# *E*lectrica*V*enue.com Site Analysis

## Database and Data Warehousing Report

Harika Kasireddy, Rachel Azarian -Group 12

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# Introduction

Designing a large scale website requires a large number of components to research and implement. This includes curating front and backend components including but not limited to UI/UX, optimization, and database functionalities. In this scenario we are currently evaluating options for a modified and upgraded website for EV cars. An investor, named Ms. Smith, has requested a newly created site and company that would focus only on the EV car market. Ms.Smith recently came across the truecar.com website and had a nice experience with the interface. She enjoyed the way the information was laid out and the site navigation. Although, there were some elements of the site that did not appeal to Ms. Smith, and she noted room for improvement. Therefore, she would like to invest $500,000 into a new site with all the optimal features and a seamless experience in searching for EV cars, primarily with a top tier interface and database structure to efficiently highlight and sell these vehicles.

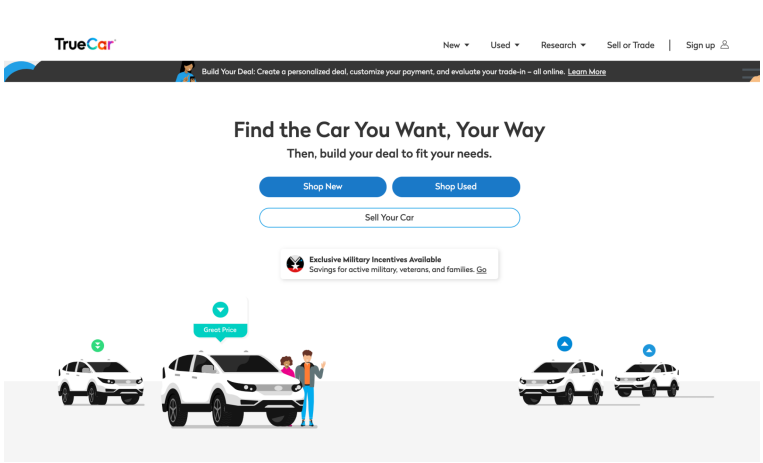
*E*lectrica*V*enue.com will be a one stop shop for individuals like Ms. Smith searching for their perfect electric vehicle. It will also allow users to explore various brands and models of used and new EV cars. As the EV market is expected to reach about 233.9 million units by 2027, the site will expect a lot of user traffic and be modified to do so. It will have similar filters, such as the “Shop New>Brand” filter that Ms. Smith admired. There may be additional filtration options based on year, model, color, size, drive type, etc. This will allow users like Ms. Smith to have an optimal user experience and efficiently find the proper EV car to purchase catered to their specific needs.

# Comparative Analysis

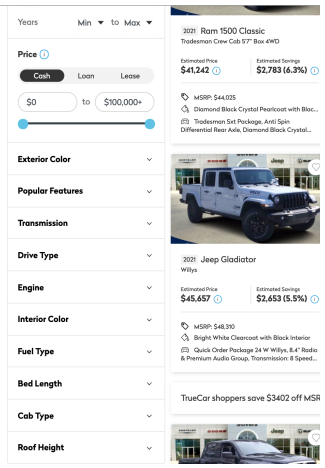
To understand best how to go about building *E*lectrica*V*enue.com, their competitor sites need to be thoroughly evaluated. Truecar.com is the site that we are analyzing to understand what is successful and what is not to build data that will work with the target audience of *E*lectrica*V*enue.com. As its another e-commerce vehicle site, it provides us with a similar market to appraise and progress from.

A SWOT analysis allows designers and developers to evaluate the strengths, weaknesses, opportunities and threats of a product. In our competitor analysis, we evaluated the SWOT of truecar.com to gather copious details of their site to help further build the EV site.

