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Cross-Platform Development, I

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## 1. Table of Contents

1.	Concept .....	3
1.1	App Description: .....	3
1.2	App Download: .....	3
1.3	General Requirements: .....	4
1.4	App Requirements .....	5
1.5	Competitors .....	5
2.	Prototyping .....	6
2.1	Digital Design (Iteration 1) .....	6
2.2	Digital Design (Iteration 2) .....	7
2.3	Digital Design (Iteration 3) .....	8
2.4	Final User Testing and Feedback .....	8
3.	Final App .....	9
3.1	Proof of Cross-Platform Deployment .....	9
3.2	Two Elements that Highlight the Design and Development .....	10
4.	Reflection .....	12
5.	References .....	13
5.1	Reviewed Apps .....	14

## 2. Concept

### 2.1 App Description:



## The Secret Bar

Snowling Development Ltd. Lifestyle

★★★★★ 28

**3** PEGI 3

**i** This app is compatible with some of your devices.

Welcome to The Secret Bar app, brought to you by Vice & Co. A speakeasy Lincoln bar who are specialising in unique cocktails with a fantastic atmosphere. The app is available for both **iOS** and **Android**. Once downloaded, the app can then be used to gain entry to the bar, before then receiving exclusive discounts on drinks sent directly to your device.

These are the main features:

- ★ Use Google Maps to find your local bar
- ★ Gain entry to the bar using the inbuilt QR reader to scan the on-door password
- ★ Download and browse the drinks menu
- ★ Once seated, open the app to utilize the exclusive drinks discount

Download and install the app today and revolutionise your bar experience.  
We promise not to tell if you don't...

What's new in version 2.0.5:

- Landscape Support: The app now offers full rotation on all pages.
- Logo: Updated app icon using the brand new official logo.
- Table Booking: Need a table? Reserve your table stress-free today.

Not in your city yet? We hope to be soon! Head to <https://viceandco.co.uk/cities> for a current list of all the cities we serve.

### 2.2 App Download:

Please find the attached QR Code to download **The Secret Bar** app. (Figure 1)



Figure 1 - QR Code

## 2.3 General Requirements:

Recently a new cocktail bar opened in the Lincoln city centre, branded as The Secret Bar. The company Vice & Co thought it would be a cool concept to build an underground bar, which was *supposedly* hidden in the back of an old electronics shop (Figure 2). The idea was to build a mobile app that utilized modern technologies, such as a QR scanner to scan the on-door password, which will then have to be spoken in-order to gain access to the bar. Alongside this, Google Maps will be implemented to guide *lost travellers* to the underground bar. Once a customer is seated they will then be able to receive exclusive drink discounts from the nearby iBeacon communication with their mobile device.



Figure 2 - The Secret Bar Location

The app was designed to respond to a mobile moment, which is any instance where a user requires their mobile phone for a specific purpose (Braze, 2018). A mobile moment could occur whilst running, cycling, swimming, mountaineering or any other event, where a desktop or laptop could not perform the same task. Discovery, is the mobile moment which this app responds to by ensuring that the bar customers are using the app to interact with the surrounding environment.

It will be vital for the customer to download and utilise the app on their mobile phone, rather than attempting to use it on a desktop or laptop computer. This is because the app needs to take advantage of the in-built phone camera to scan the QR code on the bar's door, revealing the password to the user, before it is then spoken to gain access to the bar (Figure 3). As a prompt, the app will be advertised on Vice & Co's Facebook, Twitter accounts and Website and also displayed in their bar window. The app can also be used to navigate to the premises, using Google Maps Navigation API that utilises the phone's in-built GPS tracking. iBeacons will have been pre-installed into the premises with the capability of broadcasting exclusive discounts on drinks directly to any mobile device in range.

