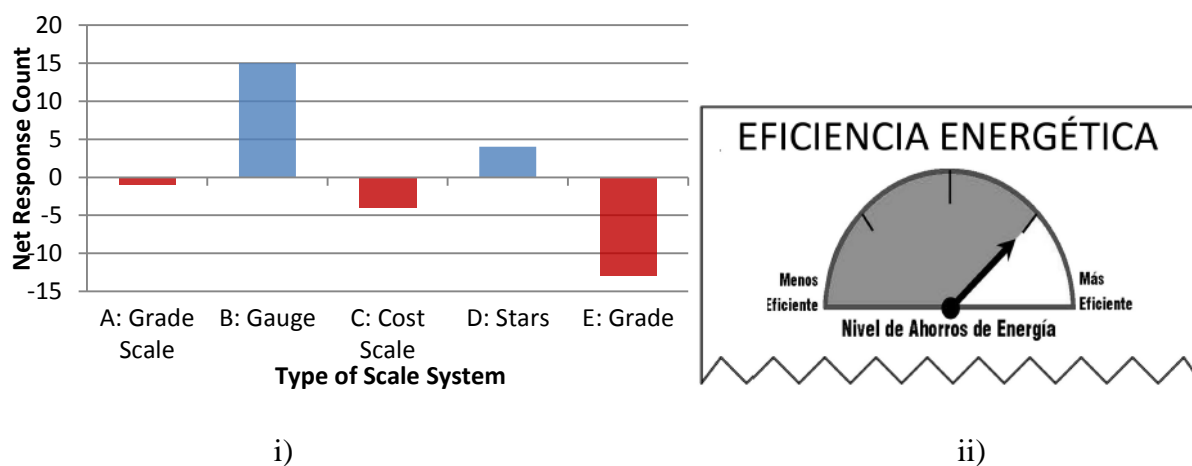


Figure 22: i) Net Selection of Possible Scaling Systems, ii) The Scaling Option That Was Most Approved

The next label feature tested in our surveys was the title of the label. This included both the title name as well as the logo design. It should be noted that Ley 7447 requires that the label be entitled “Etiqueta Energética,” or “Energy Label.” However, this title received the lowest rating of all tested choices. This may indicate that the government does not sample consumers for their thoughts and opinions. The most positively received title was “Ahorros Energéticos,” or “Energy Savings.” This title also includes a reference to “Ticos,” or the name in Spanish used to refer to Costa Ricans. The chosen title and logo, as well as a graph of the net responses to the titles are shown in Figure 23.

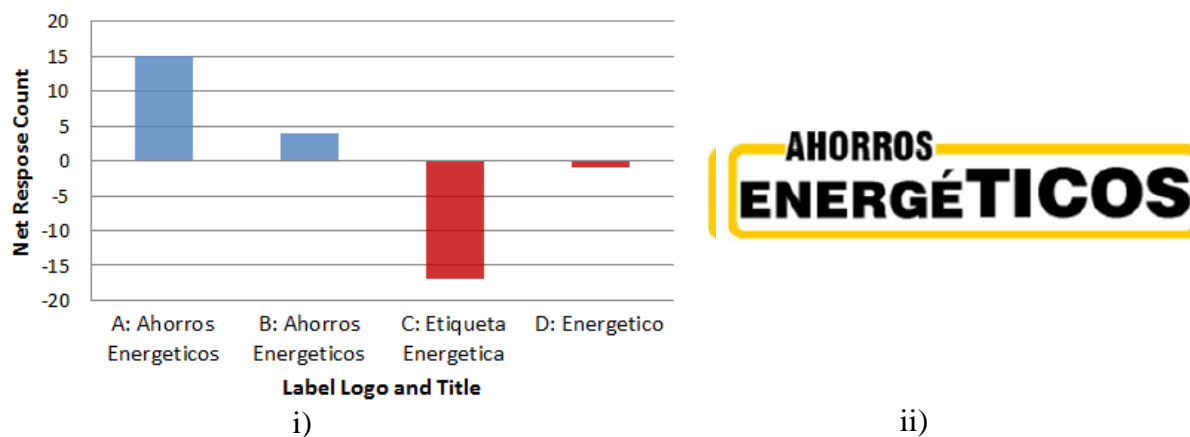


Figure 23: i) Net Selection of Possible Titles, ii) The Title Option That Was Most Approved

After the title, consumers were tested on label color and label layout. As expected, Costa Rican consumers favored more colorful labels. A label with a rainbow colored background was considered the most attractive. Solid green received the next highest net rating. The label layout had far more pronounced results than the color preferences. The majority of those surveyed preferred a portrait layout with a minimal number of boxes containing numerical information. The least preferred label layout was a star-shaped label with a minimal amount of data. The numerical results of these survey sections and specific questions can be found in Appendix E.

For the final question of the survey, the six draft labels shown in Section 5.4.1. were presented to the respondent. Unsurprisingly, the label which received the highest ratings incorporated the most popular title, scaling system, and layout. The only feature not incorporated in the highest rated label from the results of previous questions was the background color. However, the second most popular label was extremely colorful. The highest rated label and net response count is depicted in Figure 24. Additional data and other label drafts can be found in Appendix E.

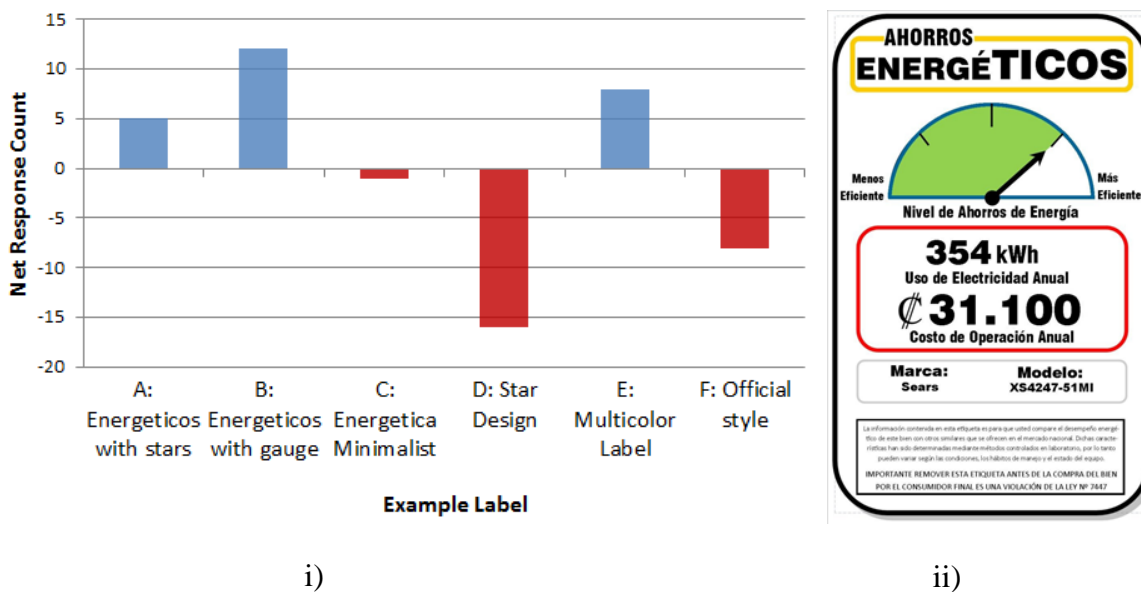


Figure 24: i) Net Selection of Possible Label Designs, ii) The Label Design Option That Was Most Approved

Chapter 6: Conclusions

From our research, we drew four main conclusions pertaining to each objective.

1. Communication between implementation bodies could be improved
2. The existing system for the implementation of energy efficiency labels is inefficient
3. The public was generally not knowledgeable of energy efficiency labels
4. Features of labels that are attractive and comprehensible to consumers should be developed

The first conclusion was the most obvious when communicating to the individual organizations involved in the implementation body. Many of them were not aware of the projects that were being led by their partners. An example of this is the lack of knowledge about the ENERGICE label by other organizations. ICE pointed out that enforcement was a main flaw in standardizing a label. MEIC, which is a member of the enforcement body and investigates the market pertaining to labels, was not aware of ENERGICE. MEIC and MINAE are the bodies responsible for enforcement. They are currently discussing the delegation of tasks to begin enforcement, but it appears that neither organization is assuming responsibility. We concluded that there is an obvious disconnect between organizations within the implementation process.

The second conclusion was established after meeting with all of the implementation organizations. We were introduced to LEY 7447, which requires thirteen specific aspects to be displayed on an energy efficiency label for appliances. However, this law does not specify a standardized testing procedure, nor does it mandate a specific design to display the information. Clearly, this leads to different results from energy efficiency testing and a confusing variety of labels. A single government body responsible for its enforcement is also needed. The absence of enforcement is due to outdated regulations, lack of resources to regulate the market, and

miscommunication between organizations. The underlying issues tie with our previous conclusion: a general lack of effective communication.

Our third conclusion was determined via survey results assessing public opinions on energy efficiency. The top priorities for Costa Ricans when buying appliances, in order of importance, are: price, lifetime of product, brand, energy efficiency, visuals, size, and cost of use. Energy efficiency was of rather low importance when compared to other appliance features. Interestingly, results show that about one-third of the sample had not seen energy efficiency labels at all. This indicates that one-third of the surveyed consumers are unaware that energy efficiency labels are supposed to help them make informed decisions. To create a demand for energy-efficient appliances, consumers need to understand how appliances can save money in the long term of their usage.

Our fourth conclusion was also determined via survey results. After testing three types of labels, we determined that Costa Ricans preferred a more informative energy efficiency label. On average, 59% of Costa Ricans would have purchased a refrigerator with an EnergyGuide label rather than the ENERGY STAR or European Union label. Results also showed participants preferred a label that is law-compliant, displays cost of operation per year, has an analog gauge comparative image, has the title “Ahorros EnergÉTICOS”, utilizes rainbow colors, uses large font, and uses a simple layout. This may indicate insufficient research by the government and by manufacturers on consumer preference when the law was initially created.

Chapter 7: Recommendations

7.1 Steps for Future Implementation of an Efficiency Label in Costa Rica

After interviewing the companies involved in the implementation process, we observed specific areas that need improvement. When interviewing employees from each of the implementing organization, we inquired about the flaws of the system and how they could be improved. With information from implementation companies, research into existing labels, survey results, and our observations of the current system in Costa Rica, we developed recommendations for a standardized label system. These recommendations should make labels more effective and useful for consumers. The labels will help consumers make informed decisions when buying appliances, while promoting energy-efficient appliances. The four main recommendations include:

1. Collaboration
2. Standardized, Mandatory, Label System
3. Consumer Education
4. Government Involvement

7.1.1 Collaboration

From our observations and interviews with CICR, ASEGIRE, ICE, ECA, INTECO, and MEIC, many of the organizations do not update each other with regards to ongoing energy efficiency projects. While each organization operates independently, the lack of communication creates duplication of efforts and lax oversight. Case in point: the CICR was unaware of ICE's project to develop a label and initiated this study duplicating the process. Also, the lack of communication between MEIC and MINAE has prevented strong enforcement of regulations. To

successfully implement a standardized label system, these organizations need to hold closer ties with each other.

In order to persuade these organizations to collaborate effectively towards the goal of standardizing an energy efficiency label in Costa Rica, we suggest forming a standing committee with regularly scheduled meeting times. Organizations present in this committee should include producing companies, accreditation companies, testing laboratories, and enforcement bodies. In this committee, members will be informed of all projects pertaining to the implementation of a label. This will provide an opportunity for organizations to collaborate to improve the standardized labeling system. The committee will also ensure that each organization will be involved in the label implementation process, rather than the current situation of several companies trying to standardize several different labels. It is expected that this will reduce the number of labels in the market and lower confusion among consumers. Our suggestions for the companies to be included in this committee, as well as their responsibilities, are detailed in Table 2.

Table 2: Suggested Committee Members, Roles, and Responsibilities

Company Name	Category of Company	Responsibility
CICR	Management	Encourage member institutions to cooperate with program
ICE	Testing Laboratory	Test appliances and confirm validity of label information
ECA	Accreditation	Certify ICE and INTECO procedures
INTECO	Accreditation	Create standards for product quality
MEIC	Enforcement	Educate consumers through media campaigns
MINAE	Enforcement	Investigate label compliance and fine offenders, create initiatives for updated regulations
ASEGIRE	Management	Encourage member institutions to cooperate with program
Manufacturer	Producer	Provide quality products that abide by the law
Appliance Retailer	Distributer	Promote label use in stores; sales rep. training

7.1.2 Standardized Mandatory Label System

Once a committee has been formed, the tasks needed to create a comprehensive labeling system can be articulated and delegated to the individual organizations. Each organization will be responsible for tasks to properly implement and sustain an effective standardized energy efficiency label. The committee should be guided by two objectives: 1) to update regulations that specify responsibility to enforce LEY 7447 and 2) to mandate standard testing procedures to ensure comparable results and a standardized label design.

To complete the first objective, the committee must update the regulations that declare who is responsible for the enforcement of LEY 7447. Currently, both MEIC and MINAE are accountable for the enforcement of labels in the market. We expect that under the joint supervision, clear regulations will emerge that delegates enforcement responsibilities.

We recommend that MINAE should take the lead in creating a more proactive enforcement body. Presently, MEIC's purpose is mainly to educate consumers, receive consumer complaints, and investigate the validity of complaints. This organization, however, lacks the resources to enforce labels in stores. MINAE, however, is responsible for the technical aspects and validity of the information on the energy efficiency labels. Ideally, MINAE will work with ICE to test the accuracy of the information provided by manufacturers. If the information is incorrect, MINAE would be responsible for penalizing the appropriate party. The fines will go towards funding the implementation process. Since there is currently no law directly stating this responsibility, this leads to confusion between MEIC and MINAE about their specific roles. An updated law would solve the issue of miscommunication and delegate responsibilities for label implementation.

With an active enforcement body regulating energy efficiency labels in the market, manufacturers will be more likely to comply with the law. Currently MEIC and MINAE are discussing the development of a sanction for placing invalid information on energy efficiency labels. Therefore, manufacturers will have an incentive to become certified and to place a standardized label on their appliances. MEIC and MINAE must update the regulation, and make label regulation an essential priority.

To complete the second objective, we recommend that the proposed committee petition the government to introduce a new regulation: it should require all appliances (domestic and imported) to be certified within Costa Rica. This regulation should mandate that all similar appliances undergo a standardized testing procedure. It should also decree that all required information is displayed on a standardized label design. This would allow consumers to consistently find information in the same location on labels. Using one standardized label required by the government would furthermore eliminate the existence of multiple labels on appliances. This will reduce the amount of misleading information available in the market.

7.1.3 Education

Our survey showed that approximately one-third of our participants had not seen energy efficiency labels at all. To create a demand for energy-efficient appliances, consumers need to understand their impact on the environment and how they can lead to saving money. These examples lead us to recommend that educational programs are launched that focus on the following topics:

- Mass media campaign
- Training of sales representatives
- Informational graphics in-store

We recommend a series of three campaigns to meet these needs.

The first campaign is to inform consumers of the benefits of energy-efficient products through mass media. The content will educate consumers about appliances that cost less money to operate and reduce the total impact on environment. This campaign could be done via television, radio commercials, internet campaigns, product advertisement campaigns, and child enrichment programs in schools. Many people watch television, listen to radio, and use the internet. Using these resources allows the campaign to reach a wide audience in a quick manner. Encouraging manufacturers to use information relating to energy efficiency in their advertisement campaigns and commercials will emphasize its importance to consumers.

Child enrichment programs promote conservation of energy to school students. Educating younger generations about ways to reduce energy consumption will promote energy-efficiency within their households. Equipped with specific information about energy-efficient appliances, children can have substantial impact on their families' daily habits. Convincing children that this is an important issue will also encourage energy-efficient practices in the future.

The mass media campaign should be managed by MEIC. This follows the department's objectives of giving consumers the information needed to make informed decisions.

The second campaign focuses on educating sales representatives. They should be aware of the advantages of energy-efficient products, how to interpret energy efficiency labels, and how to use this information to persuade consumers to buy efficient appliances. Energy efficiency should be made a priority for these employees. They are responsible for convincing consumers to purchase energy-efficient appliances. They furthermore assist consumers in comparing important features of products. Energy efficiency should become one of these important features. This program can be implemented by CICR and ASEGIRE contacting their member institution and

stores, and encouraging stores such as Play and Importadora Monge to add training focused on energy efficiency labels.

The third campaign focuses on educating consumers on the existence of energy efficiency labels. It should also indicate an official label and how to use the features to compare products. Consumers need to be made aware of the availability of this information. This information should encourage a demand among consumers for more efficient appliances. Consequently, the demand should promote competition among providers who supply these appliances. To achieve this, we suggest a large, explanatory poster in appliance stores. These posters will draw attention to the labels, and highlight their features. It will give a detailed illustration and description of features to increase understanding among consumers. Highlighting the importance of the features will give consumers the tools to make proper comparisons in appliances. The previously mentioned committee dedicated to improving the standardize label system should be responsible for creating these posters and distributing them to appliance stores.

In summary, these education campaigns will promote energy-efficient appliances, create demand for efficient appliances, and increase competitiveness between manufactures to make better products.

7.1.4 Government Involvement

Our final recommendation is for the government to initiate programs and policies that will encourage manufacturers to become certified through a Costa Rica company and use an official, standardized label. In the United States, ENERGY STAR can attribute its success to a similar program. An U.S. Executive Order required the government to purchase only office equipment that was compliant with ENERGY STAR standards. The amount of products used by the government created a large demand for energy-efficient appliances. This encouraged

manufacturers to produce more ENERGY STAR compliant appliances to meet the government demand. The availability of these appliances then led to consumers purchasing more efficient appliances.

We recommend a program in which the government exclusively uses appliances that are certified in Costa Rica. Governments are one of the largest consumers in the market. A program similar to that developed in the United States would encourage Costa Rican manufacturers to improve the energy efficiency of their products to remain competitive in the market. Once companies begin to produce appliances that meet government requested energy efficiency standards, they will become more widely available to consumers. Then, educational campaigns such as those described above can be used to encourage consumers to purchase these efficient appliances.

Another important contribution the Costa Rican government could make is to offer tax exemptions for importers and domestic manufacturers that meet energy efficiency standards, and use environmental friendly procedures in production. Ideally, these tax incentives will save manufacturers money. Those savings should trickle down and reflect in the prices of the product. If energy-efficient products cost less, more consumers will buy them. This will conserve electricity and thereby result in increased demand for efficient appliances.

Currently, the problem is verifying which products are compliant with the standards. We recommend that INTECO develops the standards that manufacturers are required to achieve and organizes the entirety of the certification process. For example, companies could bring products to INTECO, which in turn will work with ICE to complete energy consumption analysis. Then, INTECO will certify the product and issue the completed, standardized label to the manufacturer. When INTECO accredits that appliance, it can also determine if the product is

approved for a tax exemption, and if it meets the qualities of the government program. With one company responsible for these functions, the certification and label implementation process would become a straight-forward, transparent procedure.

7.2 Standardized Label based on Consumer Input and Ley 7447

In addition to recommending improvements to the current energy efficiency labeling systems in Costa Rica, we also recommend a single standardized label design. In order to outline the process we have created an example label that fully integrates the consumer preference into its design. This ensures understanding of key features and usefulness of the label. Our same methodology can be applied on a larger scale to adapt the best energy efficiency label for Costa Rica. This would allow the public to accept the label and to have confidence and ownership in it.

This prototype label was created using crucial information gathered from consumer surveys, feedback from sales representatives, and includes input from implementing bodies. Several key features are incorporated into the final suggested label including law compliance, cost of operation per year, bright visual appearance, and clear explanations of technical data.

