Pay As You Drive

Research Report

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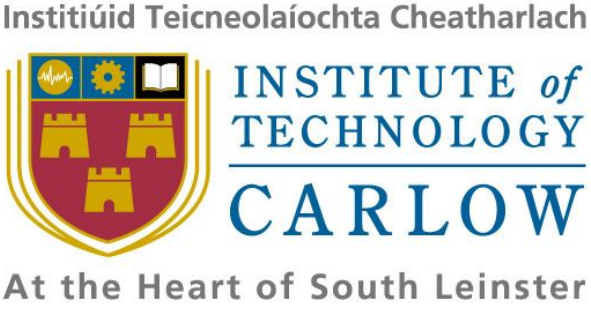

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Section 1 - Introduction

The following academic literature is a research document related to a fourth year project based around creating a mobile application for a new motor insurance approach called ‘Pay As You Drive’.

Section 2 - Project Scope

The idea behind this project is to create a mobile application operating on Android and iOS that monitors all factors relevant to car insurance whilst the user is driving. These factors will then determine how much the user owes towards insurance costs at the end of the month. The application will measure driving traits such as distance travelled, speed, dangerous driving and types of roads being driven on (see section 3.2 for more details). The mobile application must also have a platform that allows configuration of the insurance costs to give meaning to the measurements being monitored.

Development of the mobile application will be developed for both iOS and Android simultaneously using a javascript based language called React Native. React Native uses one codebase to develop for both platforms. The mobile application will also integrate both Google’s Firebase and SQLite into the backend to make up all database requirements.

This project will also encompass research into different approaches taken by motor insurance companies, specifically modern approaches such as using blockchain technologies in a decentralised manor (peer-to-peer) or using the customary centralised approaches seen in motor insurance companies today.

Section 3 - Research Outcomes

Section 3.1 - React Native vs Native (iOS vs Android)

“With the rise of React Native popularity and the growing number of popular mobile apps (such as Facebook, Instagram, Pinterest, Uber, Discord, SoundCloud, Skype…) being partially or completely rewritten in React Native, the question arises: **Should mobile developers use React Native for mobile development instead of going full native with Java or Swift?**” (Trnka, 2019)

Section 3.1.1 - React Native

To make the decision to develop in React Native, first a look at the development environments, layouts and styles is necessary.

React Native is a javascript based language developed by Facebook to allow develop users to user React capabilities alongside native platform features.

React Native is used to develop for both Android, iOS and UWP by using backend javascript scripts to work cross-platform. Designing with React Native uses JSX which is a type of web development style similar to using HTML and CSS.

OvalButton.js

```
import React from 'react';
import { StyleSheet, TouchableOpacity, Text } from 'react-native';
import { COLOR_WHITE, COLOR_OVAL_BUTTON } from '../../../utils/colors';

const OvalButton = (props) => {
  const buttonStyle = [styles.buttonStyle, props.buttonStyle];
  const titleStyle = [styles.titleStyle, props.titleStyle];
  return (
    <TouchableOpacity
      style={buttonStyle}
      onPress={props.onPress}
    >
      <Text style={titleStyle}>
        {props.title}
      </Text>
    </TouchableOpacity>
  );
};

const styles = StyleSheet.create({
  buttonStyle: {
    height: 50,
    width: '90%',
    alignItems: 'center',
    justifyContent: 'center',
    borderRadius: 27,
    backgroundColor: COLOR_OVAL_BUTTON,
  },
  titleStyle: {
    fontFamily: 'Avenir-Black',
    textAlign: 'center',
    fontSize: 16,
    color: COLOR_WHITE,
  },
});

export default OvalButton;
```

React Native - Figure 1

Figure 1 shows the coding style of React Native, with sections like ‘styles’ showing the web development styling similarities of CSS, and the structuring of JSX tags in a format similar to HTML.