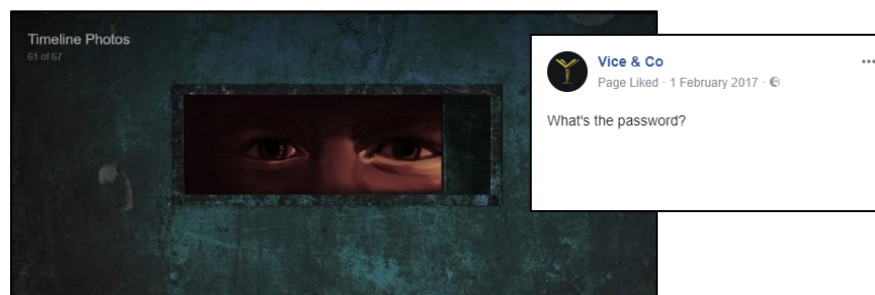


Figure 3 - The Door Password

The Secret Bar has been established to cater for romantic date nights, meetings and drinks with friends, with the bar aiming to offer a new luxury experience. Browsing the bar's Facebook (2018) page helped to provide an overview of their target audience. This was achieved by inspecting online customers' comments, which revealed that mostly 20 to 35 year-olds used the bar. Their set menu of luxury cocktails was aimed towards people who had disposable money to spend, therefore appealing to a more affluent customer base amongst this age range. From this, the app will need to be designed appropriately for this type of business, their targeted customer base and also promote the bar's luxury theme.

## 2.4 App Requirements

- Produce an app to utilise a phone's in-built camera, which can be used to scan the QR code in order to decrypt the password. There will be a QR sticker mounted onto the bar's door and on entry the staff will require this password to be spoken before admitting the customer.
- The bar is relatively new to Lincoln being opened in late 2017 and because of this a Google Maps Navigational API will need to be installed, assisting *lost travellers* to locate the bar.
- On entry to the premises, the app will have to communicate with a nearby iBeacon which will be responsible for sending the exclusive drinks discounts directly to customer devices. An iBeacon is a device that uses Bluetooth to broadcast data within short distances and can therefore be used to communicate with a mobile device, before displaying a message or discount code. Beacon Zone (2018) explained that a standard iBeacon has an approximate range of 70 meters, which is enough to cover the entire premises.
- The bar's drinks menu will be accessed and downloaded using the app, therefore allowing customers to browse the luxury cocktails menu before visiting. This will be used to attract the customer.
- By downloading and installing the app, it will then be possible to make table reservations, ultimately taking pressure off the bar staff by having to answer less interrupting phone calls regarding bookings.
- The bar's contact information will be included on the app, this then provides customer with a phone number, email address, bar address and social media links, which allows them to review the bar before visiting.

## 2.5 Competitors

**Pizza Express:** Performing a search on the Google Play Store for Pizza Express highlighted that the app was surprisingly last updated in 2013. The app had received many bad reviews with a rating of only two out of five stars. Features of the Pizza Express app included a table booking system, which allowed customers to reserve tables at their local restaurant. This feature is a useful because it allows the customer to make an instant table reservation, it also saves the bar staff from answering interrupting phone calls regarding bookings. To accompany the incorporated table booking option, from using the app it was also possible to download the food and drinks menu. Overall, the layout of the app was simple with a straightforward navigation that followed a basic format which including only four pages with each named appropriately. Doing this appeals to a wide range of customers, who might not be technical minded. Making note of these features, it was decided that some could be transferred to the proposed app, such as a table booking form alongside a simple app navigation structure. Pizza Express's app demonstrated a clean interface which was easy to understand and navigate. It also included various accessibility options, such as text-to-voice and the ability to alter text size, increasing the size, therefore making it easier to read for any visually impaired users.



Figure 4 - Pizza Express

**All Bar One:** Searching the Google Play Store for 'Luxury Bar Experience' returned the popular app 'All Bar One', which was introduced and last updated during 2017. Because of the similarity between 'The Secret Bar' and 'All Bar One', the app was therefore ideal to be reviewed. It was firstly noticed that the



Figure 5 - All Bar One

app offered a rewards scheme, which provided the option to collect voucher codes that could then be redeemed for a free hot drink. From opening the app, a register or login screen is loaded, and therefore requires an account to be created or accessed. On signing up to the service an introductory email was received, offering a free drink at the bar. The app had an attractive design, giving off the impression of a fresh and modern bar environment, which was achieved by using attractive fonts and a promoting a stylish layout. The app included similar options to Pizza Express, with the ability to book a table and browse the drinks menu. These features are common across both apps, and therefore will be considered for their inclusion into the proposed 'Secret Bar' app.

