Xparcel Parcel Management System

Extending the tracking and parcel management services provided by existing courier companies.

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1 INTRODUCTION

The beauty that helps make the internet what it is today would not have been possible without courier services. As online commerce sectors flourish they rely heavily on the solutions of trustworthy and reliable logistical delivery systems. As the volume of online shopping increased with options to order multiple items at once to one's home the courier companies have had to keep up and ensure that items are delivered both fast and safe.

The globalization of trade has resulted in the emergence of a core of logistics and delivery companies that trade across the continents. The technology now employed to achieve and sustain efficient services, whilst keeping the costs competitive is already a feat of excellence. As online commerce evolves to a more mature phase, there has been little advance in customer service apart from the ability to find out where one's parcel is using a Tracking Number. Endeavoring to advance customer service and expand the now much improved online commerce experience beyond to the delivery and logistics end of the process, we decided that getting a notification that your package is "in transit" was fast becoming outdated and low-tech. With the level of technology companies like UPS, DPD and FedEx already use for their own management the infrastructure clearly already exists to further better and empower the customer to greater controlling their package delivery status. UPS, DPD and FedEx rely on advanced solutions for commercial shipping. These solutions include the ability to continuously monitor shipments at any location in real time. With sensitive shipments that may have special maintenance needs while in transit this has become much more relevant in a political security context also given the rise in piracy. Courier companies are able to monitor the temperature, humidity and other aspects of such shipments.

It came to our attention that the services provided by these companies in Ireland are greatly limited in comparison to what is available in other developed economies particularly the United States. We found that once an order had been placed and the customer had received their tracking number delivery details that to update those details after the delivery had been initialized became a challenge for the customer. To simply update the delivery location of the package was not possible, and to update the delivery date of the package could only be done once the company had attempted to deliver the package and subsequently failed to do so. Leaving a physical written notification of attempted delivery, the ubiquitous 'Sorry we missed you' card makes poor use of the 'always on' world of communication many consumers now live in. Missed deliveries do not just add to the cost margins of the delivery companies, they also add frustration and inconvenience to the increasingly varied customer spectrum. An article written by Andrew Bomford for the BBC news magazine titled "The Parcel Conundrum" outlined that in the UK alone, almost 12% of first time deliveries failed. If you think about it 12% is still an impressive record considering the overall volume handled by these companies. That 12%, however, costs the industry in the UK alone £1 billion. There appears to be no way of monitoring the performance of these services. Our aim is to make the next leap in communication to allow an improved Courier Customer service solution.

2 PROPOSAL

2.1 PROBLEM AREA

The existing parcel tracking services supplied by courier companies for customers receiving packages is form of communication. This set of communications are sent via email or text messages and are triggered by the last know position of the client's package. The problem that we would like to address is by bettering the communications between the company and the client.

After the order is placed and dispatch, and the receiving client has been sent the Tracking details of the package, there will be unforeseeable factors that could impair the smooth delivery of the services. Online retailers would provide estimated delivery dates based on the courier's specifications and the distance to the delivery address. Although most major courier companies have on-time delivery average of between 90% to 95.3% as written in the article "High-volume online shopping is putting a strain shipping firms and causing delays" in the Los Angeles Times on April 25th 2016. The problem arises with the estimated delivery date "3 to 5 days" or "3 to 5 working days". So if a person has an important package they are awaiting and planned to take time off work or out of their weekly schedules to make sure that they were available to receive the package. It is possible that the package would not arrive on those days. Although an updated status message suggested that the package would be arriving soon. It is not justifiable to take the chance and take time off when there is still uncertainty of the details.

Elements that could affect the deliverance of packages are not circumstantial. Probably the most common challenge is traffic. Traffic is unpredictable factor that could have delivery trucks caught up in traffic for long periods of time. Leaving the receiving client waiting without any knowledge of the deliveries current status. Another factor is the weather. Bad weather can ground air traffic and slow down or even prevent vehicles from running. Adding to the possible delays of the delivery.

Many company's reputations have been tarnished because of employee negligence. The manner in which some employees have carried out the deliveries, ended with damaged or missing goods. Employees have been found to lie about making delivery attempts or miss handling the packages. A blog called '"Anyone else sick of An Post 'attempting' to deliver parcels & taking the piss? Any solution?" submitted by SandorClegane_AMA ("https://www.reddit.com/r/ ireland/comments/ 2w6pa4/anyone_else_sick_of_an_post_attempting_to_deliver/")' discusses the dealings people have had in experiencing this problem of attempted deliveries that did not happen. SandorClegane_AMA explains in the opening post.

"*There have been numerous incidents where they leave a note or the tracking website says 'Attempted Delivery' at say 11 AM.I know for a fact I was home at that time. They don't ring the doorbell or use the intercom. They then send out a note, via the normal mail carriers, to allow you to collect your parcel at the post depot. They are utterly taking the piss.*

I've complained and they say it is a private company working for them, who are only pretending to attempt delivery, and dump the parcels at the depot. They are still responsible for it, I cannot control who they hire to drive the van. Anyone manage to get this sorted out? What is the most effective channel for complaint?"

In an article on BBC newbeat, titled "Concern over courier companies keeping up with orders" written by Ben Mundy at "http://www.bbc.co.uk/newsbeat/article/21183060/concern-over-courier-companies-keeping-up-with-orders" has the testimony of Liz Garton from Crawley United Kingdom. Liz complains about a delivery being left in her garden shed.

"*I didn't know it was there for four days. They put a note through the door saying, 'Sorry we missed you' so I went to the collection place but they said it had been delivered. It makes me angry because it could have got wet and damaged.*"

In the same article Aron Stanley explained how his package was thrown over the garden wall.

"*They posted a card telling me the package had been left in a safe place but they'd actually chucked it over an eight foot (2.4m) fence. I do like shopping online but I now look to see who will be delivering the stuff before I buy.*"

These are just a few examples of the possible outcomes people have experienced with courier services. The failure to produce these promised services reflects badly on the delivering company as well as the online vendor. By not offering the best service they could have. The lack of communication between the courier companies and the purchasing client is damaging customer relations for the vendor and the couriers. If there was the option to have a steady stream of information flowing between the two, scheduling and managing the deliveries would go a lot smoother resulting in more successful service. People's lives tend to be dynamic and unpredictable, and having services that can work around such factors is what will greatly improve the customers experience.

2.2 Problem Solution

Our proposed solution to these problems would take advantage of the already existing technological infrastructure that many of the big names in logistics already possess. The large databases, tracking and service API's, GPS, and the platforms that connect them all.

The service would contain several features. Some features are well known in the industry but sadly are not available to Ireland. The feature to modify your delivery date before the package is delivered. The delivery date should be able to be modify to a time after the estimated delivery date was scheduled. By providing this feature we hoped that it would allow people to customize the day they are available to receive packages. Making the process more convenient and easier to plan around for the receiving client.

The second feature would allow the client to change the address that the package has been registered to be delivered to. This could only happen, at the latest 24 hours before the client receives a “final call for dispatch” notice. The goal of allowing the client to be able to change the delivery address would be to provide convenience at the customer prevail. Both these services would help in minimizing the number of attempted deliveries and get the packages to the customer at a convenient time and place. Live tracking feature for customers to monitor the delivery progress in real time. The live tracking feature would be activated and available to monitor when the package has reach its final leg of its journey. The relevance behind this feature would be to help minimize misconduct in employees delivering parcels. Customers would be able to see where the courier driver is, and determine a time frame that they could be arriving. This would make the client aware of the deliveries imminent arrival, and help avoid false attempted deliveries. It would also help by giving the client information about the drivers current traffic situation and help predict a time at which they could arrive.

This group of features should bridge communications between customers and the courier companies and provide the flexibility to mould into their schedules and lifestyles

2.3 PROJECT GOALS

We hope to achieve a solution that will provide a better functionality and promote a more intuitive design. This in turn will improve customer service and leave a smaller carbon foot print the industry produces. The carbon foot print is reduced by minimizing the number of re-deliveries company vehicles would have to make.