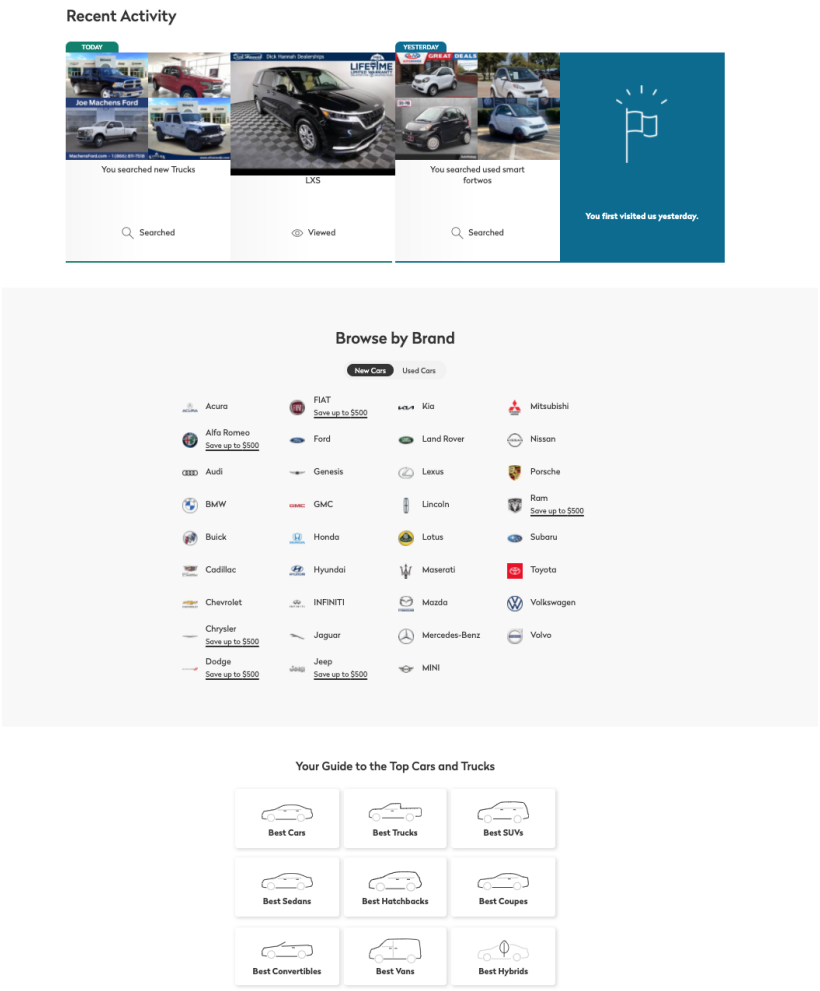
Truecar.com has many strengths that they emulate on their site, as well as business practices. The site has a wide inventory of products and various car models to allow for a vast consumer base. The website structure is organized with clean labelling and easy to navigate layout for any user to easily comprehend. It additionally has markets in multiple regions for customers in various markets to utilize.




*Img 1- Easy to Use/ Navigate Home Screen*




*Img 2- Essential Filters*




*Img 3- Various search options to make a more efficient shopping experience*

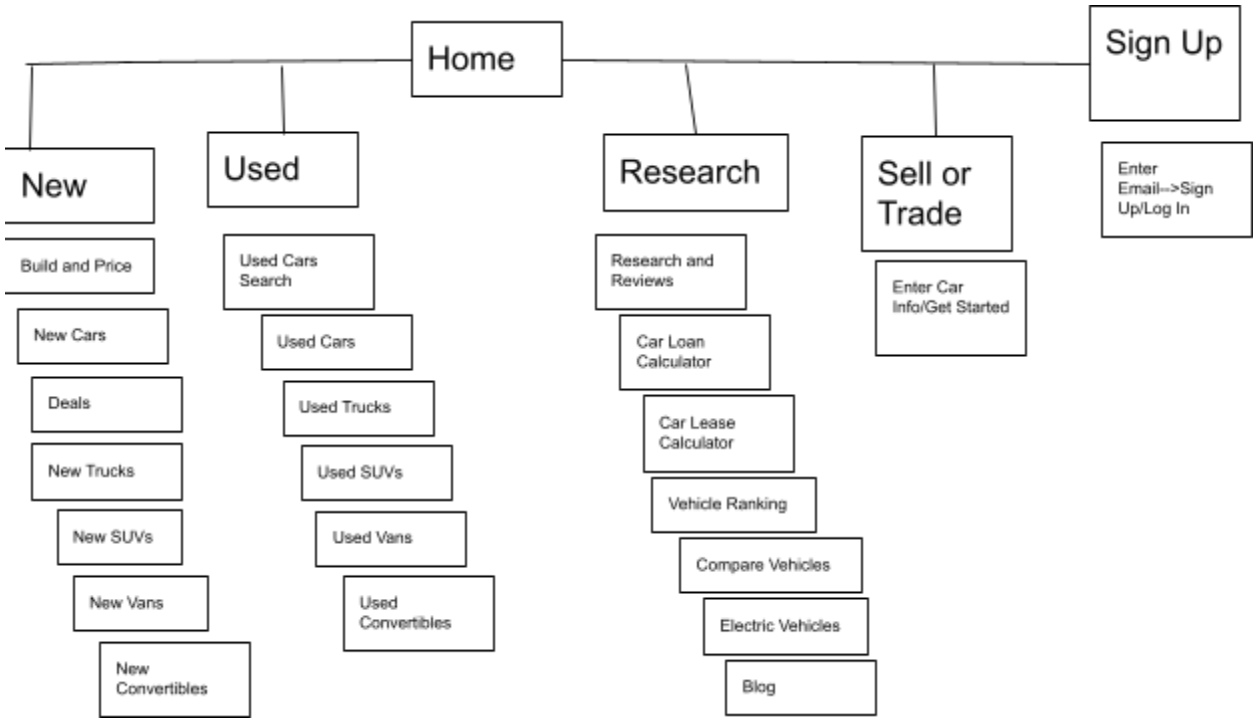
Along with the strengths, truecar.com displays some weaknesses as well. An example is when searching through the inventory on the site, such as “New Vans”, several thousand vehicles come up, with only about 20 showing per page. Even with the filters available, it still would take several pages for customers to view the available inventory. Therefore, the site should reduce the size of the filter section and make more room to view the cars quicker and easier. Although it's nice for some customers that the site first separates the vehicles between new and used and then gives subcategories from there, this may not be the preferred method for all shoppers. For example, some