Having a single codebase allows for easier maintaining and future changes, simultaneously making changes to both platforms, as well as no need for expertise in both Android or iOS app development. However, Android and iOS have very different development guidelines and styles, such as Human Interface Guidelines by Apple and Material Design by Google. This is a downfall by using React Native, but allows for a single style across both platforms that is consistent and unique.

Another cross-platform programming option is Flutter by Google. This is a very recent release based on a languaging style called Dart. Flutter offers very similar capabilities as React Native, but due to being a recent option it does not have the community, support and library options that React Native can offer.

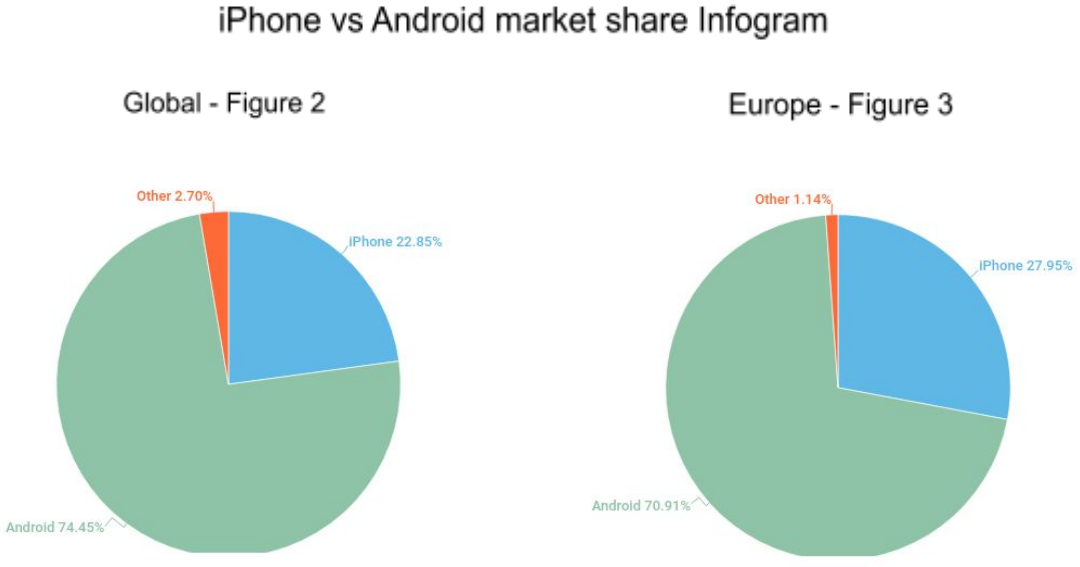
Section 3.1.2 - Native

To be able to choose one single mobile application platform, the argument of iOS vs Android, then research brings up an often bias and complicated debate that even market statistics can make it unclear.

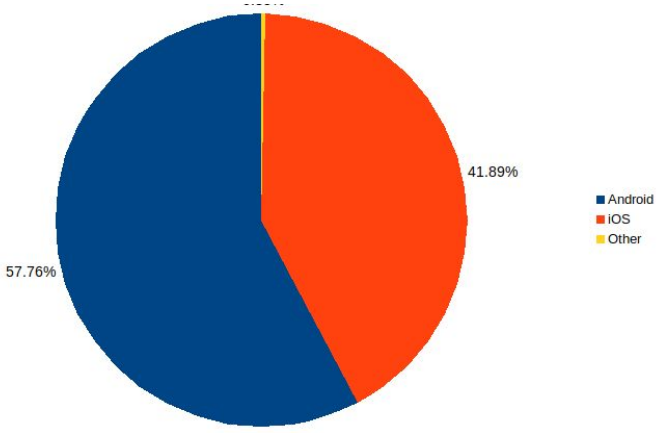
If a decision is made by numbers then three main factors can be researched:

Market Share
If the choice of which platform to develop for was made by looking at market share then Android would be a clear leader (as shown in Figure 1 and 2 below). As this project is directed towards an Ireland customer base Figure 3 gives more relevant and interesting figures specific to Ireland.