It would be in the best interest of Costa Rican appliance labeling, if the recommended label meets the 13 features stipulated by Decreto 29751. Although we do not agree with all points of the law, compliance with it would allow for more rapid implementation. Even though the law demands a large amount of data to be displayed, it could be included without creating an overwhelmingly complex technical label. An example of this is the preferred label design from our second round of surveys: it was the most highly rated label design and it was almost fully law compliant. The only area where our design differs is the title. By law the label is required to be named “Etiqueta Energética”. However, as mentioned earlier this title was very poorly

received by the public. For this reason the recommended example label design does not include this title. The final recommended standardized label design can be seen in Figure 25.

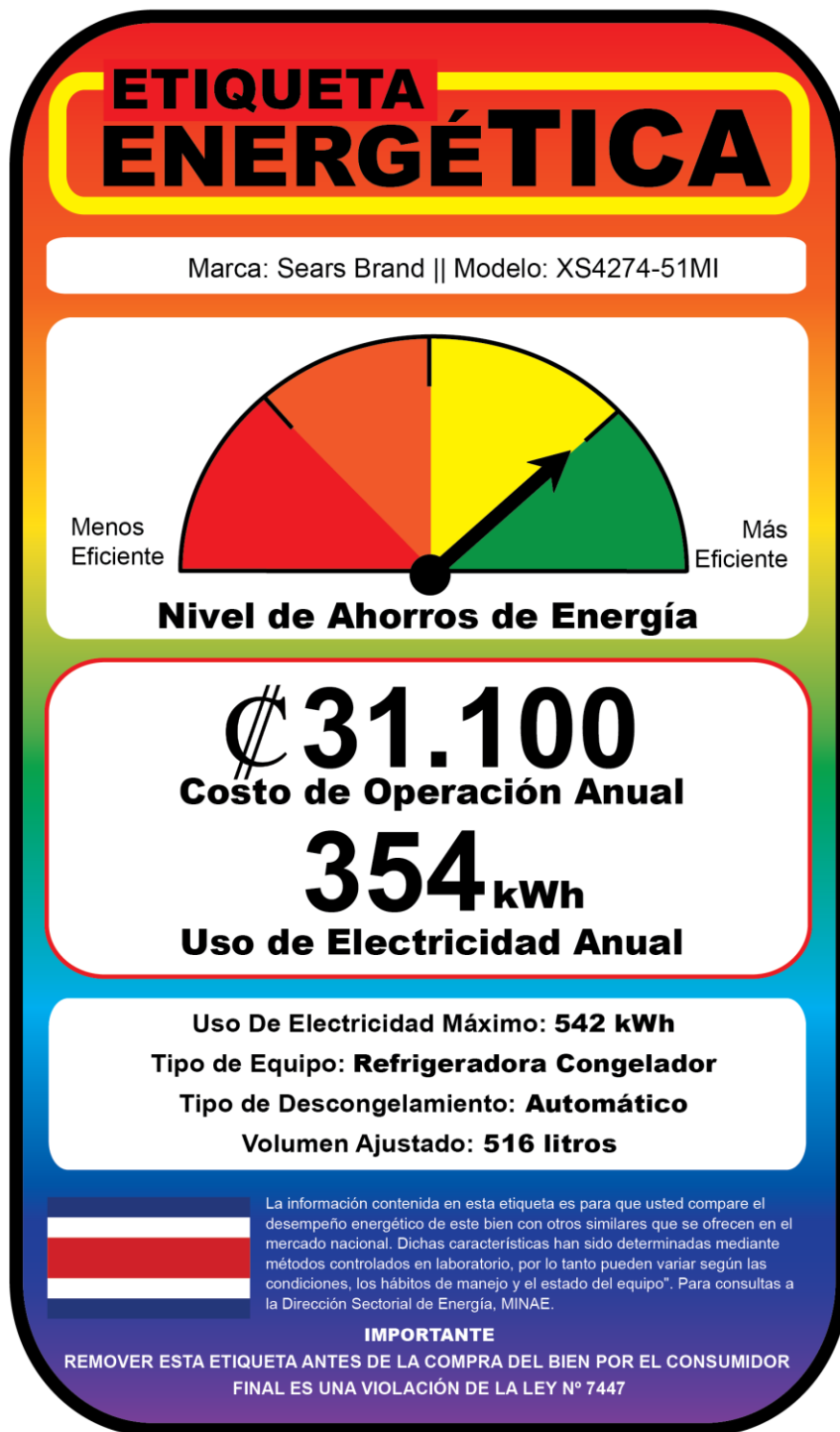


Figure 25: Final Recommended Label Design

Resumen de Recomendaciones en Español

Después de entrevistar las organizaciones involucradas en el proceso de la implementación de los etiquetados, observamos problemas específicos que necesitan mejoramiento. Preguntamos los empleados de las organizaciones sobre los defectos en el sistema actual de la implementación y sus sugerencias para arreglarlos. De estas sugerencias y nuestras observaciones, hemos diseñado las recomendaciones siguientes:

1. Colaboración de las organizaciones de implementación

De nuestras observaciones y entrevistas con la CICR, ASEGIRE, ICE, ECA, INTECO, MEIC, y MINAE, algunas de las organizaciones no son conscientes de los proyectos que fueron iniciados por otras organizaciones. La falta de comunicación impide la tasa de desarrollo para estandarizar una etiqueta de eficiencia energética.

Sugerimos la formación de un comité que sea dedicado a la estandarización de una etiqueta de eficiencia energética. Este comité constará de representantes del gobierno y de la industria, incluso todas partes del proceso de la implementación de las etiquetas. Estos miembros incluyen las organizaciones de regulación, acreditación, certificación, y pruebas de electrodomésticos. En el comité, los miembros serán informados sobre todos los proyectos en relación a la implementación de un etiquetado. También recomendamos que el comité asegure que cada organización sea involucrada en el proceso de la implementación. Esto reducirá la cantidad de confusión entre las organizaciones sobre sus responsabilidades. Sugerimos que cada organización trabaje en partes específicas del proceso para estandarizar y mejorar el sistema.

Miembros, Papeles y Responsabilidades Sugeridos para el Comité de Establecimiento de un Etiquetado Normalizado

Nombre de Organización	Categoría de Organización	Responsabilidad
CICR	Gerencia	Animar a las empresas a usar las etiquetas de eficiencia energética y promover el proceso de crear el sistema normalizado
ICE	Pruebas	Probar los electrodomésticos confirmar la validez de la información mostrado en las etiquetas
ECA	Acreditación	Certificar los procedimientos de ICE e INTECO
INTECO	Acreditación	Crear normas para la calidad y eficiencia de los electrodomésticos
MEIC	Seguridad del estado	Educar a los consumidores mediante las campañas de los medios de comunicación
MINAE	Seguridad del estado	Investigar la conformidad a las leyes en relación a las etiquetas y crear iniciativas para actualizar las regulaciones
ASEGIRE	Gerencia	Animar a las empresas a usar las etiquetas de eficiencia energética y promover el proceso de crear el sistema normalizado
Productores	Producción	Fabricar productos de alta calidad que siguen los reglamentos de la ley

2. Estandarizar y requerir el uso de un etiquetado de eficiencia energética

A causa de las regulaciones anticuadas, hay confusión entre las organizaciones sobre el departamento que sea responsable para la regulación de las etiquetas según la LEY 7447. También la ley no requiere ni una prueba para la eficiencia energética de los electrodomésticos ni un diseño normalizado de una etiqueta. Recomendamos que el comité trabaje para actualizar las regulaciones que especifican la responsabilidad de hacer cumplir los reglamentos de LEY 7447. También sugerimos que requiera un diseño normalizado para las etiquetas y un procedimiento estandarizado de pruebas para proveer los resultados comparables en los electrodomésticos.

Es necesario que las direcciones de MEIC y MINAE actualicen las regulaciones y que hagan la regulación de las etiquetas una prioridad. Además, una regulación nueva es necesaria para requerir que todos los electrodomésticos similares reciban el procedimiento estandarizado de pruebas. Este reglamento necesita requerir la muestra de la información en un diseño normalizado de las etiquetas.

3. Educar a los consumidores

Los resultados de nuestras encuestas demostraron que aproximadamente un tercio de nuestros participantes no han visto las etiquetas de eficiencia energética. Para crear una demanda para los electrodomésticos eficientes, es necesario que los consumidores entiendan la eficiencia energética y sus beneficios para ahorrar el dinero y dañar menos el medio ambiente. Para hacer esto, sugerimos el uso de tres campañas educativas para informar los consumidores sobre los beneficios de la eficiencia energética y la disponibilidad y uso de las etiquetas de eficiencia energética. Las campañas recomendadas son:

- Una campaña de los medios de comunicación de anuncios
- La capacitación de las representantes de ventas
- Los gráficos informativos y carteles en las tiendas

4. Participación del gobierno

Hemos desarrollado otra recomendación para iniciar los programas gubernamentales y políticas para animar a los fabricantes a obtener certificaciones para sus productos a través de una empresa costarricense. También es importante que los fabricantes muestren una etiqueta oficial y normalizada en sus productos. Sugerimos un reglamento que requiere que el gobierno

compre sólo los electrodomésticos que son certificados en Costa Rica y que cumplen con ciertas normas mínimas de eficiencia energética. Un programa similar fue muy exitoso en la creación de la publicidad de la etiqueta ENERGY STAR en los Estados Unidos. Otra contribución posible e importante del gobierno es el ofrecimiento de las exenciones de impuestos para los importadores y fabricantes domésticos que producen electrodomésticos que cumplen con los requisitos mínimos de eficiencia energética.

Appendix A: ENERGY STAR Refrigerator Standards

Table 3: ENERGY STAR Energy Efficiency Criteria for Residential Refrigerators and Freezers

Product Class		ENERGY STAR Energy Use (kWh/year)
1	Refrigerator & Refrigerator-Freezer with manual defrost	$\leq 7.056*AV + 198.72$
2	Refrigerator-Freezer with partial automatic defrost	
3	Top-Mount Freezer without through-the-door ice	$\leq 7.840*AV + 220.8$
4	Side-Mount Freezer without through-the-door ice	$\leq 3.928*AV + 406$
5	Bottom-Mount Freezer without through-the-door ice	$\leq 3.680*AV + 367.2$
6	Top-Mount Freezer with through-the-door ice	$\leq 8.160*AV + 284.8$
7	Side-Mount Freezer with through-the-door ice	$\leq 8.080*AV + 324.8$
8	Upright freezer with manual defrost	$\leq 6.795*AV + 232.47$
9	Upright freezer with automatic defrost	$\leq 11.187*AV + 293.49$
10	Chest Freezer	$\leq 8.892*AV + 129.33$
11	Compact Refrigerator and Refrigerator-Freezer with manual defrost	$\leq 8.560*AV + 239.2$
12	Compact Refrigerator and Refrigerator-Freezer with partial automatic defrost	$\leq 5.600*AV + 318.4$
13	Compact Refrigerator-Freezer-automatic defrost with top freezer	$\leq 10.160*AV + 284$
14	Compact Refrigerator-side mounted freezer with automatic defrost	$\leq 6.080*AV + 400.8$
15	Compact Refrigerator-bottom mount Freezer with automatic defrost	$\leq 10.480*AV + 293.6$
16	Compact Upright Freezers with manual defrost	$\leq 7.824*AV + 200.64$
17	Compact Upright Freezers with automatic defrost	$\leq 9.120*AV + 312.8$
18	Compact Chest Freezer	$\leq 8.360*AV + 121.6$

Appendix B: Consumer Awareness and Comparative Analysis Survey

The following appendix demonstrates the responses of our first survey. The first part of survey was to determine how knowledgeable Costa Rican consumers were about energy efficiency and their priorities when shopping for home appliances. The second part of the survey determined their preferences between the three international labels we studied. Finally, the third section tested consumers' preferences and understanding of the individual characteristics of the label. This appendix shows the questions and results of each of these survey sections.

Demographic Data

In this section of the survey the demographic data of participants was collected, this included age, income and sex.

Edad: Menos de 20 años 20-29 30-39 40-49 Más de 50
Age: Less than 20 years of age 20-29 30-39 40-49 Above 50

Table 4: Percentage of Survey Respondents by Age Range

Age	Count	Percentage
<20	11	7,86%
20-29	62	44,60%
30-39	23	16,67%
40-49	24	17,52%
>50	14	10,29%
Declined	6	4,44%

Ingreso por mes:

Menos de ¢ 500.000 Entre ¢ 500.000 y 1.000.000 Más de ¢ 1.000.000

Income per month:

Less than 500,000 colones Between 500,000 & 1,000,000 colones

More than 1,000,000 colones

Table 5: Percentage of Survey Respondents by Average Monthly Income

Income per Month in Colones	Count	Percentage
<500,000	64	48,12%
500,000-1,000,000	33	25,00%
>1,000,000	12	9,16%
Declined	31	23,85%

Sexo: Hombre Mujer

Gender: Male Female

Table 6: Percentage of Survey Respondents by Sex

Sex	Count	Percentage
Male	84	65,63%
Female	51	40,16%
Declined	5	3,97%

Part 1 – Buying Tendencies

Question 1

Enumere del 1 al 7 los siguientes factores con respecto a la importancia a usted cuando compra los electrodomésticos: 1 es el más importante y 7 es el menos importante. Por favor, use todos los números una vez.

- | | |
|--|----------------------|
| ___ Tamaño | ___ Precio |
| ___ Apariencia visual (colores, diseño, etc.) | ___ Vida útil |
| ___ Eficiencia y consumo de energía | ___ Marca |
| ___ Costos durante su uso | |

Please rank the following 7 factors in order of importance when buying appliances. (1 is best and 7 is the worst). Please use each number only once.

- | | |
|--|---------------------|
| ___ Size | ___ Price |
| ___ Visual appearance (color, design, etc.) | ___ Lifetime |
| ___ Efficiency and energy consumption | ___ Brand |
| ___ Costs during use | |

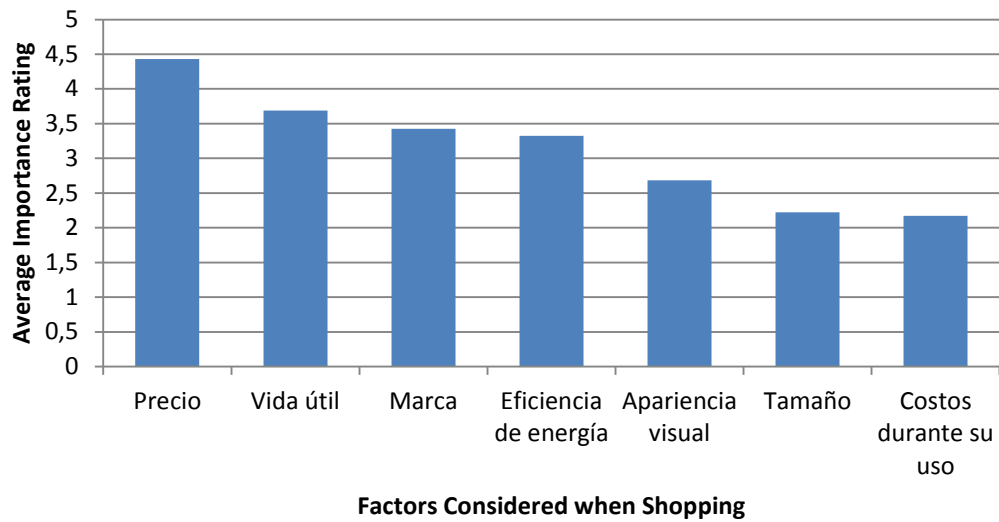


Figure 26: Average Importance Rating of Factors when Shopping for Home Appliances. Higher Values Indicate Greater Importance

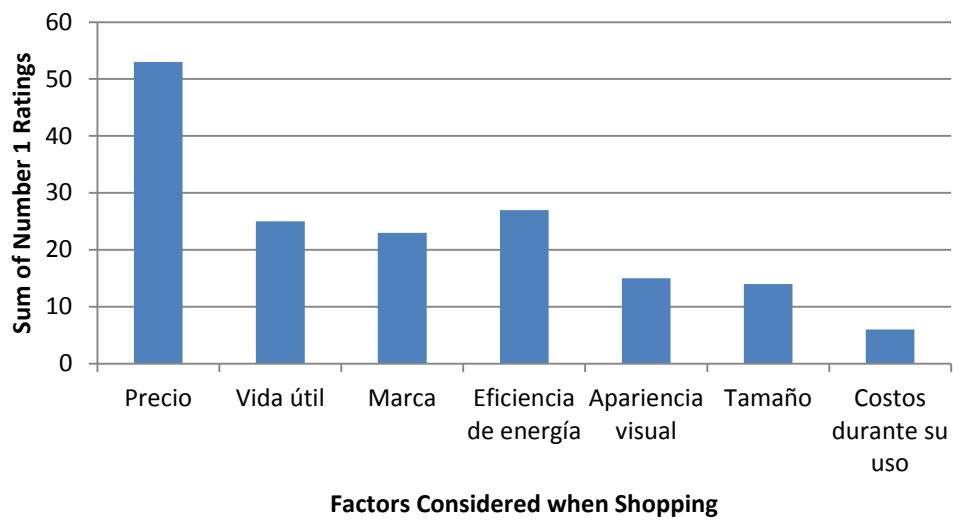


Figure 27: Number of Times Each Factor was Rated as Most Important

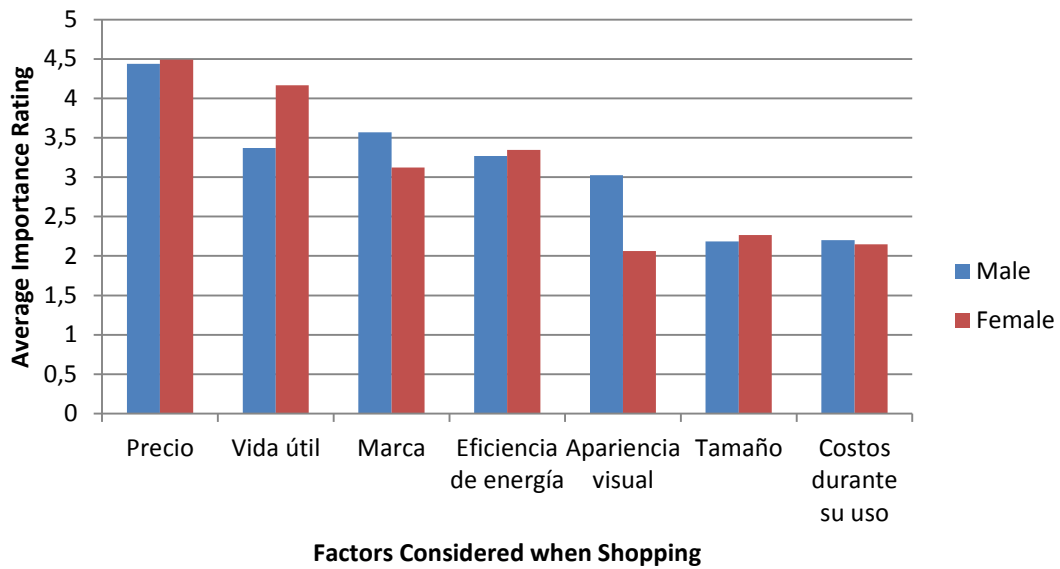


Figure 28: Average Importance of Factors when Shopping for Home Appliances vs. Gender of Respondents. Higher Values Indicate Greater Importance

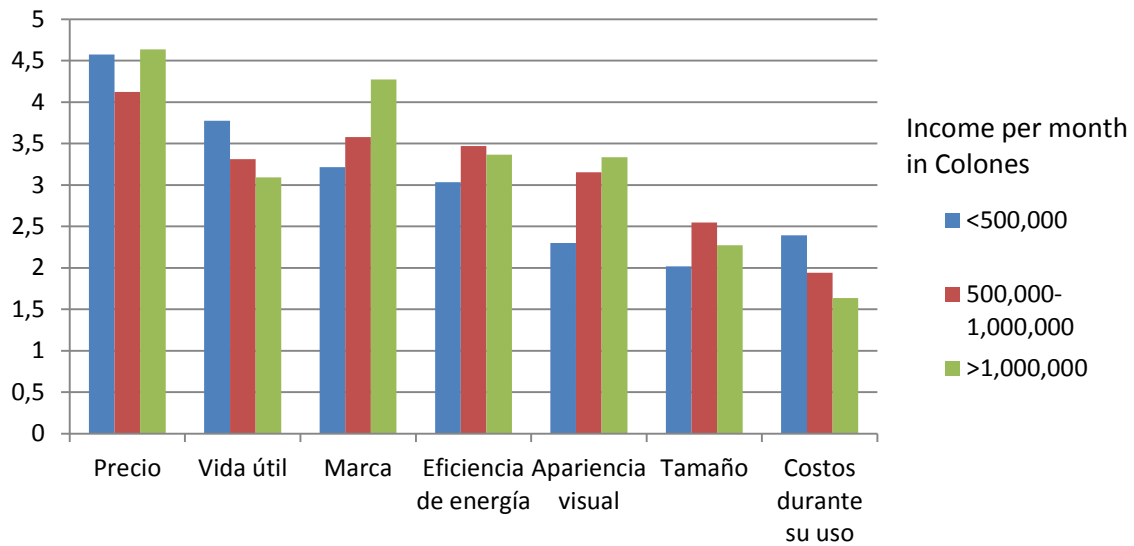


Figure 29: Average Importance of Factors when Shopping for Home Appliances vs. Income of Respondents. Higher Values Indicate Greater Importance

Question 2

¿Qué tan importante es la eficiencia energética para usted en una escala de 1 a 5? 1 es el más importante y 5 es el menos importante.