car shoppers just have an ideal budget, color, make, or model they are shopping for and do not mind whether the car is new or used. Therefore, a view to see all cars, trucks, vans,etc. available and then filter out new and used from there will give more flexible consumers an easier way to shop instead of individually having to go through the new and used sites with the same filters. As these weaknesses are analyzed, there will be a lot of room for growth and opportunities. The car industry is constantly evolving, and simultaneously as are customers' needs. Truecar.com should constantly be collecting data and target market analyses to properly update the top products and search results for their site. Additionally, they should build their customer service list for consumers to get more immediate help instead of having to give their information to learn about their vehicle options. The site should also look at their competitor sites to see how they are marketing and profiting from similar target audiences. This is primarily where truecar.com may have any threats to their market and site as well. Sites such as Cargurus.com, Cars.com, Kelley Blue Book, AutoTempest.com, and several others should be evaluated and compared to see where truecar.com may fall short in the consumers eyes. This can include competitive pricing, inventory options, customer service etiquette, and various other factors that can be addressed. Overall, Truecar.com has a lot of great elements for a great user experience, and can use this SWOT to see how their site can be further optimized.

A sitemap is a list of pages that are contained in a website that is accessible to its users. It can be used as a planning tool for designing a website or to organize web pages in a hierarchical way. Sitemaps display the relationship between various pages and content of a website, demonstrating the way that the website is organized, how it

can be navigated, and how it is labeled. For truecar.com, their sitemap can be shown and divided through their top 5 categories displayed from their home page: New, Used, Research, Sell, Sign Up.  The site has a simple navigation and filtering system once on the individual car pages. The sell and sign up pages are a single search or login page.

TrueCar.com Sitemap:



# Business Rules and Requirements

Business rules are important to an organization, because they help identify data sources and lead to the creation of a data model. Business rules are descriptions of certain procedures and policies for an organization's operations. They are in writing, and are usually identified by managers and policy makers that create standards, operational manuals, and procedures. They are essential for database design, because they provide a standardized view of the company's data. They also allow the database designers to understand the nature and scope of the data, which leads to an accurate data model.

There are numerous business rules that describe how *E*lectrica*V*enue.com operates. Starting with our customers, their first step on the site is creating an account. An account can only pertain to one customer, and they must have an accurate email address and password that meets our security standards in order to create a new account. An email address can be used to create only one account, and an account can only have one email address associated with it. In addition, we need an accurate full name, phone number, and mailing address. Different accounts can be created using the same phone number and address to account for multiple people living at the same address. After the account is created, the customer needs to verify their email address to ensure we have accurate account information.

The EV cars listed on our site also have certain information requirements that will improve our search functionality, user experience, and database model. Each car that is listed for sale, whether it is new or used, can only be listed once. The vehicle's VIN