Figure 3. Supports the idea of using cross-platform development approaches such as React Native, as Ireland is split 58% to 42% which is very close to being evenly split, so developing for one platform would drastically reduce potential customers.



Ireland - Figure 4



Gross App Revenue
Although Android has a very high market share worldwide, in terms of gross revenue made by the Play Store (Google's Mobile Application Store) compared with the iOS App Store (Apple's Mobile Application Store) is much less yearly than its competitor.

In 2016 the Play Store made $3.3 Billion in revenue, compared with the App Store that made $5.4 Billion it is drastically lower in income for app creators (SAG, 2019).

Deploying to Store
Something to look at when deciding on which platform to develop for is the ease and cost of deploying the mobile application to the relevant App Store.

For Android's Play Store the develop needs to pay a once off registration fee of $25 and fill in information through the Developer Console, and also deployed through the same console using a very beginner-friendly wizer (Martin, 2019).

For iOS's App Store there are more requirements and rules to publish. The developer needs both an Apple ID and a Distribution Provisioning Profile, then submit the application through iTunes Connect. Required certificates are:

- Distribution Certificate
- Push Notification Certificate
- Mobile Provisioning Certificate

There is a higher chance of publisher rejection on the App store due to the much stricter rules and guidelines (Martin, 2019).

Section 3.2 - User Geolocation Tracking

The main functionality of the app is based around monitoring a user whilst driving, storing their habits to analyse and calculate insurance statistics. Google maps is the most popular and community supported geolocation service providing map information and tracking services. Google Maps API has a comprehensive suite for mobile application development, and specifically with React Native through supported react native community libraries.

The expected Minimum VIable Product for the project will collect and monitor the following data from users:

Distance - The idea of 'pay per mile' requires tracking of the distance travelled by the user.
Speed - Safe drivers essentially pay less in insurance per month and will be tracked. This is combined with the type of road currently on and their location to calculate the acceptable speed compared with the current speed of the driver.
Location - Location will be tracked to monitor what kind of road the user is on, for example a highway is much safer and less damaging to a car than a single lane dirt road.
Aggressiveness - This is tracking the smoothness of the driving, collecting data such as abrupt braking or sharp corners at high speeds.

Section 3.2.1 - React-native-maps

github.com/react-native-community/react-native-maps
React native maps is a react native package that provides Google Maps API for React Native. The Google Maps API gives access to location tracking, specifically using the `watchPosition` method to react to user movement.

Google Maps API constantly monitors longitude and latitude and can be used to monitor speed, distance and location.

Section 3.2.2 - Offline Capabilities

In the case where a user has poor or no internet access the monitoring of driving data needs to be stored locally until an internet connection is restored and the data can be added to the database.

Section 3.3 - Backend Structures

Section 3.3.1 - Firebase

Firebase is described as Backend-as-a-Service (BaaS), originally developed by Firebase in 2011 and acquired in 2014 by Google. The aim of Firebase it to supply all the Backend tools needed to quickly and securely develop high-quality apps.

Realtime Database is is considered a NoSQL type cloud database, where data across all clients would be updated in 'real time', while staying available offline. The information is stored in JSON so both computer and human readability is easy, sharing one cloud based database across both Android and iOS.

As well as a database service, Firebase offers Authentication and Cloud Storage that relate to the mobile application development.

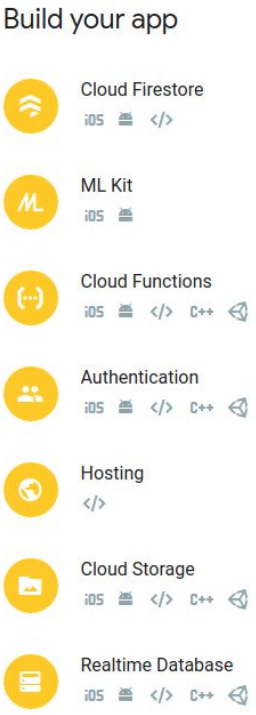


Figure 4 - Firebase applications (firebase.google.com/docs, 2019)

Section 3.3.2 - SQLite

"SQLite is a C-language library that implements a small, fast, self-contained, high-reliability, full-featured, SQL database engine." (SQLite org, 2019)

SQLite is a light-weight database software that is ideal for mobile application development. The software works on both iOS and Android.