Encierre sólo uno: **1** **2** **3** **4** **5**

On a scale from 1 to 5, how important is energy efficiency to you?

1 **2** **3** **4** **5**

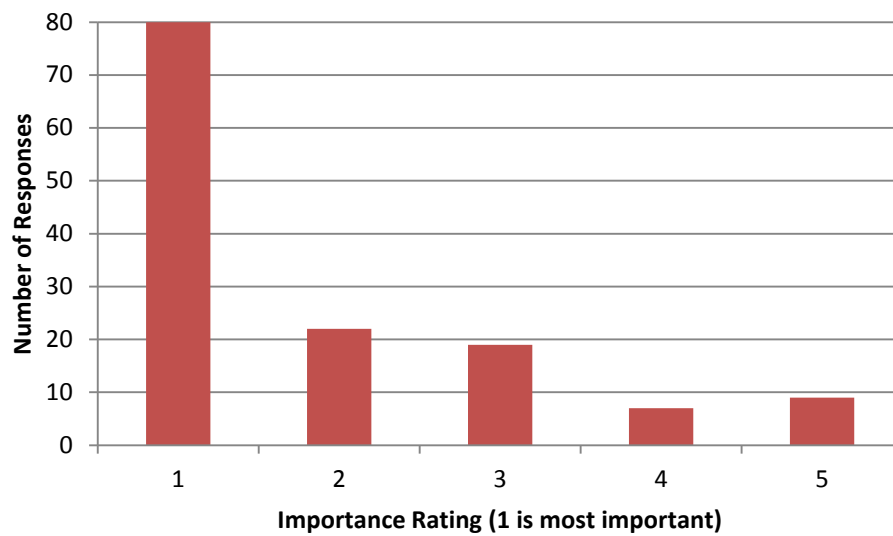


Figure 30: Importance of Energy Efficiency when Rated on a Scale of 1 to 5

Table 7: Average Importance of Energy Efficiency when Rated on a Scale from 1 to 5

Mean	Median	Mode	Standard Deviation
1,854015	1	1	1,223494

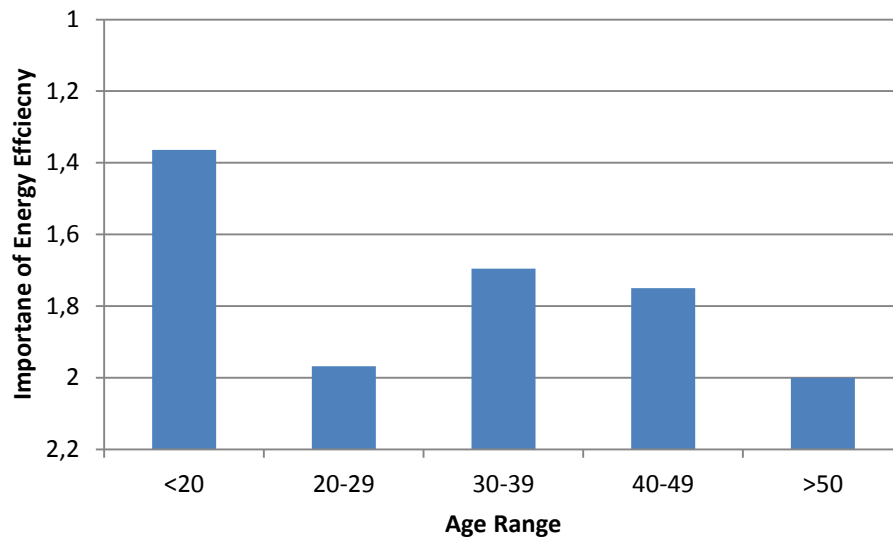


Figure 31: Importance of Energy Efficiency on a Scale of 1 to 5 vs. Age of Respondent

Question 3

¿Ha visto usted etiquetas de eficiencia en los electrodomésticos? Encierre uno: **SÍ** o

NO

Si contestó sí:

a. ¿Le transmitió alguna información? **SÍ** o **NO**

b. ¿Influyó esto en su compra? **SÍ** o **NO**

Have you seen any labels on products?

If yes: **YES** or **NO**

Did you learn new information from the label? Circle one: **YES** or **NO**

Did it influence your decision on which product to purchase?

Circle one: **YES** or **NO**

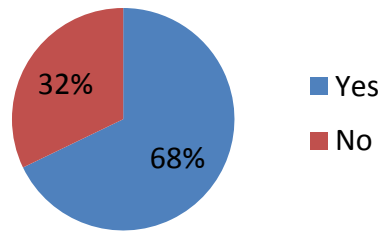


Figure 32: Percentage of Those Surveyed who Had and Had Not Seen Energy Efficiency Labels before our Survey

Table 8: Those who Found the Information from Energy Efficiency Labels Helpful

Demographic	# of Responses		Percentage	
	Yes	No	Yes	No
All	77	17	81,91%	18,09%
Sex:				
Male	48	10	82,76%	17,24%
Female	25	7	78,13%	21,88%
Age:				
<20	5	1	83,33%	16,67%
20-29	29	11	72,50%	27,50%
30-39	16	2	88,89%	11,11%
40-49	16	3	84,21%	15,79%
>50	7	0	100,00%	0,00%
Sales Rep	18	1	94,74%	5,26%

Table 9: Those whose Buying Decisions were Influenced by Energy Efficiency Labels

Demographic	# of Responses		Percentage	
	Yes	No	Yes	No
All	71	20	78,02%	21,98%
Sex:				
Male	43	15	74,14%	25,86%
Female	26	5	83,87%	16,13%
Age:				
<20	4	1	80,00%	20,00%
20-29	32	10	76,19%	23,81%
30-39	11	4	73,33%	26,67%
40-49	17	2	89,47%	10,53%
>50	4	3	57,14%	42,86%
Sales Rep	16	3	84,21%	15,79%

Question 4

Cuando compra electrodomésticos, ¿dónde encuentra la información sobre los electrodomésticos? Encierre todas las que aplican:

- a. Dentro de la tienda sin ayuda de un representante de ventas**
- b. Dentro de la tienda con ayuda de un representante de ventas**
- c. En internet**
- d. Recomendaciones de amigos o familia**
- e. Otras fuentes : _____**

When you purchase appliances, where do you usually find information?

- a. In the store without help**
- b. In the store with help from sales representatives**
- c. Online**
- d. Recommendations from friends or family**
- e. Other sources : _____**

Table 10: Locations where Consumers Obtain Information when Shopping for Appliances

Demographic	Number of Responses				Percentage			
	Store, no rep	Store, rep	Internet	Friends, family	Store, no rep	Store, rep	Internet	Friends, family
All	30	94	66	31	13,57%	42,53%	29,86%	14,03%
Age:								
<20	2	8	4	4	11,11%	44,44%	22,22%	22,22%
20-29	11	44	38	11	10,58%	42,31%	36,54%	10,58%
30-39	4	14	9	4	12,90%	45,16%	29,03%	12,90%
40-49	7	15	10	7	17,95%	38,46%	25,64%	17,95%
>50	6	10	4	2	27,27%	45,45%	18,18%	9,09%
Sex:								
Male	16	60	40	19	11,85%	44,44%	29,63%	14,07%
Female	13	32	25	11	16,05%	39,51%	30,86%	13,58%
Income:								
<500,000	10	51	28	18	9,35%	47,66%	26,17%	16,82%
500-1,000	5	19	21	7	9,62%	36,54%	40,38%	13,46%
>1,000,000	5	5	6	1	29,41%	29,41%	35,29%	5,88%
Sales Rep	2	17	11	5	5,71%	48,57%	31,43%	14,29%

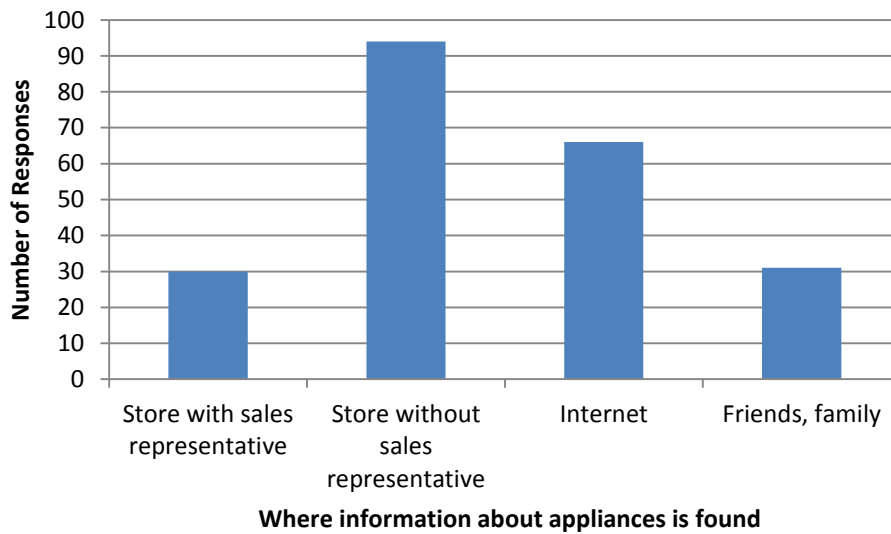


Figure 33: Locations where Consumers Obtain Information when Shopping for Appliances

Table 11: Additional Responses to Question: Where do you Find Information when Looking for Buy an Appliance?

Location	Number of Responses
Television	5
Appliance Manual	2
Newspaper	1
Media	1
Radio	1
Labels	1
Sales representatives	1

Question 5

¿Pagaría más si un producto pudiera ser reciclado en una manera amigable con el medio ambiente?

If a product can be recycled in an environmentally friendly way, would you pay more for it?

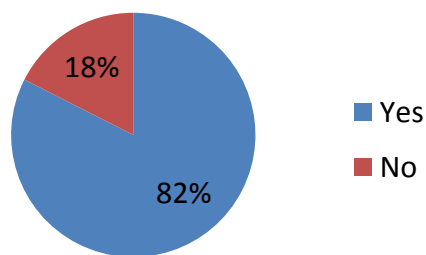


Figure 34: Those who Would Pay More for a Product if it was Recycled in an Environmentally Friendly Manner

Question 6

¿Sabe que los fabricantes pueden reciclar los productos si los devuelve?

Are you aware that you can return products to the manufacturer to be recycled?

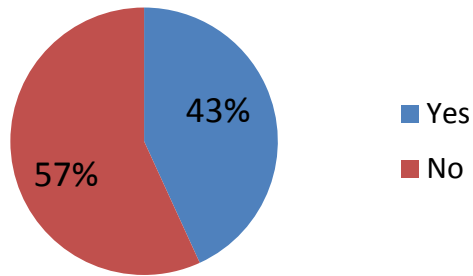


Figure 35: Those who Knew that Products can be Returned to Manufacturers to be Recycled

Part 2 – International Label Comparison

For this portion of the survey the image below was displayed to the consumer.

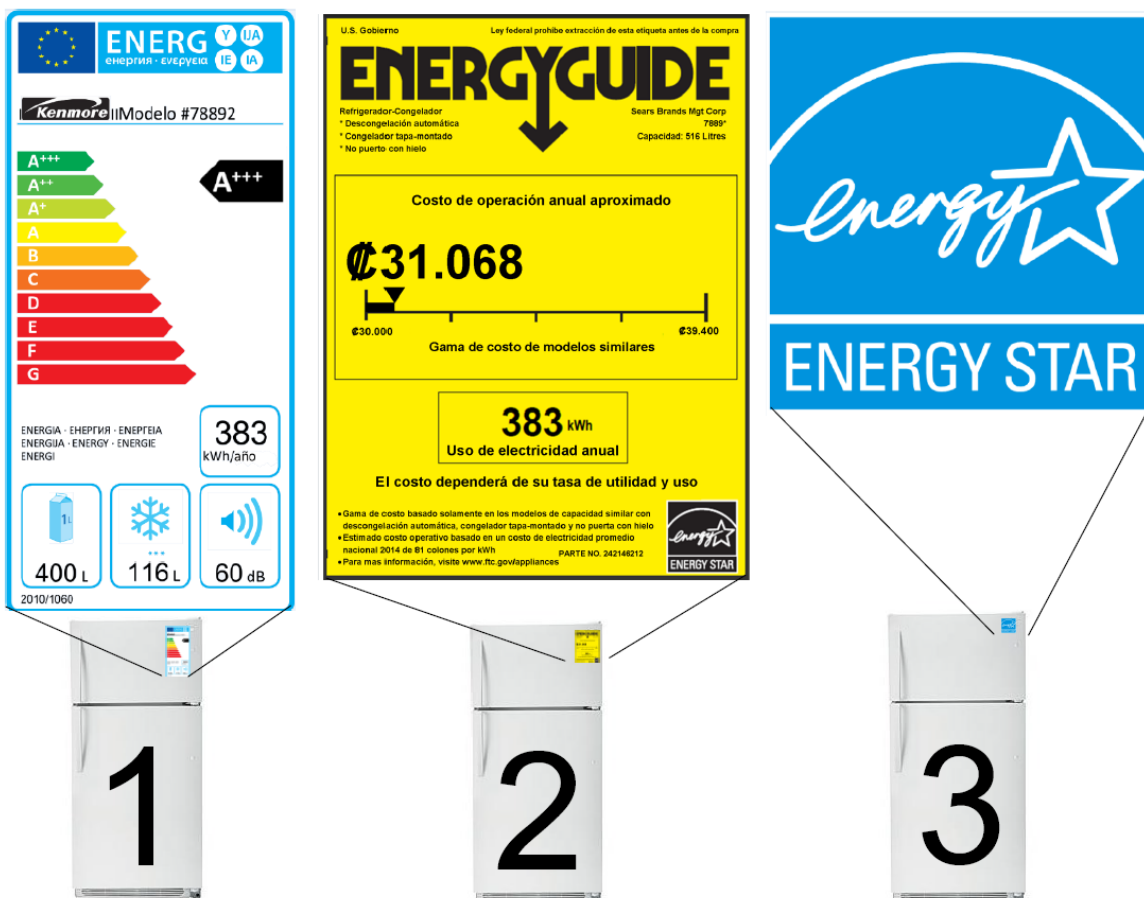


Figure 36: Example of International Energy Efficiency Labels Compared in Part 2 of Our Survey

Question 1

¿Ha visto estas etiquetas u otras etiquetas antes?

Have you seen any of these labels before?

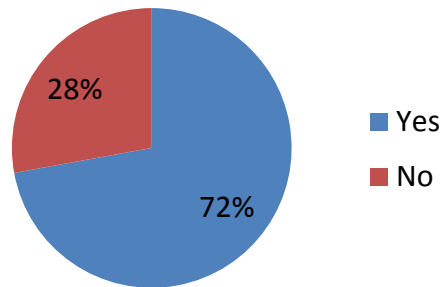


Figure 37: Those Who Recognized At Least One of the International Labels Used as Examples

Question 2

Si contestó sí, ¿cuáles?

If so, which?

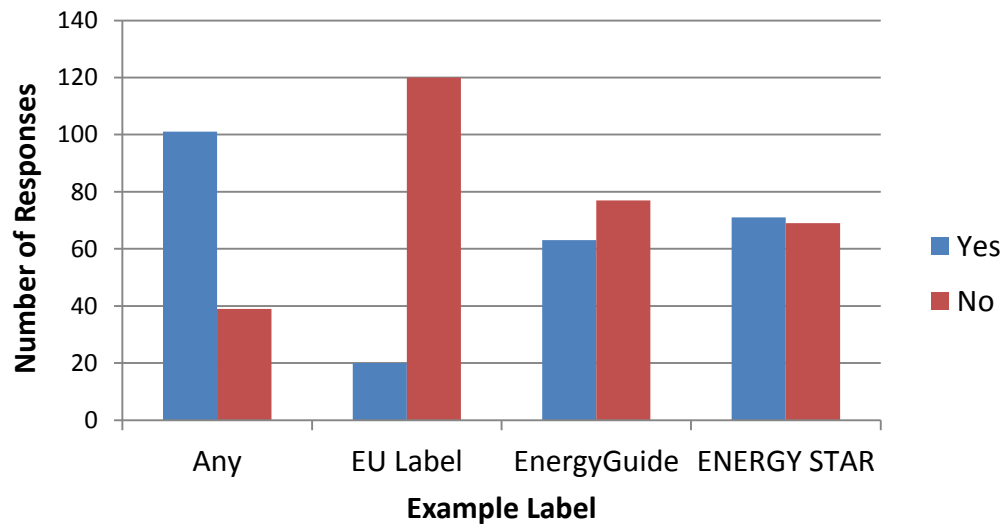


Figure 38: Distribution of International Labels that Were Recognized During Our Survey

Question 3

¿Cuál etiqueta le llamo primero la atención?

Which label did you notice first?

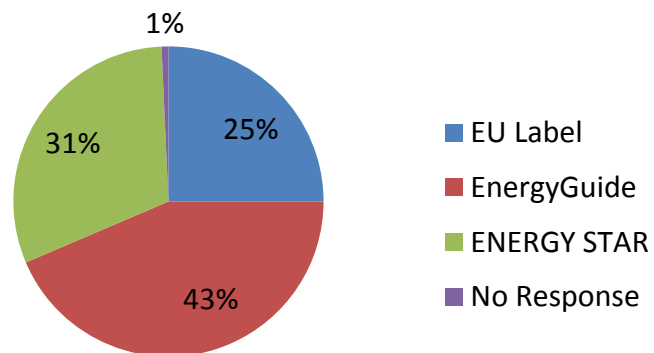


Figure 39: Distribution of International Labels that Grabbed the Respondent's Attention First

Question 4

¿Cuál etiqueta le gustó más visualmente?

Which label do you think looks the best visually?

