

**Driving analysis application**

College of Engineering and Informatics

Bachelor of Science(Computer Science & Information Technology)

Project Report

Author:

Richard Houston (19365321)

Academic supervisor:

Dr Seamus Hill

# List of figures

# Chapter 1 Introduction

**1.1 Problem Statement**

The purpose of this report is to provide an account of the processes and procedures that were implemented to construct my final year project. These included but were not limited to research, planning, external resources, software development, testing and evaluation of results.

The purpose of this project is to convey the workings of a provocative, useful, and innovative data analytics tool. This report centres on the development of a driving analysis application for commercial fleet management; the ultimate end being fleet sustainment and providing data driven decision making with regards to replacement selection. Factors that we will consider will be the type of vehicle being used, the average distance per trip and the type of routes used among other considerations.

**1.2 Project Inspiration**

Firstly during the course of my Professional Experience Programme(PEP) placement with Manna.aero, an Irish drone delivery service provider I saw first-hand the importance of data for modern day firms both in terms of regulatory requirements and its’ use in driven decision making. An example of data driven decision were the selection of only certain craft which had passed the required number of test flights to be certified for operations i.e. reducing the likelihood of a critical system failure during flight operations. I also saw the importance of the human factor for the successful operation of a logistical system that cannot be fully extrapolated with vehicle journey analytics. From surveys carried for Manna in partnership with Tesco we tailored our product to cater to consumer feedback. For example customers wanted a simple, quick user interface so instead of picking individual items a wide variety of bundle options were implemented e.g. the breakfast bundle which contained bacon, eggs, pudding etc. This experience showed the usefulness of data to a corporate leadership group.

Secondly outside of college I am a commissioned Officer in Irish Defence Forces which has gained me a lot of valuable experience. One of the main challenges I have faced planning any military tasking outside of the base installation is the means of getting your people and equipment to and from that area of operations. For example ferrying recruits to military training area for an exercise or repairing radio equipment located on radio masts which are often located in remote mountain areas. Within the Communication and Information Services(CIS) Corps unit which I help lead we have several types of vehicles from 4x4s, crew-cab jeeps, flatbed truck and large work vans with ladder cages. Ref This is a broad spread of vehicles to enable us to tackle any mission we may regularly face. Vehicles are used to varying degrees and as such the unit maintains a log of the timings vehicles were signed out for use, the appropriate tasking and the journey distance as per the odometer. It is here I first thought about the loss on information regarding the routes taken, duration of journey, load factor. As the saying goes “what’s measured get managed” and I believe that digitisation and dissemination of this information could provide insights as to how the unit is functioning and possible better ways to deploy resources.

Final there is a moral and legislative pressure on firms and state bodies to reduce their carbon footprint which has been steading growing since the turn of the millennium and this has been heightened by recent uncharacteristically severe weather events e.g. wildfires in Australia and flooding closer to home. Fortunately there is a synergy between the two goals of becoming more environmentally friendly and reducing and or managing operational overheads which in this case will be automotive vehicles.ref

**1.3 Project Idea**

I have build a web application called “smartHaul” to encompass the above inspiration. The web application aims to streamline and simplify the process of storing and managing user journey analytics that encompasses a strong emphasis simplicity and data security. SmartHaul empowers users and corporate entities to easily keep track of their travel information in a secure and organised manner which is superior to paper based approaches as described above. By leveraging firebase functionality such as hosting and authentication smartHaul and intuitive mapping software from MapBox; smartHaul practically solves the hassle of manually recording the data and provides digital accessibility for data driven decisions at the corporate level.

**1.4** **Project Management**

Project management is essential for successfully planning, executing, and completing projects within a specified timeframe and budget. It helps organizations achieve their goals and objectives by systematically organizing resources, tasks, and stakeholders.

As a result of being a single person project I choose test driven development as my project management methodology. Agile which was which I had be accustomed to was not suitable as matching my abilities to an estimated difficulty of a project facet was often a fruitless exercise when on many occasions I would leave a sticking point and then come back to it at a later occasion with a fresh approach. The heavy workload of final semester as played a part in this choice in that it was easier to use the snowball methodology by picking facets from my list of tasks and desired functionality that could be completed quicker thus keeping motivation higher and thus avoid the sense of being overwhelmed or trudging through a never ending functionality issue.

**Wrike**

For the purposes of tracking my test driver development tasks I made use of Wrike which split taskings on a board much like Trello into:

* New
* Planned
* In Progress
* Review
* Completed

It also catered for the use of gantt charts as a means of scheduling the taskings. Other functionality with Wrike includes priority grading and due dates. If there were other members of a development team there is a means of delegating taskings.

A screenshot of a computer

Description automatically generated

**Git**

GitHub is a widely used platform for version control and collaboration that allowed me to work on the smartHaul web application more efficiently. By utilizing Git, a distributed version control system, GitHub enabled me to track changes, collaborate with those offering help, and manage the project's source code effectively.

Branching when combined with debugging data allowed me to quickly identify areas of code which were causing bugs and/or were not interfacing with other external resources such as MapBox, Firebase and mySQL. Meaningful comments also help identification of certain project facets that were being worked on at that time.

Github also provided a mean of data redundancy in the case of an accident with my device and so ensured that not all was lost in such a scenario.

