

# Inventory App

Software Development  
4th Year Project

## *Project Report*

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## Introduction

In this project report I will reflect on the outcome of the Inventory App project, discussing the goals achieved, a detailed description of the submitted project, some screen shots of the mobile application and website, a brief description of conformance to specification and design, the personal and technical lessons that were learned throughout the developmental process of the project, and an overall review to the project.

## Description of Submitted Project

### Mobile Application

The Inventory App mobile application that was developed allows a user to create an inventory of their music, books, games, DVDs etc. A user can register to gain access to the application by creating a username and password and providing a valid email address. Once the user has registered they can then log into the app using their created username and password. Once logged in the user can add items to their inventory by using the built in barcode scanner to scan the barcode on an item. Once the item has been scanned, the item information will be automatically retrieved and the item added to their inventory without the need for the user to type in any details. In the case that the information for the item cannot be retrieved the user has the option to manually enter the item details by typing in the item information or using optical character recognition to take a picture of the title or author of a book, for example, and the text will be decoded from the picture and the item fields populated. The user can browse all the items, which have been added to their inventory by selecting a category such as Books, Games, DVDS, and the items will be displayed as a list. If the user wants to view an item they can click on the item in the list and all the item information will be displayed on the screen. Item information can be updated or the record of the item deleted from the inventory. If the users inventory contains many items, instead of scrolling down through all the items to find the item they are looking for, they can use the search option, which allows them to search for an item based on title, author or category by typing into the search bar. If a match is found the item information will be returned. A report can be generated for all the items stored in the inventory by creating a CSV file of all the item information, which is then emailed to the users email address as an attachment which can then be downloaded. An internet connection is required to submit or retrieve item information on the application, as the information is stored on a virtual private network in a MySQL database. The application has a very simple, functional, user-friendly interface. All that the user has to do to add an item to their inventory is scan the barcode, this reduces complexity and the laborious task of the user manually entering the details of every item to the database.

The mobile application was developed using Apache Cordova. Apache Cordova allows the creation of mobile applications using web technologies. The application was built and tested on the android platform with a minimum requirement of android Jelly Bean 4.2 for the application to function.

The application can also be built on the iOS platform, as all the plugins used are compatible with both platforms.

## Website

To accompany the mobile application, a website is available for the user to view and organise their inventory. Once the user has registered through the mobile application they can then log into the website using their user credentials. Once the user has logged in they will be directed to the dashboard of the website where they can choose to view the items in their inventory by selecting a category. When the user has selected a category, all the items related to this category will be displayed in a list. The user can view a single item by clicking on the item in the list, which will allow them to update the item information or delete the item from the inventory.

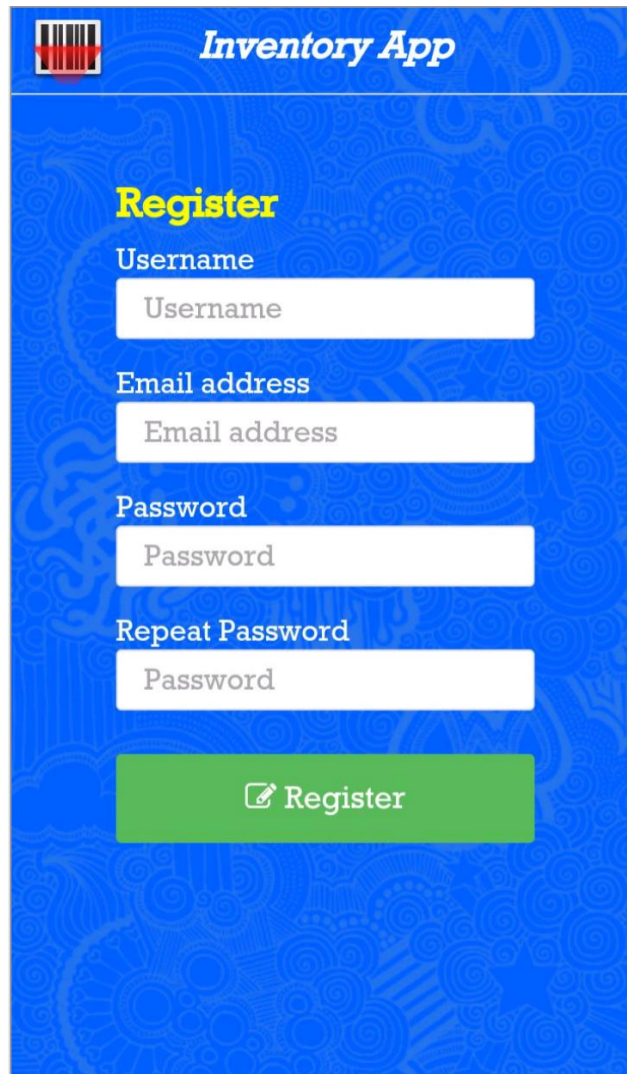
The website can be accessed at <http://www.inventoryapp.eu>

The website is hosted on a DigitalOcean Ubuntu 14.04 droplet. It was created using the Flask web framework, using Python 3.4, HTML, CSS, jinja templating.

The MySQL database is also hosted on this DigitalOcean droplet.