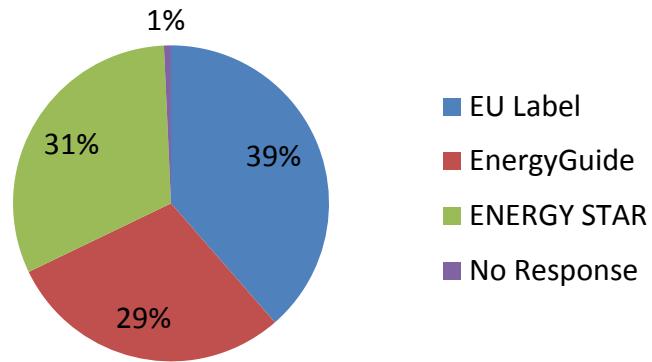


Figure 40: Distribution of International Labels That Consumers Thought were Most Visually Appealing

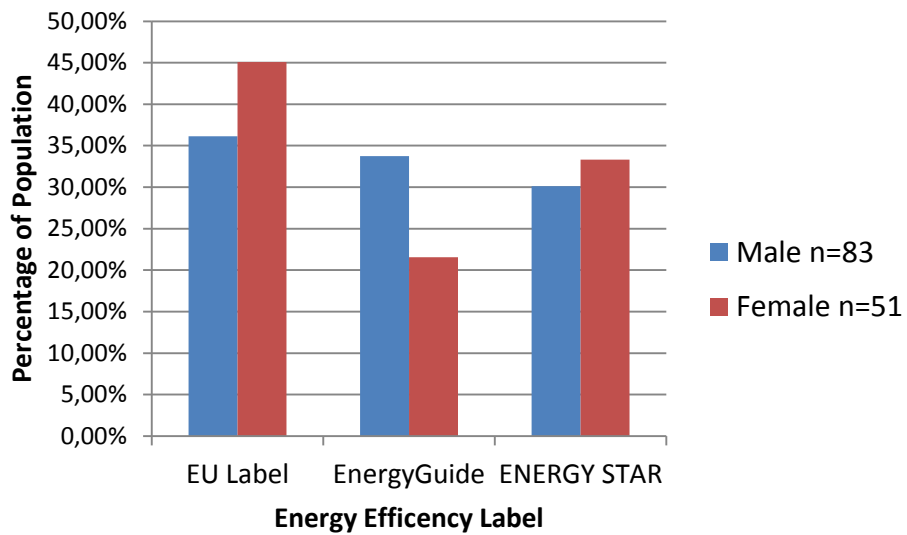


Figure 41: Most Visually Appealing Label vs. Sex of Respondent

Question 5

¿Qué le llama más la atención en una etiqueta: Encierre uno:
INFORMACIÓN o **DISEÑO**

Which calls your attention more in a label, the design or information?
INFORMATION or **DESIGN**

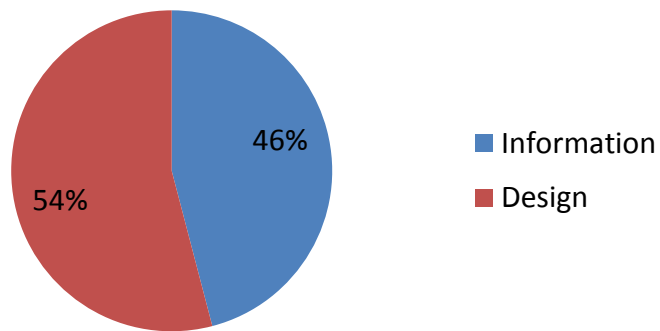


Figure 42: Distribution of Participants that Found Information or Design of the Label Most Important

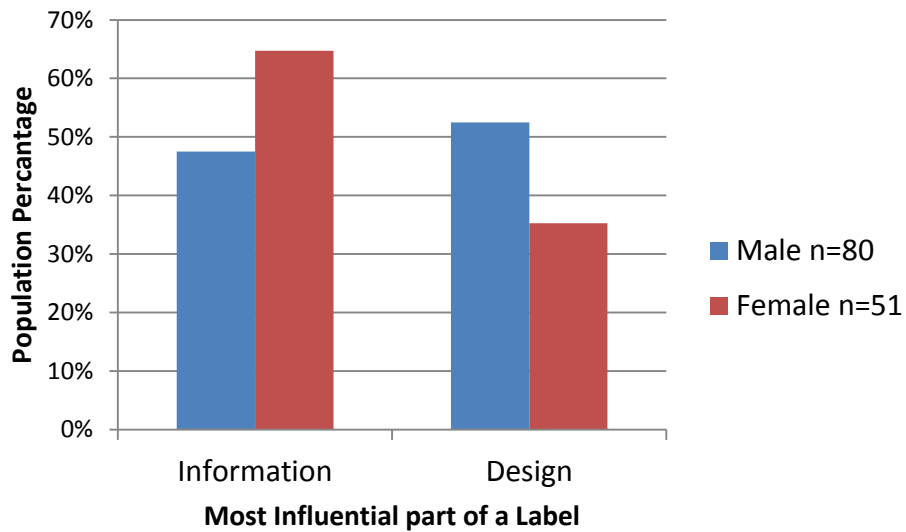


Figure 43: Preferences of Design or Information on a Label vs. Sex of Respondent

Question 6

¿Cuál etiqueta fue la más informativa?

Which label provides you the most helpful information?

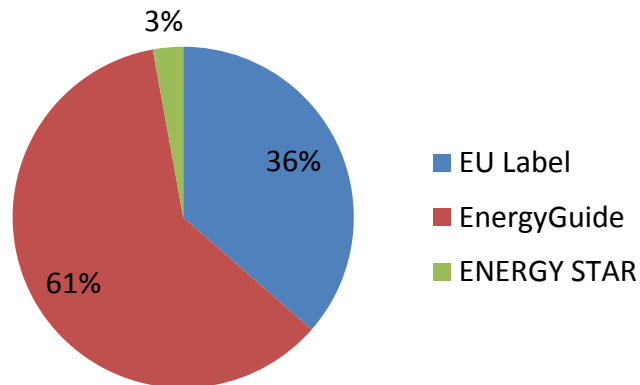


Figure 44: Distribution of International Labels that Participants Found Most Informative

Question 7

¿Cuál etiqueta fue la más comprensible?

Which label was the easiest to understand?

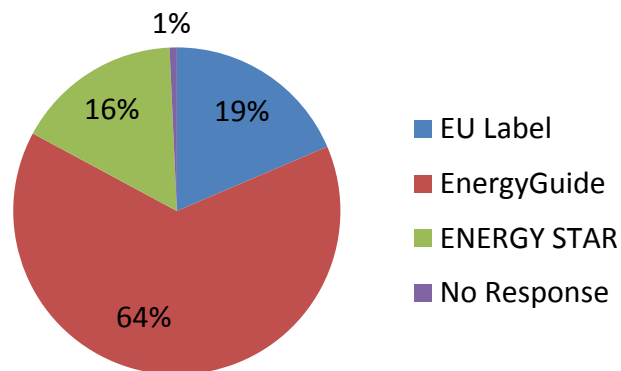


Figure 45: Distribution of International Labels that Participants Found Most Understandable

Question 8

¿Cuál etiqueta le da mayor información sobre la eficiencia energética del electrodoméstico?

Which label gives you more information about energy efficiency in appliances?

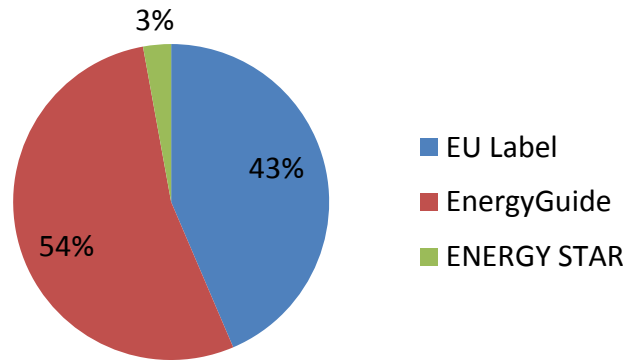


Figure 46: Distribution of International Labels that Participants Thought Displayed the Most Information about Energy Efficiency of the Appliance

Question 9

Basado en la información mostrada por la etiqueta, ¿cuál producto compraría?

Based on information provided by the label, which product would you choose?

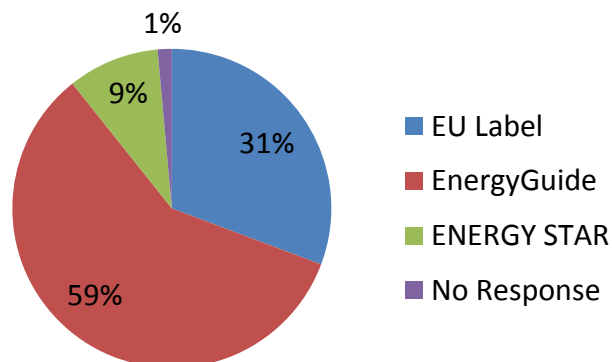


Figure 47: Distribution of International Labels for Which Participants Would Buy the Product Based on the Information Provided by the Label

Question 10

¿Cuál de estos tipos de etiquetas prefiere?

Which of these three types of labels do you prefer?

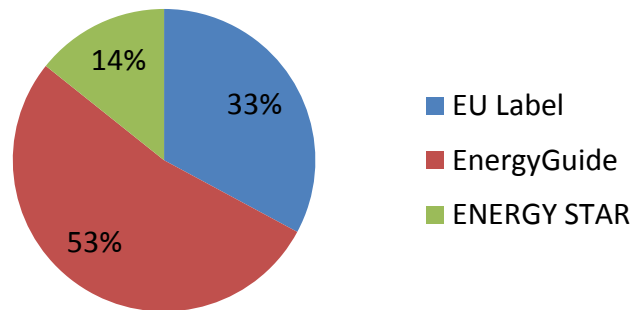


Figure 48: Distribution of International Labels which Participants Considered their Favorite Label Type

Part 3 – Label features

For this portion of the survey the image below was displayed to the consumer.

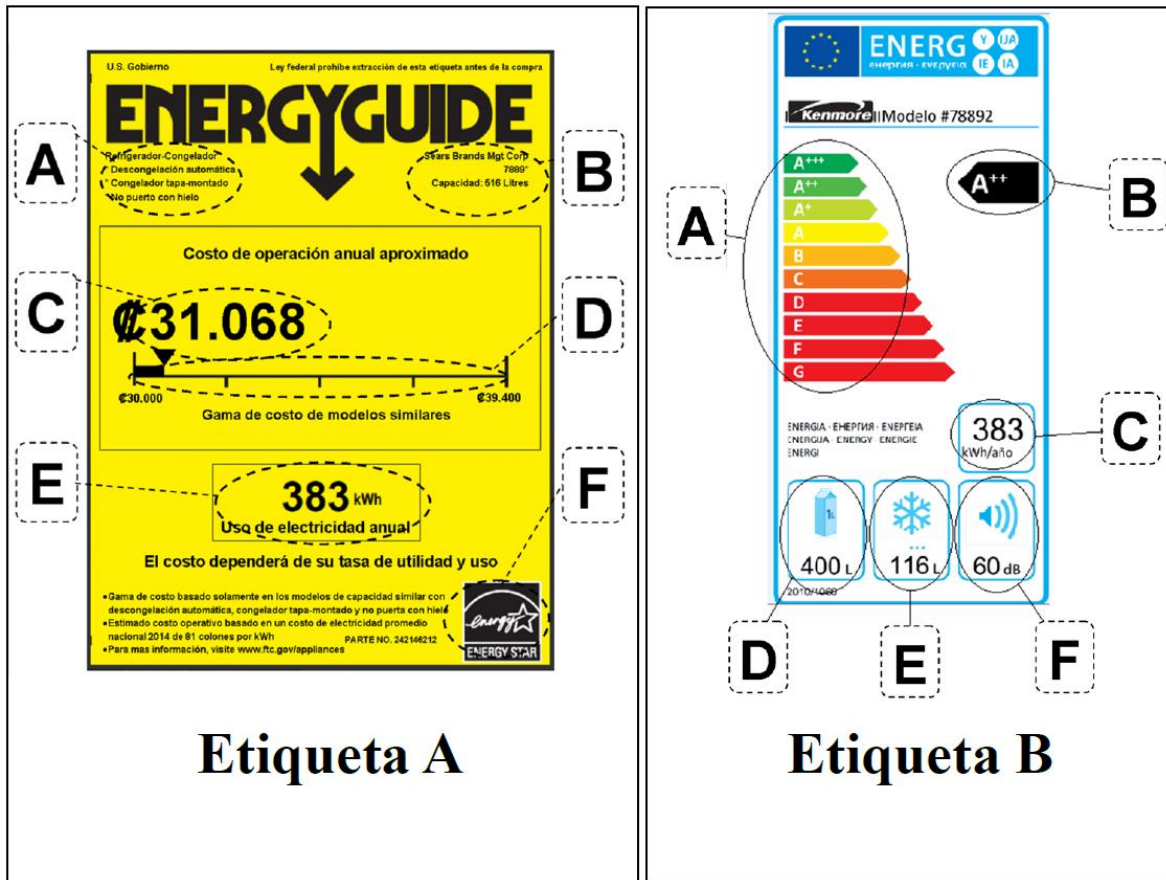


Figure 49: Specific Characteristics of Energy Efficiency Label Features Examined in the Third Part of Our Survey

EnergyGuide (Etiqueta A) Features

Para esta etiqueta, por favor enumere los aspectos del 1 al 6 en orden de utilidad para usted siendo: 1 el más importante y 6 el menos importante. Use todos los números una vez.

También escriba un cero para los aspectos que no entiende.

For the following labels, please rate the aspects that are useful to you according to the diagram. 1 is the most useful and 6 is the least useful. Please also write 0 for the aspects you do not understand.

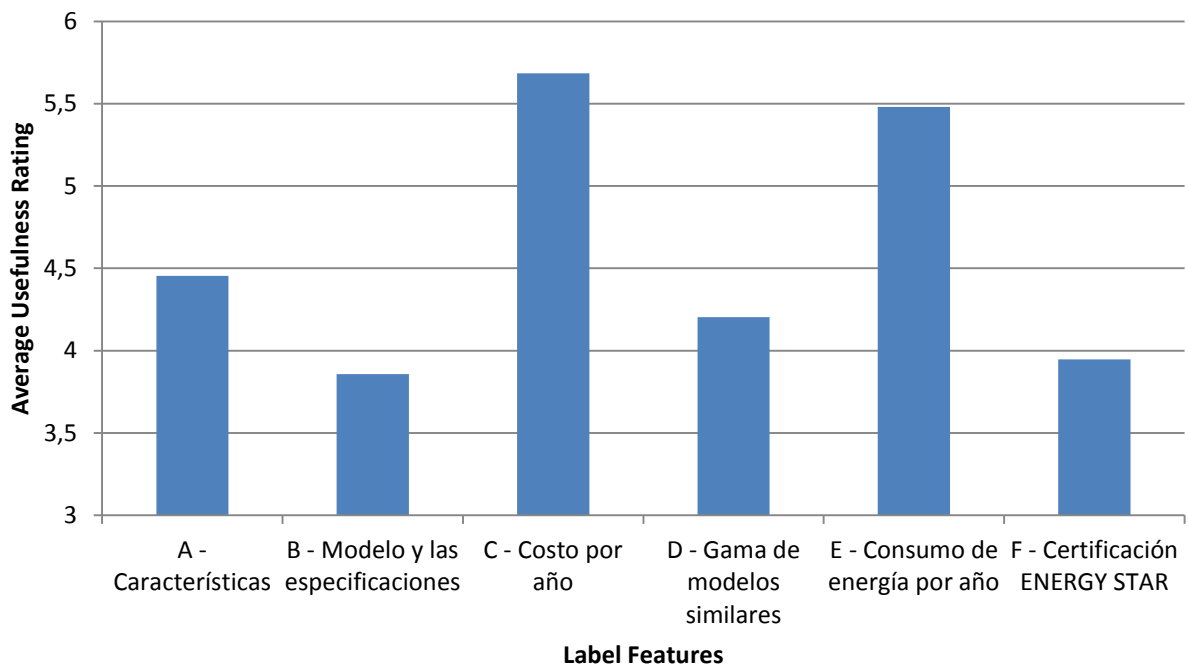


Figure 50: Distribution of EnergyGuide Features Participants Found Useful. Higher Values Indicate More Useful

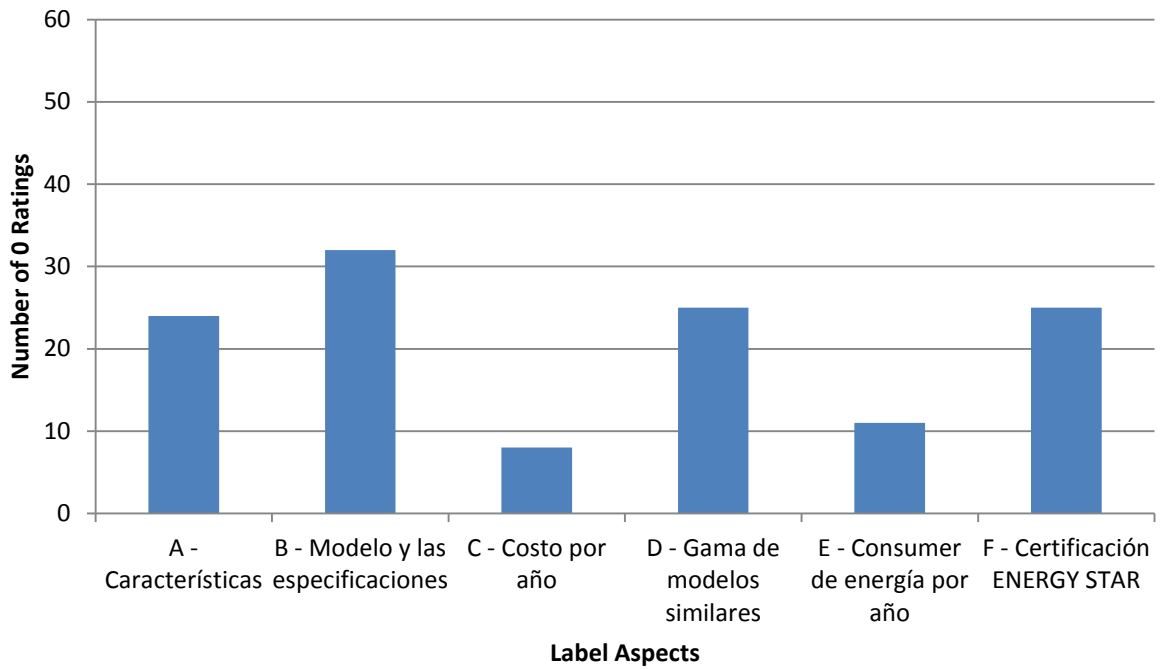


Figure 51: Number of Times a Feature of EnergyGuide was Not Understood

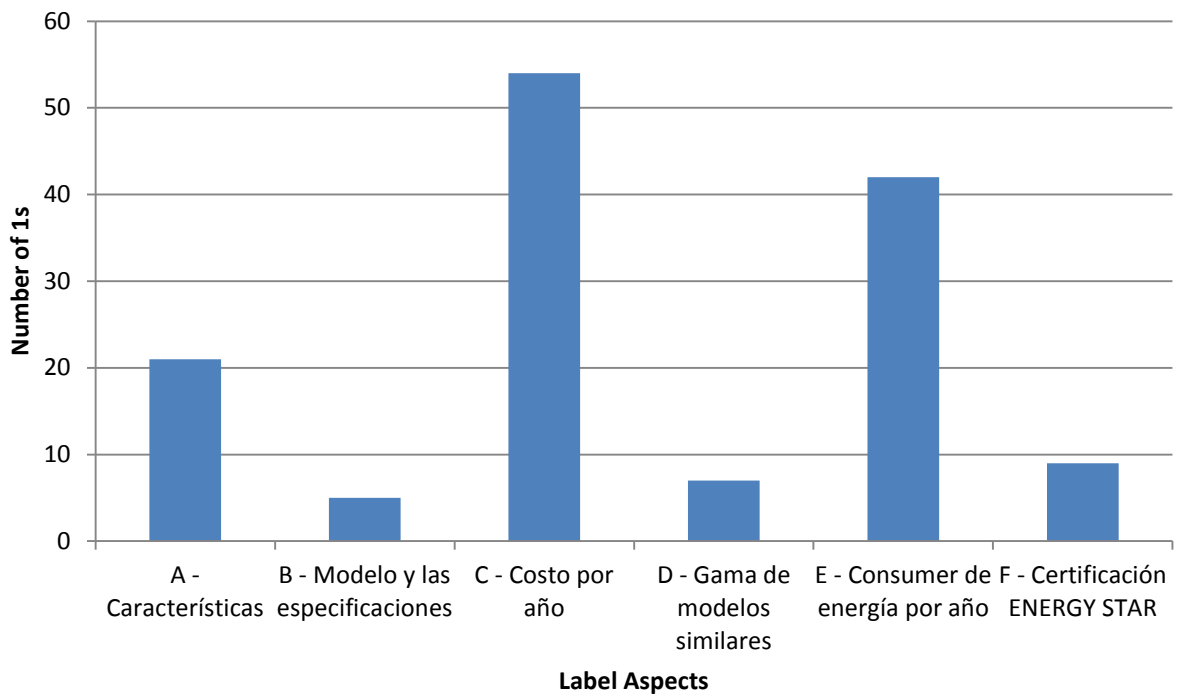


Figure 52: Number of Times Each Feature of EnergyGuide was Rated as The Most Useful Characteristic

European Union Energy Efficiency Label (Etiqueta B) Features

Para esta etiqueta, por favor enumere los aspectos del 1 al 6 en orden de utilidad para usted siendo: 1 el más importante y 6 el menos importante. Use todos los números una vez.