2.4 Group Goals

Group goals we would like to achieve will be demonstrating and combining the skills we have learned them over the past two years. We will be also using new skills that we are learning in this year such as different APIs for our real time tracking using a google map API. We will have a repository on GitHub which we will be using for all our code in the development phase. We aim to learn and understand the benefits of team work.

Carnegie Mellon lists the benefits as:

- ❖Tackle more complex problems than they could on their own.
- ❖Delegate roles and responsibilities.
- ❖Share diverse perspectives.
- ❖Pool knowledge and skills.
- ❖Hold one another (and be held) accountable.
- ❖Receive social support and encouragement to take risks.
- ❖Develop new approaches to resolving differences.
- ❖Establish a shared identity with other group members.
- ❖Find effective peers to emulate.
- ❖Develop their own voice and perspectives in relation to peers.

There are a few well known sayings regarding group work:

- ❖“More hands make for lighter work”
- ❖“Two heads are better than one”
- ❖“The more the merrier”

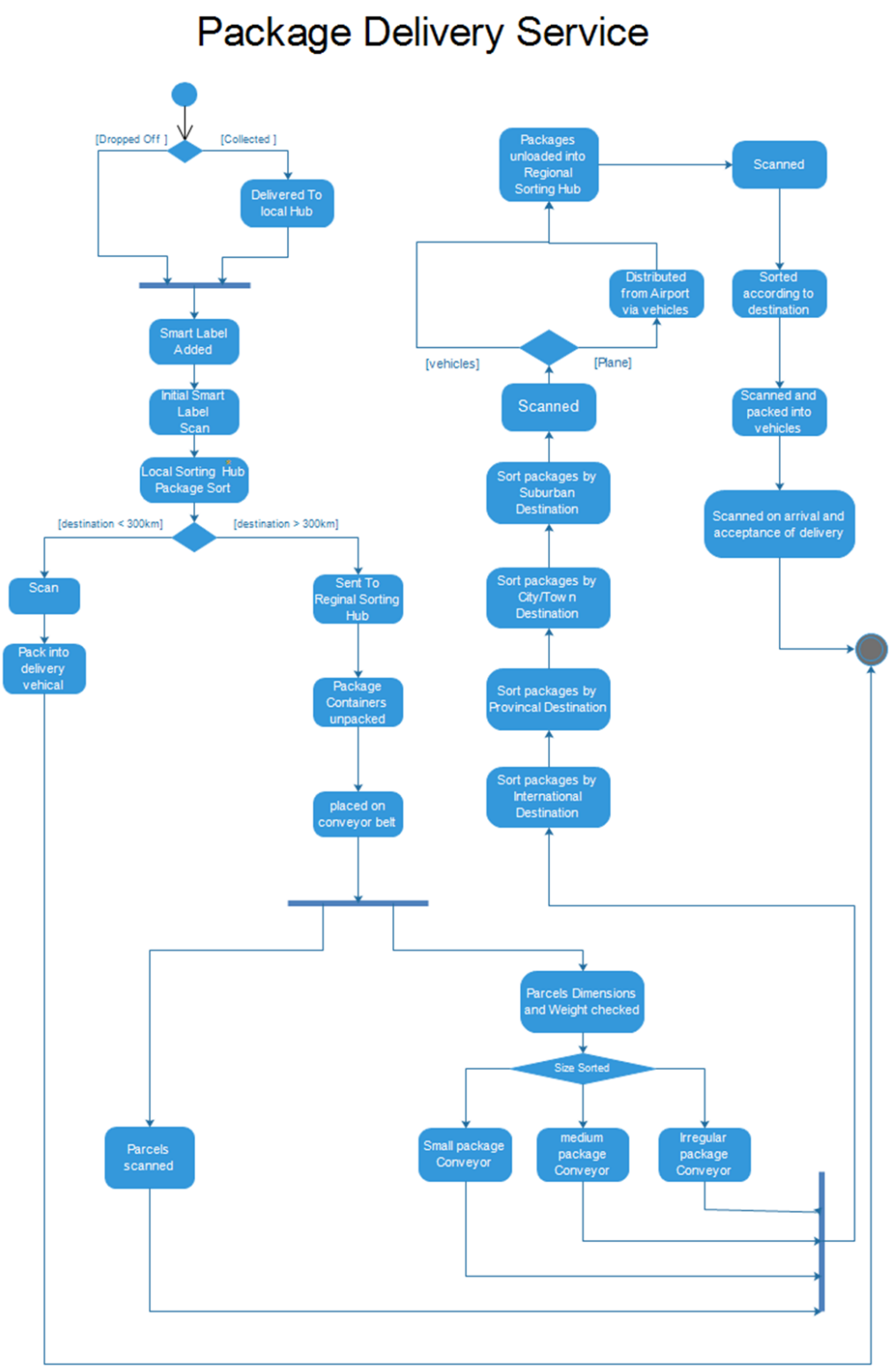
3 Research

3.1 Package Delivery Services

Understanding the process of the courier companies steps of delivery would provide a greater insight as to the functionality we would be able to add to our application to enhance the customers experience. The steps of delivery will depict a high level case of the delivery process and the commonalities that each courier company shares. In the case of this research the commonalities are based on FedEx and UPS. The research was obtained from a documentary series called “Inside UPS” and another called “UPS/FedEx Inside the package Wars” by CNBC network.

There two basic methods of enter of a package into the system. Each company has drop off points at which the package can be dropped off. Usually an office where the customer sending the package will register the delivery details of the package and the link of the tracking number is made with the package. The other point of entry into the system is on collection from the sending clients base of operation. Larger companies make use of these services for convenience purposes. The package is then sent to the company’s local sorting Hub, where the tracking number is linked to the package details. The Smart labels that are added to the packages are a mix of Bar Codes and specialized QR Codes. When the packages reach the local sorting hubs they go through the process of sorting. They are sorted into two groups determined by the distance to their destination. If the destination is less than 300km then the package is sent to be couriered from the local sorting hub the next day. Otherwise if the package destination is over 300km away it is transported either by plane or vehicle to the central sorting hub, which would be the main area of package traffic flow. After the packages have been sorted by destination and size in the Central Sorting Hub. The packages are pack into pods and shipped to their destination areas, County, Province or City. From this point the package is pack into the delivery vehicle and sent on its final leg of its journey. The packages tracking numbers are scanned at various check points throughout the process to keep track of its position and status.

The diagram that follows is a step by step flow of the process explained above.



3.2 COURIER REPORTS

To further our understanding of the services provided by existing courier companies we did a study of serval companies. The study was to

understand the available solutions each company has to offer and point out any limitations within their services and applications.

3.2.1 UPS Shipping Solutions

UPS Background

UPS was founded in 1907 as a messenger company and has been at the for front of molding and developing the Courier and Logistics Industry as we know it today. They have the corporate focus of enabling international commerce. UPS in based and runs in more than 200 countries worldwide and is recognized as one of the biggest Logistics services on the market.

Solutions

UPS provides a number of services to both customers shipping items and to the end receiver of the shipment. These services are based on the services offered in Europe.

Tracking Solutions and Services packages:

- Online Tracking: This services is provided free with all packages shipped by UPS. There are several ways of accessing your tracking details of a shipment. The end client is able to use a Tracking code generated when the shipment is created (created via Quantum View manager). They could use a reference number (short hand of the tracking code). Track by email or SMS tracking.
- UPS Locations: This is a mapping service hosted by Bing Maps. Its purpose is to show the location of possible UPS pick up points and drop off holding points where people can collect shipments.

• InfoNotice℠: This UPS service is the name of the interface that end clients use to monitor their shipment statuses. Through this interface they are able to check the tracking details. They can verify the delivery status. They are able to change the delivery options. The options are Will Call: this is where UPS will hold the package at a nearby UPS location for you to collect. Deliver to Another address. Reschedule Delivery. Return to sender.

These solutions provided by UPS would be considered as positive services by allowing the end client with greater control over their delivery. Although this amount of solutions is available its seems the industry has not taken the next level of service improvements. Listed below are what I believe to be the weaknesses of these service provided by UPS in regards to the end clients satisfaction.