## Mobile Application Screens

### Registration Screen



**Inventory App**

**Register**

Username  
Username

Email address  
Email address

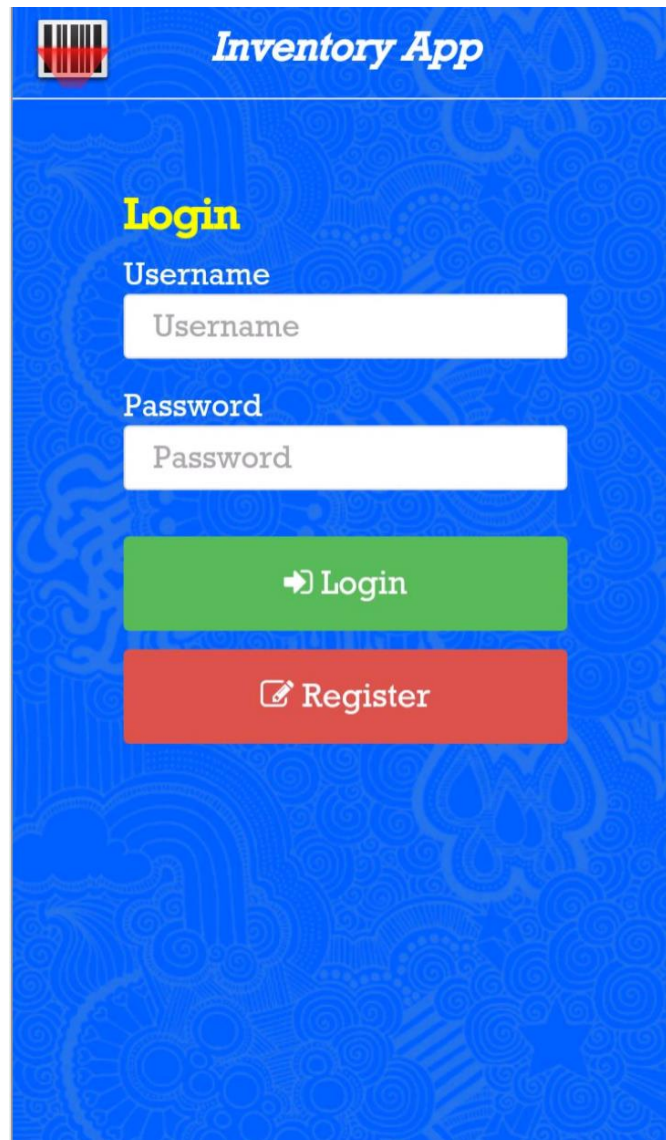
Password  
Password

Repeat Password  
Password

Register

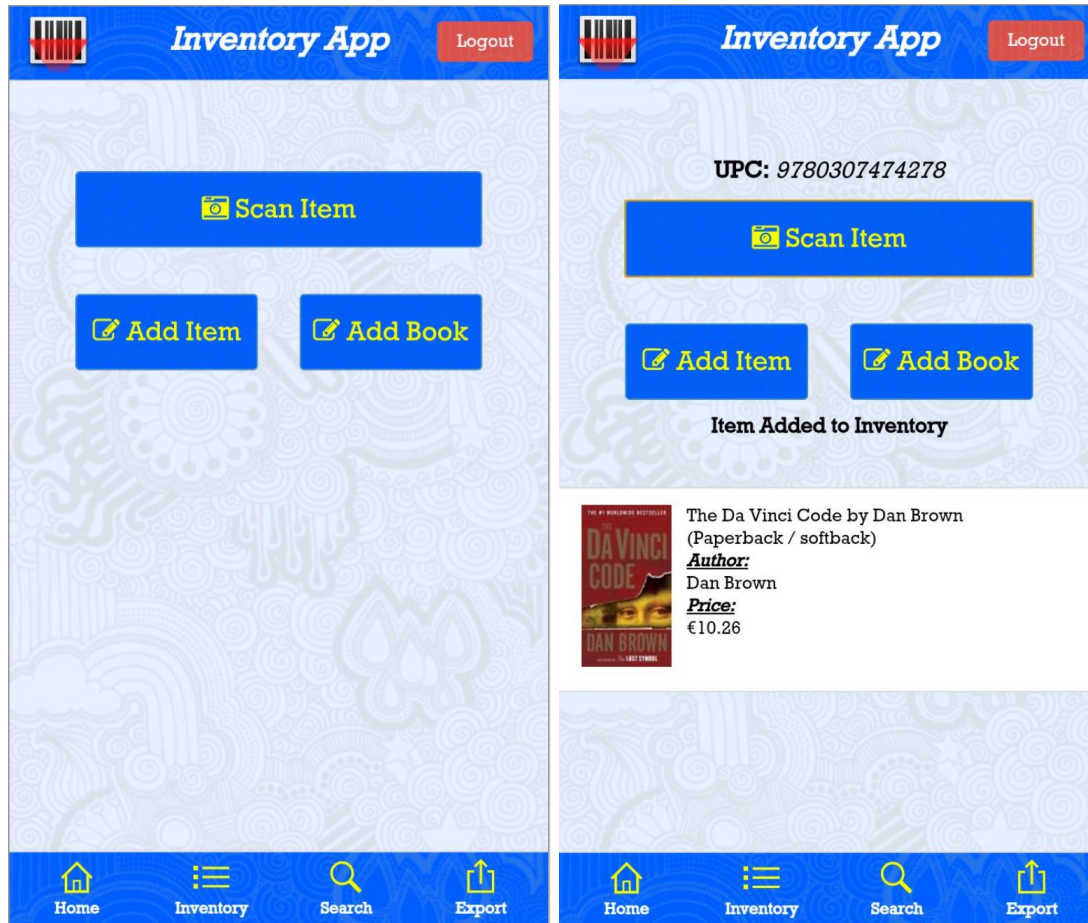
This is the register screen where the user creates a username and provides their email and a password. The username must be unique, the email address cannot be associated with another account already on the system and the password fields must match.

## Login Screen



This is the login screen where the user can gain access to the application by providing the username and password they created when registering. If the credentials are valid, the user will be redirected to the home page of the application.