También escriba un cero para los aspectos que no entiende.

For the following labels, please rate the aspects that are useful to you according to the diagram. 1 is the most useful and 6 is the least useful. Please also write 0 for the aspects you do not understand.

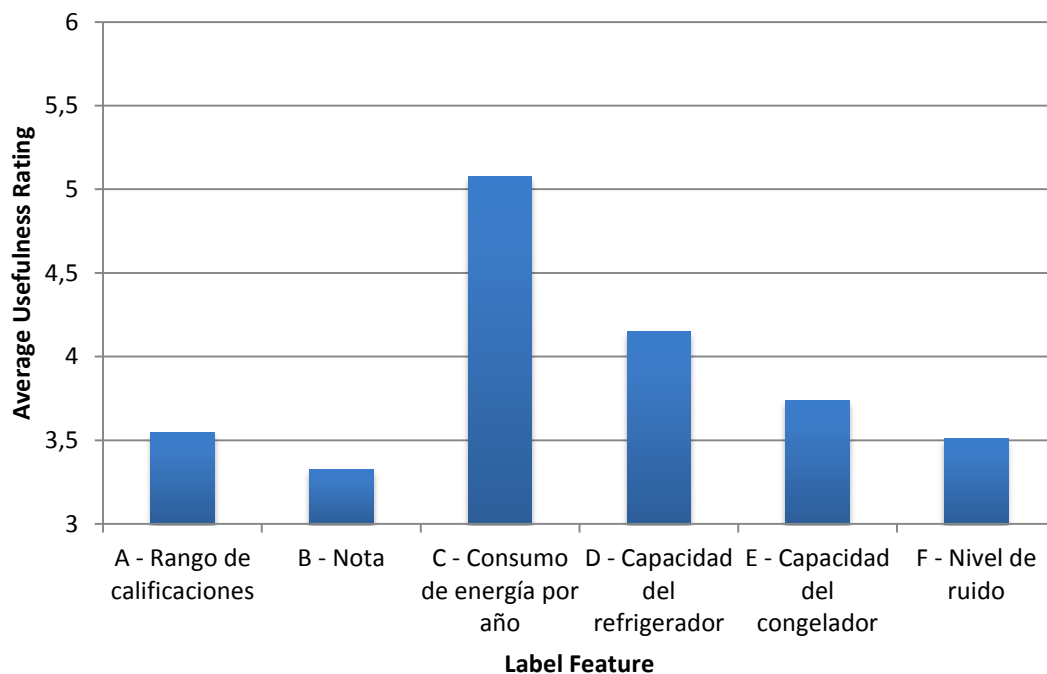


Figure 53: Usefulness of European Union Label Features. Higher Values Indicate Greater Usefulness

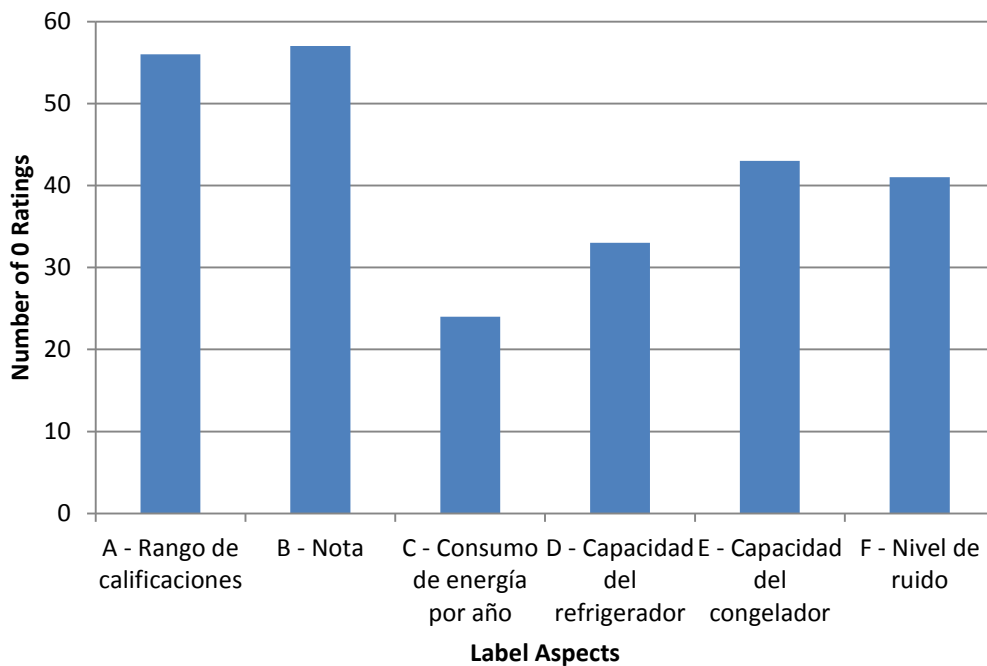


Figure 54: Number of Times a Feature of the European Union Label Was Not Understood

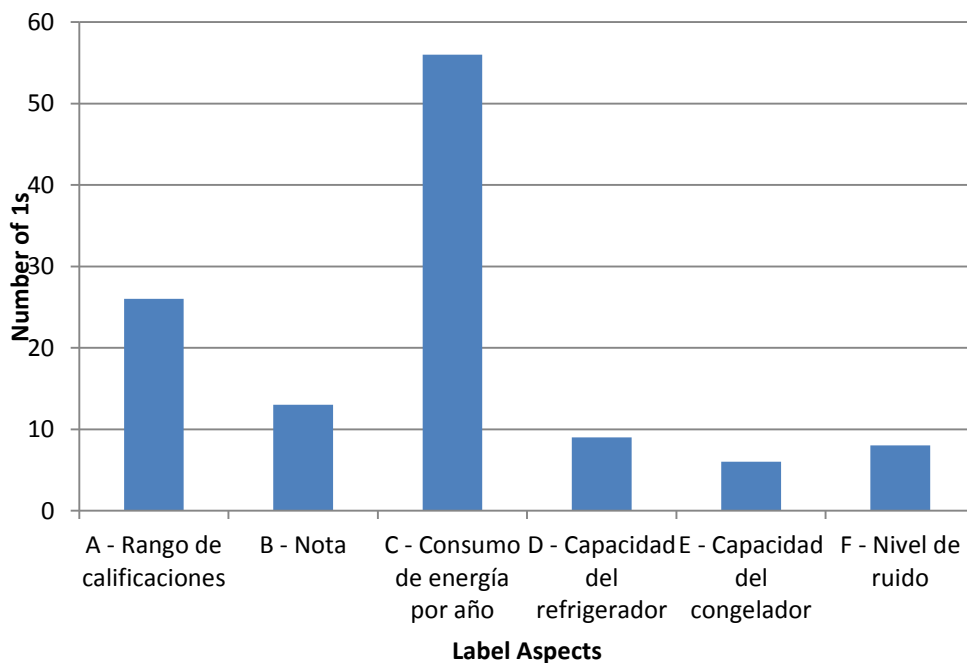


Figure 55: Number of Times Each Feature of the European Label Was Rated as the Most Useful Characteristic

ENERGY STAR Question

La etiqueta 3 representa el mejor diez por ciento de la eficiencia energética de los electrodomésticos. Si un electrodoméstico tiene esta etiqueta, ¿escogería usted comprarlo en vez de un aparato sin esta etiqueta?

Label 3 represents the highest ten percent of appliances with respect to energy efficiency. If an appliance has this label, are you more likely to buy it instead of an appliance without the label?

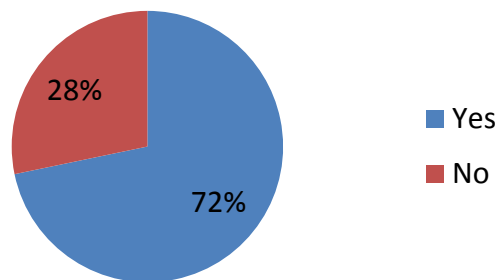


Figure 56: Consumers Who Would Buy an Appliance with ENERGY STAR Instead of Another Appliance Without It

ENERGICE Question

¿Ha visto esta etiqueta?

Have you seen this label?



Figure 57: The ENERGICE Label Developed by ICE

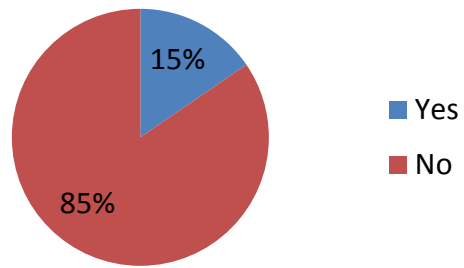


Figure 58: Distribution of Participants Who Had and Had Not Seen the ENERGICE Label

Correlation Matrix

The correlation coefficient between the results of each question can be calculated

via:
$$\text{Correl}(A, B) = \frac{\sum(A-\bar{A})(B-\bar{B})}{\sqrt{\sum(A-\bar{A})^2 \sum(B-\bar{B})^2}} \quad (1)$$

Equation (1) is used to determine the relationship between any two elements in two arrays A and B. The higher the absolute value of the correlation coefficient, the stronger the relationship between the results of the two questions.

An example with a simple data set will illustrate the use of Equation (1). In Table 12: Example Data Entry Columns for Equation (1) column A holds the numerical results from 5 survey questions arbitrary set as (3, 2, 4, 5, 6); \bar{A} is the average of all results from column A. Column B holds the numerical results from 5 survey questions arbitrary set as (9, 7, 12, 15, 17); \bar{B} is the average of all results from column B.

Table 12: Example Data Entry Columns for Equation (1)

	A	B
1	Data1	Data2
2	3	9
3	2	7
4	4	12
5	5	15
6	6	17
7	Formula	Description (Result)
8	=CORREL(A2:A6,;B2:B6)	Correlation coefficient of the two data sets above (0.997054)

Using data sets A and B in conjunction with Equation (1), we obtain:

$$\text{Correl}(A, B) = 0.997054$$

The result from Equation (1) is a coefficient representing the degree to which there is a relationship between the data in column A and the data in column B. The closer to 1 the coefficient is, the stronger the relationship. The closer to 0 the coefficient, the weaker the relationship. Moreover, the closer to -1 the coefficient is, the stronger the inverse relationship.

In the above example, data sets A and B are strongly related. The correlation coefficient computed via Equation (1) makes this relationship evident: all values of data set B are approximately three times that of data set A.

The following correlation matrix was our basis for our results pertaining to the public's general knowledge and awareness of energy efficiency.

	Survey ID	Age	Income	Sex	Size	Visual	Energy	Cost of use	Price	Lifetime	Brand	Importance of Energy Efficiency	Have you seen labels?	Useful info?	Influenced?	In store, no rep	Store, rep	Internet	Friends, family	Pay more if recycled?	Know can return?	Have you seen these?	Seen EU	Seen Energy guide	Seen Energy Star	Which first?	Prettiest?	Info v. Design	Most Informative?	Most Understandable?	Which is the most energy Efficient?	Which would you buy?	Which type do you prefer?	A - Fridge Features	B - Fridge model, specs	C - Cost per year	D - Range of similar models	E - Energy usage per year	F - Energy Star Certification	A - Grading range	B - Grade rating	C - Energy usage per year	D - Fridge capacity	E - Freezer capacity	F - Noise	Are you more likely to buy w/ E Star?	Have you seen ICE label?	Location	Sales Representative?
Survey ID	1,00	-0,05	0,11	0,09	0,24	0,20	0,18	0,34	0,00	0,15	0,34	0,11	-0,15	0,06	0,14	-0,03	-0,02	-0,20	0,20	0,13	0,09	-0,13	0,01	-0,31	-0,05	-0,11	-0,19	-0,16	0,10	0,09	0,05	-0,06	-0,06	0,11	0,25	0,08	0,14	-0,13	0,05	-0,05	0,11	0,11	0,13	0,14	0,05	-0,05	0,11	0,90	0,46
Age	-0,05	1,00	0,29	-0,02	-0,04	-0,02	0,00	0,04	-0,03	0,14	-0,07	0,06	-0,02	-0,01	0,06	-0,20	0,01	0,08	0,08	0,01	0,09	0,01	-0,10	-0,09	0,26	-0,25	-0,17	0,02	-0,02	-0,08	-0,08	-0,05	-0,12	-0,25	-0,26	-0,14	-0,14	-0,10	-0,18	-0,13	-0,05	-0,05	0,10	-0,04	-0,17	-0,05	0,02	0,01	-0,10
Income	0,11	0,29	1,00	-0,04	0,03	0,03	0,08	0,21	0,06	0,20	-0,05	-0,03	-0,04	0,08	0,15	0,01	0,13	-0,16	0,03	-0,08	0,01	-0,13	-0,10	-0,14	0,02	-0,16	-0,06	0,06	0,00	-0,13	-0,10	-0,13	-0,16	-0,04	0,03	-0,03	0,13	0,03	0,12	-0,08	0,04	0,05	0,20	0,10	-0,02	-0,08	0,02	0,13	-0,02
Sex	0,09	-0,02	-0,04	1,00	0,13	0,28	0,11	0,12	0,00	-0,10	0,18	-0,12	0,06	-0,03	-0,05	-0,07	0,02	-0,06	0,01	0,04	0,06	0,15	0,10	0,10	0,04	0,04	-0,05	-0,04	-0,04	-0,03	-0,08	-0,02	-0,07	0,07	0,01	-0,04	0,14	0,00	-0,03	0,10	0,07	0,07	-0,02	0,01	0,05	0,16	0,01	0,04	-0,01
Size	0,24	-0,04	0,03	0,13	1,00	0,45	0,19	0,30	0,03	0,02	0,09	-0,01	-0,06	0,14	0,19	-0,11	-0,14	-0,17	0,08	0,04	-0,07	-0,05	0,01	-0,02	-0,08	-0,02	0,02	0,04	-0,02	0,11	0,06	-0,10	-0,07	0,05	0,17	0,01	0,22	-0,01	0,18	0,04	0,09	0,05	0,13	0,05	0,10	-0,07	-0,09	0,19	0,10
Visual	0,20	-0,02	0,03	0,28	0,45	1,00	0,14	0,30	0,11	0,03	0,24	-0,04	-0,01	-0,02	-0,02	0,03	-0,20	-0,31	0,06	-0,02	-0,11	-0,06	-0,07	-0,08	-0,03	-0,01	0,07	-0,12	-0,09	0,04	-0,12	-0,02	-0,07	0,09	0,14	0,09	0,19	0,02	0,16	0,04	0,11	0,15	0,16	0,14	0,19	-0,06	-0,04	0,12	-0,02
Energy	0,18	0,00	0,08	0,11	0,19	0,14	1,00	0,47	0,02	0,26	0,04	0,20	0,07	-0,03	0,05	-0,01	-0,08	-0,06	-0,08	0,08	-0,04	-0,02	0,03	-0,12	0,12	-0,01	0,09	0,18	0,09	-0,05	0,03	-0,01	-0,06	0,03	0,14	-0,02	0,17	0,10	0,20	0,10	0,03	0,00	0,08	0,09	0,13	0,00	0,04	0,13	-0,04
Cost of use	0,34	0,04	0,21	0,12	0,30	0,30	0,47	1,00	0,07	0,29	0,22	0,15	-0,12	0,12	0,15	-0,05	-0,05	-0,14	0,05	0,11	0,03	-0,21	-0,10	-0,28	-0,04	0,04	0,01	0,06	-0,01	-0,03	-0,07	0,03	-0,08	0,15	0,22	-0,02	0,32	0,10	0,30	0,14	0,22	0,11	0,25	0,23	0,26	-0,05	0,05	0,28	0,12
Price	0,00	-0,03	0,06	0,00	0,03	0,11	0,02	0,07	1,00	0,13	0,17	-0,06	0,08	-0,11	-0,05	0,13	-0,05	-0,28	-0,13	-0,10	-0,02	-0,14	-0,04	-0,12	-0,10	-0,02	0,01	0,03	-0,12	0,01	-0,10	0,04	-0,02	0,15	0,17	0,23	0,05	-0,06	0,09	-0,03	0,09	0,05	0,00	-0,06	0,00	-0,16	-0,21	-0,06	-0,07
Lifetime	0,15	0,14	0,20	-0,10	0,02	0,03	0,26	0,29	0,13	1,00	0,23	0,09	-0,13	0,15	0,21	-0,09	0,02	0,02	-0,10	0,11	-0,01	-0,20	0,01	-0,21	-0,13	-0,13	-0,05	0,08	0,09	-0,05	-0,02	0,03	0,01	0,05	0,13	0,01	0,12	0,04	0,10	0,13	0,08	-0,19	0,12	0,06	0,17	-0,15	-0,01	0,11	0,01
Brand	0,34	-0,07	-0,05	0,18	0,09	0,24	0,04	0,22	0,17	0,23	1,00	-0,02	-0,10	0,05	0,06	0,05	-0,18	-0,06	0,08	0,03	0,11	-0,14	-0,10	-0,21	-0,15	0,03	0,07	-0,08	0,14	-0,04	0,08	0,11	0,05	0,10	0,26	0,03	0,10	-0,12	0,04	-0,03	0,04	-0,01	0,09	0,07	0,13	0,00	-0,01	0,24	0,21
Importance of Energy Efficiency	0,11	0,06	-0,03	-0,12	-0,01	-0,04	0,20	0,15	-0,06	0,09	-0,02	1,00	0,04	-0,02	-0,02	-0,05	-0,03	-0,13	0,03	0,11	0,03	-0,13	0,04	-0,07	-0,04	0,04	0,12	-0,04	0,05	-0,06	-0,06	0,10	0,13	0,07	0,04	-0,05	0,08	0,00	-0,12	0,06	-0,03	0,01	-0,07	-0,02	0,03	-0,01	0,04	0,13	0,11
Have you seen labels?	-0,15	-0,02	-0,04	0,06	-0,06	-0,01	0,07	-0,12	0,08	-0,13	-0,10	0,04	1,00	-0,71	-0,72	-0,05	0,04	0,10	-0,04	0,08	0,00	0,39	0,15	0,28	0,27	0,06	0,23	0,29	0,06	0,09	0,04	0,12	0,19	-0,16	0,00	0,01	0,02	0,10	0,08	-0,02	0,06	0,12	-0,10	-0,10	-0,04	-0,06	-0,09	-0,19	-0,17
Useful info?	0,06	-0,01	0,08	-0,03	0,14	-0,02	-0,03	0,12	-0,11	0,15	0,05	-0,02	-0,71	1,00	0,75	0,05	0,01	-0,06	0,04	-0,07	-0,02	-0,27	0,00	-0,20	-0,19	0,03	-0,11	-0,16	-0,02	0,02	-0,10	-0,07	-0,07	0,02	-0,12	-0,06	0,03	0,01	0,01	0,07	0,06	-0,06	0,09	0,12	0,18	0,13	0,12	0,09	0,08
Influenced?	0,14	0,06	0,15	-0,05	0,19	-0,02	0,05	0,15	-0,05	0,21	0,06	-0,02	-0,72	0,75	1,00	0,10	-0,06	-0,08	-0,04	0,01	-0,02	-0,26	-0,03	-0,19	-0,16	-0,05	-0,16	-0,14	0,01	-0,05	-0,07	-0,19	-0,09	0,15	0,02	0,04	0,02	-0,09	-0,06	0,04	-0,03	-0,07	0,07	0,06	0,06	0,11	0,07	0,18	0,13
In store, no rep	-0,03	-0,20	0,01	-0,07	-0,11	0,03	-0,01	-0,05	0,13	-0,09	0,05	-0,05	-0,05	0,05	0,10	1,00	-0,26	0,03	-0,07	-0,02	-0,01	-0,02	0,09	-0,12	-0,08	0,23	0,15	-0,09	0,06	0,03	0,15	0,02	0,09	0,05	0,03	0,06	-0,06	0,03	0,04	-0,05	-0,08	0,04	-0,04	0,00	0,05	0,14	0,14	-0,07	0,13
Store, rep	-0,02	0,01	0,13	0,02	-0,14	-0,20	-0,08	-0,05	-0,05	0,02	-0,18	-0,03	0,04	0,01	-0,06	-0,26	1,00	-0,19	-0,21	-0,07	-0,02	0,04	-0,02	0,11	0,01	-0,04	-0,07	0,06	-0,07	-0,03	-0,09	-0,07	-0,06	-0,11	-0,10	-0,06	-0,03	0,04	-0,04	-0,09	0,03	0,01	0,02	0,03	0,05	-0,10	0,05	-0,07	-0,09
Internet	-0,20	0,08	-0,16	-0,06	-0,17	-0,31	-0,06	-0,14	-0,28	0,02	-0,06	-0,13	0,10	-0,06	-0,08	0,03	-0,19	1,00	0,01	0,17	0,11	0,11	-0,06	0,12	0,22	0,00	-0,10	0,10	0,21	0,04	0,13	0,11	0,08	-0,10	-0,15	-0,17	0,05	-0,04	-0,02	-0,06	-0,13	-0,19	-0,13	-0,16	0,26	-0,02	-0,17	-0,02	
Friends, family	0,20	0,08	0,03	0,01	0,08	0,06	-0,08	0,05	-0,13	-0,10	0,08	0,03	-0,04	0,04	-0,08	-0,07	-0,21	0,01	-0,11	-0,09	-0,09	0,03	-0,07	-0,02	-0,11	-0,28	0,02	0,02	0,11	-0,02	0,11	-0,02	0,11	0,03	0,13	-0,01	0,00	0,13	-0,01	0,00	0,13	-0,01	0,00	0,14	-0,07	0,09	0,24	-0,01	
Pay more if recycled?	0,13	0,01	-0,08	0,04	0,04	-0,02	0,08	0,11	-0,10	0,11	0,03	0,11	0,08	-0,07	0,01	-0,02	-0,07	0,17	-0,01	1,00	0,18	0,01	0,10	-0,05	-0,15	-0,04	-0,09	0,14	0,13	0,08	-0,01	0,06	0,02	0,09	0,11	-0,08	0,00	-0,05	-0,02	0,14	0,05	-0,03	0,05	0,04	0,09	0,02	0,12	0,12	-0,01
Know can return?	0,09	0,09	0,01	0,06	-0,07	-0,11	-0,04	0,03	-0,02	-0,01	0,11	0,03	0,00	-0,02	-0,02	-0,01	-0,02	0,11	-0,09	0,18	1,00	0,04	0,09	-0,03	0,02	-0,04	-0,07	0,06	0,08	-0,05	-0,01	0,09	0,05	0,05	0,19	-0,18	-0,04	-0,09	0,14	-0,08	0,09	0,02	0,00	-0,01	-0,05	0,01	0,03	0,11	0,11
Have you seen these?	-0,13	0,01	-0,13	0,15	-0,05	-0,06	-0,02	-0,21	-0,14	-0,20	-0,14	-0,13	0,39	-0,27	-0,26	-0,02	0,04	0,11	-0,09	0,01	0,04	1,00	0,25	0,56	0,63	-0,18	0,03	0,03	-0,03	0,06	0,00	-0,01	0,01	-0,21	-0,15	0,02	-0,06	-0,02	-0,05	-0,05	-0,06	0,12	-0,31	-0,16	-0,17	0,12	-0,07	-0,16	-0,18
Seen EU	0,01	-0,10	-0,10	0,10	0,01	-0,07	0,03	-0,10	-0,04	0,01	-0,10	0,04	0,15	0,00	-0,03	0,09	-0,02	-0,06	0,03	0,10	0,09	0,25	1,00	0,16	-0,05	0,13	0,08	0,11	0,09	0,14	0,11	0,07	0,16	-0,12	-0,03	-0,05	-0,07	0,11	-0,05	0,06	-0,12	0,04	-0,30	-0,25	-0,14	0,01	0,08	0,02	-0,16
Seen Energy guide	-0,31	-0,09	-0,14	0,10	-0,02	-0,08	-0,12	-0,28	-0,12	-0,21	-0,21	-0,07	0,28	-0,20	-0,19	-0,12	0,11	0,12	-0,07	-0,05	-0,03	0,56	0,16	1,00	0,20	-0,02	-0,04	0,09	0,00	0,06	-0,15	-0,10	0,01	-0,11	-0,18	0,03	-0,09	0,08	-0,08	-0,03	-0,09	0,12	-0,19	-0,15	-0,06	0,05	0,06	-0,32	-0,28
Seen Energy Star	-0,05	0,26	0,02	0,04	-0,08	-0,03	0,12	-0,04	-0,10	-0,13	-0,15	-0,04	0,27	-0,19	-0,16	-0,08	0,01	0,22	-0,02	-0,15	0,02	0,63	-0,05	0,20	1,00	-0,34	-0,10	-0,08	-0,08	-0,08	-0,02	-0,05	-0,11	-0,26	-0,19	-0,05	-0,10	-0,11	-0,11	-0,20	-0,13	0,11	-0,26	-0,13	-0,21	0,14	-0,11	-0,04	-0,15
Which first?	-0,11	-0,25	-0,16	0,04	-0,02	-0,01	-0,01	0,04	-0,02	-0,13	0,03	0,04	0,06	0,03	-0,05	0,23	-0,04	0,00	-0,11	-0,04	-0,04	-0,18	0,13	-0,02	-0,34	1,00	0,53	0,11	0,14	0,17	0,11	0,26	0,45	0,11	0,07	0,08	0,07	-0,02	-0,02	0,20	0,16	0,20	0,08	0,09	0,18	0,09	0,04	-0,14	0,03
Prettiest?	-0,19	-0,17	-0,06	-0,05</																																													