Weakness:

- The user interfaces to update delivery information is poorly designed. Could be more intuitive and user friendly.
- There is little design implementation that encourages the client to update their delivery information, lessoning the chance of first time delivery.
- Locations could make use of GPS API's to track packages in transit, giving customers piece of mind.
- There is no notification of pending delivery arrival on its day of transit. Whether the client is notified the day before as the last resort or the morning of the delivery transit.

In conclusion UPS has the technological structure in place to vastly improve their customers experience by giving them complete control of their shipments and added piece of mind with the vast methods of accessing their tracking services (UPS EFRI Technology: A GPS based

system that monitors shipping vehicles for the internal employees use). A live tracking systems would greatly improve and impress customers.

3.2.2 DPD

About them…

Interlink Ireland Ltd was founded in 1986 with 10 depots and a central hub based in Athlone, Co. Westmeath. They are now Ireland's largest dedicated parcel delivery company with 38 depots throughout the country handling in excess of 11 million parcels per year.

DPD was awarded best supplier of the Year at Retail Excellence Awards 2016.

What do they have to offer?

DPD's technological developments:

- Real time tracking
- On line track and trace
- Predict™
- DPD Parcel Wizard™
- "In flight" delivery options.

Predict™

DPD has a technology called Predict™ service. It will tell you when the parcel will arrive.

How does it work?

- You provide DPD with your customer's mobile number and/or email address.
- On the morning of delivery, they send you an SMS and/or email specifying the 1-hour window in which to expect delivery.
- You have the option to reschedule to a more suitable day, right from their device.

DPD Parcel Wizard™

UK Virtual Address

How does it work?

- Use DPD's UK Virtual Address when ordering online from your favorite UK e-tailers.
- DPD will deliver on a date that suits you
- And they will get your parcel to home or a location that suit you.

3.2.3 17Track.net

17TRACK is an all-in-one package tracking website and app. They support over 170 Postal Carriers, Multiple International Express and Popular E-Commerce Carriers.

Pros:

- They use an automated tracking system to automatically detect the courier service from your tracking number without you having to select one.
- They support a wide variety of top and international courier services.
- They support a wide range of languages.
- They are ever expanding their supported courier services.
- Free app download.
- Very easy to use and intuitive layout both web and app based.

Cons:

- You don't have any contact with your courier service.
- You are unable to change your delivery location, time or date.
- No real time tracking.

Although there are more Pros than cons listed above I believe that these cons would be of high value to the customer and greatly improve their

overall satisfaction and experience of using a tracking service. This is why we have set out to implement this into our design.

3.2.4 Nightline Group

Tracking Parcel:

1. website
2. smart phone

Door to Door tracking Via “bespoke smartship”.

Parcel Motel: service offered by the company to pick up parcel remotely.

Nightline “Smart Shop Account”: a unique tracking system.

Parcel Motel

“NightLine’s convenient, secure and round the dock delivery and return service for online shoppers”.

SmartShip

A programme designed by Nightline, which tracks every step of the journey from booking to delivery and payment.

Nightline Logistics:

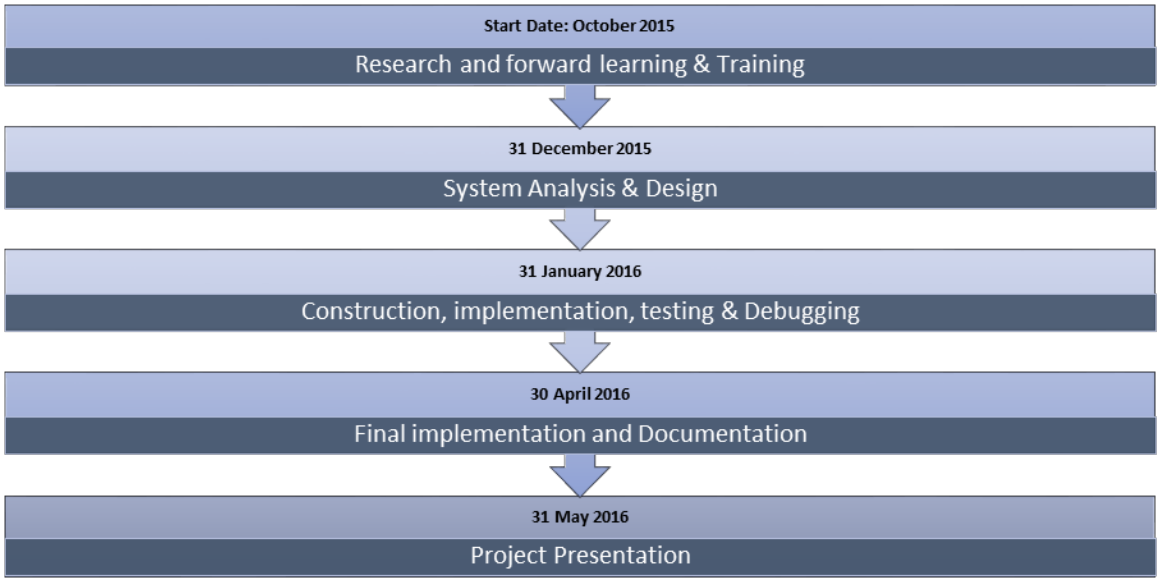
- combines smartship
- world class supply chain management
- secure storage
- automated ordering and reporting

3.3 PROJECT SCOPE

This project will consist of creating a web application and mobile applications to deliver customizable features in relation to courier delivery

services. The time line in which the project will be constructed from October 2015 to May 2016. The project will be broken up into segments and assigned to each developer in accordance to strengths and motivation to learn each technical aspect. We had planned to develop an Android application along with an IOS application. We decided as a group that we needed to narrow the projects scope and limited the focus to a web application that is mobile friendly. Team members and their respective departments and head roles consist of Thiago Murphy – Front end Web Designer, Wade Williamson – Database, Varadane Calleemootoo – Server administrator and Kyle Truebody – Web Developer. Design of the project will be a collaborative compilation. Each segment is not necessarily member specific. Members will be involved in aspect of other members segments to help balance work load and over all understanding of each element of the project.

Our summarized Projected timeline:

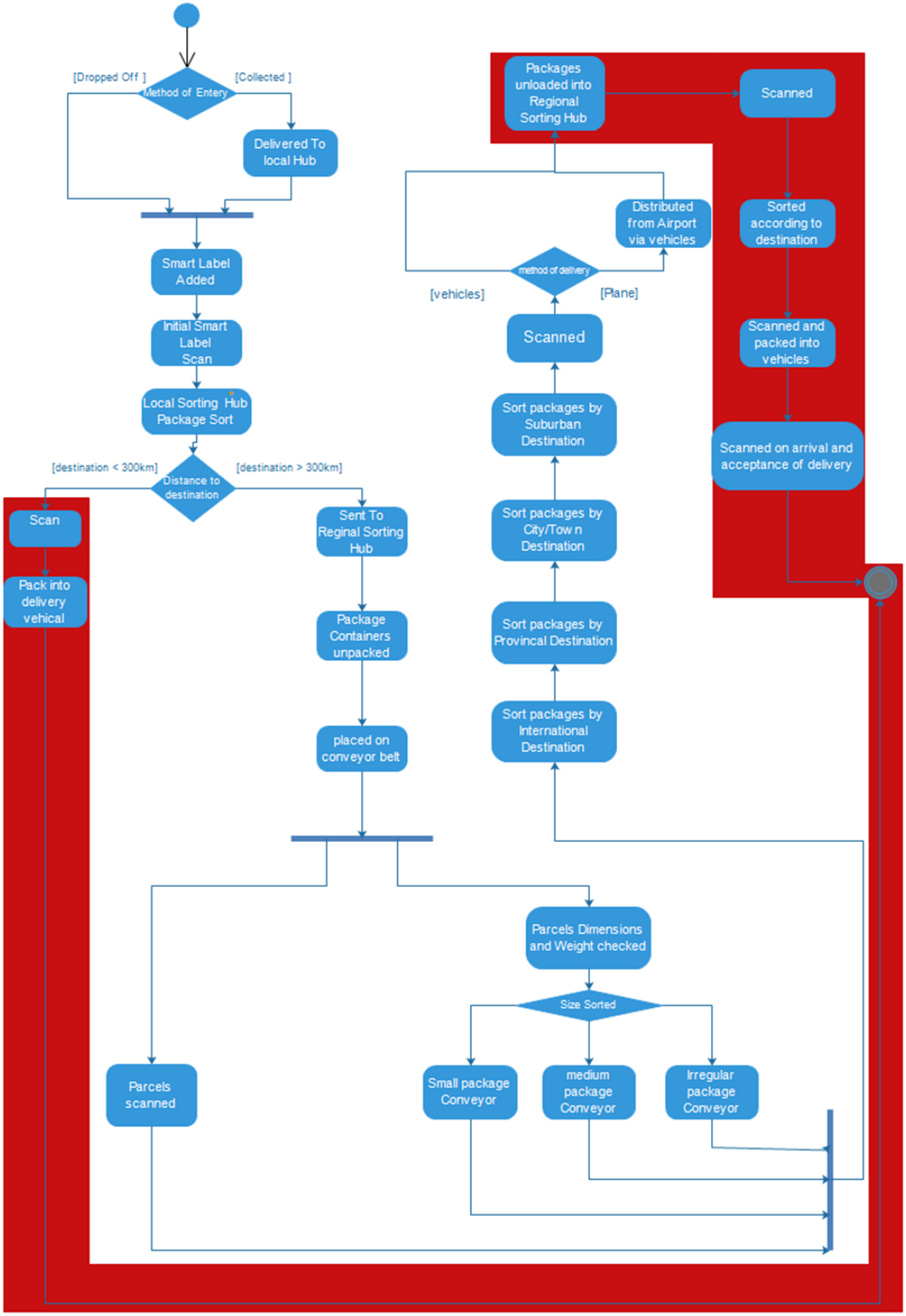


Key aspects that will be included in the project will include a client web page. Here the will be able to interact with the service directly. Changing delivery location or/and date and time of the parcel. Re-scheduling the date of delivery or adding an alternative address with a named signatory to

receive for the client (a neighbor). The Service provider web site for accessing and database and accessing client information. The mobile applications will interact with clients in a more simplified and focused intent. Both Web and Mobile applications able to track the courier van to keep check on real time status of the delivery to help maintain delivery time. Tracking will be handled by scanning QR codes and Bar codes with mobile devices. The QR and Bar codes will be scanned at check point intervals to monitor the package location and status. The QR code will trigger an email and text delivery update along with the packages Track and Trace number to access the update delivery options. This is where information can be updated for the customer to see on the applications provided.

The project scope will focus on the sequence highlighted in red of the following flow diagram.

Project Sequence Focus



3.4 Initial Summary Schedule

Schedule is broken down into a monthly iteration and anticipated goals.

Month	Iteration Description
October 2015	Research – Industry standards, understanding internal functionality. Understanding the technology needed to implement application functionality.
November 2015	Research and Training – Formularizing ourselves with New IDE's and technologies needed. Learning standards and syntax for each technology(iOS, Android, JQuery etc) Surveys- If possible running a survey for the clients experience with current standards of service.
December 2015	Research- Have a detailed understanding of all aspects of the project goals and requirements Training- Continue building confidence with respective skills.
January 2016	Analysis- An in depth analysis of the research collected. Decide on the most suitable development style. Design- A group collaboration of detailed software design and final functionalities included. Detailed documentation and construct segmented user stories.
February 2016	Implementation- Configure server hosting Construction- Each team member start their respective area of development. Testing – If any areas able to be tested. Debugging where necessary
March 2016	Construction- Continuous development of application Testing- Testing of all application locally and then hosted, Debugging where necessary
April 2016	Construction- final iteration of construction finalizing overall features to keep. Testing- final testing and real world testing. Out Sourced testing- Getting feedback from outside sources.
May 2016	Testing – Documenting the testing Documenting – Collection of the overall research, documenting design iterations and final project documentation.

4 PLATFORM JUSTIFICATIONS

4.1 SPECIFIC PRODUCTS, SOFTWARE AND SERVICES

The products and services and software that we will be using to build and manage the project are as below.

1. MySQL: Will handle the relational databases in our project. The database will store information relevant to the packages and the clients.
2. GitHub: GitHub will hold our local project repository for group members to work from.
3. Apache: Will host our project on Apache server.
4. Ammps: Ammps will be used for developing and testing our platform before hosting.
5. PHP: Server side code implementation.
6. API's: We make use of Google Plus Oauth API, Google Maps API, Facebook Login API.
7. HTML5: For the web document.
8. JavaScript: For front end development. We will make uses of Bootstrap, JQuery, JQuery-UI to provide multiple platform layout sizes.
9. AWS: For hosting the final web product and databases.
10. Asana: Web application used for project managing.
11. Dropbox: Used for file sharing.

4.2 ASANA JUSTIFICATION

What is Asana?

Asana is a web and mobile application designed to help teams track their work and to improve team collaboration. It focuses on allowing users to manage projects and tasks online without the use of email.

Uses of Asana

Each team can create a workspace. Workspaces contain projects, and projects contain tasks. In each task, users can add notes, comments, attachments, and tags. Users can follow projects and tasks and, when the state of a project or task changes, followers get updates about the changes in their inboxes.

Why we chose Asana?

We chose Asana as it is an easy and efficient way to manage all team members work as well as delegate new tasks. We also have the option of adding guests / lecturers to Asana so they are able to see how we progress with our project. It has an easy to use interface as well as a mobile app which make getting notifications about new tasks or updated tasks very easily. Asana also provides a tool where by our progress is shown in graph format so we are able to easily see and track the progress of our project.

Our project is available to view at https://app.asana.com . Please use these login details to view our project on Asana.

User: xparcelproject@gmail.com

Password: LiveTracking082646

4.3 AMMPS JUSTIFICATION

What is AMMPS?

AMMPS is a cross platform AMP stack for windows, mac and linux. AMMPS is based on MAMP, WAMP and LAMP to make it a cross platform AMP stack. AMMPS is a stack/bundle that converts your machine to a web server. AMMPS bundle have a web system “Apache”, databases systems “MySQL”, Programming Language “PHP” and combine all the components together to a web hosting system for someone to be able to host their web page online.

Why we chose AMMPS?

We chose AMMPS because it is a cross platform AMP bundle. AMMPS have all the services that we need to be developed, host our codes and the databases for the table that will hold the data/contents. AMMPS has the following programming languages, databases systems and web hosting systems:

Programming Languages:

- PHP
- Perl

Databases Systems:

- MySQL
- MangoDB

Database system managers:

- MySQL Lite
- PHPMYADMIN

Web hosting System:

- Apache

4.4 AGILE JUSTIFICATION

What is Agile?

Agile focuses on continues improvement, scope flexibility, team input as well as delivering essential products. Agile methodologies include scrum and extreme programming among others. Agile software development uses iterative development which provides continuous feedback.

12 Principles of the Agile Manifesto

The 12 principles of the agile manifesto are used to implement agile methodologies into our project.

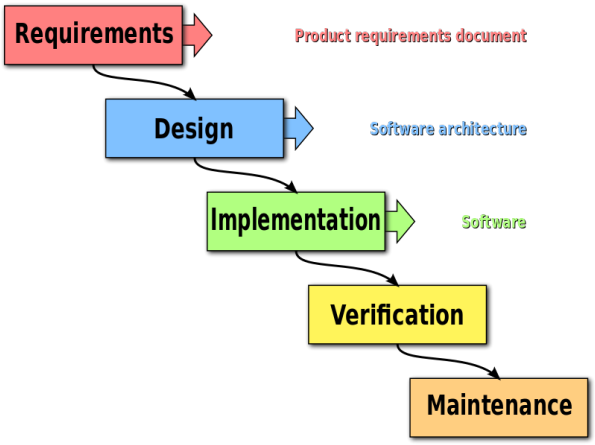
1. Satisfaction, by continuous delivery of valuable software
2. Requirement changes, for the customers' competitive advantage,
3. Working software, delivered frequently,
4. Business' and developers need to work together throughput the project,
5. Projects built around motivated people. Trust.
6. Face-to-face conversations are key,
7. Progress is measured on working software,
8. Sustainable development. Maintain a constant pace,
9. Attention to detail,
10. Keep it simple,
11. Organization,
12. Effectiveness within the team.