## Home Screen



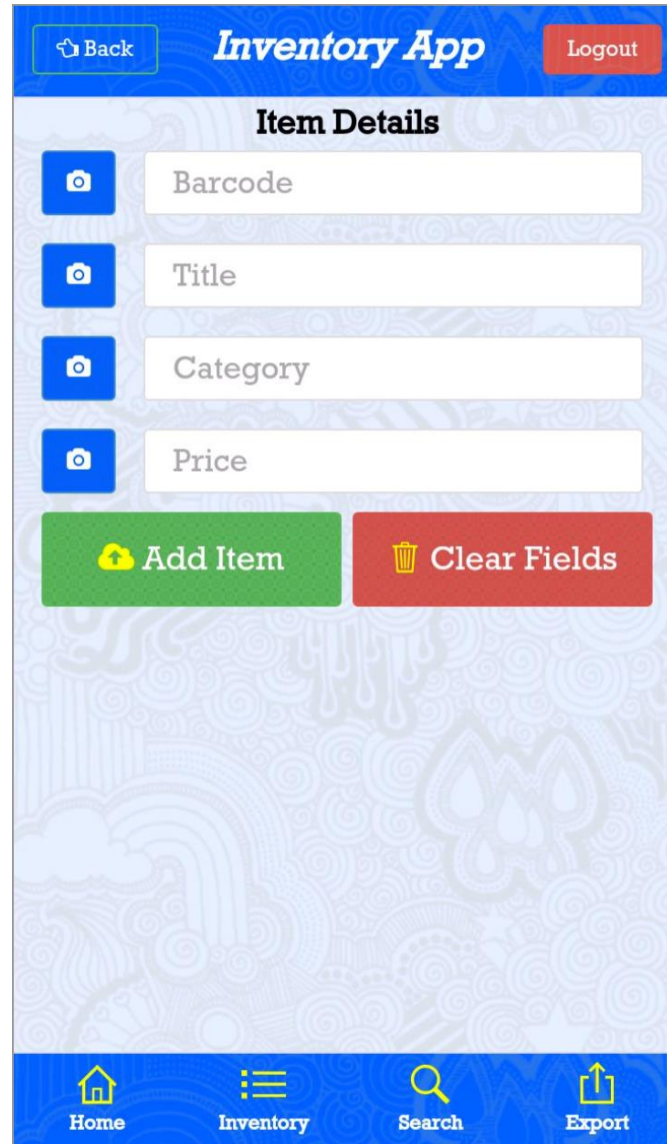
This is the home screen where the user will be directed once they have successfully logged in to the app. The user can choose to scan an item, add an item manually or add a book manually.

The image on the right is the home screen after an item has been scanned, the item information is displayed to the user.

The user can navigate to other sections of the application by using the navigation bar at the bottom of the screen.



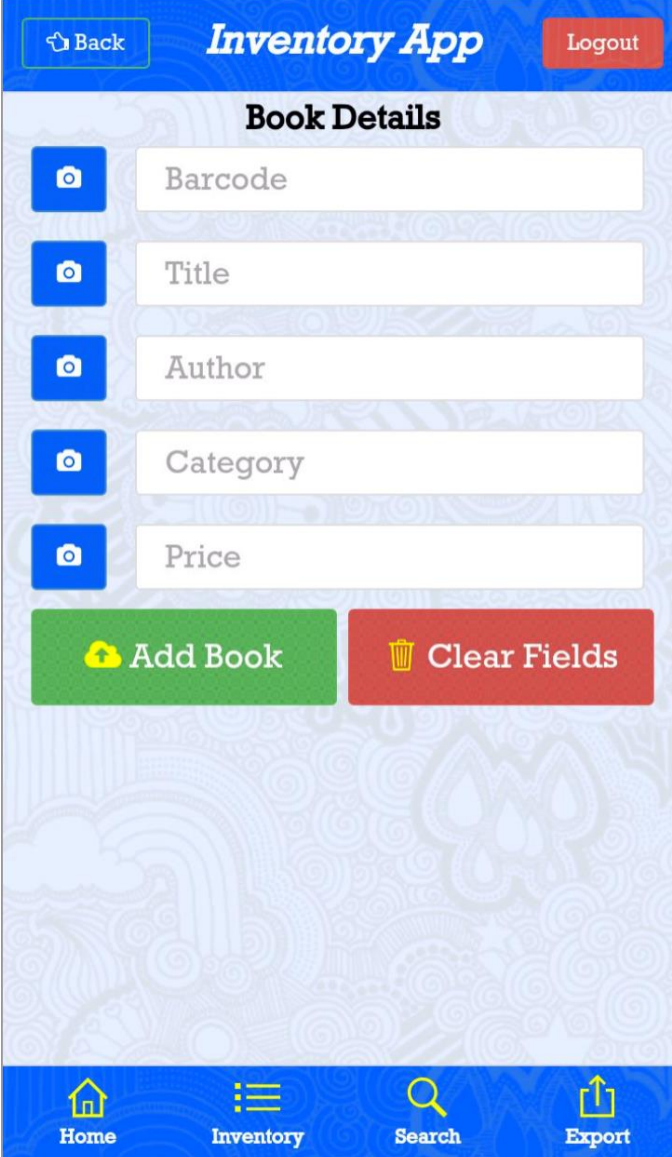
## Add Item Screen



The screenshot displays the 'Add Item' screen within the 'Inventory App'. The app's title 'Inventory App' is centered at the top in a white font on a blue background. To the left of the title is a 'Back' button with a left-pointing arrow, and to the right is a 'Logout' button. Below the title bar, the screen is titled 'Item Details'. It features four input fields, each with a camera icon to its left: 'Barcode', 'Title', 'Category', and 'Price'. At the bottom of the form area, there are two buttons: a green 'Add Item' button with a plus sign icon and a red 'Clear Fields' button with a trash can icon. The bottom of the screen has a blue navigation bar with four icons and labels: 'Home' (house icon), 'Inventory' (list icon), 'Search' (magnifying glass icon), and 'Export' (share icon).

On this screen the user can add an item manually by typing in the required fields in the form. Optionally the user can use the optical character recognition for populating the fields by pressing the camera button located next to the text field. The item can be added to the inventory provided that the barcode is not already associated with an item currently in the inventory and all of the fields have been populated.

