CPT THE SECOND

CUSTOMER PRODUCT TRANSPARENCY

SMARTPHONE APPLICATION
DESIGN PROPOSAL
& PLAN

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DESIGN PROPOSAL

SUMMARY OF BRIEF

Client's Request

SAP Research Centre Brisbane have approached The University of Queensland's School of Information Technology and Electrical Engineering (ITEE) students to design and build a mobile customer transparency tool to provide transparency into the sustainability of a retailer's top products and suppliers. The client is seeking a unique and creative solution to be deployed as a smartphone application that takes advantage of the latest barcode scanning or augmented reality technology.

The broad proposal from SAP was to design and develop a mobile application that allows customers to access supplier and product related information, providing transparency into the retail supply chain. The application will assist customers in making informed purchasing decisions by providing insight into the sustainability of the product. The sustainability characteristics specifically mentioned by SAP are as follows:

- Ecological Footprint (such as energy efficiency, water use)
- CO2 Emissions
- Manufacturer Improvement Initiatives (such as waste reduction and recycling initiatives)

In conjunction with revealing environmental sustainability information, SAP Research were also interested in helping customers choose and differentiate between products by providing insight into their health, financial, and social impacts. The following characteristics were suggested by the initial proposal and also revealed during further communication with SAP:

- Allergen Information
- Product origin information (preferably displayed visually on a map)
- Working conditions of manufacturing workforce
- Ingredient origin information (such as 'rainforest alliance' coffee certification)
- Social and macroeconomic impacts of production (i.e. not too heavily focused on one industry)
- Nutrition information

While SAP were happy for developers to use their creativity in order to arrive at a solution, the primary focus was clear. The application should provide factual sustainability information (ecological, health, social, and economic impacts), rather than developing an application with peer-based product reviews as the core structure.

About SAP Research

SAP Research is the Australian research arm of the global technology leader SAP AG and is located in Brisbane. SAP Research employs 500 employees (including PhD candidates) and has a network of 19 research locations across five continents. Their areas of research attempt to anticipate identify and capitalise upon emerging IT trends and turn simple innovations into valuable business products [10].

The research unit is just a small subsidiary of SAP AG, which boasts over 54,000 employees across the globe making it the world's largest business software company. SAP AG's core product focus is developing Enterprise Resource Planning software but also develops customer, supplier, supply chain, and product management solutions. Their research division explores new technologies and trends which fall under the following seven key topics:

- Business Intelligence
- Business Network Orchestration
- Internet Applications and Services
- Mobile Computing and User Experience
- Security and Trust
- Software Engineering and Tools
- Technology Infrastructure [6]

The domain of this project falls squarely under SAP's 'Mobile Computing and User Experience' research area which attempts to deliver "high impact product innovations in mobile computing, Internet-of-Things, and user experience technologies" [6]. The development of a customer transparency tool is of interest to SAP Research as it represents a highly innovative and expandable concept with good potential as a profitable business product.

Motivations behind the Project

Traditionally, aspects such as cost, familiarity, and quality have been the primary factors influencing the decision to purchase one brand or product over another [2]. However, rapid changes in environmental awareness and the ability for information to propagate globally over social networks,

have brought about another major factor that is becoming increasingly important in the product comparison process - sustainability [2]. Claims of using cheap labour or toxic ingredients can rapidly spread and damage a brand or company reputation in a very short time frame [1]. Bad publicity, whether accurate or not, is more likely to present itself when a company wraps the development of its products in a shroud of secrecy. The need to draw back the curtain on the supply chain has never been greater [1] [13].

The main goal of the system is to assist retailers in developing a high level of trust with its customers through displaying information on the supply chain of products. By creating an application that provides transparency into the supply chain, retailers and suppliers become more accountable for their products which in turn increase customer confidence over time. Giving customers access to such sensitive information will bring about positive change in sustainable business practices for many companies in the retail industry [5] [1] [13].

Benefits to SAP

As a business, SAP must be able to derive sufficient cash flow from the project in order to cover the capital outlay and generate a profit. While actual marketing and sale of the final product will be up to the client, the project still must define a clear target market and business model in order to justify its acceptance by SAP.

As will be explained in detail later, the customer product transparency application is used by two distinct parties - the end user who interacts with the mobile application and the retailer who populates their products into a database via a back-end API. The project can be marketed in two ways (the decision of which will be left up to SAP):

- End user purchases the mobile application via their platform's 'App Store'
- Retailer purchases API access to product database

Marketing to End User

The most straightforward type of business model is where the end user, such as a supermarket customer, purchases the application via their mobile phone's app store and installs it on their device. The revenue stream will be highly dependent on the average person's perception of the value that can be derived from the application. This is not necessarily a problem if users can immediately recognise value, and the utility of that value is greater than the price charged for the application. Upfront pricing is widely known to inhibit viral uptake of mobile applications, and while the intrinsic value of the app is not dependent on having mass users (as would an app relying on peer-

contributed content - social networking sites etc.), upfront pricing may inhibit the larger retailer goals that rely on a large social response to the app.

Upfront pricing is not the only option when charging end users. The success and profitability of many mobile applications rely on releasing the application for free, and then once users recognise sufficient value they may pay a premium to unlock additional features. This type of pricing strategy is often known as 'Fermium' pricing [17].

Marketing to Retailers

A slightly more involved business model is to charge retailers access to the product database. Under this model the retail business agrees to pay a licensing fee in order to have their products listed in the database. This means the retailer must also be able to derive sufficient value from the application to justify the expense (discussed further in later sections). While charging the retailer and offering the mobile application for free, it is expected that the user uptake will increase significantly.

Both of these options, however, contain a level of risk. The application's functionality is put at risk as the entire application relies on the willingness of the retailer to provide such information. For example, if all supermarket chains did not pay for the database access, then the value of the application is significantly decreased. Despite these risks, the situation is considered unlikely due to the competitive nature of the retail sector - if one major supermarket were to agree then they would immediately gain a competitive advantage if the others chose not to follow. By agreeing to pay for access, the retailer would also gain some control over additional product recommendations, opening up the opportunity to upsell and cross sell products.

The option to display advertising should also be evaluated as a potential source of revenue, whether it is in conjunction with one of the above options, or as the sole source of revenue. Advertising may be sourced via iAd for iOS devices, via AdMob or Adsense for Android devices, or independently through retailers.

Aside from financial gain, the project aligns itself with the wider corporate social responsibility goals held by SAP AG. Their primary Corporate Social Responsibility goal of "making the world run better" involves promoting sustainability of the supply chain. By providing software that helps increase the transparency and address risk in the supply chain, SAP can turn the concept of sustainability into concrete actions that directly benefit both society and our environment. This project will add to the 900 million consumers [12] estimated to be living healthier and safer lives due to the initiatives and supply chain management software put in place by SAP.

Benefits to the Retailer

Given the intention for SAP Research to resell the customer product transparency application, the end client i.e. the retail business, must also be able to gain sufficient value from the project. As mentioned earlier, this is very important if the client decides to charge retailers a licence fee to list their products.

While it might seem counterintuitive, sustainability and profitability are not mutually exclusive. Not only can supply chain transparency help the retailer avoid damaging speculation about its suppliers, there is also evidence of consumers responding positively towards retailers advocating sustainable sourcing [3]. Companies willing to respond to changing consumer preferences can potentially leverage the benefits of transparency at many points along the supply chain, with opportunities listed below [7]:

Suppliers

- Product innovation & new market opportunities
- Brand awareness
- Increase credibility of claims
- Certification awareness (Halal, Rainforest Alliance, etc.)
- Adapt quickly to changing consumer preferences

Retailers

- Develop competitive edge
- Take advantage of a high growth market
- Strengthen corporate social responsibility
- Increase social media presence
- Increase customers loyalty [13]

A retailer who is the first in their industry to contribute data will secure a clear competitive edge over their competitors by capturing the high growth 'sustainability-aware' consumer market. The retailer will also have the opportunity to promote their commitment to sustainable sourcing, giving greater credibility to their wider corporate citizenship and environmental policies. For larger retailers such as Woolworths or Coles, share prices respond positively to any announcement that may signal

long-term value creation. A commitment to sustainable sourcing is likely to signal increased stability in the supply chain, reducing the volatility in future earnings.

Additionally, customers are often willing to pay a higher price for goods they know are environmentally friendly. Retailers and suppliers must convey this information more powerfully in order to attract consumers [9]. This means the introduction of supply chain transparency to customers will not reduce the business's profits if it is selling sustainable products. If anything, it encourages companies to do the right thing and choose suppliers carefully which will in turn convince suppliers to better their products [13].

Benefits to the End User

Ultimately it is the end user who the system must satisfy most - without a strong user base the application is useless to all parties. While the individual user's utility of the application is not dependent on the system having many users, the retailer's commitment to sustainability must be recognised by a large volume of its customers in order for the expense involved in contributing data to be justified. A large user base is even more pertinent if the client decides to charge retailers a licence fee.

This Customer Product Transparency system provides many benefits to the end users of the application. It ensures that customers have confidence in the products they are purchasing as they can easily access information regarding the sustainability and social responsibility of suppliers, nutrition details and the origin of the goods. The information available also allows customers to compare products efficiently, making it convenient to select healthier products. It saves customers time at supermarkets trying to determine which products are right for them.

The customer reviews within the system give an independent third party opinion on products which builds the confidence and trust of customers. It acts as confirmation that product information provided is reliable and enables customers to give feedback on particular products that may influence other customer's opinions. This then reflects upon the suppliers of the goods, influencing them to make right decisions in the future (e.g. with respect to the environment). All of these factors give consumers a sense of power and results in greater satisfaction.

DESCRIPTION OF SOLUTION

High Level Proposal

To fulfil the specific requests outlined by SAP Research, the following design proposes the development of an android or iOS smartphone application to provide detailed information about a consumer product. The application will use optical barcode recognition to reveal a unique product identifier when the user captures an image of the product's barcode. The unique identifier is then submitted to the application's web service which returns basic product information and detailed sustainability and supply chain information to the user.

Sustainability and supply chain information will include:

- Product name, description, health related information, rating, and reviews
- Sustainability information
    - Energy efficiency, water use, CO2 emissions
    - Product certifications (e.g. Halal, Rainforest Alliance sourced)
- Supplier name, description, rating, and reviews
- Supplier Improvement initiatives:
    - Waste reduction or recycling initiatives
    - Biodegradable packaging development
    - Supply Chain Management initiatives (e.g. Just In Time production)
    - Water recycling and conservation measures
- Google Map path/waypoint information that shows the origins of a product, its ingredients, and/or other points along the supply chain.

Justification of Form

One of SAP's fundamental requests was that the solution had to be mobile. Subsequently, the choice was between deploying the project as a mobile web application where no code is installed on the user's device, or to deploy the solution as a full platform-dependent application. The following section outlines the pros and cons on of each of the available options.

	Pros	Cons
Web Application	● Platform Independent ● User does not need to download updates if bugs detected ● CSS-based graphic styling ● Easy Public API Integration ● One package solution, no additional web service required	● No support for advanced camera functions ● Heavy mobile internet usage ● Slow response times
Mobile Application	● Full camera integration and access to advanced functionality ● Fast response time ● Minimal internet usage ● Familiar user interface (for Android / iOS) ● Open source software packages ● High level of support for public API integration	● Requires web service to handle database requests ● Platform dependent, will require separate application to be developed per operating system ● Manual user updating when patch is released

Weighing up the advantages and disadvantages of the available options, the decision is made clear by the fact that the core functionality of the proposed solution relies on being able to access the advanced functionality of the user's camera. The benefits of the web application are mainly to do with simplicity of deployment and maintenance, and to create a complex solution to allow access to the user's camera is a risky endeavour given the benefits is only marginal.

Functions & Features

The product transparency system comprises of three distinct parts - the user's mobile application, the web service that returns data to the user application, and a back-end database administration tool. To prove that the proposed solution fulfils all of SAP's requests, the following section will outline all major functionality included, as well as briefly describing functionality considerations that were not included in the final design. The client's primary requests for the solution were that the smartphone application:

1. increases transparency of the retail supply chain
2. provides sustainability, carbon footprint, and health related information
3. shows product origin on a visual map
4. utilises barcode recognition or augmented reality technology

5. aligns with SAP AG's higher organisational goals and interests.

Major Functions

Barcode Processing

As the client specifically requests that the application to use barcode recognition technology or augmented reality, the proposed solution leverages existing open source barcode scanning packages. These code packages are freely available for all major mobile platforms (Android, iOS, WP7), and significantly reduce required coding hours for the project. The barcode scanning technology functions by activating the user's embedded camera, to which the user then locates the barcode on the product they are interested in and photographs the barcode. The application then interprets the image and returns the product barcode for submission to the web service.

Data Retrieval

After the application interprets the barcode, it then generates a formatted server request containing the barcode and request type and submits it via the user's mobile internet connection to the externally running web service. The web service interprets the request and retrieves the respective database entry and returns it to the user's application. Several other information requests may be received by the web service for retrieving further information about the product, supplier, mapping locations, etc.