Appendix C: Survey of Sales Representatives

In addition to the opinions of consumers, we also surveyed sales representatives. This gave us a better idea of what information is told to consumers when buying home appliances. We used an open response survey that was conducted with 22 sales representatives at four stores, however only 18 of these respondents filled out the qualitative section of the survey. The data presented in this appendix reviews that questions and responses of these surveys.

Question 1

¿Cuáles factores son los más importantes para los consumidores cuando compran electrodomésticos?

What do consumers look for when purchasing appliances?

Table 13: Factors that Sales Representatives Believe are Most Important to Consumers When Buying Appliances

El certificado de ENERGY STAR, El consumo anual
Marca - precio - respaldo – Garantía
Consumo, precio, espacio
Consumo Energético
Precio, tamaño, características del producto
Marca, precio, vida útil, apariencia estética, actualidad del producto
Que sean muy ahorrativos en consumo de luz
Consumo Energético
precio, calidad, reconocimiento de marca
precio, marca
Si se le habla de consumo energético le gusta mucho sin importar mucha la marca y luego el tamaño del aparato
Precio, marca y consumo
Marca, el precio, garantía, si tiene repuestos
Consumo, energía, y garantía
Precio del producto, ahorro de energía, vida útil, eficiencia
Consumo energético, precio, garantía
Vida útil, precio
Consumo energético, vida útil

Table 14: Word Count for Responses for Factors that Sales Representatives Believe are Most Important to Consumers When Buying Appliances

Word	# of uses	Word	# of uses
precio	11	útil	4
consumo	10	el	4
marca	7	y	3
de	5	producto	3
energético	5	energía	3
vida	4	le	2
garantía	4	si	2
del	4	tamaño	2

Question 2

¿Cuáles aspectos de los electrodomésticos usa usted para persuadir a los consumidores a comprarlos?

What aspects of the appliances do you use to persuade consumers to purchase appliances?

Table 15: Feature of Products That Sales Representatives Use to Persuade Consumers to Buy New Appliances

Precio incluyendo las ventajas o beneficios y el ahorro
Los beneficios que le aporta el electrodoméstico
Consumo, precio, espacio y calidades
Ahorro de energía
la calidad del mismo, marca y garantía
Beneficios del producto
Que tiene el sistema de ENERGY STAR
ahorro de la energía
marca, precio
marca, lo resistente, lo duradero
Ahora se puede convencer más por el consumo energético y luego por alguno plus de acuerdo a las marcas
características propias del producto más calidades del mismo
marca, precio, garantía
Consumo y garantía
Precio y calidad de producto
Consumo energético, precio, garantía
Beneficios, garantía
Garantía, vida útil, consumo energético

Table 16: Word Count for the Responses of Feature of Products That Sales Representatives Use to Persuade Consumers to Buy New Appliances

Word	# of uses	Word	# of uses
precio	13	producto	4
consumo	12	útil	4
y	9	la	3
garantía	9	le	3
marca	9	que	3
de	9	lo	2
energético	7	tiene	2
del	6	por	2
el	6	se	2
calidad	5	luego	2
energía	4	más	2
vida	4	si	2
beneficios	4	mismo	2
ahorro	4	las	2

Question 3

¿Qué tan importante es la eficiencia energética para los consumidores en una escala de 1 a 5? 1 es el más importante y 5 es el menos importante.

Encierre sólo uno:

1 2 3 4 5

How important is energy efficiency to the consumer on a scale of 1 to 5? 1 is most important and 5 is least important.

Circular one:

1 2 3 4 5

Table 17: Statistical Averages for the Importance of Energy Efficiency to Consumers, According to Sales Representative

Mean	Median	Mode	Standard Deviation
1,833333	1,5	1	0,957427

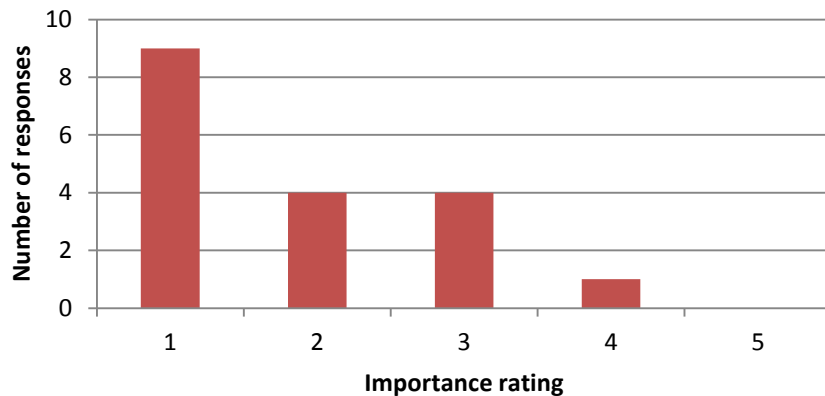


Figure 59: Distribution of the Important of Energy Efficiency to Consumers on a Scale of 1 to 5, According to Sales Representative. 1 is the Most Important

Question 4

¿Usa la eficiencia energética para persuadir a los consumidores al momento de comprar electrodomésticos específicos? **SÍ** o **NO**

- a. Si contestó sí ¿cuál información usa para persuadir a los consumidores a comprar electrodomésticos eficientes?

Do you use energy efficiency to persuade consumers to purchase specific home appliances?

- a. If yes, what information do you use to persuade consumers to buy specific appliances?

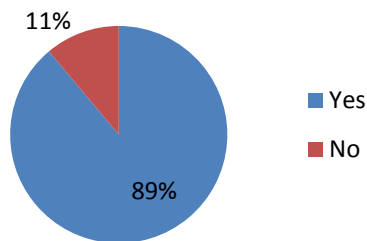


Figure 60: Distribution of Sales Representatives that Use Energy Efficiency to Persuade Consumers to Buy New Appliances

Table 18: Information that Sales representatives Use to Market Efficient Products

Sí, En que aunque el producto sea de mayor costo se ahorra un % del consumo energético ya que es lo más caro ahora
Sí, Comparación de los datos de consumo eléctrico
Sí, Su consumo va a ser más barato
Sí, Con menos consumo menos paga electricidad
No
Sí, ahorro monetario contra costo, desempeño y eficiencia del producto
Sí, el consumo de luz, la vida útil, y la marca
Sí, el sello de ENERGY STAR
Sí, que consume muy poca energía aparte que tiene un precio muy cómodo y que es muy bueno en vida útil.
Sí, por su utilidad, satisfacción al cliente
Sí, le hago la comparación entre marcas y en capacidades
Sí, consumo anual marcado en la etiqueta amarilla
No
Sí, consumo anual
Sí, certificado ENERGY STAR y consumo anual
Sí, informarlos sobre el consumo energético y el ahorro que pueden tener por año
Sí, el ahorro de energía al usarlos
Sí, kWh por año, comparativo energético con otras marcas

Table 19: Word Count for Responses to Information that Sales representatives Use to Market Efficient Products

Word	# of uses	Word	# of uses
consumo	10	su	2
y	6	útil	2
de	6	vida	2
que	6	comparación	2
el	6	costo	2
la	4	al	2
en	4	con	2
ahorro	4	del	2
energía	4	más	2
anual	3	año	2
por	3	star	2
muy	3	un	2
energético	3	marcas	2
producto	2	menos	2

Question 5

En su opinión, ¿sería útil para los consumidores una etiqueta normalizada de eficiencia energética? **SÍ** o **NO**

In your opinion, would a standardized energy efficiency label be useful to consumers?

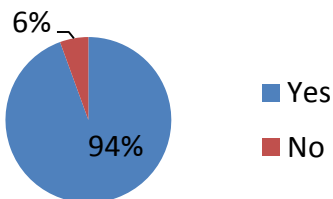


Figure 61: Distribution of Sales Representatives that Think a Normalized Energy Efficiency Label Would be Useful to Consumers

Question 6

¿Cuál información en una etiqueta atraería a los consumidores al momento de comprar electrodomésticos eficientes?

What information of the label would attract consumers when purchasing appliances?

Table 20: Information of Labels that Will Persuade Consumers to Purchase Efficient Appliances, According to Sales Representatives

Cuanto consume si tiene luz LED, si tiene discos expandibles
Mostrar el ahorro en colones
La cual muestra el bajo consumo y el costo que es el consumo anual o mensual
Consumo mensual por uso de 24 horas
Consumo bajo, ahorro monetario, marca de elite (conocida y alta calidad demostrada)
la amarilla que es la más informativa
ahorro de energía
lo primero que les van a durar y van a ahorrar en no estar cambiandolos tan seguido
que traen más información, son más útiles a la hora de que una persona entre a una tienda, trae satisfacción al cliente
El consumo mensual ya que por año las personas no entiende y también no siempre saben a cuanto equivale en dinero
Consumo eléctrico y gasto monetario
precio en colones de consumo por día
Calculo anual de consumo en colones
Consumo anual
Información de consumo
Cuanto ahorra a la un año en total del uso en comparación a otro artículo
Uso electricidad anual, corto operación anual

Table 21: Word Count in Response to the Information of Labels that Will Persuade Consumers to Purchase Efficient Appliances, According to Sales Representatives

Word	# of uses	Word	# of uses
consumo	10	más	3
en	7	ahorro	3
de	7	mensual	3
que	6	información	2
y	5	tiene	2
la	5	monetario	2
anual	5	año	2
el	5	una	2
uso	3	si	2
cuanto	3	bajo	2
colon	3	l	2
por	3	van	2

Question 7

En su opinión, ¿sería útil promocionar un producto utilizando una etiqueta estándar de eficiencia energética? Encierre uno: **SÍ** o **NO**

In your opinion, would a standardized energy efficiency label be useful to promote a product?

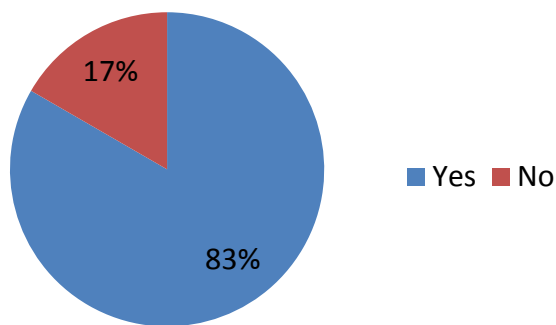


Figure 62: Distribution of Sales Representatives that Think an Energy Efficiency Label Would be Useful to Promote Products?

Question 8

¿Qué información sería útil implementar en la etiqueta estandarizada de eficiencia energética para anunciar el producto?

What information would be useful to show on a standard energy efficiency label to promote a product?

Table 22: Sales Representative Responses of Information Which Would be Useful on an Energy Label

el consumo es lo más importante como el voltaje
Capacidad - consumo máximo y mínimo porcentaje de ahorro
Costo y cantidad kWh por año
Consumos y ahorro
El porcentaje de ahorro mensual
Beneficios para uso personal y/o familiar
el consumo de kWh por año
cuanto consume por año
dibujos ya que muchas veces se comprende mejor con ejemplos ilustrativos y más clara la información
El consumo por mes, el costo en dinero promedio y comparación con otras marcas
Consumo en dinero por año kilovatio
Precio en colones de consumo por día
Consumo disminuido
Sencillo visualmente, reales de consumo anual
Consumo, modelo
Consumo anual y ahorro de este
Uso electricidad anual, información de forma atractiva y llamativa

Table 23: Word Count in Response to Information Which Would be Useful on an Energy Label

Word	# of uses	Word	# of uses
consumo	10	en	3
y	7	uso	2
de	7	costo	2
por	6	información	2
el	6	con	2
año	4	dinero	2
ahorro	4	porcentaje	2
anual	3	kwh	2

Question 9

¿Dónde encuentra información sobre los electrodomésticos que se venden? (por ejemplo: capacitación en la tienda, manuales de los electrodomésticos, en internet...)

Where do you find information about the home appliances that you sell? (For example: in-store training, appliances manuals, internet, etc.?)