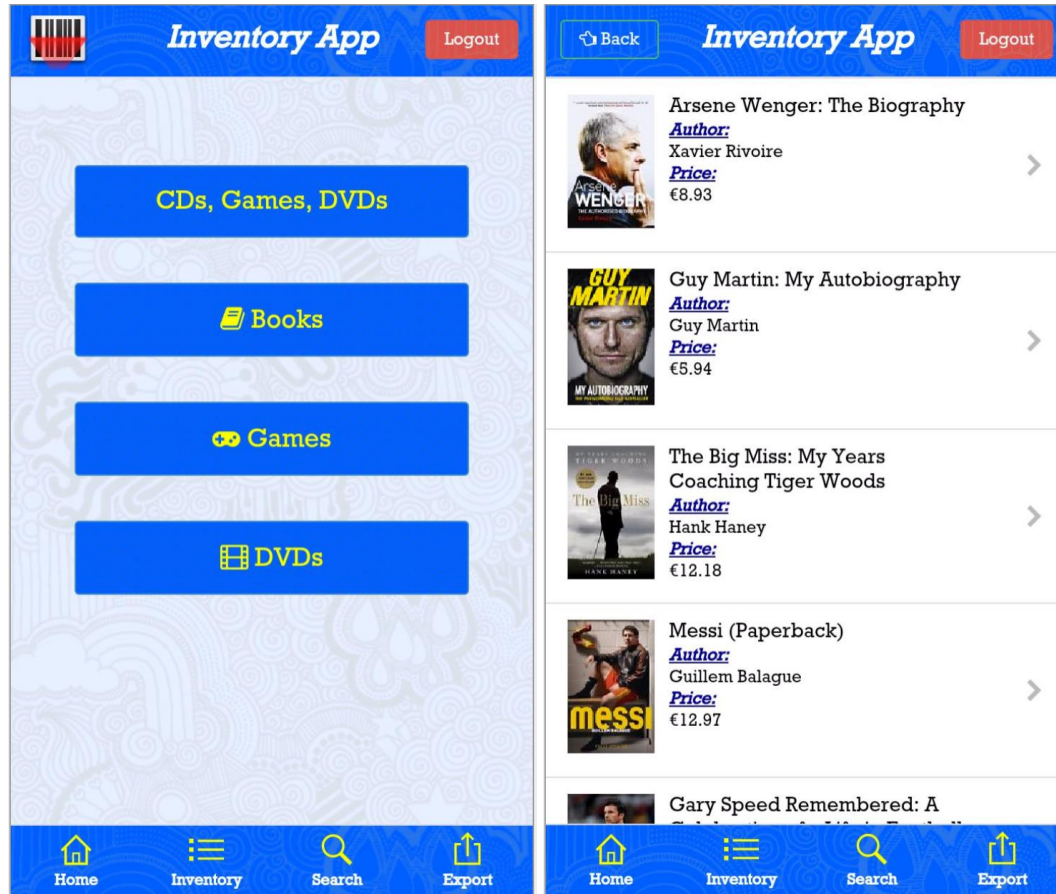
## Add Book Screen



The screenshot displays the 'Add Book' screen within the 'Inventory App'. The app's title 'Inventory App' is centered at the top in a white, italicized font. To the left of the title is a 'Back' button with a left-pointing arrow, and to the right is a 'Logout' button. Below the title bar, the screen is titled 'Book Details'. It features five vertically stacked text input fields, each with a camera icon to its left, indicating that optical character recognition (OCR) is used for data entry. The fields are labeled 'Barcode', 'Title', 'Author', 'Category', and 'Price'. At the bottom of the form area, there are two buttons: a green 'Add Book' button with a plus sign icon and a red 'Clear Fields' button with a trash can icon. The bottom of the screen features a blue navigation bar with four icons and labels: 'Home' (house icon), 'Inventory' (list icon), 'Search' (magnifying glass icon), and 'Export' (share icon).

On this screen the user can add a book manually by typing in the required fields in the form. Optionally the user can use the optical character recognition for populating the fields by pressing the camera button located next to the text field. The book can be added to the inventory provided that the barcode is not already associated with a book currently in the inventory and all of the fields have been populated.

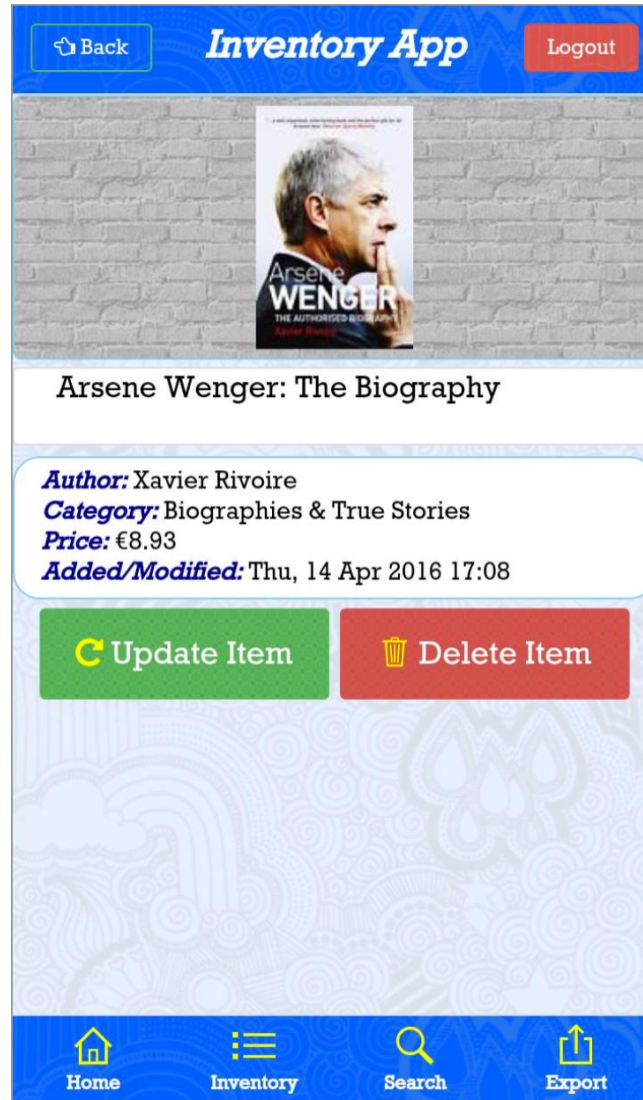
## Inventory List Screen



When the user selects the Inventory option from the navigation bar at the bottom of the screen they will be directed to the screen above on the left. This screen displays the categories of the items in the inventory which the user can select to view a list of the associated items.

