# Project Proposal

## Overview

Using a mobile device such as a phone to scan a serial number of a bike, e-bike, e-scooter and/or mobility scooter to then record and store this item specific information against an individual's personal account in a cloud-based server. This will help to deter would be theft and subsequent sale of stolen items. This registration data can be accessed by a user looking to register a new item or check if an item that is being purchased second hand has been flagged as stolen. The system would also allow one user to transfer item registration to another as proof of a legitimate sale transaction.

## Motivation

The Level up team have had several bicycles stolen over the years. Each bicycle can be individually identified by a serial number stamped or marked into the frame. Unfortunately, there is no central location to track and store these serial numbers, so the serial numbers are ineffective as a means of tracking the legitimacy of ownership or status. By creating a public registration system that can be easily accessed and utilised with mobile devices, this helps rectify this problem by making the sale of the stolen bicycle more difficult and being able to prove legitimate ownership.

‘In response to increasing concerns about stolen bikes across Victoria, Bicycle Network undertook a detailed investigation into the common characteristics of bike theft cases.

We found that:

• The number of bicycle thefts reported in Victoria has increased by 81.2 per cent in the past 10 years

• Only 9 per cent of bike theft cases are solved

• Bike thefts at car parks and multi-dwellings are growing by 40.7 per cent each year

• Only three Victorian local government areas have experienced no year-on-year growth in bike thefts

The results highlight that bike theft remains a poorly resolved issue across metropolitan and regional Victoria, and may worsen into the future without proper action being taken.’ (Bicycle Network Theft Report 2011-2020, July 2021, page 3).

## Description

## **My Bike Register** would be a Mobile Cloud Computing (MCC) service for a cloud based mobile application for multiplatform delivery that can be accessed either by mobile device or desk top computer.

## User generated accounts that record the identification and contact details of the account holder.

Name, Current Address, Profile Picture, Email Address and Mobile Number

Account legitimacy would need to be verified with a mobile number and/or email address. In addition, two factor authorisation (2FA) security will be integrated into each account to ensure secure access by only the account holder.

Once a user account has been successfully established and verified, bicycles can be added to the account. Bicycles would contain the following information:

Serial number, Type, Make, Model, Year of Manufacture, Colour, Place of Purchase, upload a photo of the bicycle, upload proof of purchase receipt and status of the bicycle (for example – Current Owner, For Sale or Stolen).

The user can store up to one (1) bicycle on the free system. To store more than one (1) bicycle then the user would need to subscribe for five (5) additional storage locations.

Mobile device applications would include the optical character recognition feature that could be used to read and then populate the serial number field of the bicycle form.

If an owner of a registered bicycle were to sell a bicycle, they would flag the bicycle status flag as “For Sale.” A potential buyer could go to the mobile app and scan or enter the serial number. The buyer would receive the “For Sale” verification notification. As part of the transaction, the bicycle would be transferred to the purchasing users account with all the associated details including the original proof of purchase etc.

A bicycle that has been stolen can have its status changed to “Stolen.” In this instance there can also be a field made available for the police report reference number with relevant details of where the report was made and to whom. Now when a potential buyer scans or enters the serial number, they will receive a “Stolen” notification. This will simultaneously notify the registered owner of the bicycle's location. The potential buyer will also be presented with a questionnaire regarding the details of the contact with the stolen bicycle and this will be provided to the legitimate owner.

Secondary advantages to the user of the register will be the ability to create a report for insurance companies that list the users registered bicycles and provide proof of purchase details. In the event of a claim these details are requested by the insurance company.

Additional commercial advantages of the register will be the ability to provide targeted advertising to users of insurance companies, bicycle shops or bicycle events happening in the area using geo-fencing features.

This system can be used for e-bikes and e-scooters as well as mobility scooters. With the values of these items in thousands of dollars, it is a logical step to create this register. This process has truly global potential and is not restricted to the Australian market.

Future additions that may be considered is to have a second-hand bicycle sales platform. Resembling carsales.com or bikesales.com.

#### Tools and Technologies

* Server – SQL Database cPanel
  + Well defined database structure that allows for remote hosting and allows for an established interface that can be remotely accessed and monitored
* Html editor – Atom
  + This is a no cost solution to create the HTML interface to the database. The site design being primarily for use on mobile devices.
* Xcode – iOS compiler
  + Used to generate the application for apple devices utilising Swift as the programming language.
* Android Studio – Android compiler
  + Used for to generate the application for Android devices utilising Kotlin as the programming language.
* Github – code repository
  + For the collaboration storage of all part of the code for all devices and platforms.
* Teams – team project management
  + To allow for seamless communication of all team members during all stages of the project
* Photoshop – artistic editing of interface
  + Graphic design tool for the application and the web-based application
* Illustrator – artistic editing of interface
  + Graphic design tool for the application and the web-based application
* OCR frameworks
  + Yet to be confirmed but likely contenders for this feature include:
    - Vision – Faster, cross platform capable, good review
    - VisionKit – Apple’s generic version. Not cross platforms.
    - Tesseract – not as flexible across platforms, still has good reviews
* ACME Animated QR Code Generator REST API v0.6
  + Allows for the creation and decoding of QR codes
* Real-Time Email Verification API
  + Used in the account creation and verification process
* Fencer API
  + Geo fencing API for advertising purposes
* Google Mobile ads (GMA) SDK
  + For targeted advertising via banner ads on pages of the application.