Table 24: Where Sales Representatives Find Information that they Use to Sell Products

En capacitaciones y muchas veces en internet
Manuales e internet
Mayormente vienen en los productos
Capacitación en tienda
A través de proveedores y la internet
Capacitaciones - manuales Internet
en internet y los manuales
capacitación en tienda y en internet
manuales de los electrodomésticos
amigos, familiares, revistas
En los artículos, capacitaciones
Internet, capacitaciones, tienda
tiendas y manuales
Internet, promotores
Asesores de tienda, Internet, manual
Capacitaciones y Internet
Internet, alguna capacitación
Capacitaciones e internet

Table 25: Word Count for the Responses of Where Sales Representatives Find Information that they Use to Sell Products

Word	# of uses
internet	12
en	8
capacitación	9
manual	6
y	6
tienda	4
los	4
de	3
e	2

Appendix D: Draft Label Designs

The labels shown in this appendix were used to test Costa Rican opinions on label designs and experiment with various possible designs. This include different titles, systems of classification and means of displaying the information.



Figure 63: Draft Label A, Designed to be Minimalist and Highly Informative. Law Complaint Except for Title

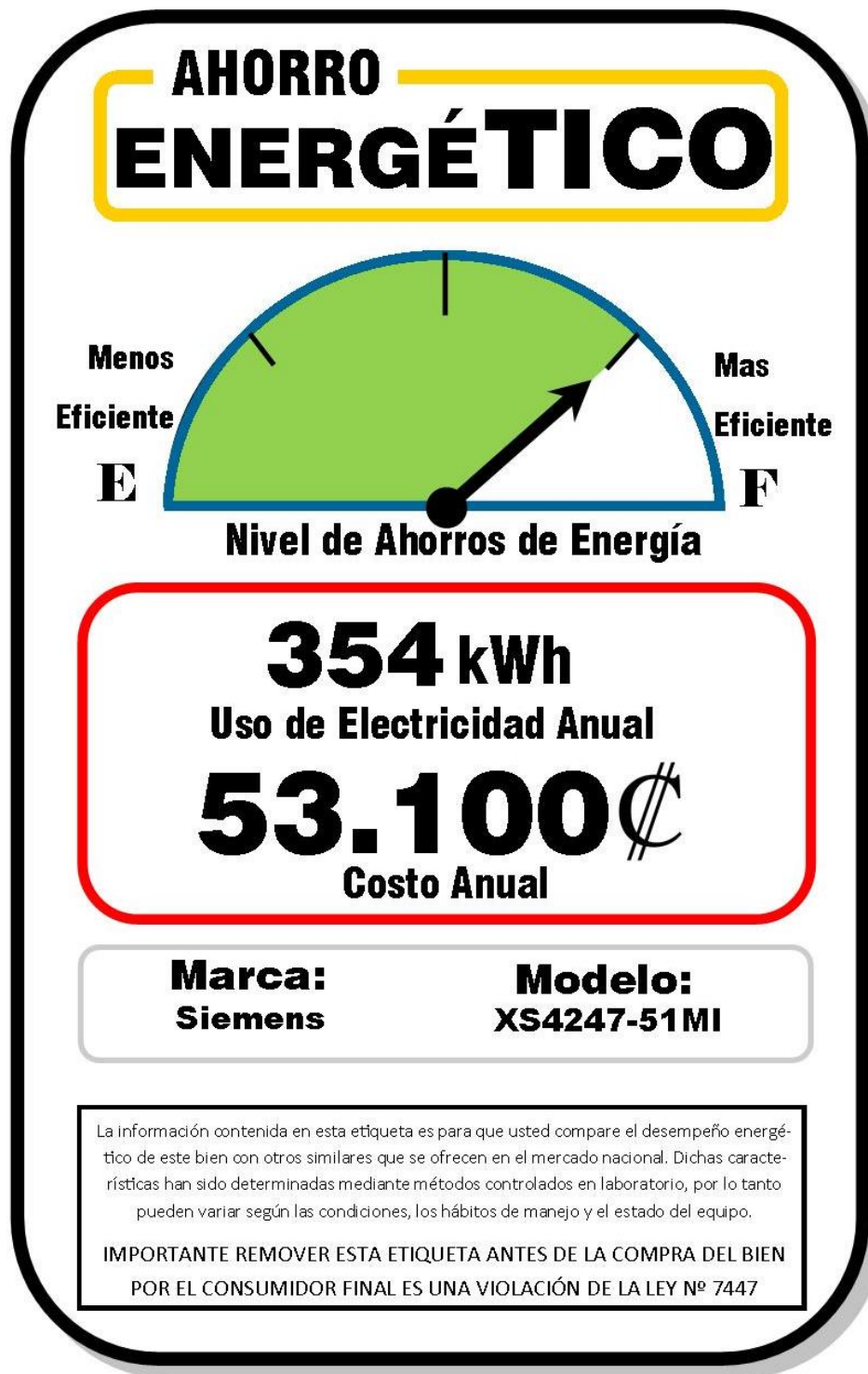


Figure 64: Draft Label B, Designed to be Informative and Simple, but Not Law Compliant



Figure 65: Draft Label C, Designed to Test Extremely Simple Label, but Not Law Compliant



Figure 66: Draft Label D, Designed to Test Unique Label Shapes, but Not Law Compliant

Etiqueta Eficiencia

Marca: Danska	Modelo: XS4247-51MI
-------------------------	-------------------------------

C\$31.100

Costo de Operación Anual

542 kWh	383 kWh
Uso de Electricidad Máximo	Uso de Electricidad Anual

516 litros

Volumen Ajustado

Refrigeradora Congelador	Automático
Tipo de Equipo	Tipo de Descongelamiento

La información contenida en esta etiqueta es para que usted compare el desempeño energético de este bien con otros similares que se ofrecen en el mercado nacional. Dichas características han sido determinadas mediante métodos controlados en laboratorio, por lo tanto pueden variar según las condiciones, los hábitos de manejo y el estado del equipo.

IMPORTANTE REMOVER ESTA ETIQUETA ANTES DE LA COMPRA DEL BIEN
POR EL CONSUMIDOR FINAL ES UNA VIOLACIÓN DE LA LEY Nº 7447

Figure 67: Draft Label E, Designed to Incorporate as Many Colors as Possible and Fully law compliant

 <h1>ENERGÉTICO</h1>	
Sears Brand Mgt Corp Modelo No 7889 Refrigerador-Congelador	
<p>Consumo energético anual normalizado</p> <p>383</p> <p>kWh/año</p>	<p>Consumo de energía máximo</p> <p>542</p> <p>kWh/año</p>
<p>costo de operación anual aproximado</p> <p>₡31.062</p>	<p>nota de eficiencia</p> <p>8</p>
<p>calidades de electrodoméstico</p> <p>Capacidad: 516 Litres Descongelación automática Congelador tapa-montado No puerta con hielo Consumo de energía máximo: 542 kWh/año</p>	
<p>La información contenida en esta etiqueta es para que usted compare el desempeño energético de este bien con otros similares que se ofrecen en el mercado nacional. Dichas características han sido determinadas mediante métodos controlados en laboratorio, por lo tanto pueden variar según las condiciones, los hábitos de manejo y el estado del equipo. Para consultas a la Dirección Sectorial de Energía, MINAE.</p> <p>IMPORTANTE</p> <p>REMOVER ESTA ETIQUETA ANTES DE LA COMPRA DEL BIEN POR EL CONSUMIDOR FINAL ES UNA VIOLACIÓN DE LA LEY N°7447</p>	

Figure 68: Draft Label F, Designed To Look Official and Fully Law Compliant Except for Label Title

Appendix E: Survey for Label Features and Designs

Demographic Data

In this section of the survey the sex of the respondents was collected if permitted.

SECCIÓN OPCIONAL: **Sexo:** __ Hombre __ Mujer
Sex: ___ Male ___ Female

Table 26: Sex of those Surveyed in Survey Two

Sex	Count	Percentage
Male	25	50,00%
Female	25	50,00%

Part 1 - Importance of Energy Efficiency

Question 1

¿Qué tan importante es la eficiencia energética para usted en una escala de 5 – 1. 1 siendo el más importante y 5 siendo el menos importante.

Encierre sólo uno: **1** **2** **3** **4** **5**

How important is energy efficiency to you, on a scale from 5-1? 1 is the most important and 5 is the least important.

Circle one: **1** **2** **3** **4** **5**

Table 27: Average Importance of Energy Efficiency, Lower Values Indicate More Importance

Mean	Median	Mode	Std. Dev.
2,367347	2	1	1,531173

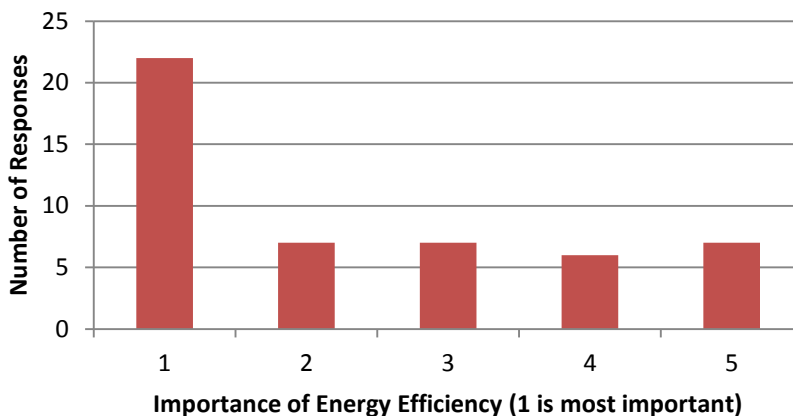


Figure 69: Response Count of Each Level of Energy Efficiency Importance

Question 2

¿Ha visto usted etiquetas de eficiencia en los electrodomésticos?

Encierre uno: **SÍ** o **NO**

Have you seen energy efficiency labels on home appliances?

Circle one: **YES** or **NO**

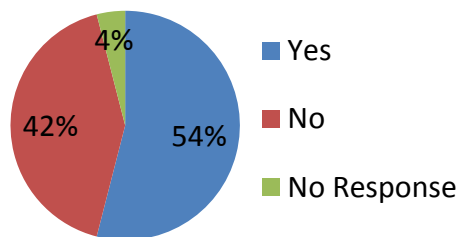


Figure 70: Those Who had Seen Energy Efficiency Labels Before

Part 2 - Classification System

For this section those being surveyed were shown the image below containing five different energy efficiency classification systems and asked to choose the best and worst.

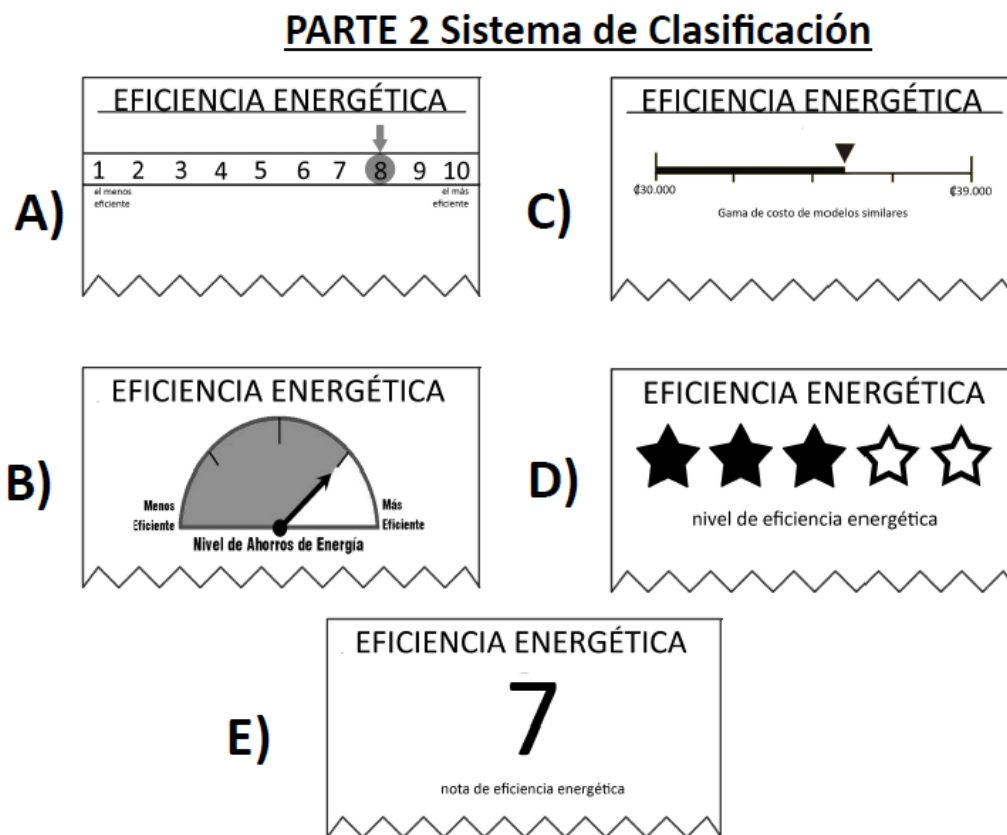


Figure 71: Visual aid for Energy Efficiency Comparison Scale Systems for Survey Two

Question 1

En su opinión, ¿cuál sistema de clasificación es el **MEJOR**?

In your opinion, which ranking system is the **BEST**?

Question 2

En su opinión, ¿cuál sistema de clasificación es el **PEOR**?

In your opinion, which ranking system is the **WORST**?

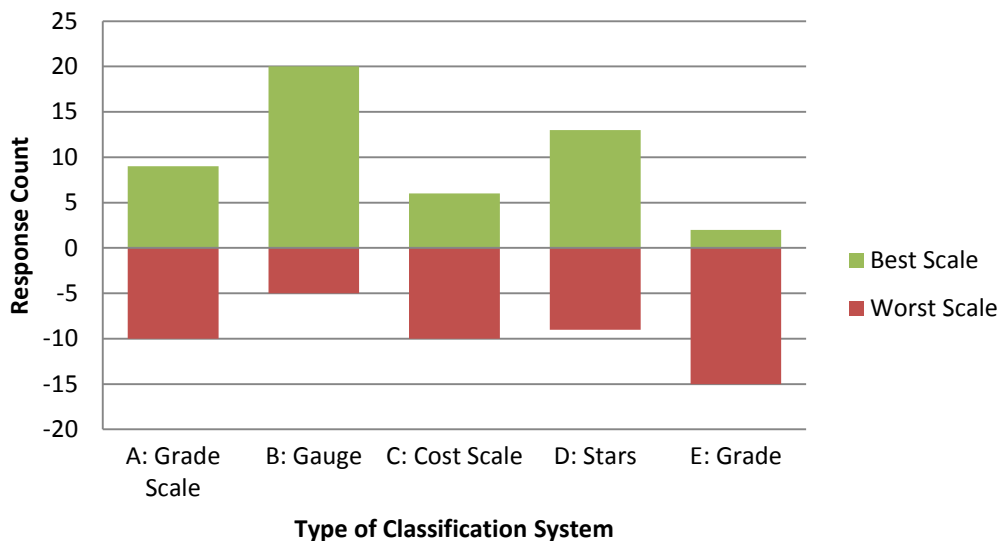


Figure 72: Number of Responses for Best and Worst Scale System

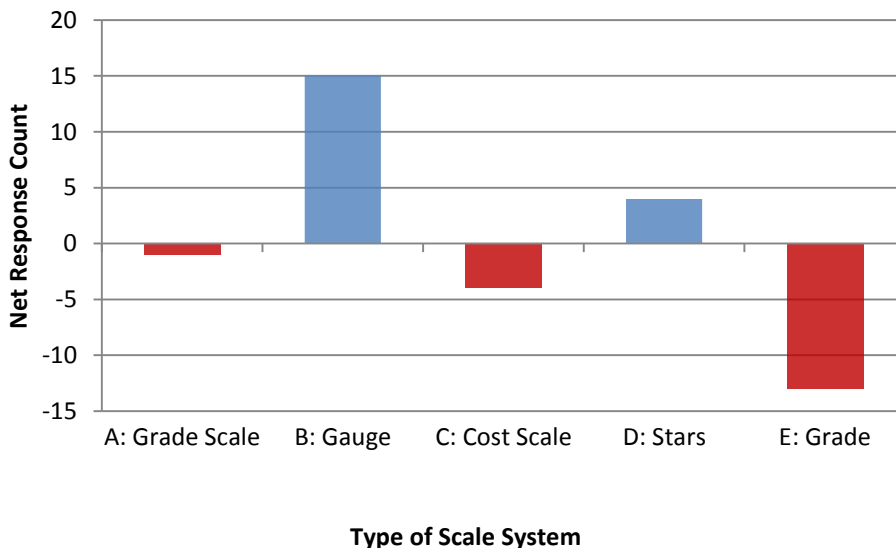


Figure 73: Net Response to Each Type of Scale System. Calculated by Subtracting the Number of Negative Responses for Each from the Number of Positive Responses

Part 3 – Label Title

For this section those being surveyed were shown the image below containing four different label titles and asked to choose the best and worst.

PARTE 3 Título

- A) 
- B) 
- C) 
- D) 

Figure 74: Visual aid for Potential Label Titles for Second Survey

Question 1

En su opinión, ¿cuál título es el **MEJOR** para una etiqueta para los electrodomésticos?

In your opinion, which title is the **BEST** for a label for home appliances?

Question 2

En su opinión, ¿cuál título es el **PEOR** para una etiqueta para los electrodomésticos?

In your opinion, which title is the **WORST** for a label for home appliances?

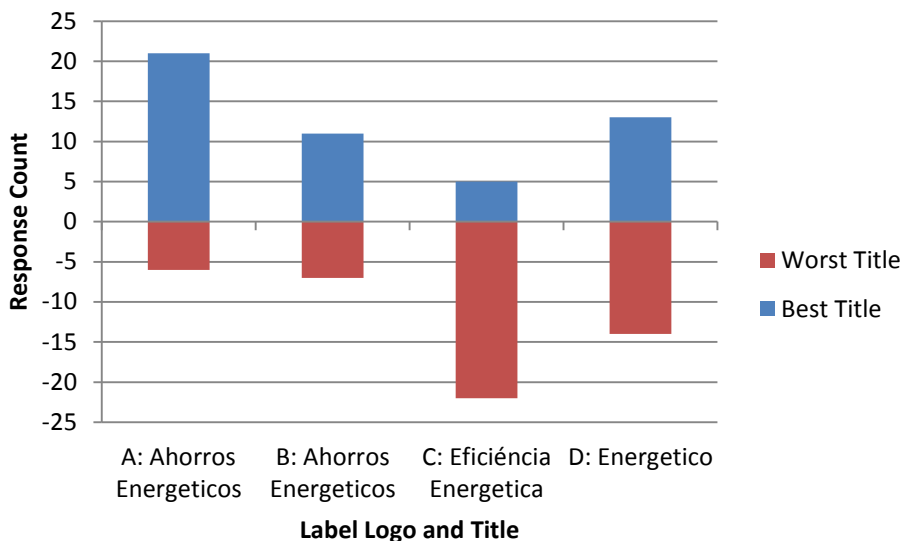


Figure 75: Number of Responses for Best and Worst Label Title

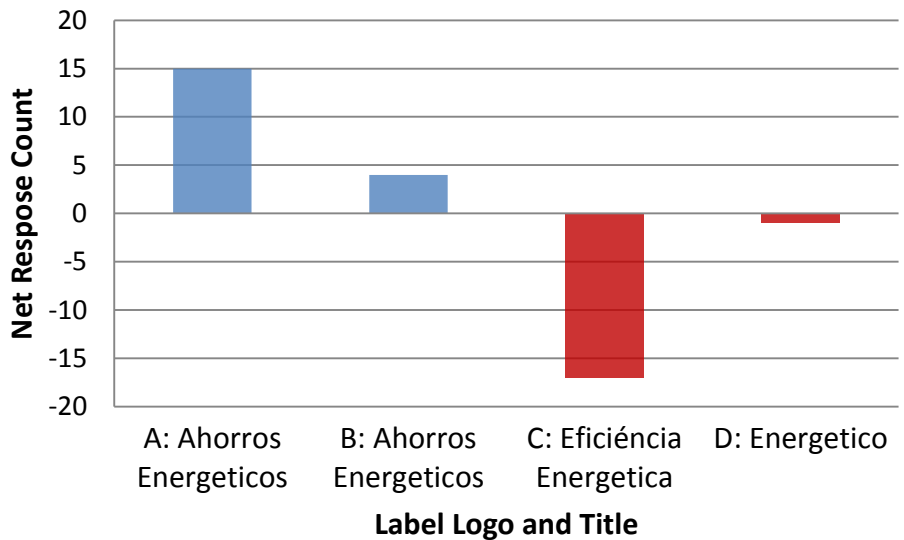


Figure 76: Net Response to Each Label Title. Calculated by Subtracting the Number of Negative Responses for Each from the Number of Positive Responses

Part 4 - Label Color

For this section those being surveyed were shown the image on the next page containing six identical labels with different background colors and patterns and asked to choose the best and worst.