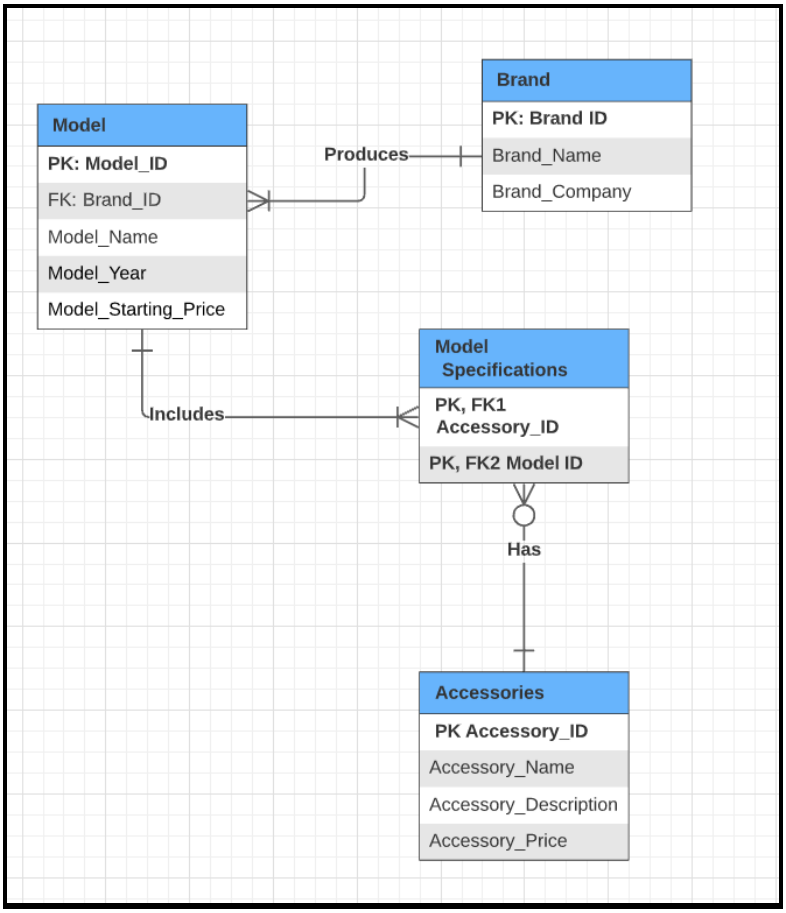
number must be accurate and will be used as a unique identifier for each listing. There will be several requirements for successfully listing a car on the site. Each listing must contain basic information about the vehicle like make, model, exterior and interior color, year, price, new or used status, mileage, drivetrain, transmission type, location, number of accidents, title, and number of previous owners. Each VIN must have these fields populated with only one option. For example, the drivetrain cannot be FWD and AWD, it must be only one. Because these are EV cars, there will be additional fields that must be populated that won't apply to ICE cars. These fields include battery type, miles of range, time to charge, acceleration time, and price per charge. Also, these fields are populated with only one option Each listing can have pictures of the vehicle, and there can be 0-10 pictures associated with each listing. In addition, each listing will have a section titled Other Features, where 0-30 options can be selected based on the vehicle's features. This will include features such as heated seats, SiriusXM, navigation, keyless entry, backup camera, sunroof, etc.

If a customer decides to purchase a car through the site, they can purchase multiple cars at once, but a car can only be purchased by one customer. They must provide an accurate credit card or bank account number and other required information for the transaction to be processed. Or, they can choose to finance the car through a bank, and *E*lectrica*V*enue.com will need all of the necessary information to receive the money from the bank for the vehicle. If the customer decides to ship the car instead of picking it up, we will need a mailing address, date, and time to deliver the car. The customer has 30 days from the date of purchase to return the car for a full refund if there are no damages to the vehicle. These business rules and requirements provide a

standard set of procedures for *E*lectrica*V*enue.com's operations. They will also allow a database model that has accurate and complete information, and will give the database designer a standardized view of the scope of the data.

# ER Diagram

An entity relational diagram (ERD) displays relationships between multiple entities or subjects within a flowchart. For *E*lectrica*V*enue.com, the ER Diagram to show the relationships between their Brand, Model, and Accessory data is shown below:



The Brand entity will include the list of brands available on *E*lectrica*V*enue.com. The Brand_ID will be the primary key, and the entity will also include Brand_Name. Here is an example of what the Brand table will look like.

| Brand_ID | Brand_Name |
|---|---|
| 1 | Hyundai |
| 2 | Tesla |
| 3 | Porsche |
| 4 | Volkswagen |
| 5 | Audi |
| 6 | Nissan |
| 7 | Ford |
| 8 | Chevrolet |

The Brand entity will have a one to many relationship with the Model entity. This will include the car models available on *E*lectrica*V*enue.com. Each model can only be a part of one brand, but a brand may have many models. A model must belong to one brand, and a brand must have at least one model to be entered into the database. The Model entity will include Model_ID as the primary key and Brand_ID as the foreign key. The Model entity will also include the Model_Name, Model_EPA_Range, and Model_Starting_Price attributes. Here is an example of what the Model table will look like.

| Model ID | Model_Name | Model_EPA_Range | Model_Starting_Price | Brand_ID |
|---|---|---|---|---|
| 101 | Model Y | 244 | 41,190 | 2 |
| 102 | Model 3 | 263 | 38,690 | 2 |
| 103 | Bolt EV | 259 | 37,495 | 8 |
| 104 | Mustang Mach-E | 230 | 43,995 | 7 |
| 105 | Leaf | 149 | 32,620 | 6 |
| 106 | e-tron | 222 | 66,995 | 3 |
| 107 | ID.4 | 250 | 41,190 | 4 |
| 108 | Model X | 371 | 91,190 | 2 |
| 109 | Taycan | 200 | 81,250 | 3 |
| 110 | Model S | 402 | 81,190 | 2 |
| 111 | Kona Electric | 258 | 38,575 | 1 |
| 112 | Ioniq Electric | 170 | 34,250 | 1 |

