Introduction

Cars have been an American fascination since Ransom E. Olds introduced the first mass produced, gasoline powered automobile, the Oldsmobile Curved Dash, in 1901 [1]. This passion for cars grew as the automobile industry grew, technology improved, and prices dropped, reaching iconic levels during the muscle car era spanning from approximately 1967 through the mid to late 1970s. With each year, individual manufacturers developed loyal followings of customers. These loyalties span generations. Parents who prefer Ford vehicles tend to have children who also prefer Ford vehicles.

Pontiac, established in 1926 [2], was a popular company from its inception. One of Pontiac’s most successful vehicles is the Pontiac Firebird. The Firebird began its production life in 1967 and continued through 2002, maintaining popularity throughout. This 35 year production span injected approximately 2.6 million Firebirds into the world. While a quantity of these have been wrecked or simply abandoned, a majority of them still remain.

With Firebirds changing hands, new people are becoming owners and enthusiasts with regularity. Given the depth at which technology has become integrated into our lives, these new owners take to the internet to learn about their new obsession. However, their excitement can quickly turn to frustration for a number of reasons such as: sites with incomplete or incorrect information, dead links, narrow topic sites, hard to understand – or badly written – instructions, and the need to navigate a large number of sites to gather a small amount of information.

The frustration of owners can be compounded when the need for parts or services arises. The price of parts can vary greatly from site to site, making finding a reasonable price complicated. It is also important to mention that one auto parts site may list a completely different part number than another (within the same brand). Lastly, common part names oftentimes are called something entirely different (and not necessarily intuitive) by every company that make the aftermarket replacement, including General Motors (the parent company Pontiac).

Lastly, one thing car owners and enthusiasts like to talk about most is their car. These conversations are preferably held with owners and enthusiasts of the same car, or at least the same manufacturer. Weeding through the many sites and forums labeled as Firebird (or f-body, the body style of the Pontiac Firebird and Chevrolet Camaro) can be challenging since some forums are much more active than others. These active sites generally have information that is more relevant and members that can more readily answer questions.

Even experienced owners and enthusiasts can encounter many difficulties with the very same issues as new owners. The experienced owner tends to have a significant amount of bookmarks intended to remind them of which site had that specific part, or that great deal, or had that forum post that they now badly need. However, the reminder rarely works and one wastes time trying to weed through their bookmarks, usually giving up in frustration.

Firebird Genius was conceived to address these issues with a primary target user being a Firebird owner. Therefore the primary goal is to provide a comprehensive resource covering all generations and models manufactured by Pontiac. Secondary users are Chevrolet Camaro owners since they possess practically identical mechanical features. Lastly, the general mechanical and care information is useful for owners of all makes and models, making the site useful to a wide range of users.
System Objectives

We have developed an application which provides the Firebird owners with extensive information in regards to their car and knowledge on handling repairs and maintenance, including providing recommendations and tips on parts, equipment, and procedures. The system fulfils these requirements:

1. Instructional, reference, and casual videos (YouTube: mechanical issues, detailing)
2. Comprehensive guides regarding repairs, maintenance, detailing, and vehicle care
3. Tips and advice (from previous experience, lessons learned)
4. General Information (Pontiac history, firebird history, interesting facts)
5. Product Recommendations (brands, types for specific tasks)
6. Retailer Recommendations (online and local)
7. Parts and Product Searches (common and hard to find parts)
8. Equipment (tools and other automotive equipment)
9. Links to:
   - Firebird related videos – YouTube
   - Photos – Flickr
   - Online informational resources
   - Online shopping resources – Amazon
   - Kelly Blue Book – Valuation

Market landscape

Competitors in online forums and local car clubs can provide answers to specific questions on the fly without the user needing to do self-searches. Retailers can listen to specific issues and recommend parts, instruction manuals, and how-to’s.