#### Application functional workflow

A picture containing text, crossword puzzle

Description automatically generated

#### Application functional outline and workflow

The outcome of the application is to make the user experience as easy as possible without creating obstacles to discourage the continuation of the collection of information. This needs to be achieved in a way that still ensures the security of the user's information and maintain the overall database integrity.

The start screen **-** will guide **new users to a registration** screen to collect basic information including name and email address and desired password. An email will be sent back to that address to validate its authenticity. Once verified the user will reach the home screen. Alternatively, a registered user will be required to login with their username and password details. Device biometric security features of the individual devices such as facial recognition or fingerprint recognition can populate the login details to expedite the process.

User Home Screen – This is the main navigation page of the application and allows the user to navigate to their account's details/settings screen, they can also navigate item check status screen and items list screen. The user will have the following options

Logout

Account Details/settings

Check item status

Receive new item

User Item list

Logout **-** will secure the application manually and take the user back to the login screen

The application will automatically logout once the program has not been accessed for a period of 5 mins. This will be a setting within the account details/setup screen. The option will be 1 minute, 3 minutes 5 minutes, 15 minutes, 60 minutes and do not automatically log me out.

Account details **-** will have, in addition to the automatic logout options, additional personal details including the following fields not completed at initial registration. A reminder will pop up encouraging the completion of these fields once the first item is entered into the system.

#### Additional details include

First Name

Last Name

Date of Birth

Current physical address

Profile picture

Contact phone number

#### Fields already completed

Email address

Password

The user can edit their personal account details on this screen from this screen. In keeping with the new account keeping requirements of the apple iOS platform there also needs to be an option to delete all user account details from the system. This feature will be made available at this screen.

Term/Conditions and Legal information –

New user Verification - will require an email or SMS to be sent to the user and the user to reply to this correspondence. This is to ensure that the user is authentic. This is a typical plugin feature. A secondary benefit of collecting and verifying the email address is this information can be used at a later stage for communication of relevant marketing information to the user should they opt in for this service.

Login – once the account has been established then the user will be required to login to their account with their login name and password.

Account Details/Settings – this is the screen where they can edit their personal details, update their profile picture, modify their opt in settings, etc. as part of apples new policies there also needs to be an option to delete the user and remove all information from the system. This option will be made available on this screen. Navigation from this screen is back to the Home Screen.

Items List – This screen contains the list of items with a basic view of the item's description and status that the user currently has stored against their profile. Within the database, this is a second list containing all the items of all the users. Each item is linked to each user via an internally generated user ID key. This process simplifies the transfer of items to different users. (See Exchange user/Sale an item) From this screen a user can navigate to item details/status screen or add a new item screen.

Item Detail/Status – This screen shows the additional information of each item stored against the user's account. Additional information such as a more detailed description of the item, photo of the bike, serial number of the frame, proof of purchase, modifications, make, model, colour, place of purchase and its status. The status displayed will be predefined as either “current”, “for sale” or “stolen”. This page will also allow for the user to delete the item from the list. From this screen the user can navigate back to the Home Screen or to the edit item details screen. This item information can be supported with artefacts such as the purchase receipt, photo of the item, photo of modifications and modification receipts and/or photos of the user with the item. By having all these artefacts and information stored against the item, in a single place it makes supporting arguments of ownership indisputable.

Edit Item Details – This screen allows the user to modify/update/change any of the item specific details. From this screen the user will be able to access a variety of functions that include file access, scanner access, camera access and optical character recognition (OCR) to assist with the collection of information and artefacts of the item and to strengthen proof of ownership. The status of the item can also be changed at the screen.

New Item – Adding a new item to the list of items that is attached to the user's account. Information recorded includes things such as detailed description of the item, photo of the item, serial number of the frame, proof of purchase, modifications, make, model, colour, place of purchase and its status from a selection of “current”, “for sale” or “stolen”. This screen also allows access to a variety of functions that include file access, scanner access, camera access and optical character recognition (OCR) to assist with the collection of information and artefacts of the item and to strengthen proof of ownership. The status of the item can also be changed at the screen.