Next, there will be an Accessory entity. This will include the additional accessories that can be included in the different models that are available on the site. The Accessory entity will include Accessory_ID as the primary key, and also Accessory_Name, Accessory_Description, and Accessory_Price. Here is an example of what the accessory table will look like.

| Accessory_ID | Accessory_Name | Accessory_Description | Accessory_Price |
|---|---|---|---|
| 201 | Non-scratch paint | Anti-scratch paint covering for vehicle | 300 |
| 202 | Trash Can | trash can built into car for easy access | 50 |
| 203 | Premium Mat | Premium weather mats | 250 |
| 204 | Extra Bright Lights | Extra bright solid white high beams | 450 |
| 205 | Tire Chains | Tire chains for snow and ice travel | 399 |
| 206 | Full Range Speakers | Custom-fit full range high quality speakers | 1200 |
| 207 | Parking sensors | Parking sensors on six locations of vehicle | 600 |

There is a many to many relationship between the Accessory and Model entities, because one model can have multiple accessories, and one accessory can be a part of many models. To solve this problem, Model_Specifications entity will be used to combine both of these entities. The Model_Specifications entity will include Model_ID

and Accessory_ID as the primary and foreign keys. This entity will solve the many to many relationships. It will have a one to many relationship with the Model entity and the Accessory entity.

## Tables with Data

Under the database, “electric_avenue”, three tables with the data from the ERD diagram were created: “brands”, “models”, and “accessories”. The code for the SQL that created and populated each table can be seen below .

**Table 1: Brand**

```
CREATE TABLE brand(
    brand_id VARCHAR(3) PRIMARY KEY,
    brand_name VARCHAR(30) NOT NULL);


INSERT INTO `brand` (`brand_id`, `brand_name`) VALUES
 ('1', 'Hyundai'), ('2', 'Tesla'), ('3', 'Porsche'), ('4', 'Volkswagon'), ('5', 'Audi'), ('6', 'Nissan'),
('7', 'Ford'), ('8 ', 'Chevrolet');
```

| brand_id | brand_name |
|---|---|
| 1 | Hyundai |
| 2 | Tesla |
| 3 | Porsche |
| 4 | Volkswagon |
| 5 | Audi |
| 6 | Nissan |
| 7 | Ford |
| 8 | Chevrolet |

**Table 2: Models**

```
CREATE TABLE models(
    model_id VARCHAR(5) PRIMARY KEY,
    model_name VARCHAR(30) NOT NULL,
    model_epa_range NUMERIC,
    model_starting_price NUMERIC,
    brand_id VARCHAR(3),
    FOREIGN KEY (brand_id) REFERENCES brand(brand_id));
```

```
INSERT INTO `models` (`model_id`, `model_name`, `model_epa_range`, `model_starting_price`, `brand_id`) VALUES ('101', 'Model Y', '244', '41190', '2'), ('102', 'Model 3', '263', '38690', '2'), ('103', 'Bolt EV', '259', '37495', '8'), ('104', 'Mustang Mach-E', '230', '43995', '7'), ('105', 'Leaf', '149', '32620', '6'), ('106', 'e-tron', '222', '66995', '3'), ('107', 'ID.4', '250', '41190', '4'), ('108', 'Model X', '371', '91190', '2'), ('109', 'Taycan', '200', '81250', '3'), ('110', 'Model S', '402', '81190', '2'), ('111', 'Kona Electric', '258', '38575', '1'), ('112', 'Ioniq Electric', '170', '34250', '1');
```

| model_id | model_name | model_epa_range | model_starting_price | brand_id |
|---|---|---|---|---|
| 101 | Model Y | 244 | 41190 | 2 |
| 102 | Model 3 | 263 | 38690 | 2 |
| 103 | Bolt EV | 259 | 37495 | 8 |
| 104 | Mustang Mach-E | 230 | 43995 | 7 |
| 105 | Leaf | 149 | 32620 | 6 |
| 106 | e-tron | 222 | 66995 | 3 |
| 107 | ID.4 | 250 | 41190 | 4 |
| 108 | Model X | 371 | 91190 | 2 |
| 109 | Taycan | 200 | 81250 | 3 |
| 110 | Model S | 402 | 81190 | 2 |
| 111 | Kona Electric | 258 | 38575 | 1 |
| 112 | Ioniq Electric | 170 | 34250 | 1 |