The unique features offered by Firebird Genius is the availability of all needed information in one location, without the need to do repetitive Google searches and weeding through multiple – usually dead end – sites. We also have access to forums and car clubs where owners can socialize with those who share their passion. Finally, we give those who would otherwise avoid such procedures the ability to tackle these tasks on their own.

<table>
<thead>
<tr>
<th></th>
<th>Firebird Genius</th>
<th>Muscle Car Club</th>
<th>Firebird Nation Forum</th>
<th>Kelley Blue Book Valuation</th>
<th>Automotive.com</th>
<th>car-part.com</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Media</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Valuation Tool</td>
<td>✓</td>
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<tr>
<td>Parts and Supplies</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Care and Tips</td>
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</tbody>
</table>
Unique features

The Database
The database for our website was created using MySQL. The integration between the frontend and the backend was done using PHP scripts. The customer feedback page is an interactive page where the user can input details and provide feedback, the data is then stored in the database and the administrator can view the feedback.

The parts and supplies page extracts information from the parts supplies table. The table has data about the model, year, name, price and availability of the particular part. Car sale information is stored in the garage value table, it has information such as vehicle name, owner, price, transmission and other details. This table will be used in the future when we implement the “Buy & Sell” page in our website to provide a platform for car sales.

Tables have been created for:

- Parts & Supplies
- Customer Feedback
- Car Sale Information
- User preferences
- Car valuation
- Contact details

The following are examples of a few of our tables

Parts & supplies table

<table>
<thead>
<tr>
<th>ID</th>
<th>Model</th>
<th>Year</th>
<th>Type</th>
<th>Name</th>
<th>Price</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Trans-Am</td>
<td>1992</td>
<td>Emblems</td>
<td>Fender ...</td>
<td>26</td>
<td>In stock</td>
</tr>
<tr>
<td>2</td>
<td>Daytona</td>
<td>1994</td>
<td>Exhaust</td>
<td>Dual Ex...</td>
<td>440</td>
<td>In stock</td>
</tr>
<tr>
<td>3</td>
<td>Trans-Am</td>
<td>1996</td>
<td>Brakes</td>
<td>Caliper ...</td>
<td>375</td>
<td>In stock</td>
</tr>
<tr>
<td>4</td>
<td>Formula</td>
<td>1998</td>
<td>Control</td>
<td>Upper c...</td>
<td>160</td>
<td>In stock</td>
</tr>
<tr>
<td>5</td>
<td>Turbo T...</td>
<td>2000</td>
<td>Speedo...</td>
<td>Speedt...</td>
<td>1325</td>
<td>In stock</td>
</tr>
</tbody>
</table>

Customer feedback

<table>
<thead>
<tr>
<th>Name</th>
<th>Telephone</th>
<th>Email</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harry</td>
<td>520-384-4920</td>
<td><a href="mailto:harry@potter.com">harry@potter.com</a></td>
<td>Good going!</td>
</tr>
<tr>
<td>Gandhi</td>
<td>984-02-1395</td>
<td><a href="mailto:gandhi@ahimsa.com">gandhi@ahimsa.com</a></td>
<td>Can you add a section for newer versions?</td>
</tr>
<tr>
<td>Sirius</td>
<td>123-456-1234</td>
<td><a href="mailto:sirius@black.com">sirius@black.com</a></td>
<td>Hi. How are you?</td>
</tr>
<tr>
<td>Voldenort</td>
<td>999-222-2323</td>
<td><a href="mailto:tomriddle@vold.com">tomriddle@vold.com</a></td>
<td>Abcdefg high</td>
</tr>
</tbody>
</table>
Analytics

The data for the analytics was extracted by crawling three different firebird forums – Firebird nation, Pontiac forum and Trans Am country. We collected the user profile data and obtained data about the car models, region, age, gender, mileage, miles driven, generation, engine, transmission and other related car information. The data was collected for a number of users and stored in the database. Using this data, we found out different interesting trends and patterns and plan to implement different features in our site to cater to these findings.