### 3. Prototyping

Snyder (2003) explains how prototyping can be used as a fast and effective way to design and refine user interfaces. Snyder suggests that it will therefore be important to design prototypes using a paper based mock-up, before using it to refine the design into a digital format. Cao (2018) investigated why prototypes are one of the most important steps during the design process. He explained how prototyping is essential for resolving usability issues before a product is launched and how designing prototypes can reveal areas that require improvement. This is because a prototype can offer a product draft, before it is handed to users for testing. This is then repeated until the prototype becomes accurate and therefore represents the final product closely. Construx (2002) introduced the theory of Evolutionary Prototyping (EP) and how it can be used as a system development lifecycle that can be adapted to allow incremental designs, which are then modified to respond to the end-user and client's feedback. Construx explained EP in-depth, highlighting the many advantages of choosing the model. The suggestion was that the main advantage in selecting EP was the ability to identify risks, before they can be tackled by speaking with the end-users and the client for feedback. Simon (2017) introduced Guerrilla Usability Testing, which was a rapid, low-cost method of quickly capturing user feedback. The tests involved observing how the customer interacts with the app, before taking notes from observations, asked questions and body language.

Following the Evolutionary Prototyping principle, a basic prototype for this project was then created using the computer program MockFlow (2018), which was capable of visualising the app. The designs can then be demonstrated to the bar's target audience to receive feedback, which could be then implemented in the next iteration.

#### 3.1 Digital Design (Iteration 1)



Figure 6 – Digital Design, iteration 1

Figure 6 illustrates the first attempt at designing the app and therefore can be used to record initial client feedback. Each of the app's pages will be briefly explained below.

**Home:** The content consisted of the company logo, a navigation bar, images, introductory text and then a promotional video of the bar. This page will be the landing page which opens upon loading and was therefore designed to provide a introduction and overview of the bar's facilities.

**About:** This page was used to promote the company's background, including embedded Google Maps to help navigate customers to the premises. The page was also considered as the repository for the drinks menu.

**Contact:** Here will be the required company's details, including phone number and address. A contact form will also be included to allow customers to send enquiries. Finally, a QR Scanner was included below the contact form.

Following the app mock-ups, it was then emailed to fellow students and staff, before it was shown to friends and family for feedback. It was important to gain a wide variety of feedback.

Feedback suggested that the 'About' and 'Contact' page should be combined, as they both included similar information and will therefore be incorporated in the next iteration. One tester was unsure where the menu was stored, explaining that the navigation did not include a 'menu' link. From this, it was decided to add the additional page named 'Menu' that would be the repository for accessing the bar's cocktails menu. The same tester also mentioned that the 'contact form' could be adapted to be used as a 'table reservation form'. This was a useful suggestion and was therefore included in the next iteration. The table reservation option will be included under the menu but will also be linked from the landing page. Version 1.0 included the QR scanner on the Contact page, however as this was to play such an important feature it was suggested by multiple testers that it should have a dedicated page. Following the above feedback, iteration 2 was then designed (Figure 7).

### 3.2 Digital Design (Iteration 2)



Figure 7 – Digital Design, Iteration 2

The second iteration of the app was a closer representation of how the app was finally designed. All of the recommended feedback was incorporated, before it was reshowed to the same set of testers for further feedback. This time the app received a stronger positive reaction, with one tester commenting,



"I like how the navigation is clear and easy to understand". Another tester mentioned that, "having a separate page for the menu made sense, and was perfect to scroll through the list of drinks". During testing there was careful observation of the user's body language and facial expressions when they engaged with the app and it was noted that all seemed at ease using it. To summarise, the general consensus was that all were in agreement that the Iteration 2 was designed to a better standard than Iteration 1. From this, it was therefore decided to create a more complete digitalised version, ensuring that the correct company logos and colour scheme were used.