**Table 3: Accessories**

```
CREATE TABLE accessories(
    accessory_id VARCHAR(5) PRIMARY KEY,
    accessory_name VARCHAR(30) NOT NULL,
    accessory_description VARCHAR(100),
    accessory_price NUMERIC);
```

```
INSERT INTO `accessories` (`accessory_id`, `accessory_name`, `accessory_description`, `accessory_price`) VALUES ('201', 'Non-scartch paint', 'Anti-scratch paint covering for vehicle', '300'), ('202', 'trash can', 'trash can built into car or easy access', '50'), ('203', 'premium mat', 'premium weather mats', '250'), ('204', 'extra bright lights', 'extra bright solid white high beams', '450'), ('205', 'tire chains', 'tire chains for snow and ice travel', '399'), ('206', 'Full range speakers', 'Custom-fit full range high quality speakers', '1200'), ('207', 'Parking sensors', 'Parking sensors on six locations of vehicle', '600');
```

| accessory_id | accessory_name | accessory_description | accessory_price |
|---|---|---|---|
| 201 | Non-scartch paint | Anti-scratch paint covering for vehicle | 300 |
| 202 | trash can | trash can built into car or easy access | 50 |
| 203 | premium mat | premium weather mats | 250 |
| 204 | extra bright lights | extra bright solid white high beams | 450 |
| 205 | tire chains | tire chains for snow and ice travel | 399 |
| 206 | Full range speakers | Custom-fit full range high quality speakers | 1200 |
| 207 | Parking sensors | Parking sensors on six locations of vehicle | 600 |

**Table 4: Features**

```
CREATE TABLE features(
    model_id VARCHAR(5),
    color_option VARCHAR(30) );
```

```
INSERT INTO features (model_id, color_option) VALUES ('101', 'Black'),('101', 'Red'),('101', 'White'),('102', 'Gray'),('102', 'Navy'),('102', 'White'),('103', 'Green'),('103', 'Opal'),('103', 'Brown'),('104', 'Black'),('104', 'Red'),('104', 'Gold'),('105', 'Blue'),('105', 'Opal'),('105', 'Orange'),('106', 'Black'),('106', 'Tan'),('106', 'Forest Green'),('107', 'Gray'),('107', 'White'),('107', 'Silver'),('108', 'Black'),('108', 'White'),('108', 'Red'),('109', 'Dark Gray'),('109', 'Dark Brown'),('109', 'Silver'),('110', 'Opal'),('110', 'White'),('110', 'Tan'),('111', 'Sand'),('111', 'White'),('111', 'Black'),('112', 'Orange'),('112', 'Red'),('112', 'Silver');
```

| model_id | color_option |
|---|---|
| 101 | Black |
| 101 | Red |
| 101 | White |
| 102 | Gray |
| 102 | Navy |
| 102 | White |
| 103 | Green |
| 103 | Opal |
| 103 | Brown |
| 104 | Black |
| 104 | Red |
| 104 | Gold |

# SQL Queries

The following SQL queries will be used in our database application for our *E*lectrica*V*enue.com website.

1. When the user clicks on a certain brand (let's say Tesla) then the models for that specific brand are displayed

```
SELECT model_name

FROM  models JOIN brand USING (brand_id)

WHERE  brand_name='Tesla'
```

| model_name |
| --- |
| Model Y |
| Model 3 |
| Model X |
| Model S |

2. When the user clicks on a certain model (Let's say Model S), then the specific information including the price of that model and EPA range is displayed

```
SELECT model_name, model_epa_range, model_starting_price

FROM  models

WHERE  model_name='Model S'
```

| model_name | model_epa_range | model_starting_price |
| --- | --- | --- |
| Model S | 402 | 81190 |

3. When the user clicks on the Exterior of a certain model (Let's say Model S) then all the color options are displayed

```
SELECT color_option

FROM features JOIN models using (model_id)

WHERE model_name='Model S';
```

| color_option |
| --- |
| Opal |
| White |
| Tan |

4. When the user searches for an accessory (such as extra bright lights) then the accessory description and price is shown

```
SELECT accessory_name, accessory_description, accessory_price

FROM accessories

WHERE accessory_name='extra bright lights';
```

| accessory_name | accessory_description | accessory_price |
| --- | --- | --- |
| extra bright lights | extra bright solid white high beams | 450 |

5. When the user enters their maximum price for a vehicle ($40,000), the application displays the brand names, model names and EPA ranges..

```
SELECT brand_name,model_name, model_starting_price, model_epa_range

FROM models JOIN brand USING (brand_id)

WHERE model_starting_price<40000;
```

| brand_name | model_name | model_starting_price | model_epa_range |
|---|---|---|---|
| Tesla | Model 3 | 38690 | 263 |
| Chevrolet | Bolt EV | 37495 | 259 |
| Nissan | Leaf | 32620 | 149 |
| Hyundai | Kona Electric | 38575 | 258 |
| Hyundai | Ioniq Electric | 34250 | 170 |