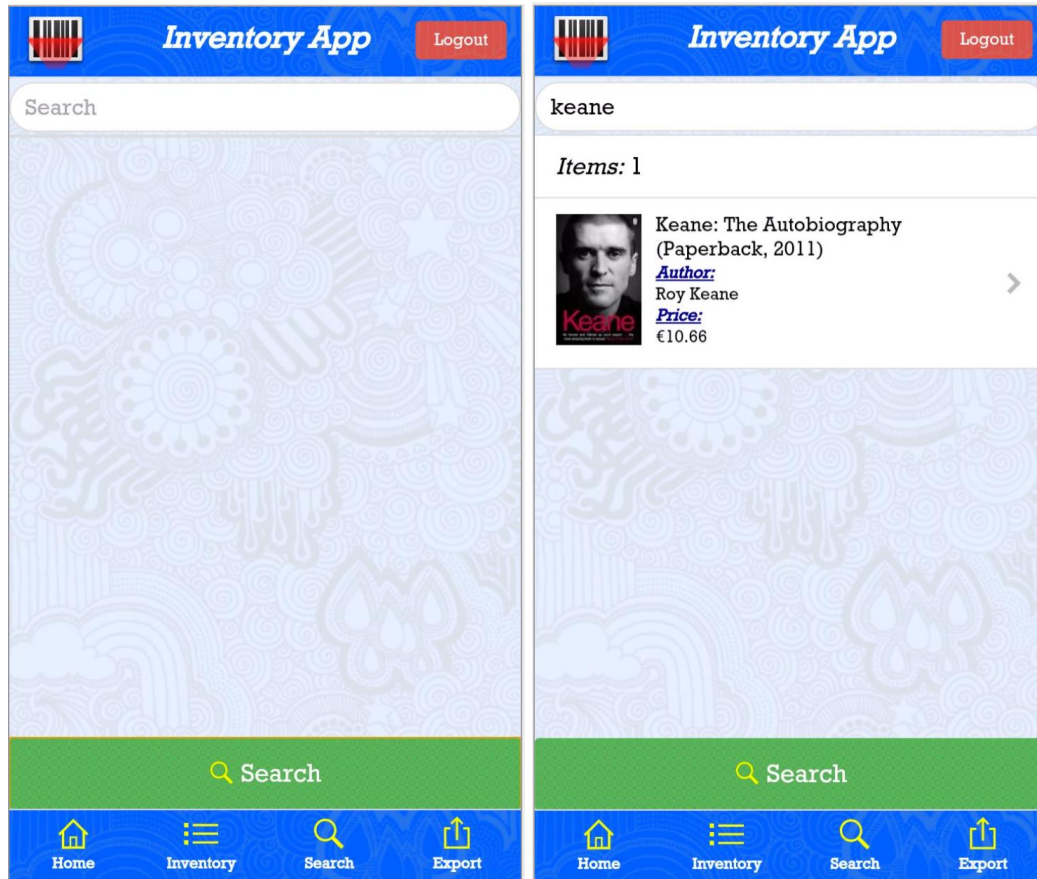
The screen on the right is the page the user is directed to when they have selected the books category from the inventory menu. This page displays a list of all the books in the inventory. The user can view a book by clicking on an item in the list.

## Edit Item Screen



This is the edit item screen that is displayed when the user selects an item from the inventory list. The user can edit the title of the item and choose to update the record of the item by clicking the Update Item button. Optionally the user can delete the item from the inventory by clicking the delete item button.

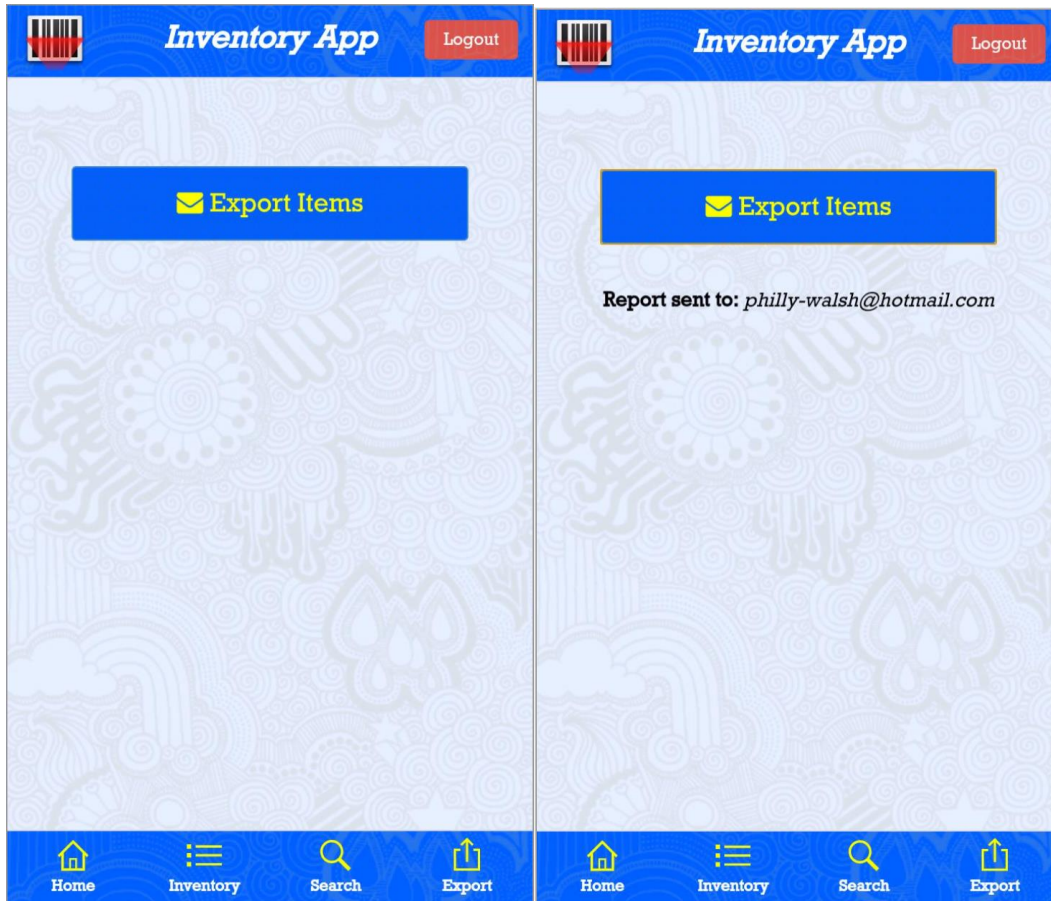
## Search Screen



The screen above on the left is the search screen that is displayed to the user when they have selected the Search option from the navigation bar at the bottom of the screen. The user can search for an item by typing into the search bar at the top of the page and pressing the search button.

