Feasibility Study: Vehicle Actual Cost Per Mile (VACPM)

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Table of Contents

1. Introduction

1.1 Overview of the Project

Vehicle Actual Cost Per Mile (VACPM) is an Android application designed to provide quick and accurate financial information to users who are currently own a vehicle or are soon to be in the market for a new vehicle. The application calculates the total cost of owning and operating a vehicle over time, taking into account factors such as miles per gallon/miles per kilowatt, lease/loan, insurance, maintenance, and other factors. The purpose is to provide the user with an in-depth understanding of the predicted costs of operating and owning a car, as well as the option to compare those costs of other vehicles side by side if they so desire.

1.2 Objectives of the Project

The objectives of this project is to –

- Provide users the ability to create multiple and observe multiple vehicles
- Provide statistical data of each vehicle obtained through various sources
- Display overall financial cost of vehicle overtime via graph
- Comparison of costs between multiple vehicles side by side via graph
- Attractable and easy to use user interface

1.3 The Need for the Project

VACPM strives to reduce manual input by the user while still providing the opportunity to adapt and personalize to their needs in order to minimize user input and offer the information the user requires as rapidly as possible. VACPM will make use of a big data collection that will be provided for each vehicle based on the year, make, and model. Moreover, it provides a significant variety of information about each vehicle's city MPG, highway MPG, engine size, and other features, which can be used to more accurately estimate its true cost of ownership. However, many factors that contribute to the actual cost will come from the user via vehicle cost for purchase, lease/loan, insurance, maintenance, and other optional input that the user may choose.

- Vehicle year, make, model

- User given vehicle name and mileage
- City MPG/MPK, highway MPG/MPK
- Engine size
- Vehicle purchase costs
- Vehicle loan/lease payments
- Insurance
- Regular maintenance costs i.e., Oil, tires, powertrain
- Optional maintenance/upgrades and miscellaneous costs

1.4 Overview of Existing Systems and Technologies

Many of the features and capabilities of existing Android systems are incorporated into VACPM. The purpose of VACPM is to bring all of these characteristics together into a single, integrated solution. The mileage tracker and the export of car log information to a graph are two of the most noticeable aspects of the program that is derived from various similar systems.

Main Technologies associated with VACPM.

- Development platform (Android Studio 2021.1.1 “Bumblebee”)
- Object-oriented programming technologies used (C++, Java)
- Markup language technologies and storage format (XML)
- Toolkit to utilize C++ in Android Studio (Native Development Kit “NDK”)
- C++ compiler for Android Studio (CMake)
- Interface between C++ objects and Java objects (Java Native Interface)
- Diagram and design tools (Draw.io)

1.5 Scope of the Project

Main actors of this system

- User

Main use cases associated:

1. User
    - Add vehicle(s)
    - Input purchase information

- Input insurance cost
- Input vehicle maintenance costs
- Input miscellaneous vehicle costs
- View overall cost per mile of vehicle(s) over time
- View graph output of vehicle(s) over time

1.6 Deliverables.

An Android software system. This contains a user interface to deliver the ability for the user to manage and manipulate their vehicle(s) stored in the user device and receive financial data about the vehicle(s) input by the user via application user interface or graph utility.

2. Feasibility Study

2.1 Financial Feasibility

Being a standalone Android application, VACPM will only demand a one-time payment fee once obtaining clearance from the Google Play Store to launch the program to the distribution platform. The production of this application is handled by four graduate students and all materials used were open source and freeware acquired by the development team. There is presently no stated proposal to release the product to the Google Play Store upon completion.

From the previous, it’s clear that the project VACPM is financially feasible.

2.2 Technical Feasibility

Project VACPM is a complete Android application. The main technologies and tools that are associated with VACPM are

- Android Studio 2021.1.1 “Bumblebee”
- C++
- Java
- XML
- Native Development Kit
- CMake

- Java Native Interface
- Draw.io
- Android emulator
- Samsung Galaxy S9+ (Android v10)
- Samsung Galaxy S21 Ultra (Android v12)

Each of the technologies, excluding the student independent Android devices, is freely available and the technical skills necessary manageable. Time limits of the product development and the simplicity of implementing utilizing these technologies are coordinated.

Currently, the Android application with be used on student independent devices and emulation software. Full release to the Google Play Store distribution platform is currently not in consideration.

From the previous, it's clear that the project VACPM is technically feasible.

2.3 Resource and Time Feasibility

Resource Feasibility

Resources that are required for the VACPM project includes,

- Programming device (Windows, Linux, Mac)
- Emulator (Android Studio)
- Programming tools (freely available)
- Programming individuals
- Vehicle data records .csv file (fueleconomy.gov)

So, it's clear that the project VACPPM has the required resource feasibility.