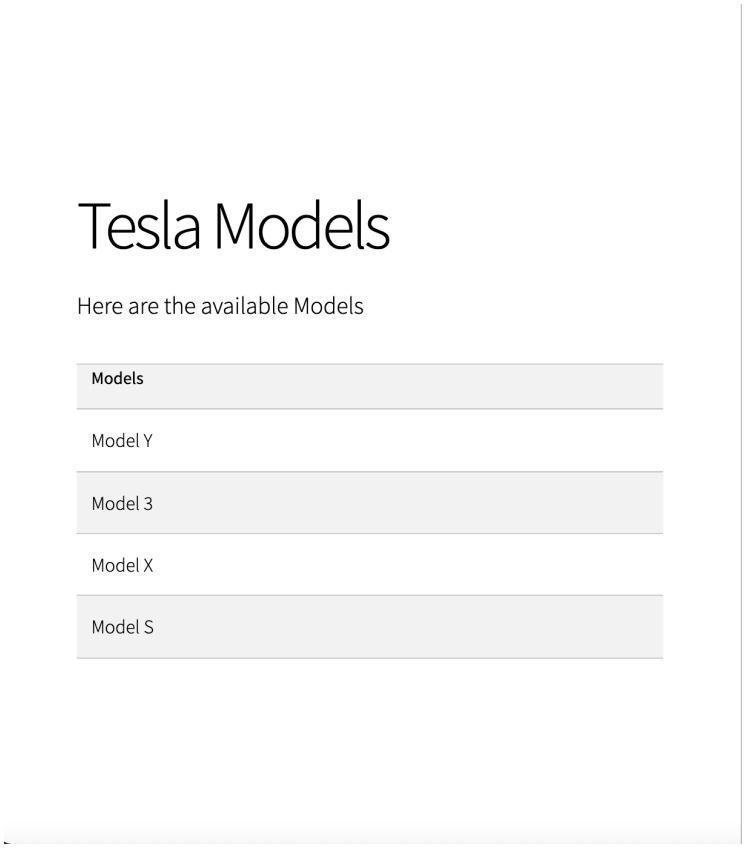
# Database Application

This is the first page of our database application. It displays the full list of EV cars available on our site. If the user clicks on a certain brand, let's say Tesla, then the models for that specific brand are displayed.

## Available EV Car Brands

Please click on a Brand to see available Models

| Brand Name |
|---|
| Hyundai |
| Tesla |
| Porsche |
| Volkswagon |
| Audi |
| Nissan |
| Ford |
| Chevrolet |




From there, the user can click on a model for more specific information. Here's an example of what is displayed when a user clicks on 'Model S'. Information about the price of that model and EPA range is displayed.

# Tesla Models

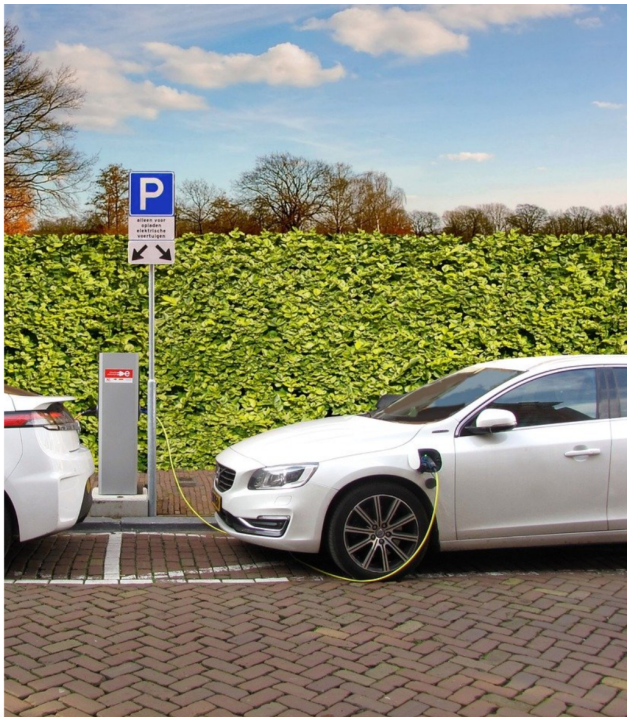
Here are the available Models. Please select a Model for more detail.

| Models |
| --- |
| Model Y |
| Model 3 |
| Model X |
| Model S |

# Model Details

Here are the model specifications:

| Model Name | Model EPA Range | Model Starting Price |
| --- | --- | --- |
| Model S | 402 | 81190 |