The screen above on the right is what is displayed to the user when the user has entered "keane" into the search bar and pressed the search button. A list will be returned containing all the items that have matched with the query.

## Export Screen

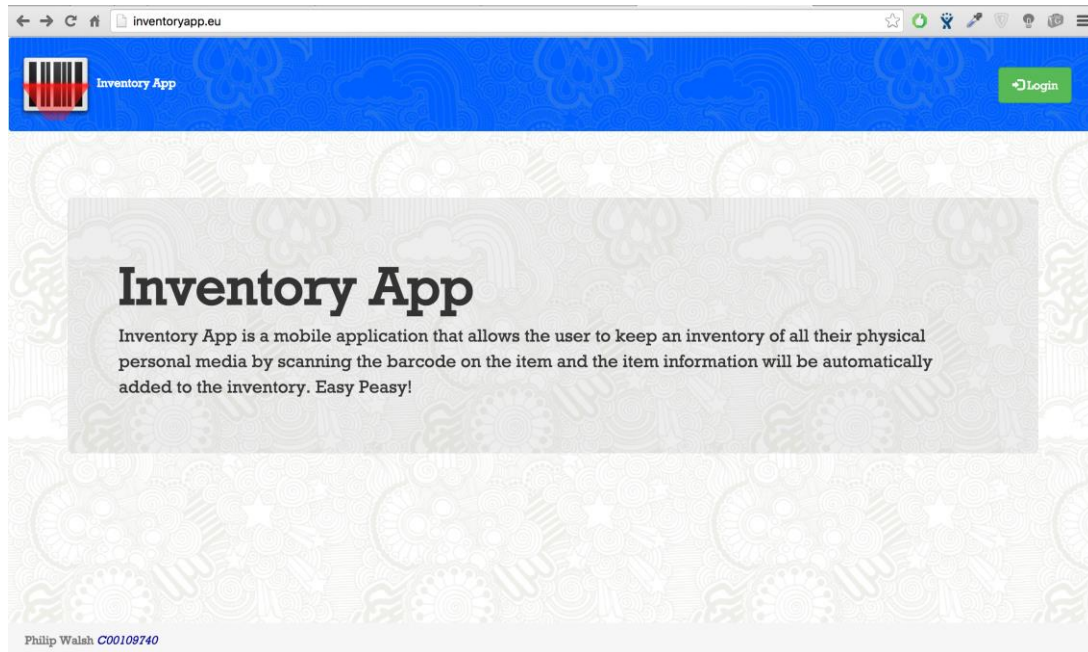


The screen above on the left is the screen that is displayed to the user when they have selected the Export option from the navigation bar at the bottom of the screen. The user can export a CSV file containing information on all the items currently in their inventory. The CSV file will be sent to the user as an attachment in an email, where it can be downloaded and viewed in a program like Microsoft Excel.

The screen above on the right is what is displayed to the user when the email has been sent. The message displayed to the user will contain the email address associated with their account.

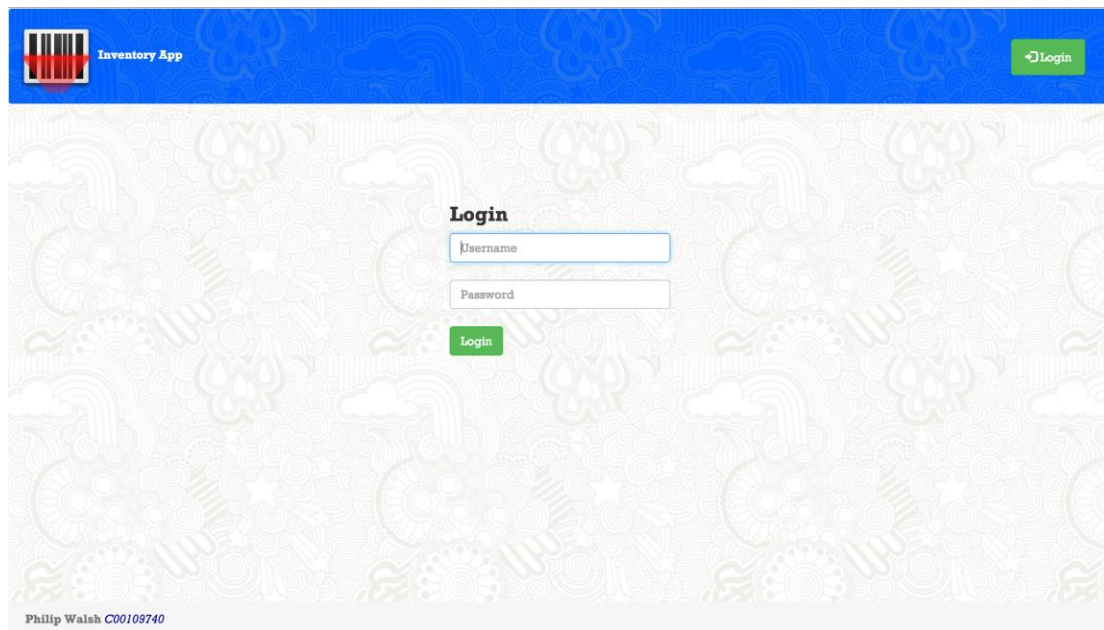
## Website Screens

### Landing Page Screen



This screen is the landing page for the website, which can be accessed at [www.inventoryapp.eu](http://www.inventoryapp.eu) . From this page the user can login to the website provided that they have registered through the mobile application first.