Data Formatting & Display

Once the database record is received, the user application creates a new screen where the data are bound to the GUI to produce a visually appealing display. The information is formatted based on the pertaining source code which defines basic styling elements, such whether to display a database field as a table or text field, and of course basic properties of the field such as width and height.

Major Features

Product Information

After receiving the server response and formatting the data, the application presents a highly formatted screen displaying all the product and sustainability (ecological, health, etc.) information. The fields and objects displayed on this screen are discussed further in the detailed design section. By providing a high level of information, the design is deemed to have satisfied the client's request that the solution provide transparency into a product's sustainability.

Supplier Information

Within the product information page, the user can select the supplier name to reveal more information about the manufacturer on a separate page. This page lists general details about the manufacturer as well as environmental initiatives and other products that the manufacturer produces. The particular fields are discussed further in the detailed design sections. Displaying supplier/manufacturer information is necessary to satisfy the client's request that the design provide transparency into the sustainability of a retailer.

Map Locations

One of the specific client requests was to display product origin information on a visual map. Each of the major mobile platforms has a corresponding mapping service (e.g. Google Maps for Android) for which a public API is provided. A separate web service request is submitted to return all locations corresponding to the product barcode. The locations stored in the database have both latitude and longitude fields for creating a waypoint with the mapping API, as well as extra fields for displaying the name, description, image of the location if such information is available from the retailer. The underlying database provisions a separate table for locations, allowing more than one location to be linked to a single product. This allows multiple waypoints to be placed on the map to form a visual network of locations.

Social Network Integration

To further the functionality of the mobile application, the design should incorporate some form of social interaction or leverage social media. As social networks are fast becoming the number one and most trusted source of information [8], most successful applications involve some form of online community or the ability to interact with the app or other users [4]. Incorporation of this design principle need not be complex - most are relatively ubiquitous, often presenting themselves as a user contributed rating system, user reviews/comments, or the ability to share over a social networking website. To align the design with this principle, users are able to share the product information returned by the application on social networking websites, and users who login via their Facebook account will be able to rate suppliers and products, as well as leave short review comments. A community-powered rate/review aspect serves to reinforce the credibility of the information provided by the suppliers and application [13].

These ratings and reviews are submitted to the web service as separate requests and recorded against the user's Facebook account, ensuring that a review or rating cannot be submitted for the same product or supplier more than once.

Additional Features

Aside from the core functionality required by SAP, a number of additional functions need to be implemented to provide the user a more 'complete' feeling and allow the user to draw more value from the application.

- Recent History: A recent searches tab on the front page of the application provides the user an easy way to access their 10 most recent products.

- Favourites: A favourites tab on the front page allows the user to easily access any products saved as favourites. A user saves a favourite by going to the menu within the product details page and selecting add to favourites, alternatively the user can also save a favourite by long pressing one of their recent searches and selecting add to favourites.

- Settings: The settings menu will allow a user to select the format of barcode to scan for. By default the application scans for all known barcode types, but to speed up process time the user can select to only scan for particular types of barcodes.

- Help Screen: A help tab will be located on the main application menu (in the same place as the settings menu) and will give the user a brief guide on how to use the application. This help screen is intended to be short but provide enough detail how to use the main functions and troubleshoot simple problems.

- Content Flagging: If a user feels an item of content such as a review or product description is incorrect or incomplete, the user can flag the item for review by an administrator.

Functionality Not Included

One of the client's research areas was the concept of an "internet of things" [14], which refers to connecting networks of real world physical objects via the internet [11]. The application of this concept was assessed for potential inclusion in the project but was decided against due to financial concerns. The idea was to build a real-time product tracking network that would provide location data of a unit of product as it was transformed across the supply chain. The network would operate similar to parcel tracking, where small M2M modems and RFID scanners would be installed at points along the supply chain (e.g. from farm all the way to warehouse distribution centre) and report back telemetry data on products that pass through each location. This would result in incredible transparency of the supplier and allow customers to assess the freshness of products by viewing the total time or distance from 'farm to fork', looking at how long a product has been stored for at a

location, and more. While an excellent conceptual idea, the financial and time constraints of the project resulted in this idea not being included in the design.

Mobile Application Delivery

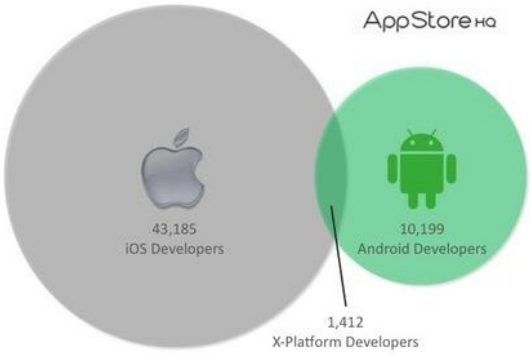
The product should be delivered to consumers via the chosen platform's respective App Store in order to roll out the application to a larger and wider target market. In making the choice of platform to deploy on, the following statistics would help to identify the targeted mobile operating system and 'app store' based on their respective popularity and market share.

Worldwide smartphone market, by operating system, by 2011 global sales according to Canalys			
Operating System	**Shipments 2011 (millions)**	**Market share 2011**	**Annual growth**
Android	237.7	48.8%	244%
iOS	93.1	19.1%	96%
Symbian	80.1	16.4%	-29.1%
BlackBerry	51.4	10.5%	5.0%
Bada	13.2	2.7%	183.1%
Windows Phone	6.8	1.4%	-43.3%
Others	5.4	1.1%	14.4%
Total	487.7	100%	62.7%

[15]

Both Android and iOS have shown great market potential as they both have a big market share and a large growth potential as compared to the other operating systems [15].

Comparison between Google Play Store and Apple (iOS) App Store



[16]

Developer App Store Membership Comparison

Membership is required to have apps placed onto the app stores, developers would have to purchase their membership at USD $99 for the Apple App Store and USD $25 for the Google Play Store. The Google Play Store would result in having more free apps when compared to the Apple App Store where most of the apps are paid for. This is an important consideration should the client decide to charge the end user for the application [16].

Software Development Toolkit and Language Comparison

iOS apps utilises Xcode for development on Mac, iPad or iPhone. For the iOS web kit it only utilises Objective C, C++ or JavaScript. Google SDK is made free and available on all platforms utilising Java and also C or C++ for interactivity.

<u>Web Service Delivery</u>

For deployment, the web service would have to be hosted online on infrastructure with low latency and high throughput capacity given the user's expectations of low response times and high potential user-base. Two possible options for the deployment of the web service to meet the demands of the application have been identified;

Cloud Computing

- Web hosting infrastructure based on the cloud.
- Advantages: Scalability, additional instances could be created or added to meet the high loads or demands of the application. Ease of use, updates and creation or removal of

instances via the control panel. Reliability, clustered server infrastructure prevents hardware or server failure.

- Disadvantages: Hardware, no access to any upgrading or integration of hardware. Cost, bandwidth would be more expensive depending on the amount of bandwidth that is required. Security, instances would not be as secure as an independent connection.

Web Hosting (Dedicated Server)

- Dedicated web hosting with complete access to applications and platform operability. Having a standalone bandwidth serving the needs of the application.

- Advantage: Hardware, ability to integrate or upgrade hardware of the server. Security, independent or isolated machine would be more secure due to lesser connections to the server.

- Disadvantages: Scalability, difficult across multiple machines for load balancing, backup and maintenance. Hardware cost involved in installation and setup of the server.

This design proposal recommends having the web service deployed on the cloud as scalability and reliability would be a major factor when having to meet with the high loads or demands of the application.

STATEMENT OF WORK

In responding to the brief, this design proposal details the development of three distinct services that work together to comprise the system. The delivery specifics of the three components are described below.

Mobile Application

Develop a smartphone application that allows a retail shopper to use their mobile phone's camera function to capture and process a product barcode, and return detailed ecological, health and economic sustainability information from an external database through a web service (described below). In addition to displaying sustainability information, the application will map out the various product origin and processing locations to give a visual representation of the supply chain. It will also integrate with Facebook allowing consumers to rate and review both suppliers and individual products. The choice of whether the user application is written for Google Android or Apple iOS devices is up to the development team.

Web Service

Develop an externally hosted web service to serve the mobile application's data requests by accessing a detailed product database. The database will store general product, sustainability, and manufacturer information, as well as user contributed content such as reviews, and administrative records such as retailer logins, content revision history, and content flagged for moderation.

Database Administration Tool

Develop an administration tool allowing retailers to upload their product databases into the product transparency system. The tool will also allow administrators to log in to manually administer content, moderate user reviews, and allow the root administrator to manage administration accounts.

DETAILED DESIGNS

The detailed design breaks down the high level proposal into the low level system design. This section is separated into the three major system components and describes each to the level of technical, but not coding, implementation.

For high level component diagram (also known as system architecture diagram), please refer to Appendix A. For ER diagram, please refer to Appendix B.

MOBILE APPLICATION

Hardware requirements

- Touch-interfaced smartphone
- LTE, HSPA or GPRS access (recommend minimum of 1Mbps downlink connection)
- Minimum 470dpi x 320dpi screen resolution (for an Android based design)
- GPS (application will use cell triangulation if GPS not available)
- 4Mpx embedded camera (or higher)
- Compatible platform as chosen by developing team (e.g. Android, iOS)
- Access to platform's app store

Functional Design

The low-level design of the mobile application is subdivided into individual functional components, which either comprise a user input, an output presented to the user, and/or an internal function.

Barcode Scanning (User Input)

The primary function of the application is to process barcodes which the user captures using mobile devices in-built camera. This component should be the first to be explored for development as it is the most integral part of application functionality. There are a number of libraries and existing code solution that could be explored, most namely, Google's ZXing library which is cross platform, open source and widely used. Assuming that ZXing is the library used to implement this functionality it is a simple matter of referencing the library, and binding a GUI button to the method in the library so that the user can action the button to scan a barcode using the devices camera. Depending on the user's actions, the library call back function will be passed a result object which may contain either an error or the text of the barcode. The result object should be checked for a barcode misread or other error and then send the resulting barcode text to the corresponding Web API method.

Client/Server Barcode Processing (Internal Function)

After sending the barcode text to the Web API, the application should display a user-friendly loading bar to let the user know that the application is currently communicating with the Web API and awaiting a response. Assuming that there are no connectivity issues (and that any connectivity issues are gracefully handled by the application) the client should receive a response specifying any errors that may have occurred on the server or the relevant product's data. However if no response is received from the server (there should be a set timeout for the request) the request should timeout and inform the user that the application is not currently able to reach the server and that they should try again later. However upon successfully receiving a proper response from the application should then navigate to a separate page displaying the product information in a user-friendly way.

Product Information Page (Application Output)

To render the page to the user the application should wrap the data model returned from the web service in a view model. This view model will help to transform the raw data returned from the Web API into a presentation friendly format so that it can be bound to the GUI controls.

The information listed on the product result page will contain the following data fields:

- Product name (Label)
- Product Image (Image)

    - The view model will use the image name returned from the web service to open a background thread to load the image over HTTP and bind it to the image control in the product details page.

- Brief description (HTML Text Block)
    - The brief product description will include a list of ingredients and nutritional information of the particular product in a tabular format (if this information is relevant and available). Data such as recommended daily intake (RDI) percentage breakdowns will also be included, to not only give an indication of health sustainability, but also allow users to compare products easily.
    - A control capable of rendering HTML formatted text must be bound to the data returned from the Web API to convert the raw data to a user-readable format.
- Allergy Information (Text Block)
    - Allergen information will be included to provide users with vital details of the product. It is essential that consumers know exactly what ingredients are contained in the goods for a variety of health reasons. These data may be stored as delimited text to allow additional graphical formatting.
    - The data from the server will have to format the list of Allergen names sent back from the Web API before they are bound to the GUI control.
- Sustainability information (HTML Text Block)
    - This section will provide end users detailed sustainability information, such as product certifications (such as rainforest alliance coffee, etc.), any product awards, and general sustainability facts including wider macroeconomic and ecological impacts. All content in this section is HTML formatted to support tables, headings, etc., and to allow quick mark up onto the application screen.
    - The data sent back from the Web API will need to format the sustainability information using the platform's HTML formatter method.
- Water Use (numeric value)

    - The following three metrics (water, energy, and CO2) are separated out to allow graphical formatting, allowing users to make quantitative sustainability comparisons between products

- Energy Use (numeric value)
- CO2 Footprint (numeric value)
- Manufacturer Name (Link)
    - The manufacturer name will be simply bound to a link control which will cause the application to make an API call requesting the manufacturer information to be displayed on a separate application page.

Manufacturer/Supplier Information Page (Application Output)

This page is displayed to the user after a separate request is sent to the Web API to retrieve the manufacturer information. The raw data from the Web API as with the products page is used to create a view model to render the information correctly for user-friendly display after being bound to controls.