The use of SQLite works well in an offline scenario where the data being collected is stored locally on the mobile device until the device connects to the internet again.

Section 3.4 - Motor Insurance Approaches

Section 3.4.1 - Peer to Peer Insurance (P2P)

“Peer-to-Peer (P2P) insurance is a risk sharing network where a group of individuals pool their premiums together to insure against a risk.” (Frankenfield, 2019)

The idea of P2P insurance is to remove the relationship between an insurer and the policyholder, allowing the insurer to keep the premiums that it doesn’t pay out in claims. The approach changes how customers and big insurance firms interact, and a leading example is Insurtech’s company Guevera.

Section 3.4.2 - Traditional Insurance

Traditional insurance such as insuring motorists will group drivers by their characteristics under the same coverage. An insurance company would assess the risk of insuring the driver by looking at age, driving history, medical disabilities etc. to group the driver into best suited insurance plan that covers the cost of insuring the individual and and assurance that if something were to happen to the motor vehicle there would be coverage.

The remaining unclaimed excess within a group would then be considered revenue by the insurance company.

Section 3.5 - Existing/Similar Applications

Section 3.5.1 - By Miles

https://www.bymiles.co.uk/
A similar motor insurance scheme to this project is by a company called ‘Miles Car Insurance’ based in the UK.

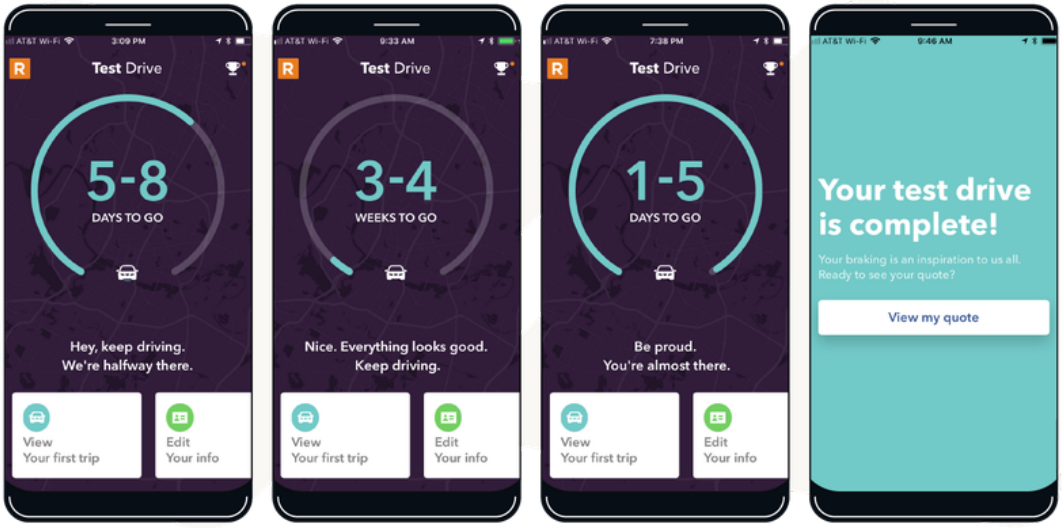
“By Miles offers a form of pay-as-you-go car insurance, where you pay per mile you drive. The less you drive, the less you pay.” (Wheal, 2019)

By Miles charges a yearly, upfront, payment to cover vandalism and theft of the car, as well as a monthly payment that is calculated by the amount of miles you drive in that month. Once enrolled with By Miles the customer is sent a ‘Miles Tracker’ to plug into your car (powered by the cigarette lighter within a car). The ‘Miles Tracker’ only tracks distance travelled by the customer, not how they drive.