Firebird models segmentation based on car model gave us the information about how many users had different car models. There were 11 different models and Trans-Am GTA seemed to be the most popular model followed by Trans-Am and 2F. Based on this information we can stock more parts on the parts & supplies section of our website based on the car model. For instance, we can stock more parts for Trans-Am GTA since most of the users have that car.

The firebird models by average age gives an idea about the average user age for each car model. The Redbird is owned by the older users with an average age of 57 and the Trans-Am WS6 is the model associated with the youngest users with an average age of 25.
The firebird parts requirement segments the demand for different car parts. From this analysis it is evident that brakes are the most required part followed by engines and exhausts. Speakers and speedometers are the least in demand. Using this information we can stock more number of brakes and engines in the store and charge higher based on the demand. Since speedometers and speakers are in lesser demand, there can be lesser number of parts sold in the store with a lower price.

The Firebird models by year lists the number of models by year categorizes the car models by years from 1970 to 2002. This gives a trend of which models are more prevalent during a particular period.

The twitter analysis was done using image recognition. A stream of tweets were collected and the images associated with the tweets were analyzed. The tweets were then segmented based on the region and the color of the car.
System Design

We used Amazon EC2 as our web server. For the Frontend, we used PHP, HTML5, and JavaScript language, and for the Backend, we used MySQL database. In order to collect data, we used R studio to collect twitter feeds and Rapid miner to crawl forum websites. After gathering all the data, we used Tableau to do visualization and analysis.

API Architecture
API Analysis

Custom Service APIs

Google Translate
There are many Firebird users all over the world. When a user visits our website, and the user doesn’t know English, the Google Translate API on the top can provide a different variety of language options for users.

Google Custom Search
The Google Custom Search API provides users a convenient way to search information within the website. Thus users do not need to create a new tab or leave our website to search for the information they want.

Auto Service APIs

Edmunds valuation
Edmunds valuation API provides user information about the current value of their car. They can easily get an idea about what their trade in value for their car is right away.

Fuel Economy
Fuel Economy API provides user information about the mileage of their car.

Batchgeo map
Batchgeo map API provides user information about the location of auto service stores in Tucson. Users can also search their nearest store by using the zip code.

Amazon Ads & Amazon Parts & Supplies
Amazon Ads provides the latest deals in Amazon for auto equipment. The Amazon parts & supplies API gives users unlimited search for different car type and demand.

Multimedia APIs

Facebook Like, Share and Comments
Facebook API allow users to comment and share their experience on viewing our website

RSS Feeds
RSS Feeds provides user the latest news for Firebird cars

YouTube Video
YouTube Video API allows users to search for videos on our website

Twitter Feeds
Twitter Feeds provides latest twitter feed for Firebird cars, users can also add tweets and follow.

Payment Method API

PayPal
PayPal API provides users an easy and secure way to purchase parts and supply within our website.
Website layout and details

The Google Translate API on the top, provides users a very convenient way to change to the language they are comfortable with. The navigation bar provides user a very clear information about our functions.

Move down to the middle of the homepage, here lists six main functions of our website, users can read the brief introduction to each function page and click the one they would like to view.
At the bottom of the homepage, we provide users the latest news for RSS feeds as well as the Google custom search service.

In the Parts & Supplies page, we provide special promotion for some products. Users can use PayPal API to purchase them.

In the YouTube video page, users can search any video they like just in our website.
Users can obtain the value of their Firebird for trade-in, private sale, or just for reference.

The Batchgeo map API lists some common auto service store in Tucson. Users can get the address and cell information for each store and also can search for nearest store by using zip code.