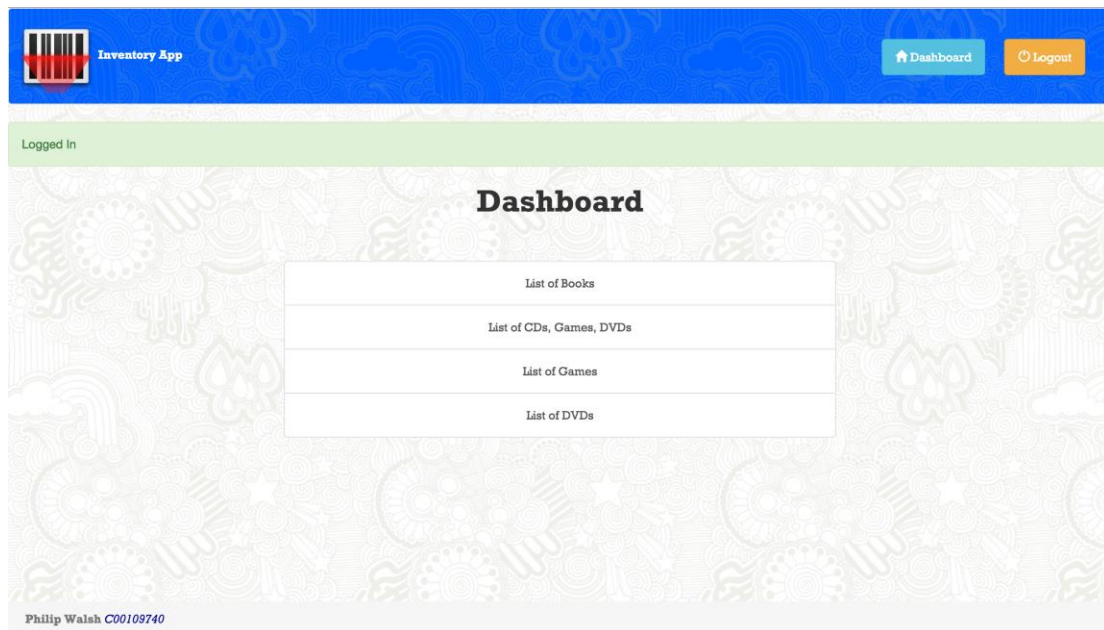
## Login Screen



This is the Login screen for the website. The user can log into the website by entering their username and password which they created while registering on the mobile application. If the user's credentials are valid, the user will be allowed access to the website and directed to the dashboard.



## Dashboard Screen







When the user has successfully logged into the website, they will be directed to the dashboard shown above. From this page the user can view the list of items in their inventory by selecting a category.

## Inventory List Screen

**Inventory App** Dashboard Logout

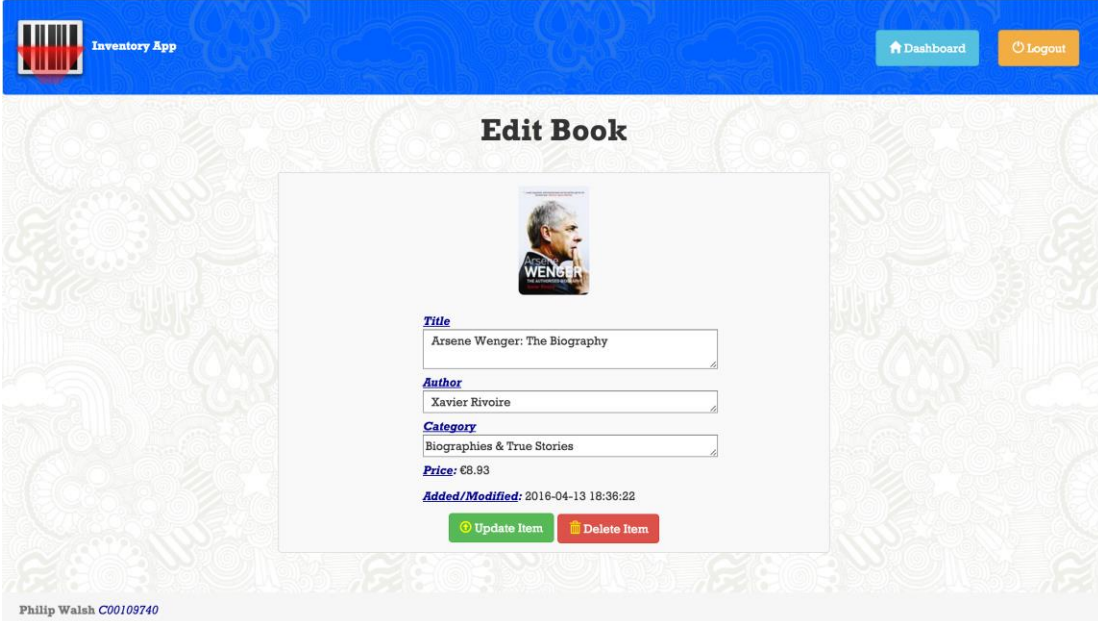
### Book List

|  |  |
|--|--|
|   | <b>Title:</b> Arsene Wenger: The Biography<br><b>Author:</b> Xavier Rivoire<br><b>Category:</b> Biographies & True Stories<br><b>Price:</b> €5.93<br><b>Added/Modified:</b> 2016-04-13 18:36:22    |
|   | <b>Title:</b> Guy Martin: My Autobiography<br><b>Author:</b> Guy Martin<br><b>Category:</b> Other Non-Fiction<br><b>Price:</b> €5.94<br><b>Added/Modified:</b> 2016-04-05 00:56:27                 |
|   | <b>Title:</b> The Big Miss: My Years Coaching Tiger Woods<br><b>Author:</b> Hank Haney<br><b>Category:</b> Other Non-Fiction<br><b>Price:</b> €12.18<br><b>Added/Modified:</b> 2016-04-05 20:57:58 |
|  | <b>Title:</b> Messi (Paperback)<br><b>Author:</b> Guillem Balague<br><b>Category:</b> Biographies & True Stories<br><b>Price:</b> €12.97   |

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The user is directed to the screen above which contains a list of all the books in their inventory, if they select the List of Books option from the dashboard screen. The user can view an item by clicking on an item in the list.