Exchange user/Sale an item – If a user wishes to sell an item the from the edit item details screen the user changes the item status to “for sale”. When this is done a screen with a for sale QR code is generated. This can be attached to any image from the user's photo library as a layer and the user can then post this picture of the item with the QR code layer to any sale platform or marketplace platform with the QR code layer attached. Any potential purchaser can then scan the QR code that is on the image, and it would link to item details so the potential purchaser will see that it is a legitimately advertised for sale item. When a transaction occurs a unique code and QR code is generated. The buyer will enter in the code or scan the QR code. The seller/user will acknowledge notification on their device to accept the transaction. The item and all the relevant data will then be transferred to the new owners account with a receipt of the transaction being left on both user's accounts as evidence of the legitimate transfer of the item. The transfer of the item on a technical level is changing the items host. All items when entered the system are independent of the host (user) and linked to the host with the host id number. When a transfer of item occurs the host id reference number is changed to the new host id.

Check Item Status – This screen is accessed via the User Home Screen. It provides the user with an area to enter in the item serial number. Alternatively, the OCR camera can be engaged to scan the serial number automatically. Once the unique number is entered into the system and varified by the user it can them scan the database for a matching item number. If the item is identified in the database, it will return the status of the item to the user presenting them with one of four possible options.

#### Option 1. the item is registered as active

This is an indication the items details are registered on the system, but it is in normal use.

Option 2. the item is registered and is flagged for sale

This is an indication that the current registered user has the item set for sale and that it is a legitimate sale, and the user has all the relevant proof of owner ship information that can be transferred during a sales transaction.

Option 3. The item is registered and is flagged as stolen

This is an indication that the legitimate owner of this item has flagged it as a stolen item. The user will then be presented with a small list of questions regarding the location of the contact, contact details of the person trying to sell the item, where they found the item for sale, etc. This information will be sent as a notification to the legitimate owner of the item which they can then use by contacting police with their case ID

Option 4. The item is not registered on the system.

This is an item that has not been registered on the system.

New Owner/Receiver of the goods – Accessed through the for-sale item status screen or directly from the home screen. This allows the user to enter in the transfer code or scan the QR code provided by the seller to facilitate the transfer of the item to the user. The transfer of the item on a technical level is changing the items host. All items when entered the system are independent of the host (user) and linked to the host with the host id number. When a transfer of item occurs the host id reference number is changed to the new host id.

## Commercial Opportunity

An opportunity exists to use the platform to advertise to a specific demographic. Enhance this cohort with geo fencing feature and you have high level targeted market access. With banner advertisements on selected screens of the application, a potential marketer can access potential customers in their region with highly relevant material. This marketing can be outsourced to Google Ads that take the demographic information and control and advertisement content. Revenue is established by clicks and is paid by Google Ads.

## Skills Required

* Skill required include have the programming knowledge for the following languages and software
* Swift – used for the programming language for the iOS operating system
* Kotlin – used for the programming language for the Android operating system
* HTML – Used to build the front end of the web interface
* PHP – Used for the backend of the web interface
* SQL – Used to create the database
* Adobe Photoshop – Graphic art components
* Adobe Illustrator – Graphic art components

## Outcome

With this project completion there will be an international database for the storage and tracking of bicycles, e-bikes, e-scooters, and mobility scooters. This will act as a deterrent for the would-be criminal and give law enforcement a tool for tracking and tracing these items. This will decrease the amount of theft and increase the number of cases solved.

Additional benefits include the ease of access and security of documentation for insurance policies and claims and the registered pawn brokers can have security in ensuring a products legitimacy prior to any exchange occurring.

## Reference

* Alexander Miller, Dr Nicholas Hunter, 31 August 2021, *Bicycle Network Theft Report 2011-2020*, Bicycle Network, viewed 19 March 2022, [<https://s23705.pcdn.co/wp-content/uploads/2021/09/Bicycle-Network-theft-report\_2011-2020\_v1.4.pdf>](https://s23705.pcdn.co/wp-content/uploads/2021/09/Bicycle-Network-theft-report_2011-2020_v1.4.pdf)
* <https://www.programmableweb.com/api/acme-animated-qr-code-generator-rest-api-v06>

Viewed 17 April 2022

* <https://www.email-validator.net/api.html>

Viewed 17 April 2022

* <https://support.google.com/admanager/answer/6238692?hl=en>

Viewed 17 April 2022

NOTE: Hosting options Amazon webservices

https://unsplash.com/photos/0ClfreiNppM

Photo by [Tiffany Nutt](https://unsplash.com/@tiffanylnutt?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText) on [Unsplash](https://unsplash.com/s/photos/bicycle?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText)

Viewed 18/04/2022