### 3.3 Digital Design (Iteration 3)

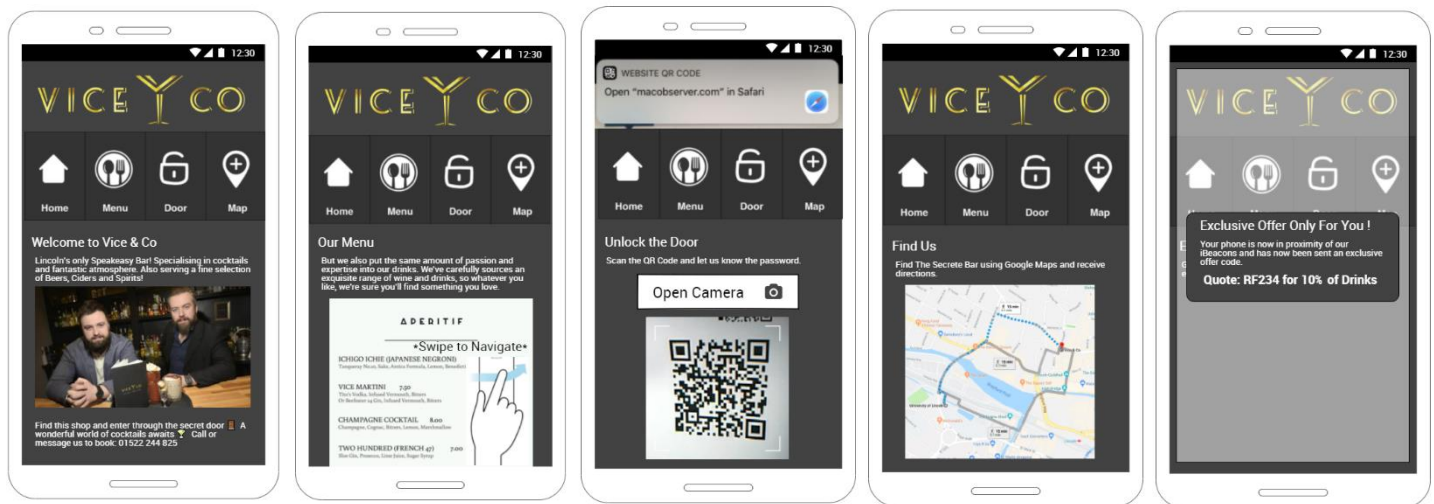


Figure 8 - Digital Design, Iteration 3

Using the computer program MockFlow (2018) it was possible to design a closer representation of how the final app may be designed including its functionality. Using the company's colour scheme, the page was designed to correspond to their branding, therefore making the app representative of their luxury experience.

### 3.4 Final User Testing and Feedback

The final drive for collecting user's feedback was conducted using a focus group, making sure they matched the app's target audience. The aim of the group was to collect and record opinions on how the app had been designed. Whilst conducting the focus group, it was made sure to follow the Guerrilla Usability Testing techniques (Simon, 2017), which included watching how the app was perceived and used. During the testing period, one tester commented, "I think the idea of making customers scan the doors QR code using the app is amazing, and makes the experience of visiting more exciting".

Quantitative and qualitative evaluations were also used when testing. Quantitative data collection was used to gain a rapid understanding of if the app's features functioned as intended, by asking for the response 'Yes' or 'No'. The following question then expected a qualitative answer, by the tester to explain in more detail what for them was good or bad about the design. Using a System Usability Scale (Figure 9), it was then possible to record feedback from the testers. When asked, do you feel confident using the system? The average score was 4.1, with the majority finding the app easy to understand. Next, asking users to rate the app's included features, the app received the average of 4.5. From this, users commented on how the many features helped to make the app attractive and exciting. One user mentioned that the various functions in the app were well integrated and utilised. Overall 80% of ten users enjoyed their experience whilst using the app. 90% all agreed that navigation on the app was simple and easy to follow.



Strongly Disagree 1	2	3	4	Strongly Agree 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 9 - System Usability Scale (SUS)

Other feedback included how the app was simple to navigate and understand, this was because of structure and accurate page names. Referring to the original set requirements, the app managed to satisfy them all with each active tester able to pick out where the requirement was met. This is exactly what was hoped to be achieved and therefore this indicated that a digital design could then be programmed that would satisfy the client's expectations.