The following information will be displayed (where available):

- Manufacturer name (Label)
- Description (HTML Text Block)
    - The raw data from the Web API will be HTML formatted text therefore the GUI control it is bound to have to be able to display HTML formatted text.
- Manufacturer Environmental Initiatives (HTML Text Block)
    - This section allows manufacturers to provide information regarding their future sustainability initiatives to ensure that consumers understand their long term goals.
    - The raw data sent back from the Web API like with the description will be HTML formatted however it must be able to also support hyperlinks to additional information without affecting application flow.
- User rating (Label or Graphic)

    - This value is calculated by the Web API and is the average of all users' ratings from user reviews.

- User reviews (Template/Control)
    - A list of sub-data models will be returned within the manufacturer data model from the Web API, these objects then have to be bound to a data template in GUI or a control custom made for this data type.

- Other products by this manufacturer (Template/Control)
    - This is like reviews a list of sub-data models that must be bound to either a template or control.

Mapping Mechanism (Internal Function)

The Location table in the data schema is linked to a product barcode in a many-to-one relationship respectively. This allows multiple locations to be recorded against a single barcode, allowing potentially complex and detailed supply chain mapping to be constructed using a public mapping API.

Map information displayed (where available)

- Ingredient/material input origins
- Manufacturing/processing locations
- Intermediate locations, such as distribution depots
- Current customer location for final path drawing (based on cell triangulation, or GPS)
- Additionally, a description and photos of the underlying location can be recorded for displaying clickable map drop-pins.

A mapping API must be selected that supports the overlaying of graphical elements such as plots and points, such as Bing or Google mapping. It would be wise to select a mapping API with a native control for the mobile platform being developed upon, this control will then be used to plot paths of products supply chains and important product locations. However depending on the mapping API selected, an API key may need to be procured. The web service will return a list of locations associated with a product, and each location sub-data model will contain a nullable property pointing to the next location in a possible path. This location 'chaining' is akin to a linked-list data

structure, whereby the mapping API can draw a potentially complex supply chain simply by reading a location record and drawing a straight line between it and the location referred to by the NextLocation entry (see data schema). Iterating over all locations recorded against a product barcode will result in the complete path being drawn. The nullable property is important for designating the end of the chain - the final location of the product.

Facebook Login Mechanism (User Input)

Users can login using their Facebook account to leave reviews and flag bad system content, their Facebook ID is then used to associate them with these system objects. For a user to login with Facebook they must be navigated to a Facebook app authorization page in a browser controlled by the application, then when the user completes the login process an authorization token must be retrieved from the browser to ensure that they are logged in, this Facebook ID can then be sent with API requests to store information in the system.

Rate and Review Mechanism (User Input)

When a user is logged in with their Facebook credentials, the ability to rate and review products and suppliers is enabled. A small section below the product or manufacturer information lists existing user reviews as well as a button to add a new review. When pressed, the button reveals a slider or series of radio buttons to rate the product/supplier a value between 1 and 5. The user is encouraged to leave a short text-based review comment of less than a certain length (such as 256, or 512 characters).

Once completed the review is sent back to the web service using a store product review API, or store supplier review API depending on the content reviewed. The API will send the user's Facebook credentials and the content ID number for storing in the database as a compound key to ensure the user cannot rate/review an item more than once.

Adding Favourites (User Input)

When a product is searched by the user and a record retrieved, one of the page's menu options is to bookmark the product into a favourites list. The favourites list is accessed via a heading on the main home screen (along with scan a barcode, and recent searches) and will display a list of all favourites saved by the user. The user can store up to a hard limit of 30 favourites before the application will present an error message when adding to favourites. This limit is designed to keep the application memory footprint low to ensure a fast application load time.

When adding a product to favourites, the product's ID number would be stored onto the memory of the mobile device for retrieving the corresponding record at a later date. When the user selects a favourite to view, the product ID number is submitted via the get product information API to retrieve the full detail of the product, which is displayed on a normal product information screen.

Recent Searches (Internal Function)

Recent searches would display the top 10 most recent searches by the user on the mobile application. The recent list is accessed via a heading on the main home screen (along with scan a barcode, and favourites). When a new retail product is scanned, the product's ID number (i.e. the barcode) would be stored onto the memory of the mobile device for retrieving the corresponding record at a later date. Only new barcode scans will add to the list, and viewing existing records (such as products stored in favourites or already in the recent list) will not contribute towards the recent list.

When the user wishes to review a product they scanned earlier, the product ID number is submitted via the get product information API to retrieve the full detail of the product is displayed on a normal product information screen.

Flagging Content (User Input)

When inside a content item such as a product or supplier information page, the user can report a problem such as inaccuracy or incompleteness of the item by bring up the screen's options menu, or obtaining focus by long-pressing on the item. The flagging content process will record the identification number of the content item and the user's Facebook ID (if available) and calls an API that stores the values in the flagged content database.

Settings (User Input)

The settings menu is located on each screen's options menu. One of the primary options available to the user is to select which types of barcodes to search the captured image for. By default the application should search for all known barcode types, however the settings menu should allow the selection of a combination of any of the following known types:

- UPC-A and UPC-E
- EAN-8 and EAN-13
- Code 39
- Code 93

- Code 128
- ITF
- Coda bar
- RSS-14
- QR Code
- Data Matrix
- Aztec
- PDF 417

This settings change is stored on the applications local memory and hence no web service APIs are required.

Help Screen (Application Output)

A basic help screen is provided to assist the user in completing basic tasks, and is located on each screen's options menu in the same place as settings. This should consist of an embedded HTML page or file to allow easy updating and maintenance. The actual content of the help page should serve as a basic guide to the application as well as provide common troubleshooting tips and FAQ.

USER INTERFACE DESIGNS

Windows Mobile & Android Platform

Colour Scheme

This is the home page for the CPT application running on the Windows Phone 7 (WP7) platform. Green was chosen to be the base foreground colour primarily because green can impress a gentle and comfortable signal to the user, and secondly because the application is aiming to establish a sense of trust between the users and the product. After user testing different background colours, it was decided that black can be the most suitable one for our interface background and fits well with the white texts and green bars.

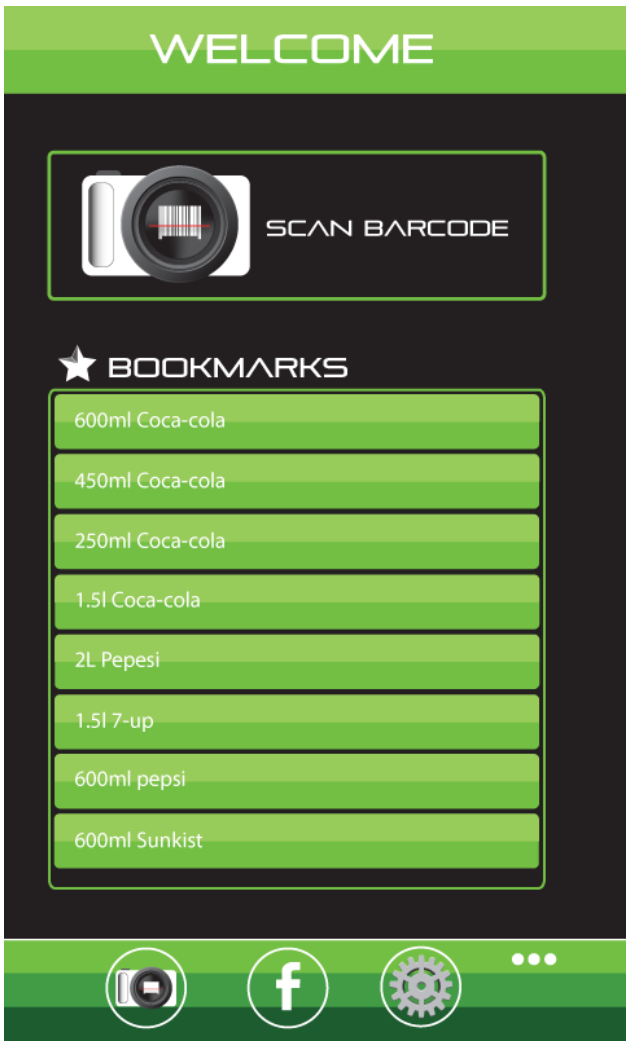
Font Selection

The index characters comprise of a font named Pirulen which is freely licenced and can be sourced from many locations on the Internet. Pirulen was selected for the high user association response, where user testing revealed that a large number of users were immediately able to identify the CPT application based on the index font. Myriad Pro was selected as the application body text based on the high readability characteristics of the font, as well as adding a subtle styling effect.

Screen Layout

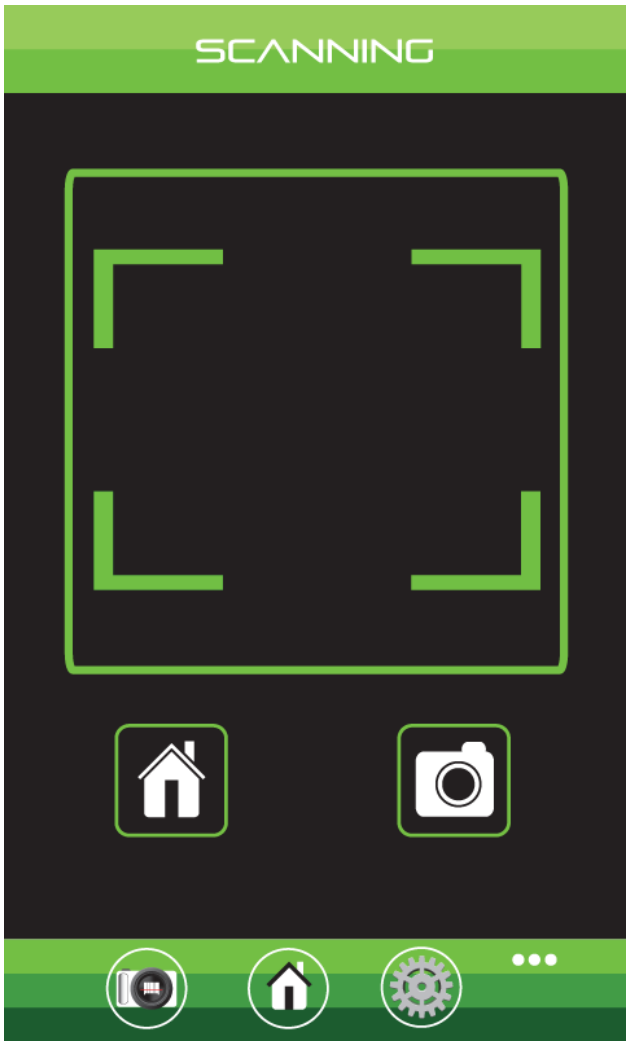
Due to the wide range of user ages, the application layout was kept simple and intuitive to ensure it could be easily navigated by all users. As the scan function is the primary user input of the application, the button is displayed at the top of the screen, allowing it to be recognized immediately. Under the scan button, recent scan records are displayed in an ordered list that helps users quickly check what they have recently searched.

In the bottom section of the home screen, there are three important buttons. The first one (denoted by the camera icon) represents the scan button, the "F" button allows users to login with their Facebook account, and lastly the cog icon allows access to the settings for the application. On the WP7 platform, three successive dots show additional menu options. In the CPT application, the only additional menu option is our help screen.



On the WP7 platform, users need to swipe their screen from left to right to change between screens. The first swipe will replace the homepage with the recently scanned products list and the second

swipe will bring up the favourites page. As the favourites and recent content have some similar features, the layout of the two pages is going to be the same.



When scanning the barcode, more than half the screen is taken up by the camera to make it as easy as possible for users to capture a high quality image of the barcode. The ‘capture image’ button is positioned in the bottom right hand corner of the screen as the majority of people will use their right thumb to take the picture.

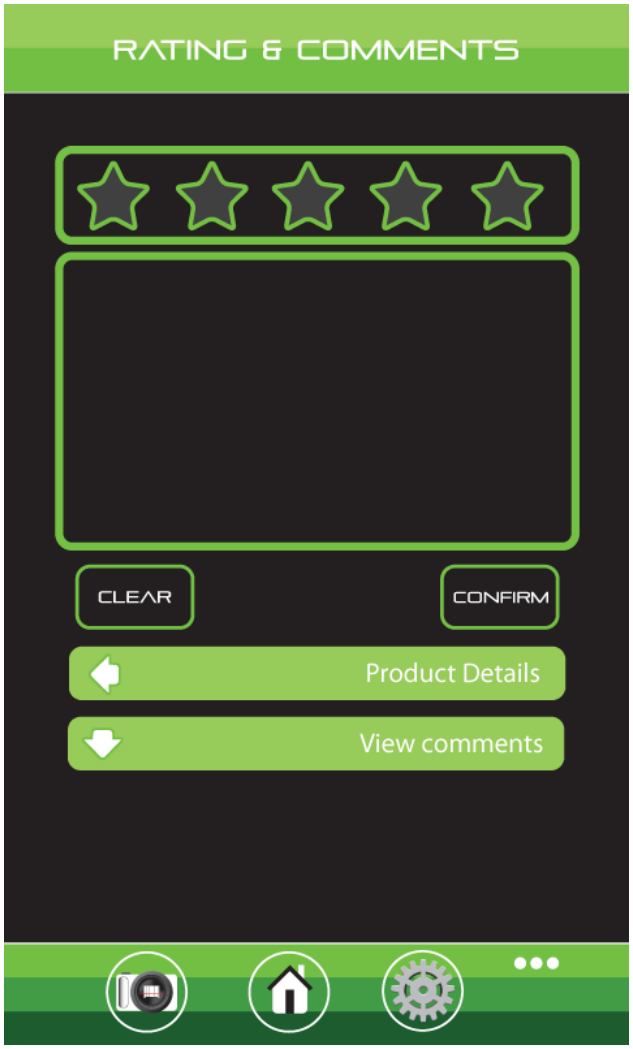
After the scan is completed, the screen will change to product details page which has all the information of the product, including energy use, CO2 footprint, location of the original product, etc. Users can also rate and review products or look at the comments provided by other users.