2.4 Risk Feasibility

Risk feasibility can be discussed under several contexts.

Risk associated with size

Estimated size of the product in lines of code:

The functions and features of VACPM will be lightweight in construction for the standalone application. Multimedia content such as stock photos and or user upload of high-resolution photos to personalize their vehicle will use the most storage space. The expected project size is estimated to not exceed 80MB.

Estimated size of product in the number of programs:

VACPM will be constructed as a single program/application. VACPM will not rely on additional outside resources or programs.

Existence of vehicle in data file:

The possibility of the user vehicle not existing in the library consisting of over 45,000 vehicles manufactured after 1960 is low. The library was acquired via a U.S. government website that requires all vehicles operated in the country to be documented to obtain various information and details about the vehicle.

Users of the product:

- Android device user

The number of projected changes to the requirements for the product? Before delivery? After delivery:

The functional requirements are clearly defined before the implementation phase. Non-functional requirements that are considered are still up for changes in future iterations of the application development.

Amount of reused software:

VACPM will be constructed utilizing the CMake G++ or GCC compiler, depending on the development device environment the developer is utilizing.

Business impact risks

Effect of this product on company revenue:

VACPM is developed utilizing multiple freeware and various free resources. Company revenue will not be impacted upon release.

Reasonableness of delivery deadline:

Being a 14-week project, the project VACPM will have several deadlines and deliverables that are scheduled successively. Depending on the coding and designing cost and effort, the deadlines are quite reasonable.

Number of customers who will use this product and the consistency of their needs relative to the product:

VACPM is only utilized by a single user upon launching the software.

Number of other products/systems with which this product must be interoperable:

This product must be integrated into an Android device running a minimum Android version 5.0.

Sophistication of end users:

VACPM is designed to have as little complexity as possible, while still offering useful forms of customization and other miscellaneous options to input and offer better output data to the user.

Amount and quality of product documentation that must be produced and delivered to the customer:

Users will be greeted with a simplistic user interface to guide them through the application’s vehicle setup and input fields and output destinations.

Costs associated with delivery:

Release to the Google Play Store will result in a one time $25.00 fee.

Customer related risks:

VACPM is designed to operate on Android devices with Android version 5.0 or later. Those with a device with an earlier version will not be able to operate VACPM.

Development environment risks:

Is a software project management tool available?

Android Studio will be used as the main project management tool.

Are tools for analysis and design available?

VACPM will require several designing software

- Draw.io (class diagram)
- Android Studio (application layout)

Are compilers or code generators available and appropriate for the product to be built?

Android Studio will be utilizing CMake to interface with the device C++ compiler.

Are testing tools available and appropriate for the product to be built?

Android Studio contains a debugger and emulation software for testing the software.

Are software configuration management tools available?

Configuration management will be done using GIT that is freely available.

Does the environment make use of a database or repository?

VACPM will not utilize a database or repository. All data and resources will be stored locally on the user device.

Are all the software tools integrated with one another?

VACPM and all its features will be packaged in a single .apk file.

Process issue risks

VACPM will use an AGILE software development methodology. This enables rapid changes to features and needs while still adhering to schedules.

Technical issue risks

Are specific conventions for code documentation defined and used?

Software code will be freely available and well documented for the course instructor.

Do you use a specific method for test case design?

Testing will be first performed on emulation provided by Android Studio to then proceed to independent device testing.

Are configuration management software tools used to control and track change activity throughout the software process?

Trello will be used throughout the software development process.

Technology risks

Is the technology used to develop the software new?

The technologies used are well established and are up to date. No obsolete resources or techniques were used during development.

Do the system requirements demand the creation of new algorithms, input or output technology?

The system will require input from the user to complete input fields required to generate the output the user will pursue.

2.5 Social/Legal Feasibility

VACPM does not intertwine with aspects that require any regulations for distribution and or operation of the product. VACPM does not require user confidential data to operate and will not access. VACPM will require access to the users local files upon uploading personal multimedia for vehicle creation if requested by the user.

3. Consideration

Performance:

VACPM’s performance and latency is of great consideration during its development. Production strives to provide user interaction with application transitions and computing output seamlessly within little response time.

Visual Appeal:

The attractiveness and low complexity of the user interface are important concepts behind VACPM’s design. The process of combining the features and functionality of various other applications that exist while maintaining an easy to use and clutter free user interface.

3. References

https://www.youtube.com/watch?v=tZvjSl9dswg&t=11506s
https://www.fueleconomy.gov/feg/download.shtml