## 4. Final App

### 4.1 Proof of Cross-Platform Deployment

Table 1. Range of Mobile Phones

<p>iPhone 6   11.2.6   750x1334</p>  <p>Figure 10 - Apple iPhone 6 with iOS 11.2.6</p>	<p>Galaxy S5   6.0.1 (Marshmallow)   1080x1920</p>  <p>Figure 11 - Samsung S5 with OS 6.0.1</p>
<p>Galaxy S8   8.0.2 (Oreo)   2960x1440</p>  <p>Figure 12 - Samsung Galaxy S8 with OS 8.0.2</p>	<p>Nexus 7 Tab   6.0.1 (Marshmallow)   800x1280</p>  <p>Figure 13 - Nexus 7 Tablet with OS 6.0.1</p>

## 4.2 Two Elements that Highlight the Design and Development

The **In-App Browser** is a useful tool to utilize and during the app development, social media links had been embedded into the app's footer. Halliday (2017) explained that the integrated in-app browser plugin can be used to load websites without leaving the app. From this, it was then decided that having four social media links in the footer, which redirected the user to the phone's default installed web browser before loading the link, was an example of a bad user design. This was because reloading the app required the browser to be closed before re-loading the app from the open apps toolbar, which seemed too unwieldy and time demanding (Southern, 2017). When this was reviewed in the testing phase, users did not enjoy having to reload the app each time they had loaded a social media link. From this, it was decided to include the in-app browser function, which loaded and ran the webpage without leaving the app. This surfaced as becoming an example of developing a more efficient design within the design process, as it meant the user did not need to reload the original app. Doing this improved the user experience and during further testing users were much happier loading the social media links than previously. They commented on the usefulness of the in-app browser and its simplicity.

It was difficult to implement the in-app browser, as firstly I was creating a new homepage for each of the websites. This then led to four additional pages which the user was redirected to when pressing the social media link. From this, it was then explained that no additional pages were required, and from using some JavaScript each link could be executed through the script. Table 2 demonstrates the JavaScript used to look for the class 'sociallinks' before then finding the URL through using data('link') attribute and passing this link into the 'window.open' which executes the in-app browser. It can be noticed that a few console logs have been inserted to ensure the script is executing.

Table 2. JavaScript, Load In-App Browser

```
$(document).on('pagecreate', '#pageone', function () {
  //console.log("Loading Social Links");

  $('.sociallinks').on('click', function (e) {
    //console.log("Social Links Button Pressed");
    var link = $(this).data('link');
    console.log(link);
    window.open(link, "_blank", "location=no");
  });
});
```

Table 3 is the HTML mark-up code for the social media within the footer. The class 'sociallinks' has been applied to all, before the data-link is used to store the websites URL. It can also be noticed that data-ajax has been set to false, which then enables jQuery Mobile to perform a normal page request instead of using Ajax.

Table 3. Footer Navigation Bar, Social Media

```
<a class="sociallinks" data-link="https://www.viceandco.co.uk" data-ajax="false">
  
  <br/>Website
</a>
```

It was decided that the **Barcode Scanner** was to be implemented into the app. This followed the initial idea of having the user scan the on-door QR code, which returned the password to the door. The barcode scanner was one of the main aspects of making the app meet the original requirements of being a mobile moment. It was required that to access the bar that the on-door QR code was scanned using a mobile device to reveal the password, which would have to then be spoken to gain access to

the premises. From a user experience, it makes the prospects of using the app more engaging and develops a broader user experience. The page itself was intended to be basic and therefore easy to navigate. The page name was 'Door' which explained exactly what it was being used for. Once the page had loaded, there was a button which read 'Barcode QR Scanner'. The button was large and easy to spot making it a noticeable feature and therefore an example of good user design. UX Planet (2017) explained that buttons should be designed to stand out and provide visual feedback. It was also important to think about the location and position of the button, by doing this it facilitates a good user experience.

Implementing the barcode scanner was initially difficult, as at first the plugin was not inserted and therefore the camera could not be accessed. Further research highlighted the camera plugin had to be specified in the 'config.xml' file (Table 4).