The product details page utilises an additional 3 colours (orange, blue and grey). In order to use colour to emphasize the attributes of icons, orange is used to represent the level of energy in the energy use bar; blue is used to represent environmental data of the product and grey represents information such as CO2 emissions (air pollution etc.).

The settings button is positioned on the right hand side of the screen as it is common for users to use their right thumb to select these types of options. The first button allows users to re-scan barcodes of products, the second button is used for adding current product details into the favourites list and the third button allows users to delete favourites from the list.

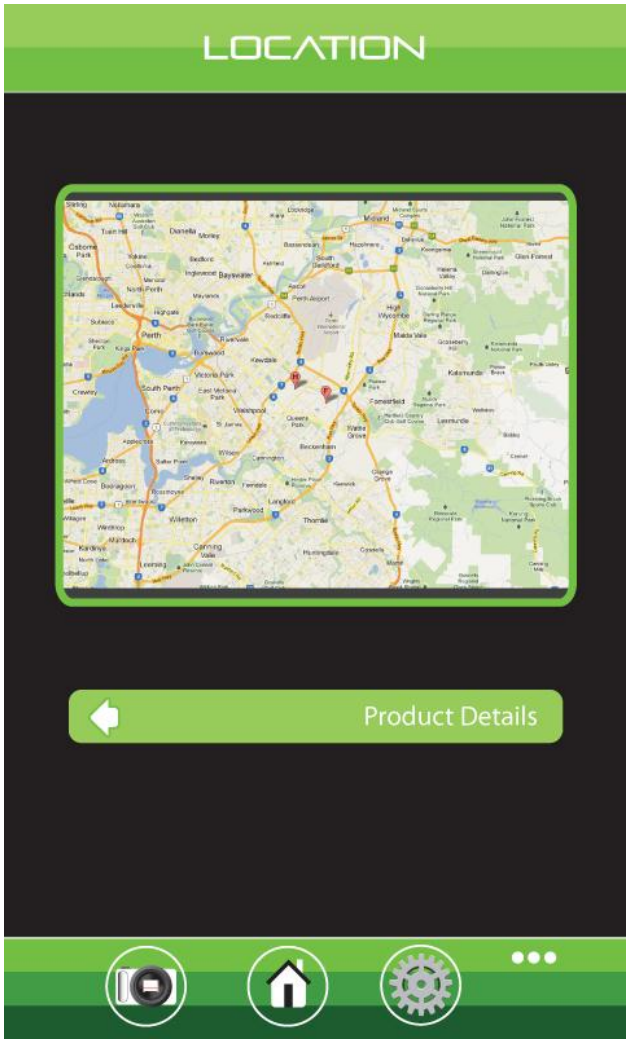
The arrow on the right hand side of each bar indicates how it works. For example, the downward arrow tells users that the option can be expanded by tapping/clicking on it. On the contrary, upward

arrow means this extended bar can be folded back down by tapping/clicking on the part of the bar. However, an arrow pointing to the right, explains that the button will jump to a new page with additional functions and/or information.



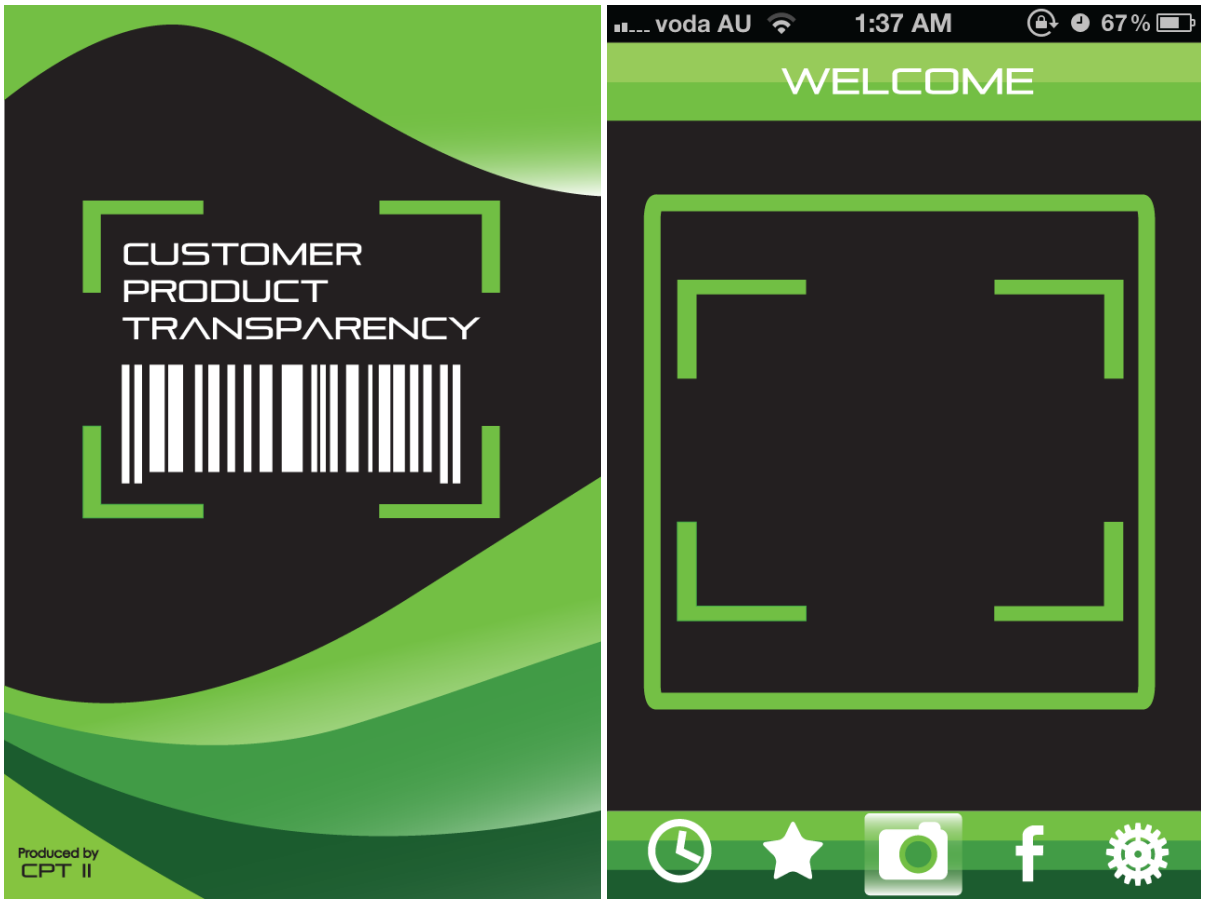
The rating and reviews page offers an opportunity for users to rate the product by selecting a certain amount of stars in the top area of the screen. A textbox is placed below the rating section and allows users to leave comments to the product. There are two buttons below which allow users to either delete the comment they have entered or to upload the comment.

In order to simplify the interface for the users, comments from other users are kept folded until the 'view comments' button is selected. These comments have arrows located on the side of the comment bar to demonstrate to users that the comments can be viewed by clicking on it. The same happens with the bar for Product details. The left arrow indicates that the page will go back to product details page, with it sweeping in from the right hand side of the screen. This animation allows users to feel more comfortable with the navigation of the application.

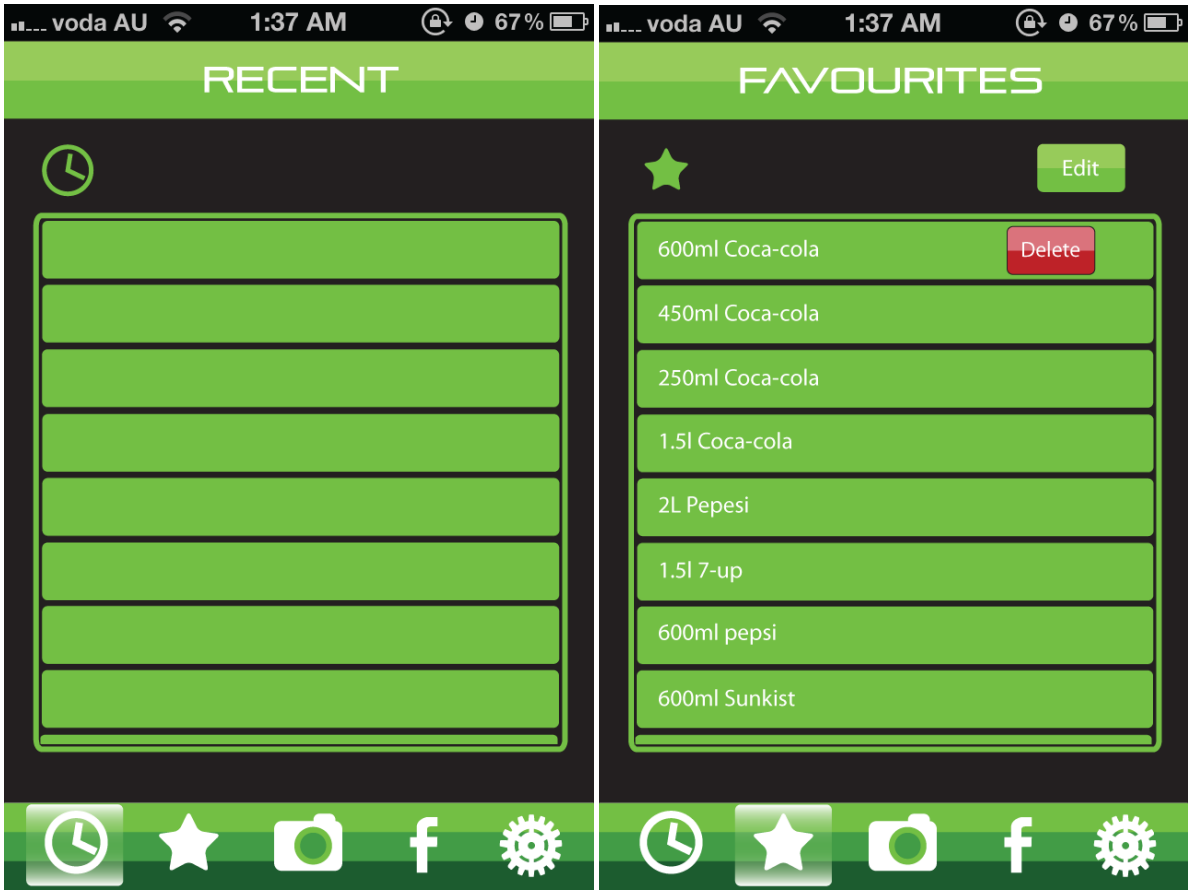


The location details for product manufacturers and the origin of product ingredients is plotted on a map, giving a visual representation of the data. It is easy for users to understand and is more appealing.

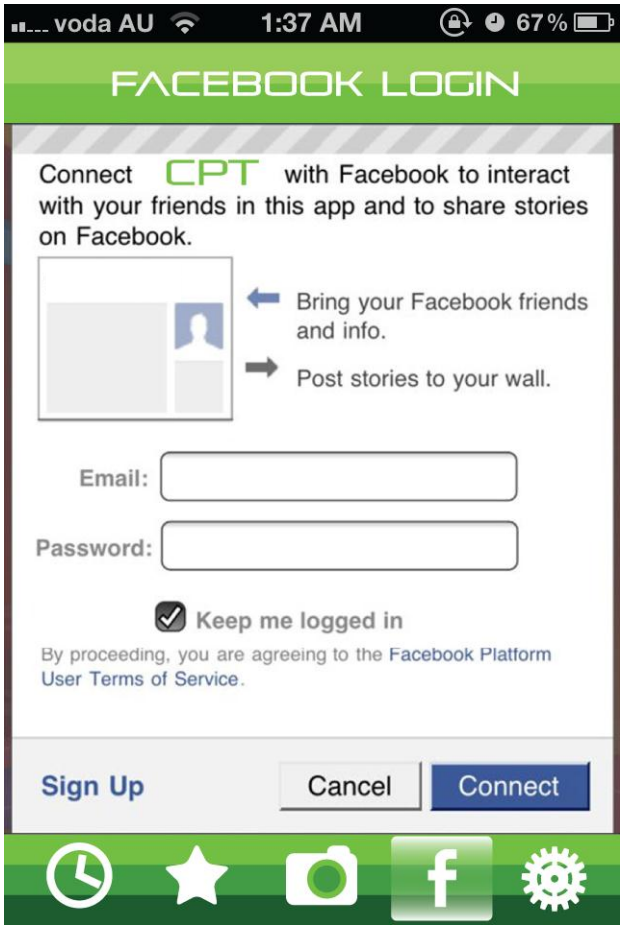
IOS Platform



Compared with interfaces for the Android and Windows Phone 7 platforms, there are some minor design changes for the iOS platform. Firstly the iOS resolution is 640 X 960, however, the WP7 platform is 480 X 800 - this means the layout has to be altered to accommodate for the change in screen aspect ratio. Based on the iOS custom interface, the top section is to be 85px and the bottom section 95px. The home page allows users to directly scan a barcode in order to retrieve product information. If users want to switch to the other function of manually inputting a barcode, they can change the screen by tapping on the different shaped button shown below.