Why we chose Agile

The reasoning for us choosing agile software development was due to the fact that this methodology incorporates iteration as well as continues feedback, which we can use to refine each stage of our development.

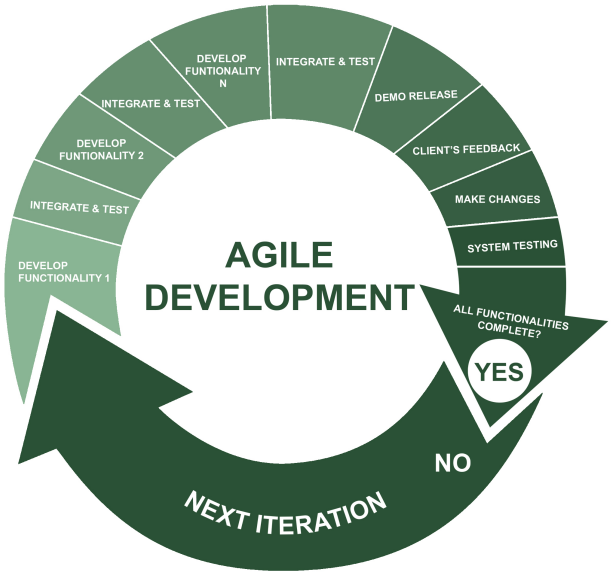
This way we are able to have multiple iterations throughout the development phase and really focus on what is fundamental to the project. Our ideas as well as feedback can have a slight change in the direction of

the development. We are then able to focus on key points to the success of software and quality of the service we hope to deliver.



We chose agile over waterfall development because this would not give us iterations in the development, it uses a sequential approach starting with requirements, design, implementation, testing, integration and finally deployment. We felt that this limited us to each stage of the process and not being focused on iterative working software.

In such a short period of time agile software development is a quick but strategic way to deliver our project, reduce risk and improve the overall quality by having continuous feedback. If any faults are pointed out they can be quickly corrected in the next iteration.



5 SYSTEM DESIGN

5.1 WHAT MAKES SOFTWARE INTUITIVE?

When researching companies that provide similar courier services, it came to our attention that several of these companies' Web Tracking Interfaces were somewhat challenging to navigate at first. It took a considerable amount of time and effort in figuring out how to achieve our intentions. Jef Raskins explains in his article "Intuitive Equals Familiar", in reference to a talk by Martin Marshall in Palo Alto (May 1994 at the BayCHI meeting) that a number of commercial magazines rated the usability of software by weighting 50% of the weightings to User Satisfaction, 30% to Productivity and 20% to Intuitiveness. From this statement we can deduce that User Satisfaction is directly affected by the productivity which is directly affected by the Intuitiveness. If a program is intuitive, then productivity is improved, leading to the overall rating of the User Satisfaction. So what makes design intuitive?

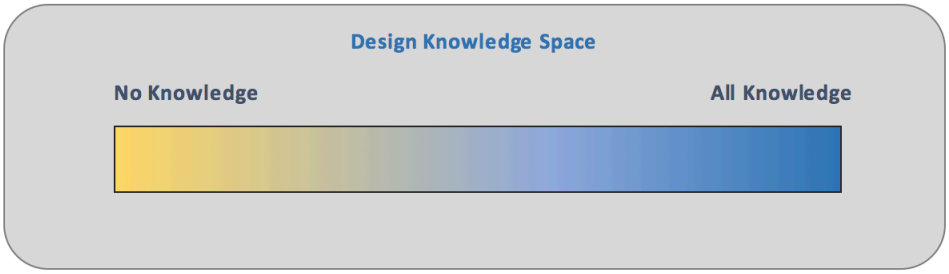
To understand what makes design intuitive, it is important to understand the meaning of intuitive. The dictionary meaning is: "spontaneously derived from or prompted by a natural tendency", but in the design industry the word intuitive does not hold the same meaning. In the design industry it's fair to say that "Intuitive" means "Familiar". Under this meaning it is easier to understand how to design intuitive software. Design doesn't intuit anything rather people intuit things. Being intuitive is personal and is derived from previous experience. Jared Spool in a talk at Design for Durpal Boston in 2010 adds that calling design intuitive is a shortcut. A design needs to be easy for the user to understand how to use it.

Design Knowledge Space

To understand what will help people determine something as being well designed we need to look at the Design Knowledge Space explained by

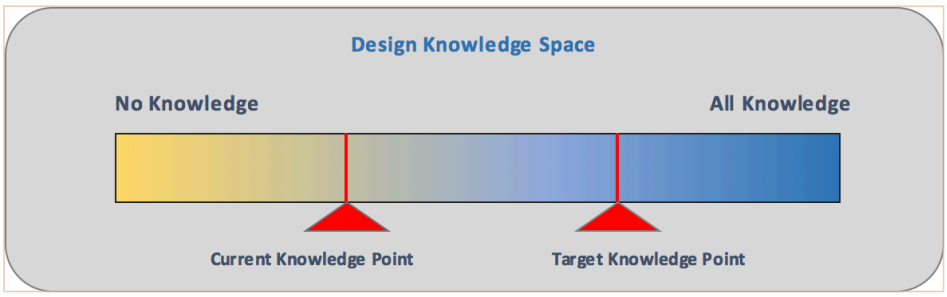
Jared Spool. The Design Knowledge space is based on an interface continuum (see Fig 1). On one side of the spectrum are the people that have no knowledge of how to use a particular program and on the other side of the spectrum are the people that have all the knowledge of that program. The distance from the left to the right represents how much a user has when they first use the interface.

Fig:1



The other points of interest on the spectrum are the Current Knowledge Point and the Target Knowledge Point (see Fig: 2). The Target Knowledge Point represents the amount of knowledge the user needs to accomplish their goal. The Current Knowledge Point is a representation of a user's knowledge of how to achieve their objective. The Target Knowledge and the Current Knowledge are the calculating factors that will play the most important part in interpreting the design.

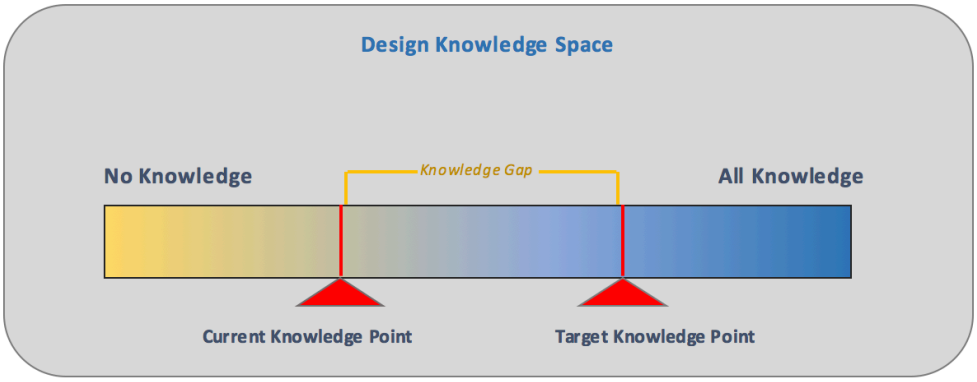
Fig: 2



The distance between the Current Knowledge Point and the Target Knowledge Point is known as the Knowledge Gap (see Fig: 3). The gap is where the design is interpreted. Things left of the current knowledge point do not need to be included into the design, because it is knowledge the user already has. And we don't need to design anything to the right of the

Target Knowledge Point, because the user will not be needing that information.

Fig: 3



A when the current knowledge is equal to the target knowledge then the user has completed their objective. There are two ways in which this can be achieved. When the users target knowledge and the user current knowledge are equal from the beginning of interaction with the interface,

or the knowledge gap is small and the interface design is helping the user bridge the gap. The user is learning but they do not perceive that they learning. Therefore, good design would be to implement factors that reduce the gap from both sides of the spectrum, because every user has a different knowledge gap. The average of the greater target user is used to determine the knowledge gap.

Therefore, include design that involves both training the user and lowers the complexity of the knowledge needed.