Revenue Model & Projection

Operating costs for Firebird Genius are relatively low in its current inception. During the first year, we anticipate no labor cost as we would develop and maintain the site ourselves to keep our costs down. Web Hosting is free for the first year, after which we have estimated a 3% annual rate increase with $25 a month base cost. Domain Name Registration requires an annual fee of $10 for which we have not estimated any increase. Lastly, as the site has a great amount of potential, we have budgeted $50 a month to cover new costs, amounting to $600 per year. Any amount of this budget not used in the current month will be carried over to the next month. At year’s end, any remaining funds will be dealt with in one of two ways: 1. carried over and a reduced “new” amount will be calculated, or 2. new
monthly fees will be calculated for annual expense and that amount will reduce the amount of the prior year remaining funds.

Revenue will be primarily obtained through affiliate programs. An affiliate program is where you permit another entity, Sears for example, to possess a small space on your site for advertisement purposes. Generally these ads are of the same theme as your site. Revenue is earned when a user on your site clicks on this add and completes a transaction on the affiliate’s site. However, sometimes a purchase is not a necessary condition for payment from the affiliate. Companies offer varying percentages of payment. The 7-day average Earnings Per hundred Clicks (EPC) figure was obtained through Commission Junction, a site that connects affiliates with sites looking to host their ads [4]. While the EPC average is listed at 7 days, to remain extremely conservative and develop an initial outlook, the first year was multiplied by 7 (7 weeks) to estimate the remaining 7 months in the year. The EPC was multiplied by 12 (12 weeks) to estimate the year 2 and 18 (18 weeks) to estimate year 3 with increased traffic flow and click percentage.

Once our site has established a user base and developed premium content, membership fees will be introduced at $10 per year. Also, with a dedicated mobile app, we will offer a “lite” version that will be free and a “full” version that will be available at a one-time cost of between $0.99 and $2.99. We estimated conservatively at $0.99 for our calculations.
Future Direction

We plan to implement the following features going forward:

User Profiles
To generate a user base to support premium content, we plan to implement a user profile system. This system will also enable users local to one another to contact each other.

Map Expansion
The functionality of our map will increase as we enable users to search for various items local to themselves such as, but not limited to:

- Parts stores
- Services
- Local owners and enthusiasts
- Local/National/Worldwide events

Increased Parts & Supplies Resources
We will include a comprehensive online retailer recommendation system as well as brick and mortar locations. We will also include recommended parts and supplies for specific requests.

Buy and Sell Cars
We will provide a means to enable users to sell their vehicle, either through a hosted eBay channel, Craigslist, or other e-Commerce applications.

Dedicated mobile application
We will provide a dedicated mobile application for Firebird Genius users.

- Lite: This version will offer basic information such as items that currently exist on our site.
- Full: This version will include location based resources and member connection capabilities. Users will also be able to view repair and care videos to their mobile device through our site.

Forum and Car Club Reviews
To reduce the time wasted trying to find a forum or car club relevant to our user’s needs, we will provide descriptions, activity levels, reviews, and recommendations of these various sites.

User Chat Feature
To further aid in social connections, we will provide a chat environment so users can get to know each other and develop connections based on similar interests, vehicles, and locations.
Roles and contributions of members

**Samantha Forbis**
- Conceived the idea of our website
- Created YouTube page and Valuation page for the website
- Implemented YouTube API and Edmunds Valuation API
- Designed the revenue model for the website
- Business analysis

**Ashwin Govindaraj**
- Created a database for storing user messages
- Created the Parts & Supplies page for website
- Implemented PayPal API
- Collected forum data by crawling the web
- Used Tableau for visualization & analytics

**Haoyan Guo**
- Front end designer
- Created most of the pages for the website
- Collected and processed the images for the website
- Integrated the APIs on the website
- Implemented Batchgeo Map API and RSS Feeds API

**Anushree Sinha**
- Implemented 6 APIs for the website:
  - Facebook, Twitter, Google Search and Google Translate API,
  - Fuel Economy and Tips API,
  - Amazon Ads and Amazon Parts & Supplies API
- Collected Twitter Feeds for analytics by using R
References