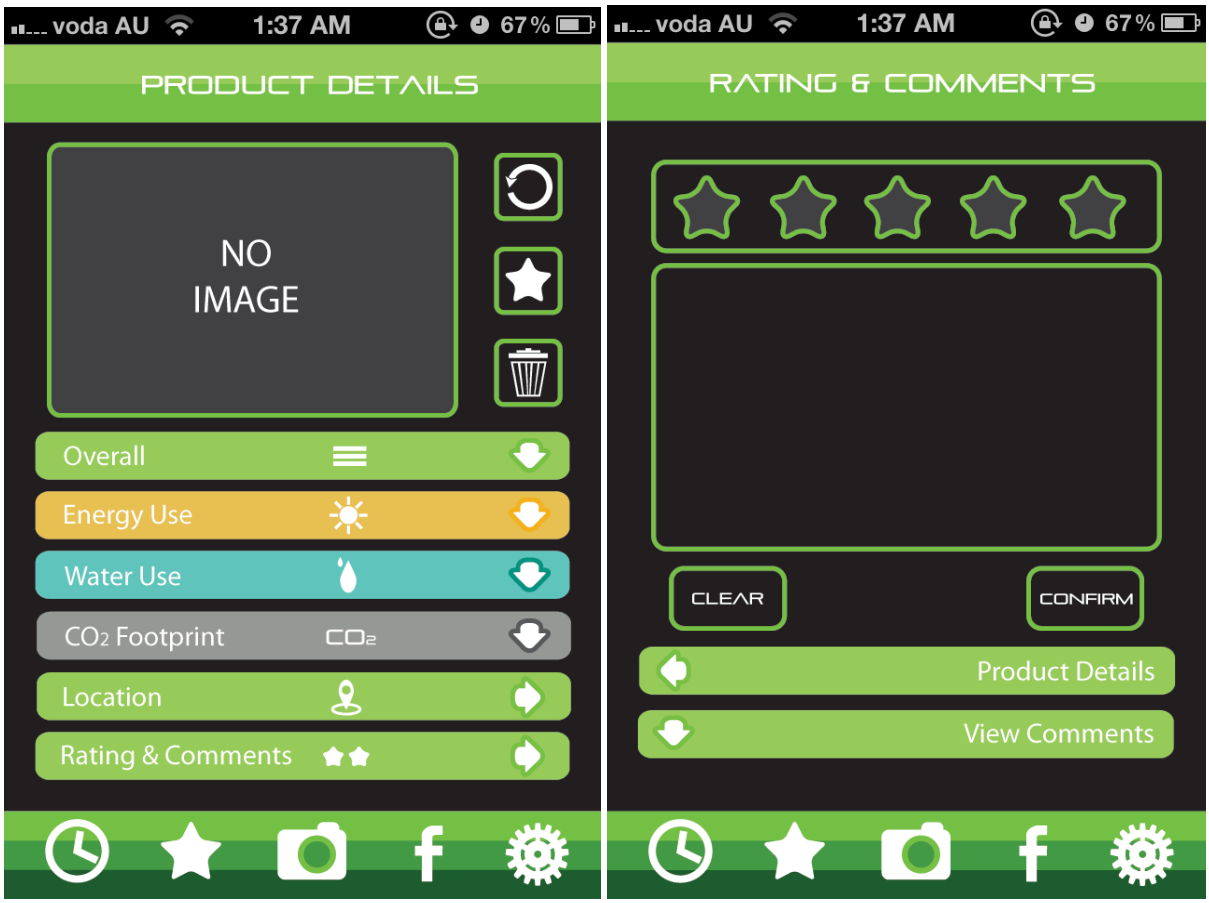


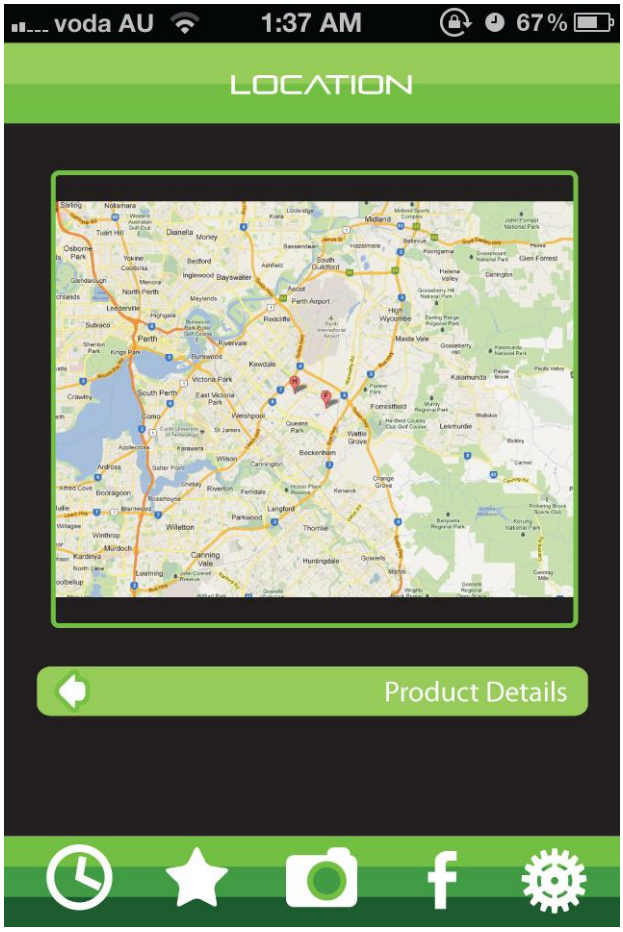
The recent and favourites screens share the same layout as the Windows Phone 7 and Android designs. The only difference is that iOS allows users to activate the delete button when swiping an item from left to right on the product list. When the user presses on the edit button, multiple selections can be made by ticking items and they can all be deleted together.



Users can type their username and password into the Facebook login page in order to connect the application with their Facebook account. Users are then able to share content on their wall, as well as allowing rate and review functionality.

The remaining pages (e.g.product and supplier details, rating and reviews, location maps) all have the same design and layout as their respective WP7 and Android versions, the only difference being the resolution and aspect ratio.


voda AU
1:37 AM
67%
PRODUCT DETAILS
NO IMAGE
Overall
Energy Use
Water Use
CO2 Footprint
CO2
Location
Rating & Comments
RATING & COMMENTS
CLEAR
CONFIRM
Product Details
View Comments


voda AU
1:37 AM
67%
LOCATION
Product Details

WEB SERVICE

The web service comprises the back end of the mobile application, serving HTTP-based data retrieval and write requests. It also serves the database administration tool by providing a number of administrator only APIs for importing new data and managing existing data. We recommend that the database should be created and populated on Microsoft SQL Server 2012 Express Edition.

Required APIs

The externally hosted web service would receive the product barcode and deliver the following sets of data or information back to the users:

Mobile Application APIs

- Get Product Information (with product barcode)
    - Returns product name, description, image, sustainability information, energy, water, CO2, allergens (formatted into a list of strings) and manufacturer name.
- Get Production Location (with product barcode)
    - Returns an array of product name, description, image, latitude, longitude and next location
- Get Product Reviews and Ratings (with product barcode)
    - Returns an array of product name, Facebook name, reviews and ratings.
- Store Product Reviews (with product barcode, Facebook ID, reviews, ratings)
    - These methods stores product reviews into the database.
- Get Manufacturer Information (with product barcode)
    - Returns manufacturer name, description and sustainability information.
- Get Manufacturer Reviews (with manufacturer ID)
    - Returns an array of manufacturer name, Facebook name, reviews and ratings.
- Store Flagged Product (with product barcode, flagging user, message)

DATABASE ADMINISTRATION TOOL

In order to import new retailer data into the system and manage existing data, an administrator portal needs to be developed. This administration tool is designed to be very lightweight with only a few core functions. Retailers and administrators will access the tool via the Internet, which will be hosted on the same server as the web service.

Low-Level Design

In order to protect the integrity of the information stored on the system, all users are required to log on to the portal before the system can be used. Users are assigned a permission level that defines which APIs they are allowed to execute, and hence which tasks they are allowed to perform. These permission levels are shown below:

1. Root user. This is the highest level of access and allows full database access as well as creation of administrator accounts.

2. Administrator. Has full access to database as well as creation of retailer accounts.

3. Retailer. Access limited to add and update product content only.

Database Import Module

One of the most critical functions of the administration tool is getting the existing retail product data into the system. After logging into the system, the retailer or administrator is presented with menu containing the option to import data into the database. If this data is unique it will create new records, if the same barcode information is already present those records will be updated with the new information. One of the requirements for this data that the retailer has the ability to export in a standard CSV or delimited text format. If this is not possible with the retailer's existing systems, the Administration APIs can be accessed through command line scripting as a more technical workaround.

Database Management

Another of the menu options is to update existing records. This is important for updating records with automatically generated identification numbers, such as manufacturer details or location data. This section of the tool consists of a number of search fields to retrieve records from the different tables. Administrators would be given greater access to find, modify, and delete via SQL commands.

Flagged Content Administration

Content can be flagged by users of the mobile application to notify administrators that the data is incomplete or incorrect. This adds a record to a table listing all reports of bad data in the system and whether or not an administrator has reviewed each item. The flagged content menu option is only visible to users with administrator permissions, and selecting the option will display a list of content records that are awaiting review. After reviewing the content the administrator's user ID is recorded against the flag to sign off that the issue has been resolved.

Administration APIs

The following APIs have to be hosted with HTTPS Bindings to facilitate the data administration in the database.

- Authenticate Users (with username and password)
    - Returns a boolean (success/failure)
- Store Product (with product barcode, name, description, image, sustainability, energy, water, CO2 and allergen ID)
- Update Product Information (with product barcode, name, description, image, sustainability, energy, water, CO2 and allergen ID)
- Delete Product (with product barcode)

- Get Flagged Object (with product barcode or manufacturer ID)
    - Returns product name, flagged message, user name
    - Returns manufacturer name, description,
- Update Flagged Object (with flag ID, message, managedby)
- Delete Flagged Object (with flag ID)

- Update Manufacturer Information (with manufacturer name, description and sustainability)
- Delete Manufacturer (with manufacturer ID)

- Update Location Information (with location ID, product barcode, name, description, image, latitude, longitude and next location)
- Delete Location Information (with location ID)

- Get Users
    - Returns an array of user ID, username, name, description, email and permission.
- Update Users (with username, password, name, description, email and permission)
- Delete User (with user ID)

Database Definition

The following section describes the database in table layout. Many of the elements require no detailed explanation; however explanatory paragraphs will accompany some of the table definitions as required. This database may be modified to incorporate extra features or changes to the design. (Italics represent foreign keys and underlines represent primary keys).

PRODUCT {ProductID, Name, Description, Image, Sustainability, Energy, Water, CO2, *ManufacturerID*}

> This table refers to the individual product entity. ManufacturerID links the current product to the manufacturer who owns the rights to the product, regardless of whether the product is imported.

MANUFACTURER {ManufacturerID, Name, Description, Sustainability}

> Records in this table refer to the entity that owns the product. A record in this table does not represent where the product is manufactured or produced, it only contains information about the legal owner. The sustainability field contains improvement initiatives and other pertinent information.

LOCATION {LocationID, *ProductID*, Name, Description, Image, Latitude, Longitude, *NextLocationID*}

> Entries into the location table are used to plot geolocations using the mapping API. To construct a map waypoint (showing the path the product has taken to arrive at the destination) locationID's needed to be linked to each other in a way that can visually construct the path. Paths can be constructed by drawing a line between a location and the location corresponding to NextLocationID. The final destination has a null NextLocationID, indicating that it is the last point or point that could be connected to the user's current location.

USERS {UserID, Username, Password, Name, Description, Email, Permissions}

> This table is used to store all user logins including both administrator and retailer logins. The permissions field can be used to distinguish between root, administrator, and retailer access rights.

ALLERGEN {AllergenID, Allergen}

Entries into this table represent known allergens. This table is separated for normality, and also to allow further expansion of fields.