Table 4. Barcode Scanner, Config.xml

```
<!--Cordova Barcode Plugin -->
<plugin name="phonegap-plugin-barcodescanner">
  <param name="CAMERA_USAGE_DESCRIPTION" value="We are using the Camera for to scan barcodes" />
</plugin>

<!--Barcode Allow Device Camera Usage (Android) -->
<edit-config target="NSCameraUsageDescription" file="*-Info.plist" mode="merge">
  <string>App Needs access to the camera access to take scan Barcodes</string>
</edit-config>

<!--Barcode Allow Device Camera Usage (iOS) -->
<edit-config platform="ios" parent="NSCameraUsageDescription" overwrite="true">
  <string>App Needs access to the camera access to take scan Barcodes</string>
</edit-config>
```

Following this, the function was then required to be programmed in JavaScript. Table 5 is the button which called the JavaScript code which is responsible for calling the barcode scanner (Table 6). The code consisted of a basic button with an 'onclick' event. Once the button was pressed, this then executed the QR scanner code. If a QR code was scanned, the page will then redirect to the 'password.html' page, which had previously been hidden.

Table 5. Button for QR Scanner, Door.html

```
<!--Barcode Scanner Button -->
<button id="Scanner" style="font-size:1.5em">Barcode QR Scanner</button>
```

Table 6. QR Scanner JavaScript, Main.js

```
$(document).on('pagecreate', '#pageone', function () {
  $("#Scanner").click(function() {
    //console.log("Camera Scanner Button Pressed");
    CameraScannerBar();
  });
  function CameraScannerBar() {
    cordova.plugins.barcodeScanner.scan(
      function (result)
      {
        //console.log("Camera Barcode Scanner Function Started");
        alert("Barcode Found!");
        location.replace("password.html");
      },
      function (error)
      {
        //console.log("Camera Barcode Scanner Function Failed ");
        alert("Scanning failed: " + error);
      }
    );
  }
});
```

## 5. Reflection

What has been gained from this task is the realisation that Cross-Platform development is useful to understand and work with. This is because by designing and programming one app, it becomes possible to export this into many different formats and work on a wider variety of devices. Medium (2016) described “cross-platform as one of the fastest-growing mobile app development trends that essentially allows you to create a single product with double the results”. This is the main benefit of choosing cross-platform as a service, being able to build native apps for all platforms. Using programs such as Android Studio only allow native apps to be programmed for Android, alongside XCode for iOS (Apple). By using PhoneGap it was possible to build agnostic apps for both platforms simultaneously, having the APK for Android and the IPA for iOS ready to download, which could then be uploaded to the App or Play Store for public use.

A few benefits of using cross-platform development could include a greater reach, being able to be released apps for multiple platforms simultaneously. Yaskevich (2018) explained that cross-platform apps are easy to build as they use HTML, CSS and JQuery to compile are therefore are ideal for web developers to use. Because of this, developing the app can be completed quickly, therefore having low labour costs. Yaskevich then explained how ‘native’ apps can offer a higher performance as they have been targeted to a specific device. However, due to only being designed for a set device, debugging and maintenance are cost efficiently. Yaskevich summarised that “clinging to native development alone and denying other possibilities isn’t practical” and therefore the use of cross-platform should be utilised for future app development.

During the development of the Secret Bar app, it was particularly difficult to understand how PhoneGap worked. By installing the phone plugins into a ‘config.xml’ with the code being called within the HTML pages it was often noticed that when compiling the code through the PhoneGap portal, one of the apps would often break with the build only working for one type of device. From this, the PhoneGap ‘logs’ feature was opened, which allowed the developer to browse through the code as it was compiled as procedure, therefore line-by-line making it easier to spot the error. Other ways of debugging included loading the app in the web browser. Once loaded, it then becomes possible to use the console logs to check for any errors that might be appearing. The console.log feature was used to ensure that the JavaScript was executing. Once the error had been spotted the code could be adjusted before it was re-uploaded and rebuilt, and then checked to see if the error had been fixed.

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## 6.1 Reviewed Apps

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