## Edit Item Screen



**Inventory App** Dashboard Logout

### Edit Book



**Title**  
Arsene Wenger: The Biography

**Author**  
Xavier Rivoire

**Category**  
Biographies & True Stories

**Price**: €8.93

**Added/Modified**: 2016-04-13 18:36:22

Update Item Delete Item

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The screen shown above is the edit item screen which the user is directed to when they have selected an item from the items list. On this screen the user can edit the item information and update the record of the item in the inventory by clicking the Update Item button. Optionally the user can delete the item from the inventory by clicking on the Delete Item button.

## Conformance to Specification and Design

The final submitted project conforms to all the functionality which was outlined in the functional specification document. The main functionalities which were outlined in the Functional Specification document were as follows: Scan an item's barcode and automatically retrieve the item information and populate the database, provide an option for the user to manually add an item in the case where the items information cannot be found, the option to use optical character recognition for population text fields while manually adding an item to the inventory, export a file containing information on all the items in the users inventory which could be used for insurance claims, for example. Allow an item's information to be edited, updated and deleted from the user's inventory, provide a website to accompany the mobile application where the inventory could be browsed and organised.

The original screens that were designed were not very pretty, but were clear and concise. The overall look of the app was improved by using textured backgrounds while keeping them very clear and concise. The aim for the user interface was to keep it as simple as possible and to try and not to complicate things which would make it difficult for the user to navigate through the app, I feel that has been achieved.

The design of the app was based on trying to keep the app as lightweight and as responsive as I could by offloading a lot of the processing to the virtual private network which hosted the backend of the project, this meant that the mobile application would need a constant internet connection for the submission and retrieval of item information from the server as nothing was stored on the application itself.

Given that all of the design and functionality outlined above was achieved within the project, it conforms well to the design and functional specification which was set out in the corresponding documents.

## Description of Learning

### Technical Achievements

Prior to commencing this project, I had never developed a mobile application so the thought was quite daunting. I researched a lot about Apache Cordova which would allow me to create a cross platform mobile application. Node.js was required to install the cordova command line tools using its npm utility. I learned how to build projects for mobile platforms for such as, iOS, android, and windows using Cordova's command line interface.

During the duration of this project I gained a lot of experience using JavaScript, as it was the primary language used in building the mobile application. JavaScript is a language I had heard many things about, good and bad, leading me to expect some minor difficulties along the way as it was not a language I had used extensively before. I learned a great deal about its features and uses for libraries such as jQuery which was used to make the app responsive and dynamic. I also learned how to use jQuery to send and receive JSON data to and from a cloud server asynchronously with ajax. I discovered how to use mobile web frameworks such as GoRatchet which provides components similar to Bootstrap for creating the user interface and how to parse JSON data returned from Ebay's API's.

To develop the backend of the project I decided to rent a virtual private server hosted in the cloud using a Ubuntu droplet from DigitalOcean, which was my first experience in doing so. Using this platform I deployed a Flask web application with an API for interacting with the mobile application, and MySQL database which stores all the data.

I also learned how to rent a domain name for the website and configure the application and the use of the optical character recognition which I was not familiar with.

Reflecting back on the development of the project I feel I gained invaluable experience in many new technologies.

## **Personal Achievements**

Following the completion of this project I feel I have achieved a lot of work and hit the vast majority of the targets I set myself before commencing the project. Learning many new technologies in such a short time frame was quite a challenge but I kept my head down and battled through the tough periods during research and development.

Seeing the fruits of my labour upon completion of the project after countless hours of debugging and head scratching taught me the value of perseverance.

## Review of Project

Overall I was very happy about how the project turned out. Using Cordova was a simpler process than I first imagined. I managed to get a very basic mobile application running on an android mobile phone a lot earlier than I thought I could.

Initially I had planned to use Parse as a mobile backend solution which provides a well documented SDK. During the second iteration of the project it was announced that this service would be retired so I took the decision to change direction and implement a new solution for the backend of the project. Taking this decision required me to take on a lot more work than was originally planned putting me back a few weeks in development time. Creating an alternative solution allowed me to exercise some new skills which I had learned in the Web Development module of my course by implementing the backend system using Python 3 and the Flask web framework which turned out to be invaluable to the project.

Given the extra work which I dedicated to the back end of the project, I feel that given more time to complete the project I could have improved the look of the user interface on the website and mobile application substantially. Also the reporting of inventory contents would have been developed to be available in various formats such as a PDF file rather than just as a CSV file. Given additional time the application could have been tested on various different mobile platforms.

Early in the development of the project I was having difficulty creating a JavaScript OCR plugin for the mobile application. Implementing my own solution for the backend allowed me to migrate the OCR engine to the cloud by using the python-tesseract wrapper for the tesseract OCR engine. In doing so, this relieved the mobile application of a lot of processing.

If I was to start to project over again I would spend more time researching backend solutions and the different OCR solutions as these were the most time consuming features in my project. Also I would spend more time taking into consideration what API I would use for product retrieval as I was denied permission to use Amazon's Product Advertising API which was another set back as I had to learn how to use a different API after I had planned to use the Amazon API.

Overall I feel I made the right with the technologies used in the final product.

## Advice for Others

The main advice I would give to someone looking to undertake a similar project, would be to thoroughly research all of the technologies that they will use. Also to spend extra time refining the design for the project before commencing with coding. Choosing the right technologies from the start is key to keeping your project on time and reduce the chance you will have of any major setbacks.



## Acknowledgements

Firstly, I would like to thank my project supervisor, Nigel Whyte, for his help and advice during all stages of development of the Inventory App.

Friends and family for their support and words of encouragement.

Paul Barry, for introducing me to the Python programming language.

*Stackoverflow*(<http://stackoverflow.com/>)

For the countless solutions to problems I encountered along the way.

*GoRatchet*(<http://goratchet.com/>)

For the mobile framework used for the user interface of the mobile application.

*DigitalOcean*(<https://www.digitalocean.com/>)

For their excellent cloud computing platform.

*Ebay Developers Program*(<https://go.developer.ebay.com/>)

For use of their Finding API for Item retrieval, which is at the core of the mobile app's functionality.

*Apache Cordova*(<https://cordova.apache.org/>)

For enabling me to make cross platform mobile applications using web technologies.

And everyone else that I am forgetting to mention, for all the help and advice along the way which has helped me to expand my knowledge and grow as a software developer.