PRODUCTALLERGEN {*AllergenID*, *ProductID*}

This table represents the weak entity relationship between a product and allergens. Being able to list all products with a certain allergen may be useful for additional features such as alerting the user if the product contains a preset allergen.

PRODUCTREVIEW {*ProductID*, *FacebookID*, Review, Rating}

Product ratings and reviews are recorded against a user's FacebookID in this table. The compound key ensures a product can only be reviewed once by a user.

MANUFACTURERREVIEW {*ManufacturerID*, *FacebookID*, Review, Rating}

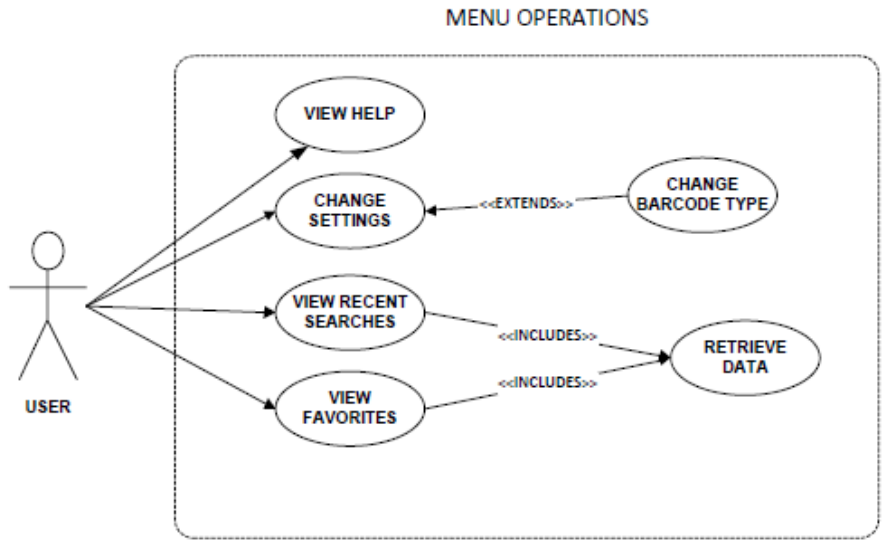
Same as above.

FLAGGED {FlaggedID, *ProductID*, *ManufacturerID*, Message, *ManagedBy*}

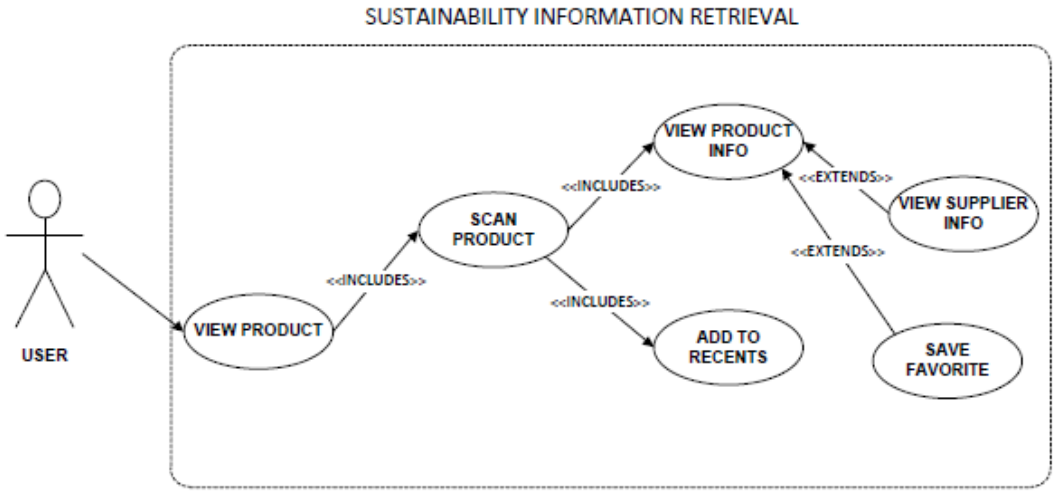
Records are entered into this table when a mobile application user flags a product or supplier entry as requiring moderation by an administrator. One of ProductID or ManufacturerID may be blank, but not both.

USE CASES / SCENARIOS & STORYBOARDS

USE CASE DIAGRAMS & DESCRIPTIONS

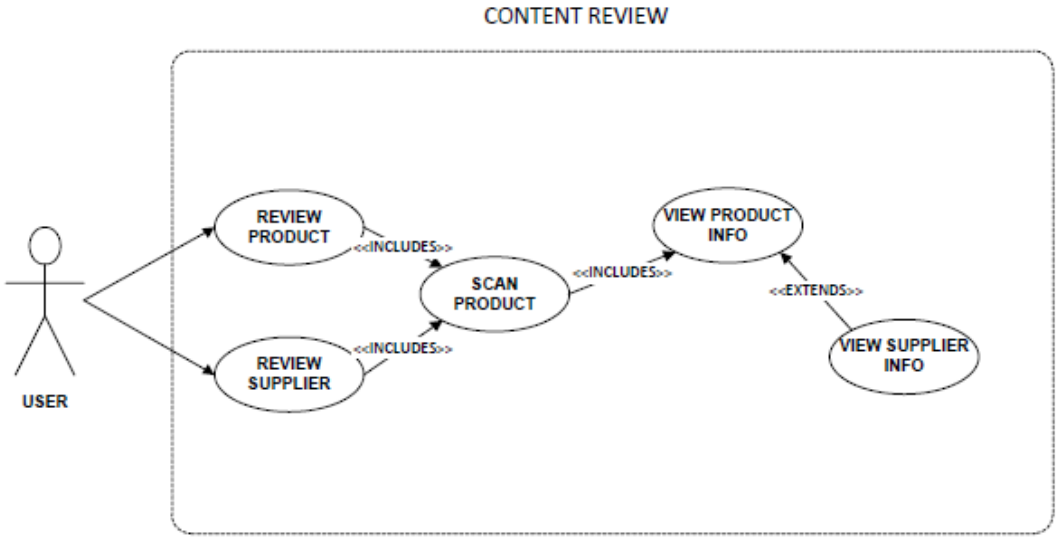


USE CASE	MENU OPERATIONS
Brief Description	View recent searches, view favourites, help menu, change settings
Actors	User
Precondition	None
Main flow of events	Request particular information from the database
Alternate flow of events	User can modify barcode scan types in settings menu
Post condition	None

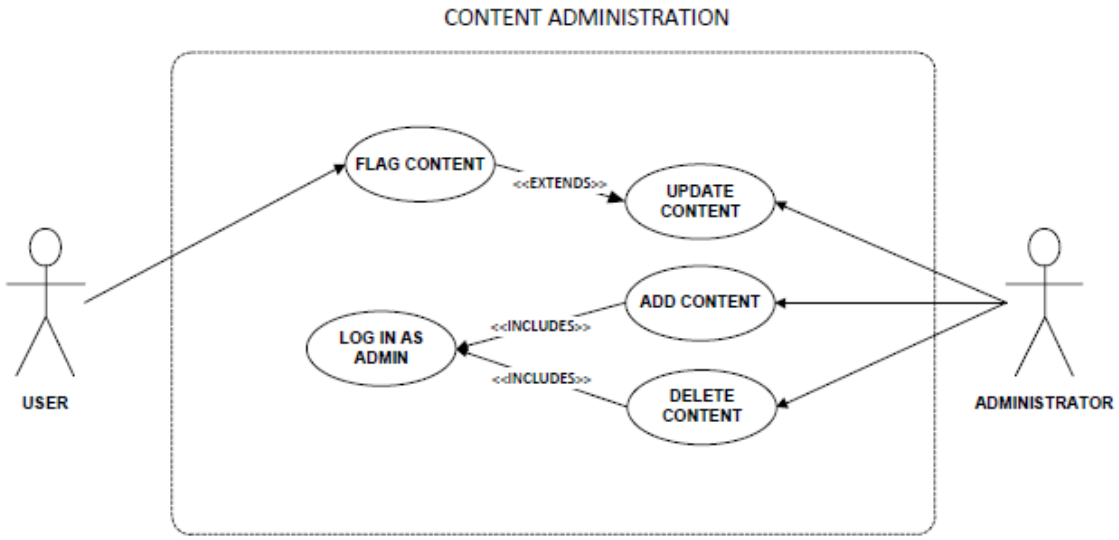


USE CASE	SUSTAINABILITY INFORMATION RETRIEVAL

Brief Description	Users scan a barcode to retrieve particular information relating to the scanned product. Users then have the option of adding products to their favourites list.
Actors	User
Precondition	The scanned barcode is valid
Main flow of events	Request specific information from the database for the scanned barcode. Once the information has been successfully retrieved, it is displayed to the user.
Alternate flow of events	User can additionally view supplier information page
Post condition	None



USE CASE	CONTENT REVIEW
Brief Description	A user provides a rating and writes a review of a product or supplier
Actors	User
Precondition	Requires sustainability information retrieval actions to be completed
Main flow of events	Both goals involve steps up to view product info, with the view supplier step only necessary for reviewing supplier.
Alternate flow of events	None
Post condition	None

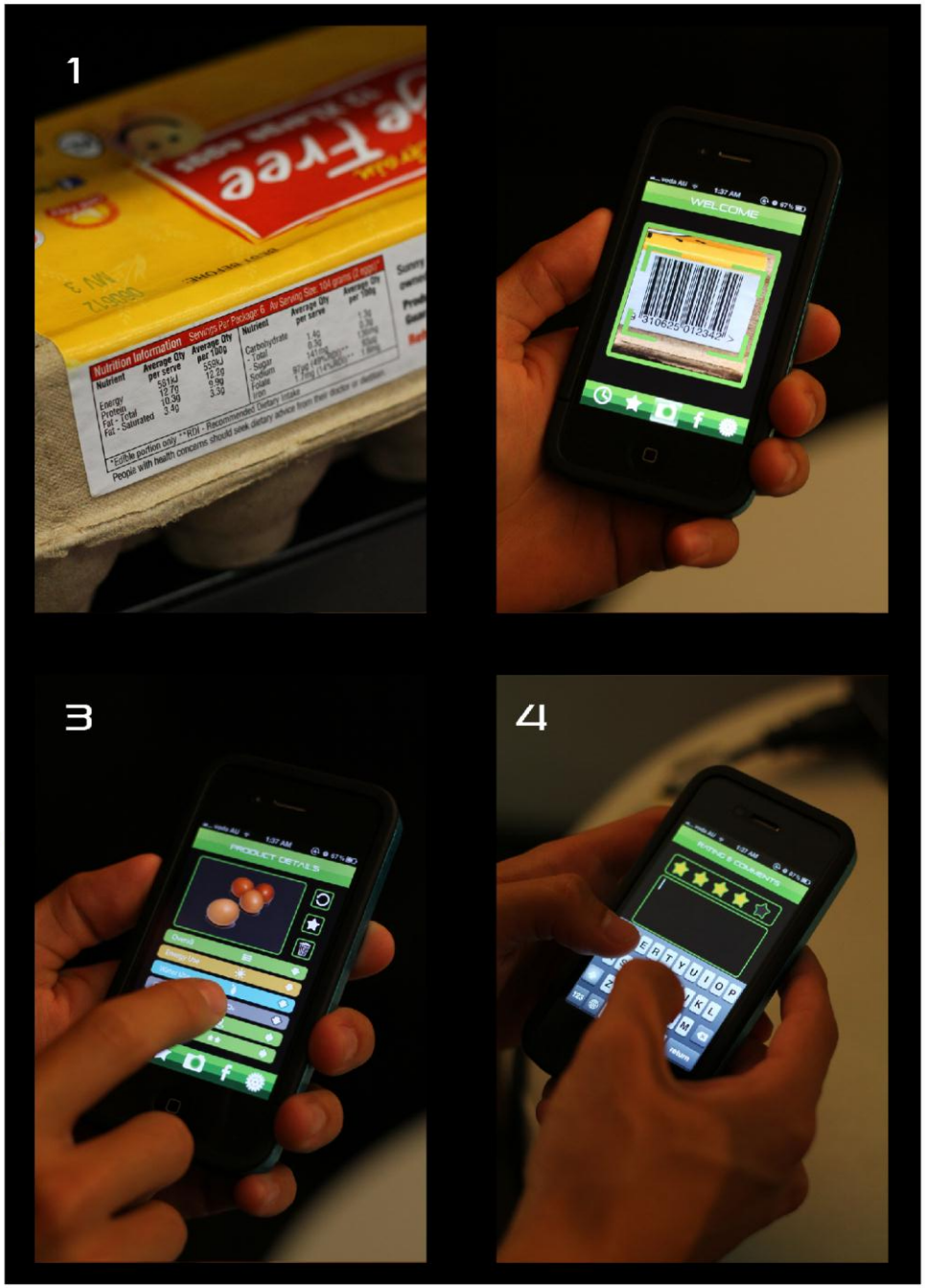


USE CASE	CONTENT ADMINISTRATION
Brief Description	This use case demonstrates administrative tasks available to the database administrator. One of the tasks involves a user flagging a product for administrative moderation.
Actors	User, Administrator
Precondition	None
Main flow of events	User flags an item of content, notifying administrator that an update of content is required. Administrator must be logged in before gaining access to perform tasks.
Alternate flow of events	None
Post condition	None

STORYBOARD (SEE NEXT FEW PAGES)

SCENARIOS & STORYBOARD 1: RATING AND REVIEWING A PRODUCT

Heather, 44 years old, has purchased a box of a dozen free range eggs. She previously checked the sustainability information of the eggs whilst she was in the shop, however she is still sceptical on the accuracy of the information provided. Once she arrives home she researches the supplier to ensure the facts she read using the CPT application were trustworthy. After discovering that her own findings matched the information she received from the application, she decides to rate and write a review commenting on the accuracy of the information and the quality of the product.