Similarities	**Differences**
A pay-as-you-drive monthly payment	Peripheral (IoT device) within the car to monitor driving stats, opposed to monitoring by mobile application
Monitors distance travelled	Does not monitor how the driver drives, not tracking speed, aggressiveness or type of roads

Section 3.5.2 - Root Insurance

https://www.joinroot.com/



Root Insurance - Figure 5

Root Insurance is a startup company that recently received $100 Million dollars in funding (Juang, 2019). The idea is tracking how a customer drives using a mobile application, and after a certain amount of time the data is analysed and a quote for the customer is worked out (Root Co., 2019).

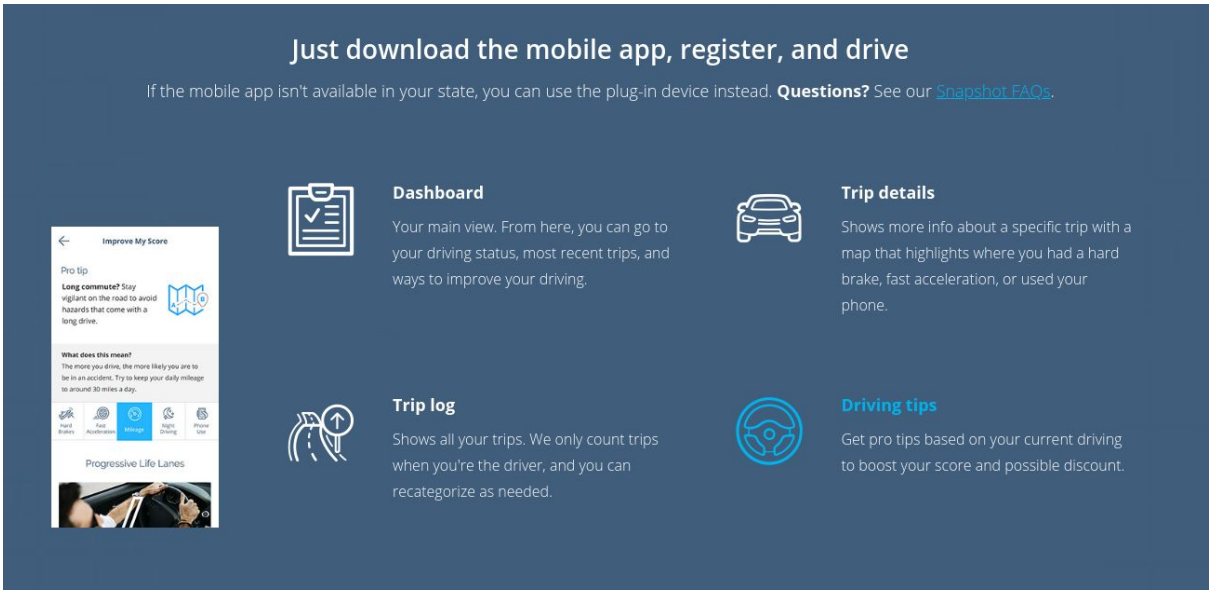
The idea is meant to be more personalised to the driver as the application will analyse their specific driving habits.

Similarities	**Differences**
Mobile Application on both Android and iOS	Uses a 'Test Drive' to calculate the drivers insurance plan
Tracks driving habits such as speed and distance travelled	

Section 3.5.3 - Progressive Insurance

https://www.progressive.com/

Progress Insurance is a company founded in 1937 that in adopting modern approaches to motor insurance. The idea is to use traditional motor insurance coverage with monthly/yearly charges similar to other companies, except by tracking the driver the company offers discounts and rewards for safe driving at the time of billing.



Progressive Insurance - Figure 6

Similarities	**Differences**
Mobile Application on both Android and iOS	Normal insurance payments offering discounts for safe driving
Continuously monitors driving habits	

Section 4 - Bibliography

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