To find out the value of the knowledge gap field tests need to be carried out. Jared Spool (Spool, J. (2005) What makes a design seem 'intuitive'?) explains:

"For identifying the user's current knowledge, we favor field studies. Watching potential users, in their own environments, working with their normal set of tools, and facing their daily challenges, gives us tremendous insight in what knowledge they will have and where the upper bounds are. Teams receive a wealth of valuable information with every site visit. For identifying necessary target knowledge for important

tasks, usability testing is a favorite technique of ours. When we sit users in front of a design, the knowledge gap becomes instantly visible. (We've had great success, right after a test, listing out all the knowledge the user needed to acquire during the test. It can be quite revealing!)".

When there is an understanding on what someone perceives a design to be intuitive then it is easier to decide on how to build it.

Design Technique

There is a number of different techniques used gathering and interpreting information to help create intuitive design.

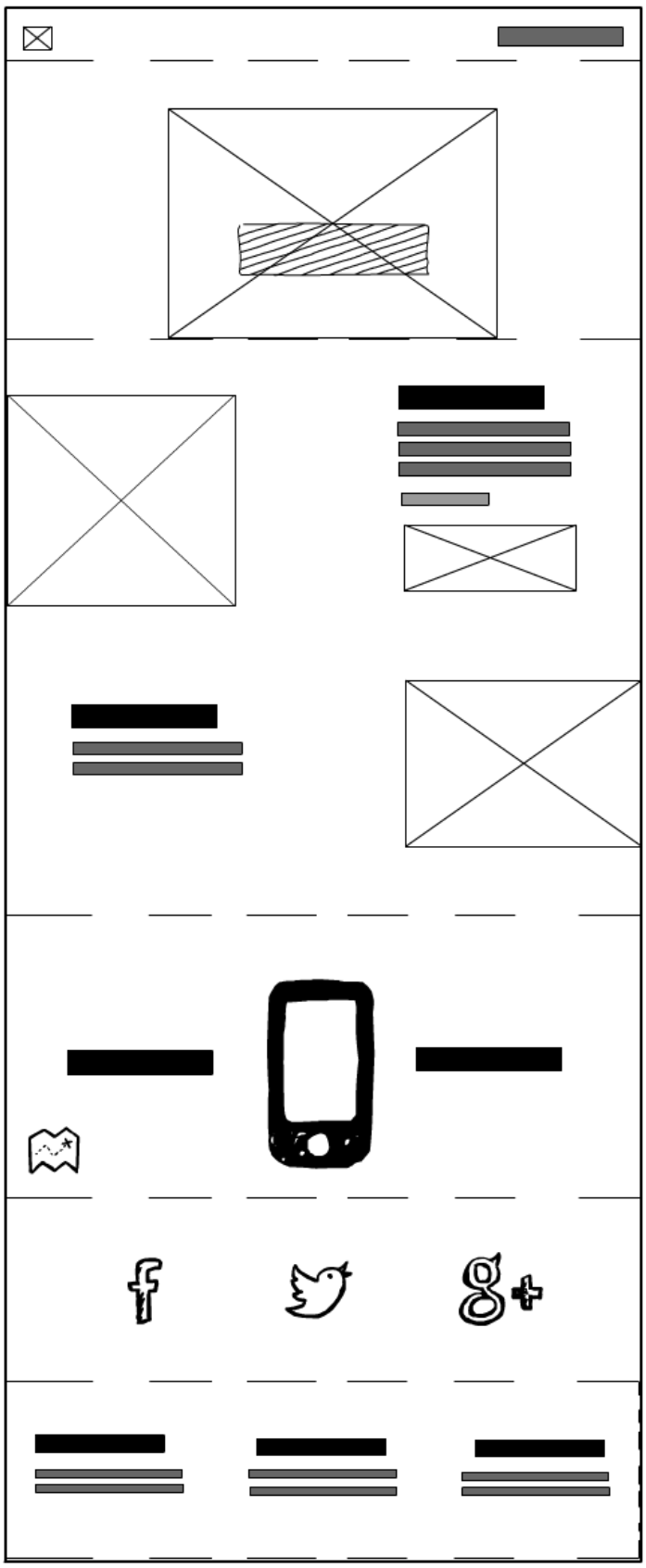
- Field Studies - Field studies help identify the target user's Current Knowledge.
- Structured usability: Identify the Target Knowledge and the Knowledge Gap by asking the users to complete a task. This way you learn about the users Knowledge Gap.
- Personas: A tool system that is used for teams to communicate their data about the user. The personas usually contain information about the individual user and their Knowledge Gap
- Patterns: A method used by designers that help them to implement similar types of design that with help in achieving the user's expectations of the software.

Design Goals

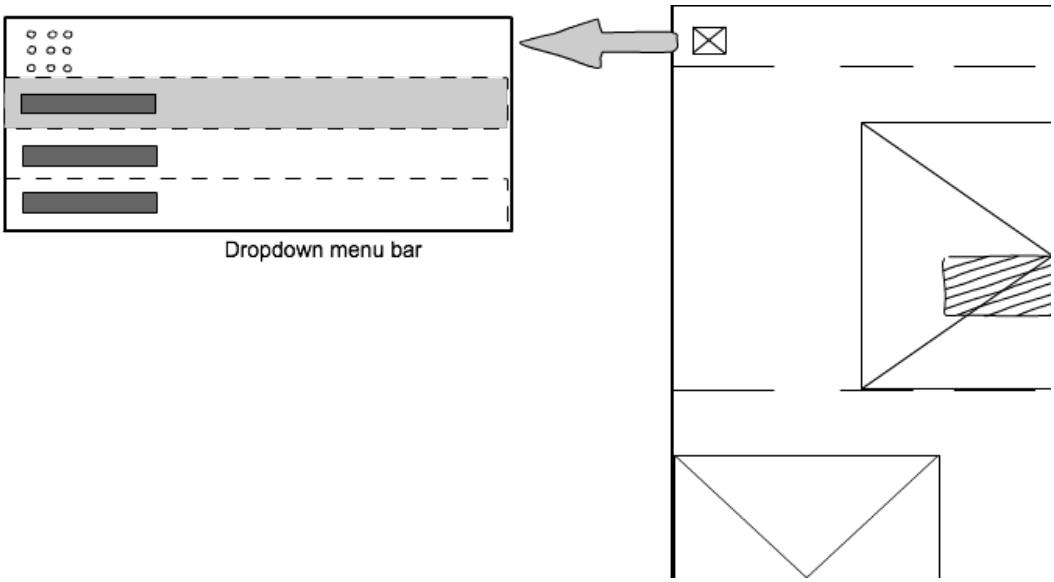
The design goals should then be to close the Knowledge Gap as close as possible. The more familiar people are with a system, the easier it is for them to operate it. Then at common points of low understanding, the design needs to provide subtle and clear clues to increase the user's knowledge. Good design is invisible, because people don't want to be side tracked from their main objective by having to try to interpret or figure out something in order to complete their goal. Making the design less complex can improve the overall design. Less is more.