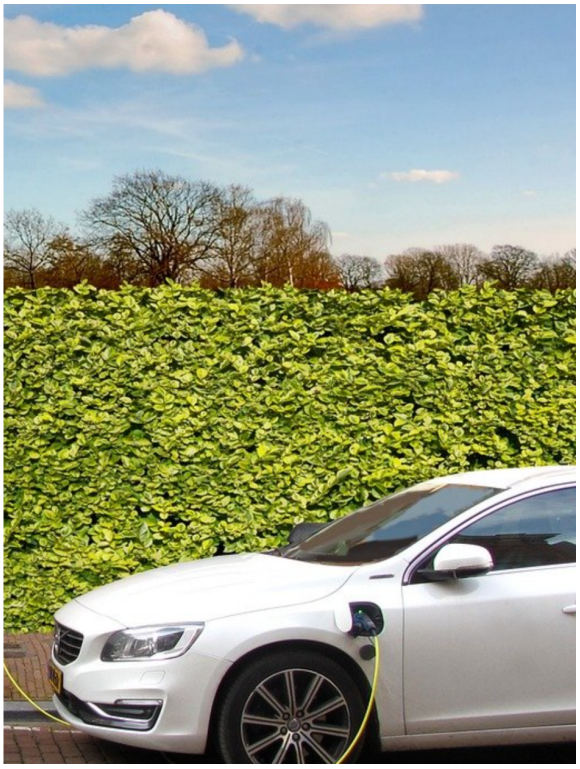



There is another page where users can see the interior and exterior color options of the different models available on the site. When the user clicks on the Exterior of a certain model, Model S for example, then all the color options are displayed.

# Model Color Options

Please select Exterior or Interior to see color options available

| Model Name | Option 1 | Option 2 |
|---|---|---|
| Model Y | Exterior | Interior |
| Model 3 | Exterior | Interior |
| Bolt EV | Exterior | Interior |
| Mustang Mach-E | Exterior | Interior |
| Leaf | Exterior | Interior |
| e-tron | Exterior | Interior |
| ID.4 | Exterior | Interior |
| Model X | Exterior | Interior |
| Taycan | Exterior | Interior |



# Model S Color Options

List of Exterior Color Options:

| Available Colors |
|---|
| Opal |
| White |
| Tan |

The next feature allows users to search for different accessories to see if they are in stock. When the user searches for an accessory, such as extra bright lights for example, then the accessory description and price is shown if it is in stock..

## Please Search an Accessory

Your acccessory price and description will be listed if it's in stock

Accessory:

SUBMIT

## Accessory Details

| Accessory Name | Accessory Description | Accessory Price |
|---|---|---|
| extra bright lights | extra bright solid white high beams | 450 |

The next feature allows the user to enter in their price range for a vehicle.When the user enters in their maximum price, $40,000 in this example, the application displays the brand names, model names and EPA ranges for vehicles in that price range.

## Please Enter Your Maximum Price

Models in your price range will be generated

Maximum Price:

SUBMIT

## Models Available

Models under your maximum price:

| Brand Name | Model Name | Starting Price | EPA Range |
|---|---|---|---|
| Tesla | Model 3 | 38690 | 263 |
| Chevrolet | Bolt EV | 37495 | 259 |
| Nissan | Leaf | 32620 | 149 |
| Hyundai | Kona Electric | 38575 | 258 |
| Hyundai | Ioniq Electric | 34250 | 170 |

# Summary

*E*lectrica*V*enue.com will have copious options for its targeted consumers through various brands, models, and accessory options available to them. In comparison to its competitors, such as Truecar.com, the visibility and accessibility of the large inventory

will be easily seen based on what the target customer is looking for. By building and maintaining a large database model the search functionality and user experience will vastly improve the customers impression and observation of the site.

Based on the analysis of competitor websites and sitemaps, as well as what the current goals are, the key entities and attributes of the database and the tables within were able to be narrowed down. The primary relationships that were focused on for customers to have a seamless experience is Brands, Models, and Accessories for all and only electric vehicles available in the inventory. In terms of creating a database, “electric_avenue”, three tables with the related data were created: “brands”, “models”, and “accessories”. Within the “brands” table, multiple brands with electric vehicles were included such as Tesla, Nissan, Volkswagen, etc. The model data will fall within all the electric options within each brand that customers can choose from, along with information such as price and EPA range. And the accessories table will go further onto the specialized components and options of individual vehicles that customers would pick from. Customers can pick a brand, price range, color, and much more, and various SQL queries can be created to show what they choose displayed on a site.

As an investor, Ms. Smith can, without contention, contribute to *E*lectrica*V*enue.com. Selling only EV cars may be an initial challenge in gathering the data and fulfilling customer expectations, but the databases that we have built and can replicate on a larger scale will make that task more minute. With the database application created, the site will display the essential data based on customer searches and preferences of electric vehicle brands, models, and accessories with ease.