A screenshot of a computer

Description automatically generated with medium confidence

# Chapter 2. Requirements

**2.1 Introduction**

The project requirements originally set out have been achieved. This is to say that the core user web application has been implemented with a third party navigations provider service as described and portrayed with the mockup frames. The technologies which I set out to use have changed somewhat with Javascript, HTML and CSS being the mainstay of the web application and SQL database present as stated but I have used Python as my primary language for the backend services as opposed to Java which I envisioned.

**2.2 Functional requirements**

Core requirements of the app are as follows:

* Home page navigation links
* User registration
* User Sign in
* Implementation of MapBox Directions API
* Data redundancy via typeform survey and insights

Home Page Navigation Links

The home page serves as the primary entry point for users, providing an intuitive and user-friendly interface. Navigation links are essential for guiding users to different sections of the web application, such as registration, sign in, and other features, ensuring a seamless experience.

Graphical user interface, text

Description automatically generated

User Registration

A user registration feature allows new users to create an account within the web application. By entering their email and password, users can securely establish their credentials, which will be used for future access and to associate their journey data with their account.

Graphical user interface, website

Description automatically generated

User Sign In

The user sign-in feature enables registered users to securely access their accounts using their email and password credentials. This authentication process ensures that only authorized users can access and manage their journey data, contributing to a secure and personalized user experience.

Graphical user interface, application, website

Description automatically generated

Implementation of MapBox Directions API

Integrating the MapBox Directions API into the web application allows users to access detailed route information and navigation instructions for their journeys. By leveraging this API, the application can provide valuable insights into factors such as distance, travel time, and route efficiency, enabling users to make data-driven decisions for fleet management and resource allocation. Note that

Map

Description automatically generated

Map

Description automatically generated

Map

Description automatically generated

Data Redundancy via Typeform Survey and Insights

Incorporating a Typeform survey into the web application serves as an additional method for collecting user feedback and journey data. This redundancy ensures that valuable information is not lost due to technical issues or user errors. The gathered data can then be analysed to gain insights into user preferences, needs, and pain points, which can be used to further improve and optimize the application's features and user experience.

Graphical user interface, text, application, email

Description automatically generated

Graphical user interface, text, application

Description automatically generated

Graphical user interface, application

Description automatically generated

Graphical user interface, application

Description automatically generated

Graphical user interface, text, email, timeline

Description automatically generated

Graphical user interface, text, application

Description automatically generated

Graphical user interface, text, application, email

Description automatically generated

**2.3 Non-Functional Requirements**

* Simplicity
* Reliability
* Security

Simplicity

As a non-functional requirement, simplicity refers to an intuitive and user-friendly design of the web applications that allows users to easily navigate and interact with it. By focusing on simplicity, the application can cater to a wide range of users with varying technical expertise, minimizing the learning curve and maximizing user satisfaction and engagement.

Reliability

Reliability is a crucial non-functional requirement that emphasizes the consistency and dependability of the application in providing accurate and up-to-date information. A reliable application builds user trust and loyalty by minimizing errors, ensuring smooth integration of external APIs, and enabling efficient data storage and retrieval.

Security:

Security is an essential non-functional requirement that focuses on protecting user data and ensuring the privacy and integrity of the application. This involves implementing strong authentication mechanisms through Firebase verification and authentication service to safeguard sensitive user information and prevent unauthorized access or data breaches. User passwords are not stored shown Firebase authentication table should the firebase console of the company be breached.

Graphical user interface, text, application, email

Description automatically generated

**2.4 Use Case**

Use Case #1

Goal: Person wants to register.

Actor: Brand new employee

Steps:

1. Enter URL: <https://smarthaul-7c251.web.app>
2. Click ‘Register here’
3. Enter email and password and click ‘Register’
4. Check browser pop up to see whether registration was successful
5. Click return to home hyperlink.

Use Case #2

Goal: Person wants to sign in and log journey.

Actor: Existing registered employee

Steps:

1. Enter URL: <https://smarthaul-7c251.web.app>
2. Click ‘Sign In’
3. Enter email and password and click ‘Login’
4. Check browser pop up to see whether login was successful
5. Choose starting place and destination
6. Save journey
7. Complete Typeform

Improvements/ Constraints

# Chapter 3. Design

Chapter 2 Research

2.1 Introduction

This chapter details the sources behind the research alongside analysis of competitors application in the markets. The sources will include snippets of functionality we are trying to recreate but also will point how our application differs.

2.2 Research sources

Research into this project began with discussing the problems of fleet management with logistics Officers in the 2nd Brigade Transport unit in Cathal Brugha Barracks in Rathmines, Co Dublin who are the brigade’s lead unit with regards to heavy logistics tasks along with the vehicle maintenance and driver training which are part in parcel of these activities. They employ a wide range of vehicle with different capabilities and roles. Fleet management apparatus does exist in headquarters but it based on manually collated information by unit personnel and lacks a lot of useful detail. Details for a logistics trip which are mostly brief with point of origin, destination, vehicle and registration used, distance travelled as per odometer and the amount of litres of fuel required to return the tank to full.

Graphical user interface, text, application

Description automatically generated

Chart

Description automatically generated