5.2 Wireframes

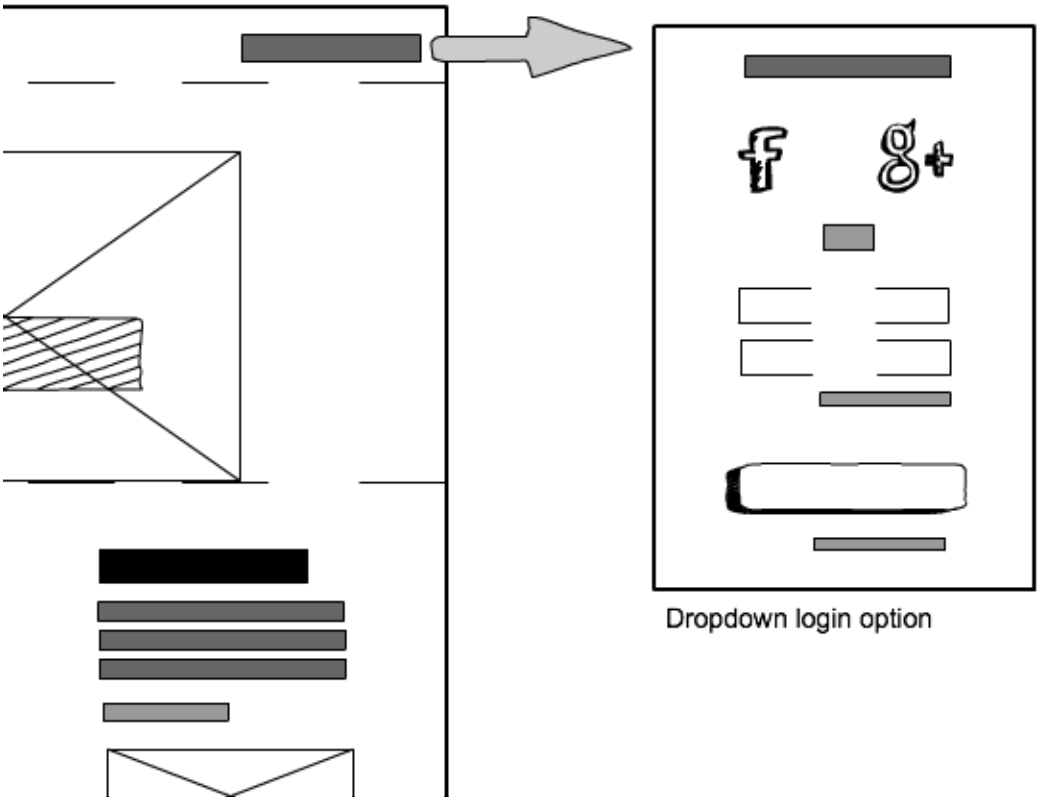
Home page:



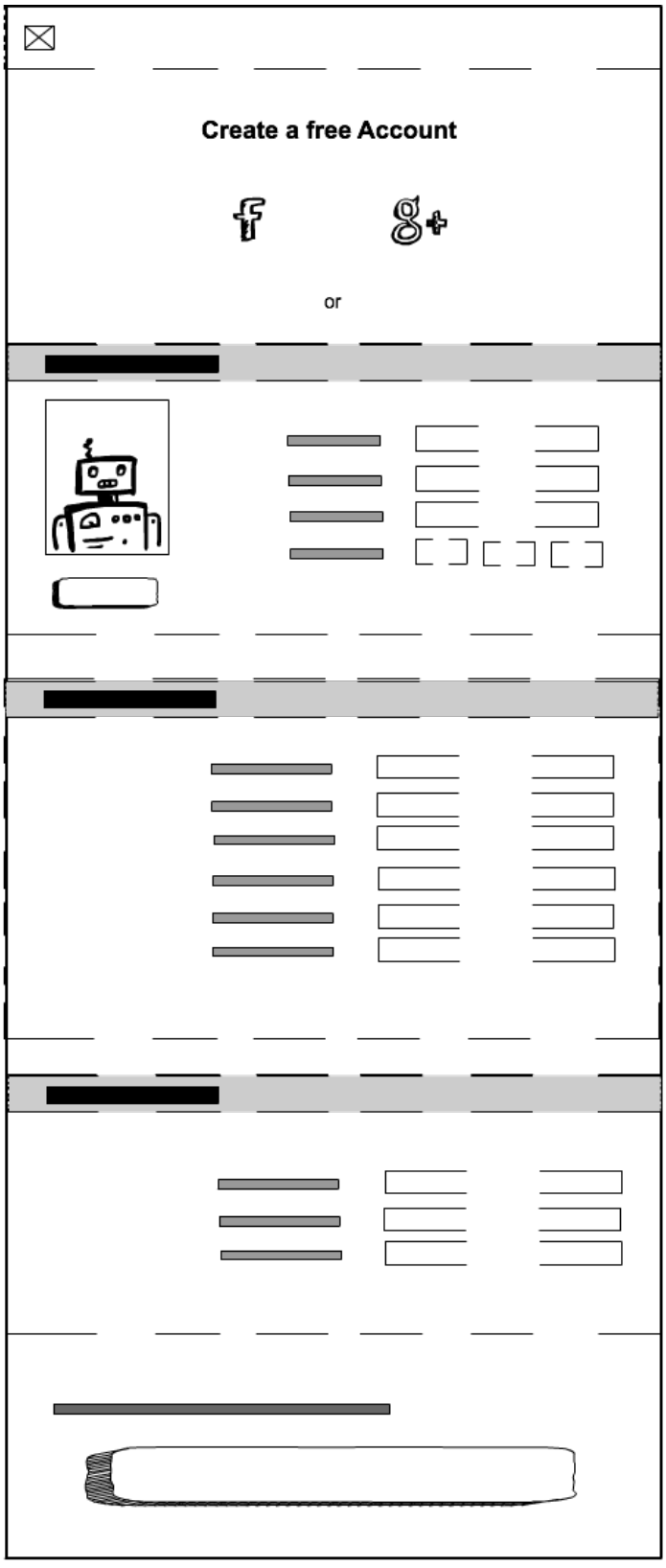
Home page menu:



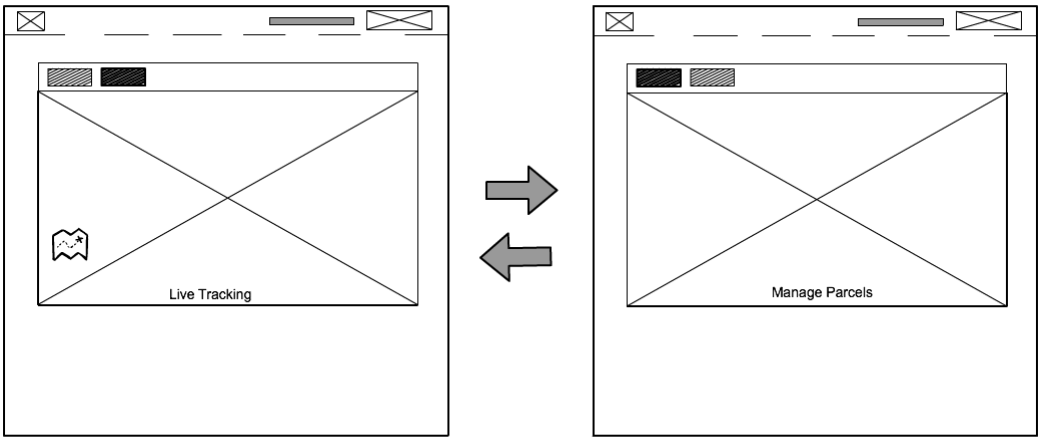
Home page login:



Register page:



Manage parcel page:



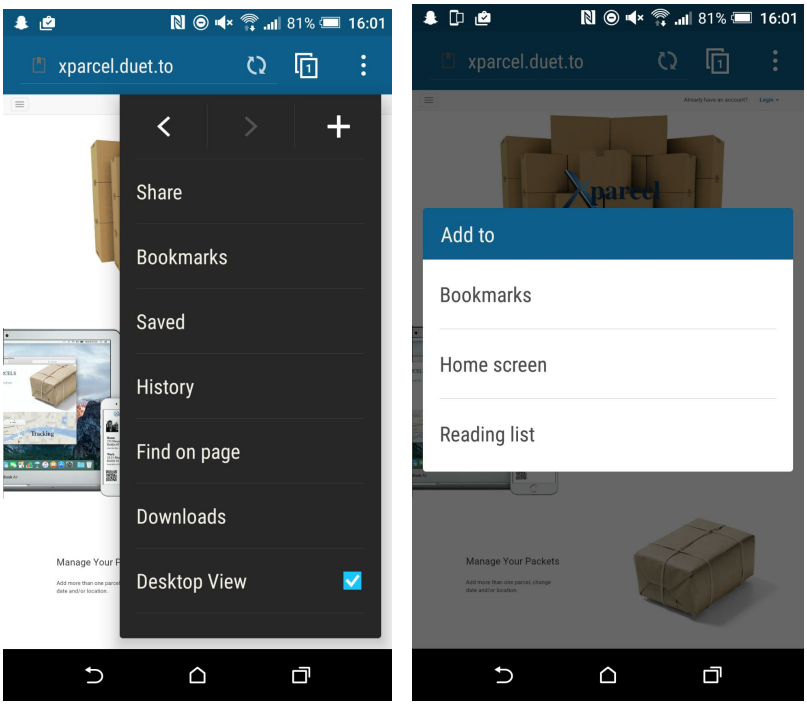
5.2.1 Mobile Design (IOS and Android)

From the outset we decided on producing a webpage, an iOS app and an Android app that would make for a better user experience. We were advised by our supervisor to drop iOS and Android applications as we would not have enough time to produce these.