1. Heather has purchased a box of a dozen free range eggs, she is not satisfied with the accuracy of the information provided on the box.

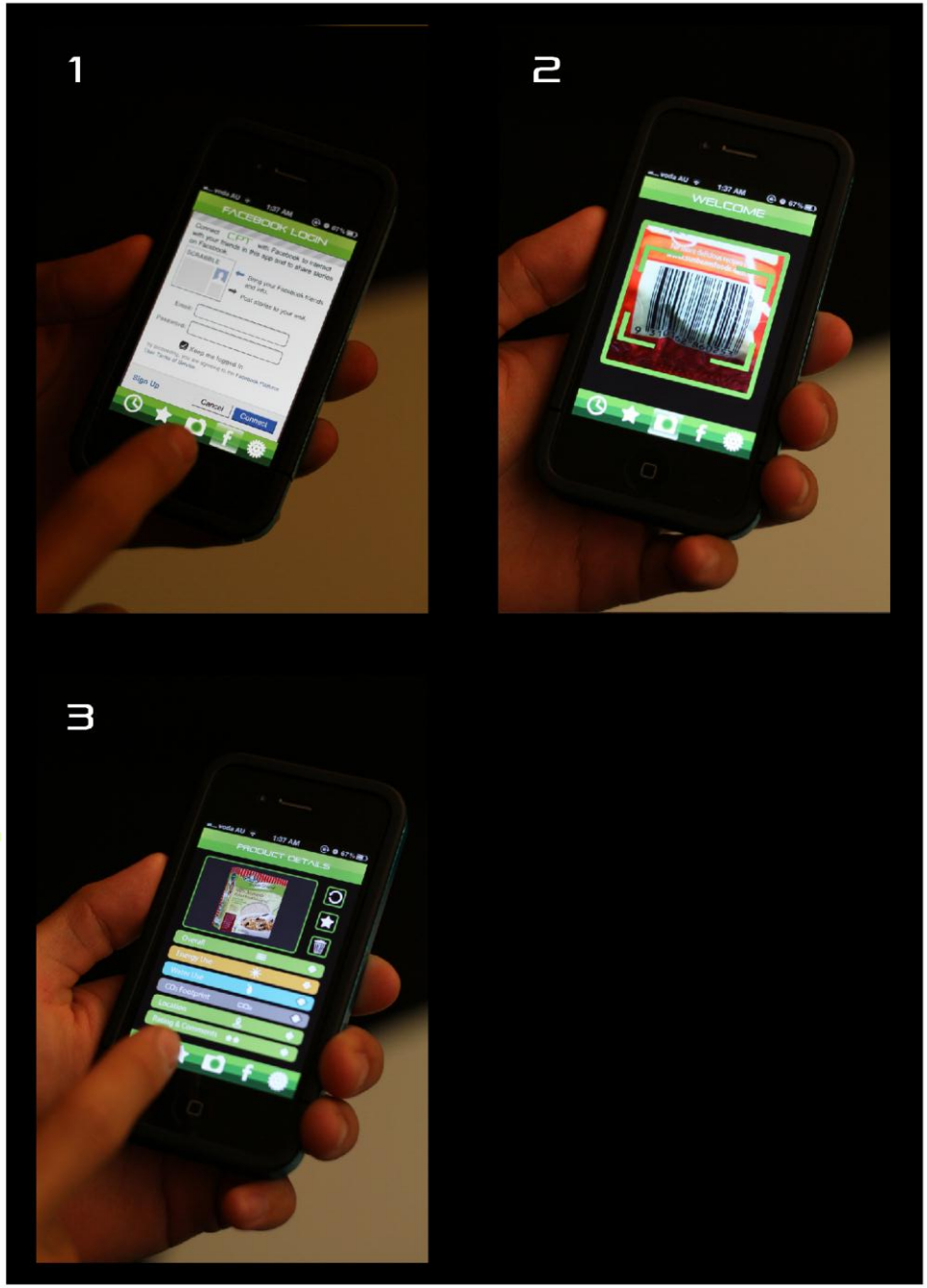
2. Then Heather opens CPT software and scan the barcode on the egg box.

3. The effort shown in the product details page fully convinces Heather, which matches the information she had discovered.

4. Heather is happy and she clicks the rating button next to the product image to jump into the rating and comment page and then she gives the product 4 stars and also she is going to leave her own comment to help with the other customer to know the product.

SCENARIOS & STORYBOARD 2: LOG INTO FACEBOOK AND SCAN A PRODUCT - ACCESSING INFORMATION ON A PARTICULAR PRODUCT

Sarah is 42 years old has two children. She has recently discovered that one of her sons is allergic to nuts and has to ensure that no food she purchases contain any traces of nuts. Sarah is trying to find a new cereal to buy and decides to use the CPT mobile application to scan a selection of cereals in order to retrieve certain allergen information.



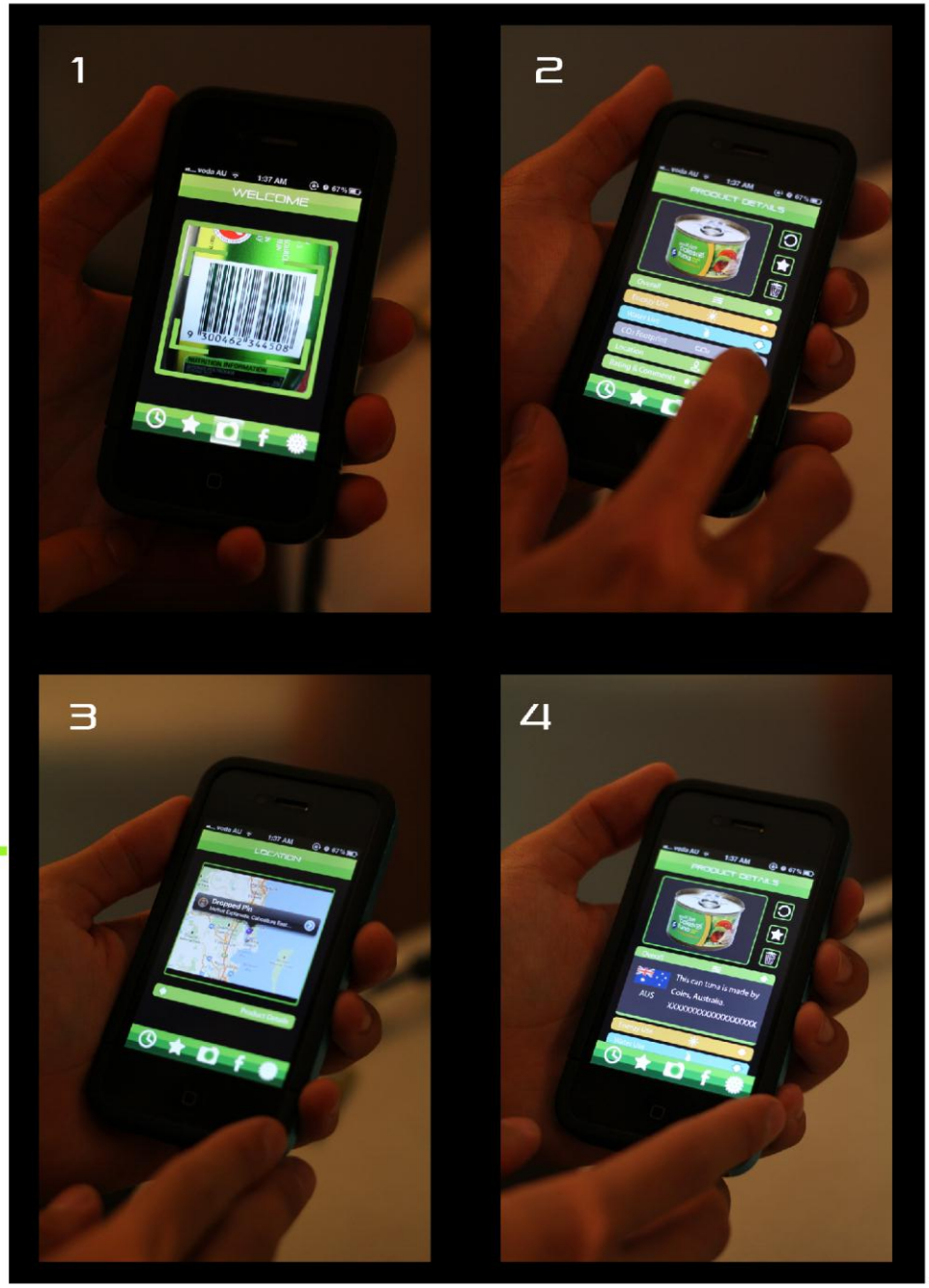
1. Sarah just press the "F" button to jump the facebook login page and then filling with her username and password.

2. She is hesitate to choose a suitable cereal for her son, so she scan a few cereal products' barcode to check their component to make sure there are no nuts involved to make her son allergic.

3. By information given by CPT, she finally focus on one product that does not have conceal inside then pick it up.

SCENARIOS & STORYBOARD 3:VIEWING THE SUPPLIER'S INFORMATION AND LOCATION (MAPS)

Samantha, 29 years old, has decided to purchase some canned tuna for lunch. Being conscious of the environment, she wants to ensure the manufacturer of the tuna promotes sustainable fishing methods and is an Australian company. She also wants to find the origin location of the product. Samantha scans the barcode to determine the specific manufacturer details using the CPT application.



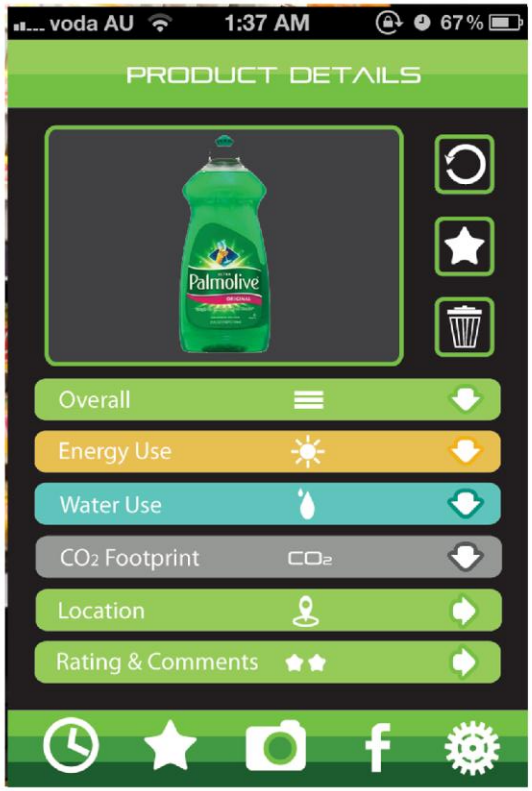
1. Samantha grab a can of tuna and use the CPT to scan the barcode on the body of can.