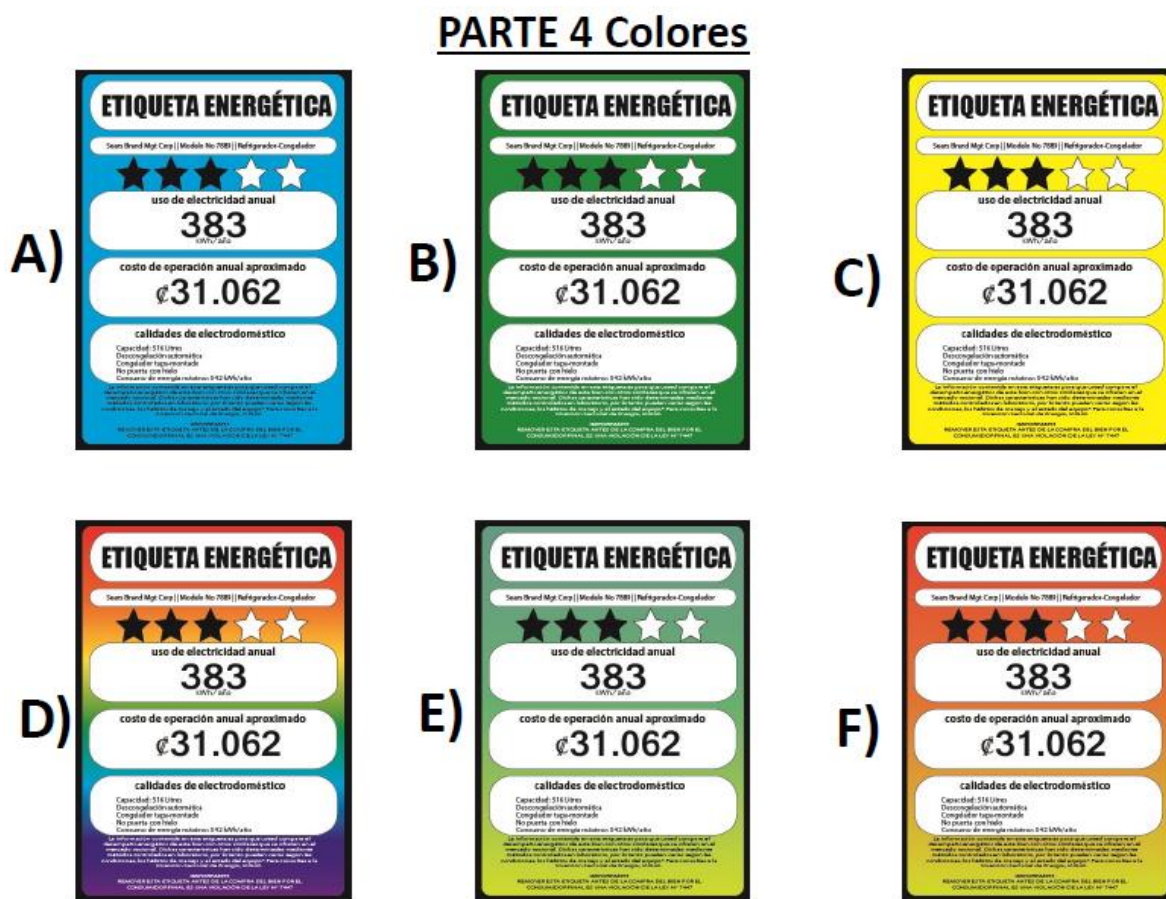


Figure 77: Visual Aid for Potential Label Colors for Second Survey. Same Design Repeated Only Differing in Background Color

Question 1

¿Cuál etiqueta le llama **MÁS** la atención?

Which label calls your attention the **MOST**?

Question 2

¿Cuál etiqueta le llama **MENOS** la atención?

Which label calls your attention the **LEAST**?

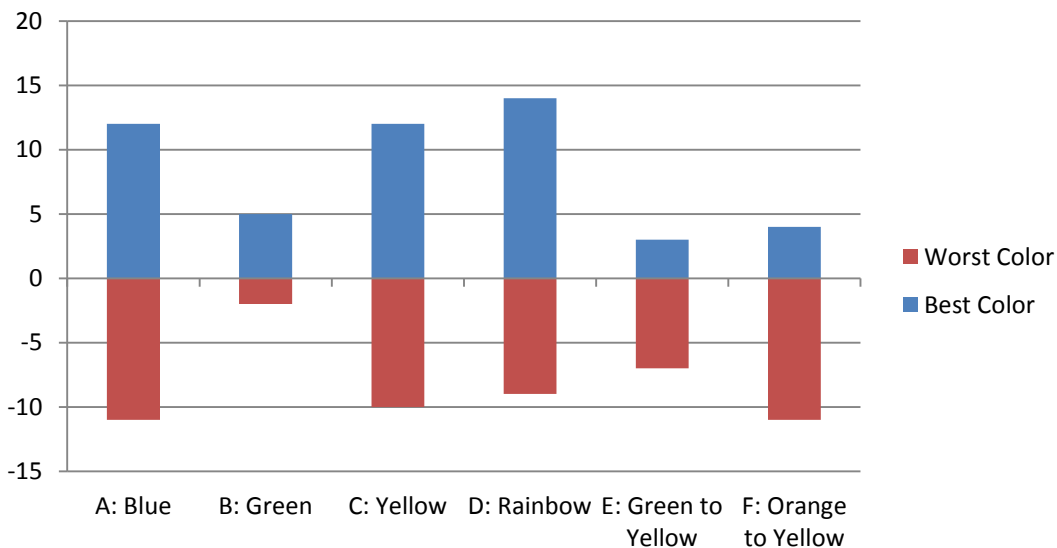


Figure 78: Number of Responses for Best and Worst Label Color

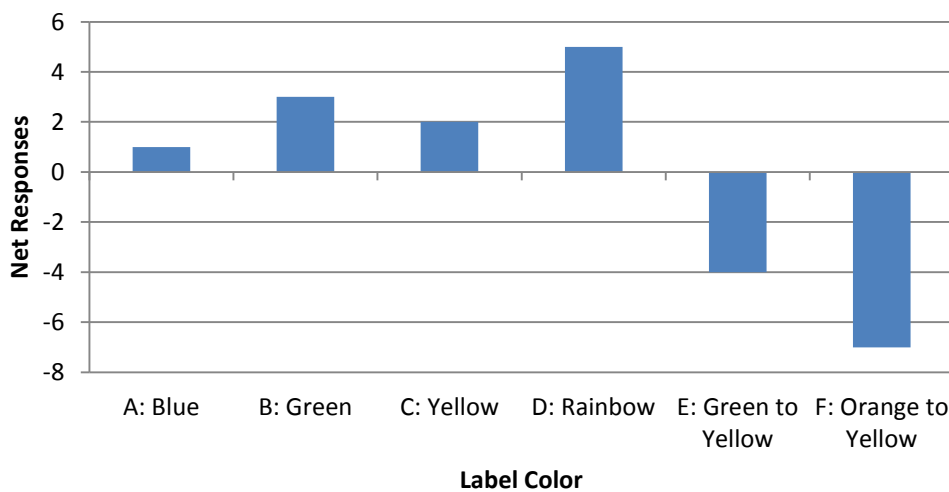


Figure 79: Net Response to Each Possible Label Color. Calculated by Subtracting the Number of Negative Responses for Each from the Number of Positive Responses

Part 5 - Label Arrangement

In this section those being surveyed were shown the image below containing four label information arrangements and asked to choose the best and worst.

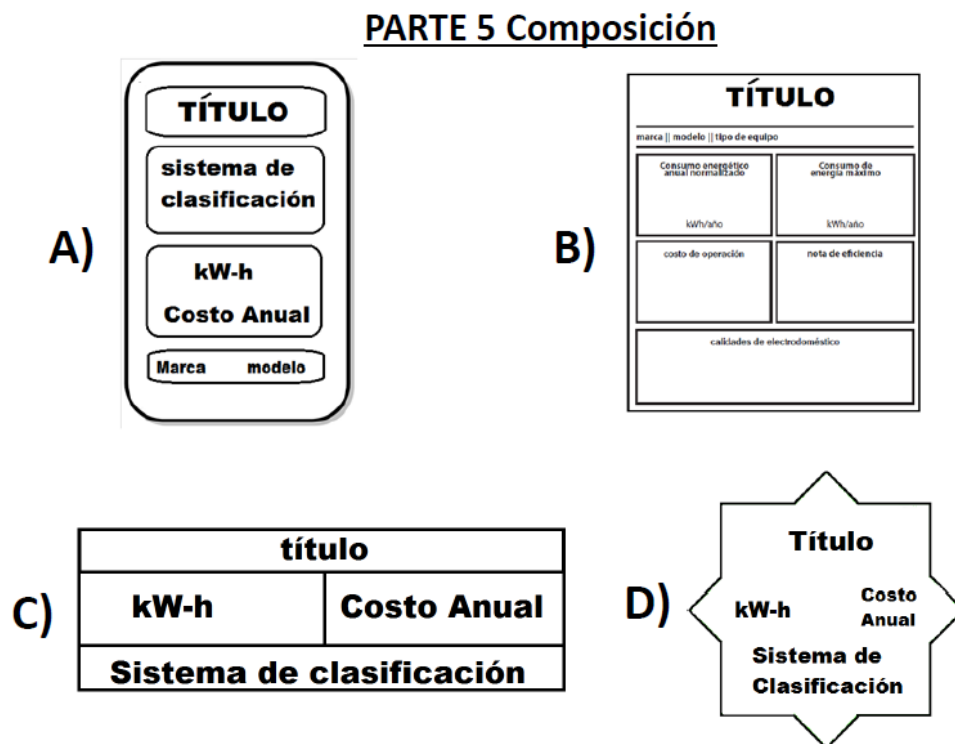


Figure 80: Visual Aid for Potential Label Content Arrangements for Second Survey

Question 1

En su opinión, ¿cuál formato de la etiqueta es el **MEJOR**?

In your opinion, which format of the label is the **BEST**?

Question 2

En su opinión, ¿cuál formato de la etiqueta es el **PEOR**?

In your opinion, which format of the label is the **WORST**?

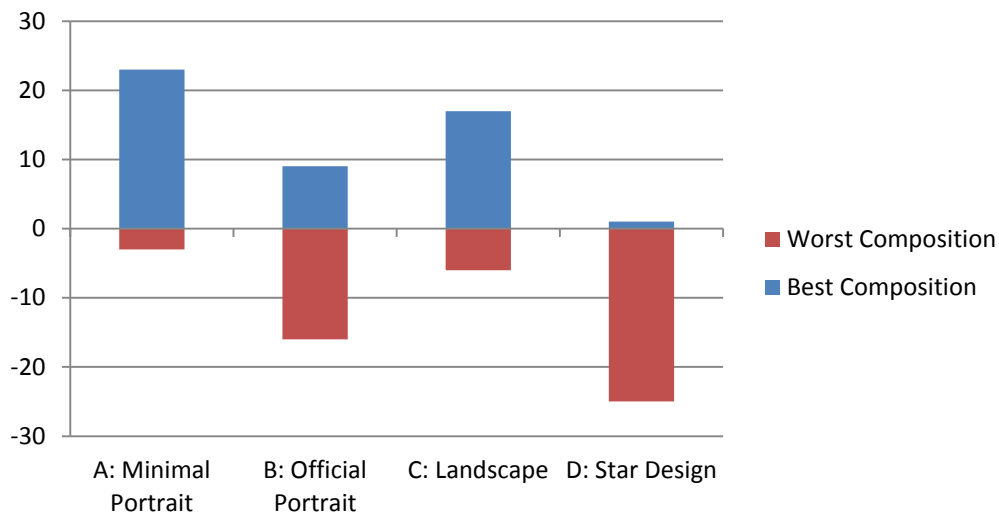


Figure 81: Number of Responses for Best and Worst Label Arrangements

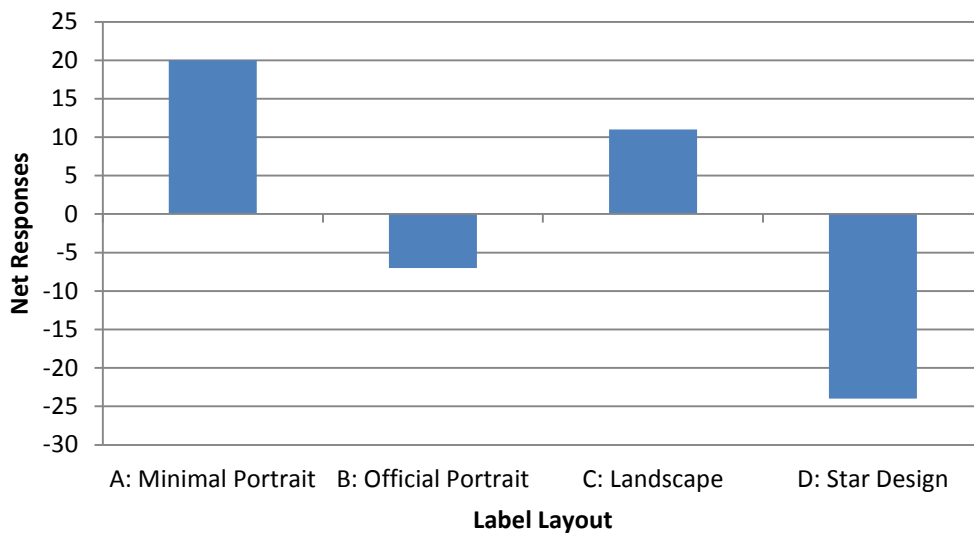


Figure 82: Net Response to Each Label Layout. Calculated by Subtracting the Number of Negative Responses for Each from the Number of Positive Responses

Part 6 - Draft Label Designs

In this section those being surveyed were shown the labels in Appendix D and asked to choose the best and worst label design as well as why they choose their favorite label.

Question 1

En su opinión, ¿cuál etiqueta es la **MEJOR**?

In your opinion, which label is the **BEST**?

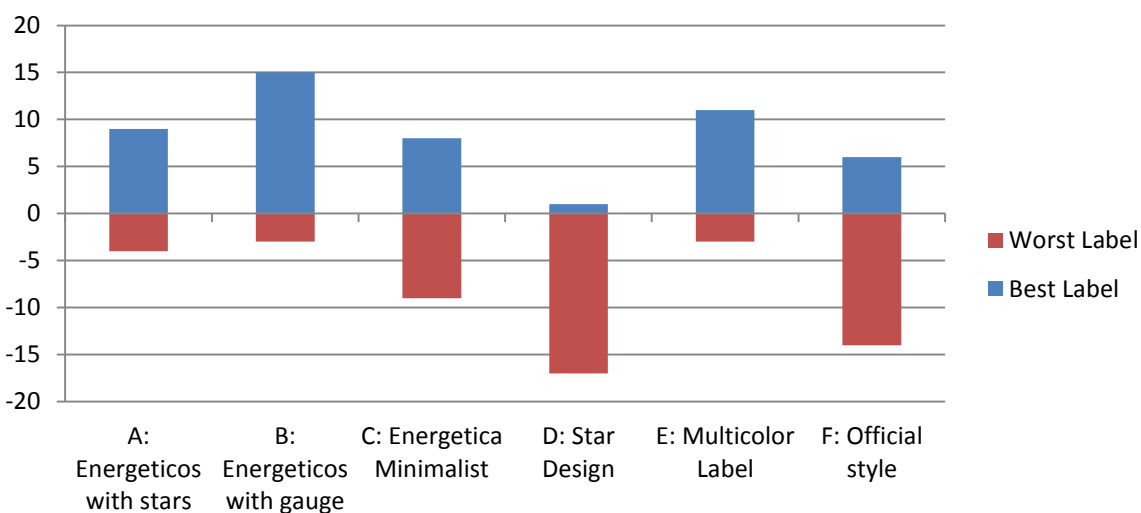


Figure 83: Number of Responses for Best and Worst Draft Label Designs

Question 2

En unas palabras, ¿por qué escogió esta etiqueta?

In your own words, why did you choose this label?

Table 28: Word Count for Why Favorite Label was Chosen

Word	# of uses	Word	# of uses
más	14	presentación	3
porque	12	en	3
la	11	llamativa	3
mejor	10	clara	2
es	8	su	2
y	6	electricidad	2
por	6	pero	2
atención	6	escala	2
información	5	ser	2
llama	5	explica	2
tiene	4	ve	2
se	4	bandera	2
de	4	gusta	2
el	4	claridad	2

Question 3

En su opinión, ¿cuál etiqueta es la **PEOR**?

In your opinion, which label is the **WORST**?

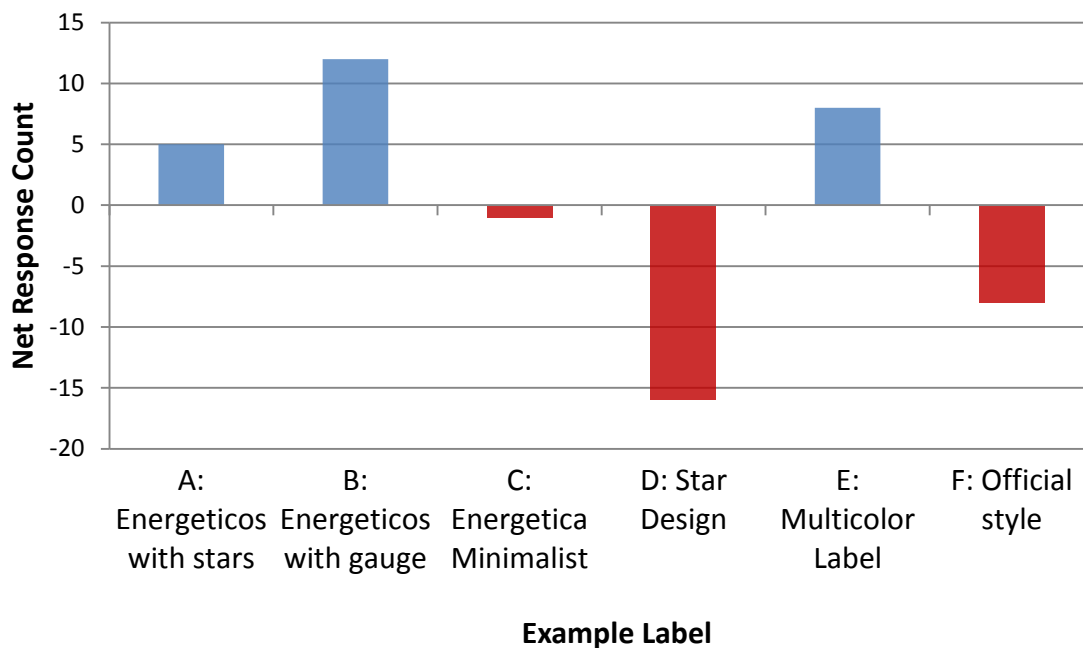


Figure 84: Net Response to Each Example Draft Label. Calculated by Subtracting the Number of Negative Responses for Each from the Number of Positive Responses

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