2. The barcode has been scanned successfully, all the information has been shown below.

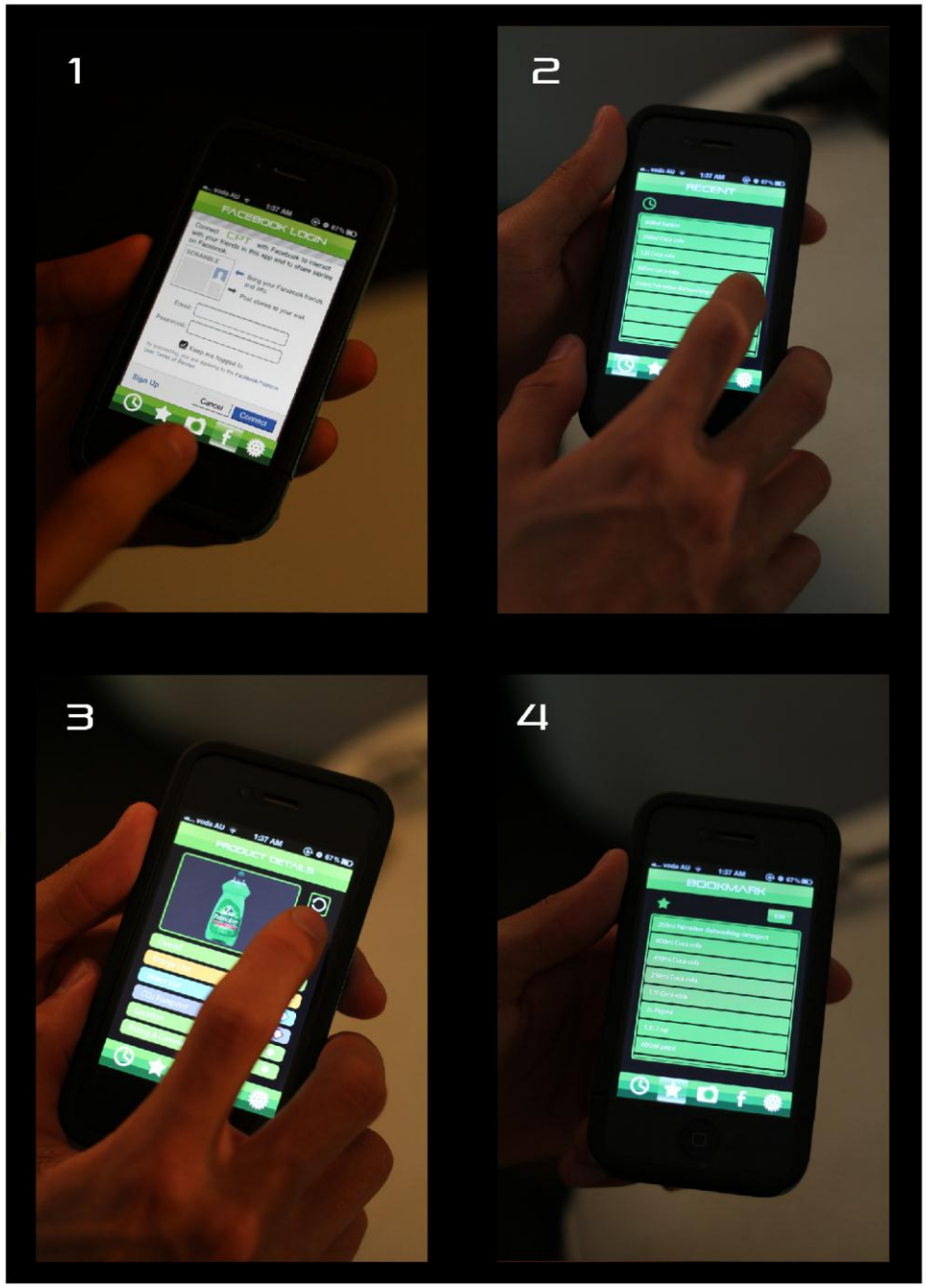
3. Samantha clicks on bar called 'location', then she knows the origin location of the product.

4. Samantha goes back to product details page and then check the basic information of the tuna can, then she finds it was made by Australia local manufacturer.

SCENARIOS & STORYBOARD 4: RETRIEVE RECENT SEARCH HISTORY AND ADD TO FAVOURITES



Margaret, 38, is a regular customer at her local supermarket store. She has recently been introduced to the CPT application and has found it particularly useful to search for new products. Last time she was at the shop, she found a bottle of dishwashing detergent that was both environmentally friendly and produced in Australia but she can't remember the name or brand of the product. Margaret decides to login to the application and retrieve her search history to find out the name of the dishwashing detergent and then add it as a favorite so her problem does not occur again.



1. Firstly, Margaret login to her account by filling with facebook username and password on the Facebook login page.

2. She thinks she had scanned a dishwashing detergent that is what she is currently looking for, then she opens the recent page by clicking the clock button on the bottom left, and she finds the one and tap the bar to enter into the product details page.

3. Margaret is happy to see the result, while she decides to add it to bookmark in case she forgets it again, so she tap the 'bookmark' button next to the product image.

4. Finally, the dishwashing detergent information appears on the top of the bookmark list.

DESIGN PLAN

INTRODUCTION

The implementation of the SAP Customer Product Transparency project will occur throughout Semester Two, spanning from 23 July through to 22 October 2012 where the deliverables are due. In order to complete the system within these dates, it is expected that each member of the development team will have to contribute at least a minimum of 10 hours per week to the project, giving a budget of approximately 50 hours per week for the 13 weeks.

Three key stakeholders have been identified for the development of the Customer Product Transparency application. These stakeholders are the SAP Research team, University of Queensland, Information Technology and Electrical Engineering (UQ ITEE) course staff, and the design and development team as they will all have the ability to directly influence the outcome of the project.

As the original project proposal was initiated by SAP Research, they have the ultimate decision making power with regards to the specifications of the application. To ensure an efficient and effective development process, it is essential for both the teams to communicate and liaise closely with each other. SAP Research will need to ensure that the application fulfils the specifications and the development or design team needs to confirm these specifications are achievable. Additionally, the development team can suggest improvements and post questions back to SAP Research.

The UQ ITEE course staffs are the additional stakeholders and they will undertake an intermediary role between SAP Research and the developers. The course staff will assist the students with any decisions regarding to the specific technical aspects of the project, communication with SAP Research, issues with particular group members and also help with any additional questions or issues that may arise. The course staffs have allocated time each week to assist with the project development and are more readily available. Any administrative or general questions should be directed to the course staff as the first point of contact.

Stakeholders Contact Details

Roheena Khan has been included in the list of key stakeholders as she is the nominated contact for the SAP Research team. Her contact details are listed below:

Name: Ms Roheena Khan

Position: SAP Contact

Location: SAP Research Centre Brisbane

E-mail: roheena.khan@sap.com

The contact details for the UQ ITEE course staff are listed below. The following staff members are responsible for all course matters relating to issues between stakeholders or issues within the developer or design team.

Name: Dr Alex Pudmenzky

Position: Course Coordinator and Lecturer

Location: University of Queensland, School of ITEE

E-mail: a.pudmenzky@uq.edu.au

Name: Mr Justin Marrington

Position: Tutor

Location: University of Queensland, School of ITEE, General Purpose South - Room 214

E-mail: justin@marrington.net

Name: Mr Jason Weigel

Position: Tutor

Location: University of Queensland, School of ITEE, General Purpose South - Room 214

E-mail: jason.weigel@uqconnect.edu.au

PROJECT MILESTONES

The project milestones divide the entire development process into manageable phases allowing the project manager to monitor and assess the progress of the application. It would serve as a guideline and an indication of when tasks should be completed. The milestones should be reviewed at least weekly to ensure the team is on track and meeting deadlines. It is strongly advised that the guidelines are adhered to as they will assist in a smoother, less stressful development process.

Project Setup

The first milestone for any project is to get the team properly briefed and setup to work on the project. This involves setting up the teams development machines with the required project development software and development configuration. The setup process should also setup team management solutions such as source version control and other project management tools. By taking the time to ensure that all team members have been setup with a complete development environment, productivity is assured.

Application Design

The project setup milestone should be completed with as much haste as possible to ensure that there would be sufficient time allowed for the application design phase. The application design phase would be the largest and longest phase that the development team would be working on. To ensure that the deadline for this milestone is met it is important to be confident with the team's decision making process, as most important decision about the application design have to be made quickly.

Application Release

The final milestone is solely for the packaging of the created project content and setting it up on the production environment to allow the client to begin using it commercially. During this step the production server must be setup to host the Web API & database with maximum efficiency to ensure that expensive resources are not being wasted. Also the application must be deployed to a user-friendly medium such as an application market to be distributed onto the user's mobile devices and documentation on the project should be hosted and made readily available making it easier and efficient for users to access.

WORK BREAKDOWN

The following section breaks down the major project milestones into smaller day-to-day tasks, allowing team members to self-assess their progress and inform the project manager if they are running behind schedule. This is important to ensure the project is finished in time and within budget, and breaking the project into small deliverables helps to limit scope drift. A timeline of these tasks can also be viewed in the project's Gantt chart.

Project Setup:

Setup Development Environment on Team Machines:	Work Hours
· Install Application / Development Software	5
· Setup Application / Development Software	5
· Setup Project Database Server	4
· Setup Data Schema on Project Database Server	5
Setup Project & Team Members on Source Version Control:	
· Create Project Repository	2.5
· Checkout Project Repository on Team Machines	2.5
· Create & Check-in Initial Project Setup	2.5
· Ignore Project Build Directories	2.5

Application Design:

Mobile Application Prototyping:	Work Hours
· Code Solutions For Application Functionality	
o Code Database Wrapper	20
o Code Manual Product Entry	10
o Code Barcode Scanning Functionality	24
o Code Location Map API Integration	16
o Code Facebook API Integration	10
o Code Product & Manufacturer Rating	20
o Code Recent Product & Favourites	20
· Document use of any Third Party Libraries	15
· UI Prototyping & Design Innovation	40
Web / Server Side Application Prototyping:	
· Code Administration Import Products	15
· Code Administration Manage Products	15
· Code Administration Flagged Products	15
· Code Administration Manage Users	15

· Web API / Data Access Layer	40
· Client / Server Communication	20
· Client / Server Functionality	20
Application Refactoring:	
· UI Polishing & Enhancement	30
· User / Error Proofing	15
Application Testing	
· Client Testing	20
· User Testing	30
Application Documentation	
· Document Frequently Asked Questions	15
· Document User Manual / User Guide	15
· Document Installation Manual	15
· Document Server Deployment	15
· Design and Document Advertising Materials	25

Application Release:

Setup Production Server:	
· Setup SQL Server 2012 Express Edition	4
· Setup Internet Information Service	4
Package Project Assets & Documentation:	
· Package Database	6
· Package Web Service	6
· Package Mobile Application	6
Deploy Production System:	
· Deploy Database	4
· Deploy Web Service	4
· Deploy Mobile Application	4

This work breakdown includes meetings and any other overhead hours.

RESOURCES (PEOPLE & TIME)

The build phase of this project will require a team of five experienced developers. Each team member will be assigned a role for the entire duration of the project build based on their individual skill set. These roles are not rigid and it is expected that team members should assist one another to help complete their tasks. These roles are described in full below.

Project Manager

This team member is responsible for overseeing the entire project. Their high level purpose is to ensure the development team produces the deliverable in time, in scope, and within budget. The person selected for this role should be available for at least a minimum of 10-12 hours per week and must be present at all client meetings and throughout the development phase, as well as remain contactable at all times for consultation.

Aside from general project management responsibilities common to all software developments, this project will also require the project manager to take charge of the system documentation as well as to assist the other team members in completing their set tasks.

General Responsibilities

- Client Correspondence
- Cost Control
- Monitoring Progress
- Monitoring Scope Drift
- Team Leadership
- Quality Control

Responsibilities Unique to this Project

- Documentation of:
    - User Manual / User Guide
    - Installation / Deployment Manual
    - Frequently Asked questions
    - Design and Document Advertising Materials
- Assist development of:
    - Mobile Application

- Web Service
- Database Administration Tool

UX Designer

This team member is responsible for the user experience and interaction design of the project. Their position in the build team is necessary to ensure the final product is designed well enough to be accepted by the targeted end user base. The person selected for this role should have significant graphical and user interaction experience, preferably someone with a background in Multimedia Design. They will be expected to contribute around 10-12 hours per week for the entire 13 weeks of the project.

Responsibilities

- Planning of user interface
- Graphical and multimedia design
- Application navigation
- Usability structuring
- Perform user testing
- Assist writing the user manuals

Developer

This team member is responsible for the engineering of all functionality in the system component. This person will lead the development and ensure that any code committed by others is functional and error free. The team member who fills this role should have experience in the development language and technologies described in the project design. In this particular project the choice of mobile platform (and programming language) is left up to the development team, and while all members of the team should be involved in the decision making, the developer should be consulted to ensure competence in the chosen language. The developer must be available for a minimum of 10-12 hours per week for the duration of the project.

Responsibilities

- Coding and development of mobile application
- Assist system architect in development of web service
- API design and development
- Functional testing of entire system

- Assist writing the deployment manual
- Runtime analysis
- Management of code repository

Database Specialist

This team member is responsible for the design and deployment of the data schema on the web service, management of the SQL database, and is in charge of the database administration tool. They will be working side-by-side both the developer and system architect when programming database read or write API calls. The person selected for this role should be experienced in software information systems design and deployment, and must be available for about 10 hours per week across the entire 13 weeks of the build.

Responsibilities

- Design, deployment, and management of data schema
- Management of SQL database
- Assist system architect in programming API and data contracts
- Development of database administration tool
- Assist developer in coding mobile application database query engine
- Assist writing deployment manual

System Architect

This team member is responsible for the design and deployment of the web service and server architecture. They will also assist the database specialist in programming the database administration tool, as well as assisting the developer to setup communication between the mobile application and web service. Their area of expertise should be in software information systems, with a focus on API communication. As with all of the team members, the responsibilities of this role suggest a commitment of approximately 10-12 hours per week for the whole 13 weeks.

Responsibilities

- Design and deployment of web service
- Assist development of database administration tool
- Design API communication
- Functional testing of web service
- Server setup

- Assist writing of deployment documentation.

GANTT CHART

Please refer to Appendix C.

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