We found another way to make the user have the app experience without having to develop it. In the photo below the user will be able to add our mobile and user friendly website to his home screen as an application.

For iOS see photo below:

For Android see photo below:



5.2.2 Electronic ID (E-ID)

We decided to use an electronic ID instead of what most courier companies would use today, such as driver license, GNIB card or passport.

This saves the user from having to carry or have at hand any of these formal documents reducing the chance of not been able to receive a parcel.

Nowadays we typically have our mobile phone with us so with the electronic ID been on your mobile phone it will always be at hand.

How does it work?

Our website will gather user information from the database and display the most important details to make user identification possible.

Users electronic signatures and IDs will be generated into QRCodes. This way the courier only needs to scan the QRCode to access full user details necessary for the transaction to be completed.

5.3 UML DIAGRAMS

5.3.1 Use Case

Primary Use Case

1 Use Case: [Client Delivery Management Service]

1.1 Description

In the efforts to deliver a package via courier services from any given location on the first delivery attempt, to the registered client from the sender. The client is granted access to monitor and manipulate the tracking status of their delivery.

1.2 Level

Primary level.

1.3 Triggers

- The customer purchases an item from an online commerce store. The package is sent via courier, it receives a smart label and is scanned.

- The customer sends a package via courier directly. The package receives a smart label and is scanned.

1.4 Primary Actor

- Customer: The receiver of the package/parcel.

1.5 Additional/Supporting Actors

- Courier Company: Handles the package to ensure safe delivery.

1.6 Stakeholders

- Package sender: Needs confirmation of the delivery.

1.7 Preconditions

The Customers [Primary Actor] package must have had the smart label scanned and sorted in the regional sorting hub. The customer must have active internet connection to the site delivery tracking service.

1.8 Main Success Scenario

1. At hand over of the package to courier company smart label is added.
2. Package tracking ID and details added to database.
3. Notification of assigned tracking ID via Email or SMS.
4. Customer can login via existing profile (Registered Account) or by using the tracking number (Guest Account).
5. The smart label is scanned.
6. The package tracking is initiated.
7. Package transit status is updated.
8. Customer receives transit status and estimated delivery date.
9. Transit status and location update at every label scanning check point.

10. Customer is able to update delivery location, date and service up to 24hrs before final dispatch.

11. The package is dispatch for final its destination.

12. On delivery the package is signed for with E-Signature or written signature to confirmation delivery.

13. The status of the delivery is updated for both parties to refer to.

14. The Tracking ID is added to package history.

1.9 Extensions

Exception: Failed delivery attempt (No authorized recipients available):

1. Courier delivery employee fills in Attempted Delivery Notice.

2. Attempted Delivery Notice is left in post box/post slot.

3. Attempted delivery logged into delivery management system.

4. Electronic Notice is sent to package recipient.

5. Alternative delivery date is sent to package recipient.

6. Package is returned to closest courier hub/office.

Alternative:

6.1. Rescheduling delivery:

6.1.1. Customer calls customer service office to reschedule delivery date or access the web application for delivery update -> (Return to Main Scenario).

6.2 Customer picks up the package from local Hub or Office.

7. After 5 – 7 days the package is returned to sender if the recipient has not requested a new delivery date.

Alternative: Customer updates delivery location.

1. Customer logs in via existing or guest profile.

2. Select the Package Tracking ID.

3. Select the change delivery Location option.
4. Enter a new Delivery Address or add address from user profile.
5. Address is validated.

   Exception: Invalid Address.

   5.1. Prompt for re-entry of address.

   5.2. Initiate main scenario with updated details.

Alternative: Customer updates delivery date.

1. Customer logs in via existing or guest profile.
2. Select the Package Tracking ID.
3. Select the change delivery Date option.
4. Select a new date to deliver on. (Maybe add time?)
5. Confirm new delivery date.
6. Initiate main scenario with updated details.

1.10 Post Conditions

1.10.1 Success End Condition

The customer receives their order and receives confirmation of delivery success and an authorized E-signature (QR Code) or valid signature is used or the delivery conditions are updated and confirmation of update is sent to customer.

1.10.2 Minimal Guarantees

The sender and the recipient are aware of every position and status of their package. The system logs the status and delivery record of package.

1.10.3 Failure End Condition

The package is stored in warehouse until further notice. Unless the holding time expires or the succession of deliveries fails the items are returned to sender.

1.11 Special Requirements

- Local area traffic congestion and bad weather factors can impede service provided.
- Vehicles have GPS tracking modules installed and activated or the driver uses mobile application to track.
- Any amended services must be done before 10pm of the local sorting hub time, to be successfully processed.
- Holding time for uncollected packages is 5 to 7 days.

1.11.1 Security

Customers will be able to manage their own login profiles. Personal details and e-signature will be encrypted.

Secondary Use Case

1 Use Case: [Client Amended Delivery Date and Location]

1.1 Description

By giving the client live feedback on package location and delivery date status the client is able to update the date and/ or the location of the delivery while in transit.

1.2 Level

Secondary level.

1.3 Triggers

- The client uses application to update delivery location.

- The client uses application to update delivery date.
- The client adds an authorized person to sign on delivery.

1.4 Primary Actor

The Primary Actor is the Customer receiving the package/parcel.

1.5 Additional/Supporting Actors

Secondary Actors:

- Courier Company: Handles the package to ensure safe delivery.
- Added authorized person: This person is a specified extra recipient able to sign and receive the delivery.

1.6 Stakeholders

- Package sender: Needs confirmation of the delivery.

1.7 Preconditions

- The Customers [Primary Actor] must a valid tracking ID issued and the delivery is still actively in transit.
- The amendment of delivery details must be before 10pm the night before expected delivery date.

1.8 Main Success Scenario

1. The customer logins into their account using Tracking ID (Guest Account) or Login details (Registered Account).
2. The user chooses to update the delivery details.
3. The details are amended within the database.
4. Notification confirming updates is emailed or SMS is sent to the user.

1.9 Extensions

Exception: Invalid Tracking ID.

1. Application validates Tracking ID.

2. Prompts error: Tracking ID not registered or not active.
3. Prompts for re-entry.

Alternative: User updates delivery location.

1. User selects Location update.
2. User selects from list of previous address or selects to enter a new address
3. Address is validated.
4. Delivery details are updated within database.
5. Confirmation of the update is emailed or sent via SMS.

Exception: Invalid Address entered.

1. Application validates zip codes and street address formats
2. Identifies the invalid entries.
3. Prompts for valid entries in referred field.
4. Prompt to select address using Google Maps.

Alternative: User updates delivery date.

1. User selects date update.
2. Users selects from a predefined set of possible dates.
3. Date change is confirmed via email or SMS.

Alternative: User authorizes new delivery recipient (Alternative person to sign for delivery).

1. User selects add new signatory.
2. Enters the Name of signatory.
3. Stipulate whether it's a neighbor of set delivery address.
4. Enter signatory address.

5. Validate address.
6. Prompt if user would like to send temporary QR E-signature ID to signatory.
7. Email E-signature to signatory.

Alternative: Users are able to get live feedback of their delivery when in final stage of transit.

1. Email or SMS notifies user of the final stage of dispatch.
2. Application option to monitor delivery is activated.
3. Estimated delivery time is calculated according to traffic condition or other impairments.

4. Live Tracking deactivated when delivery is confirmed.

1.10 Post Conditions

1.10.1 Success End Condition

The user receives email or SMS confirmation of their delivery detail updates. Details of the delivery are amended within the system database.

1.10.2 Minimal Guarantees

Any amendments to the delivery options are communicated to the user using an alternative method other than the application i.e. Email or SMS.

1.10.3 Failure End Condition

If a failure occurs the delivery details will retain their original set delivery options. Notifications of such failure is sent to the user.

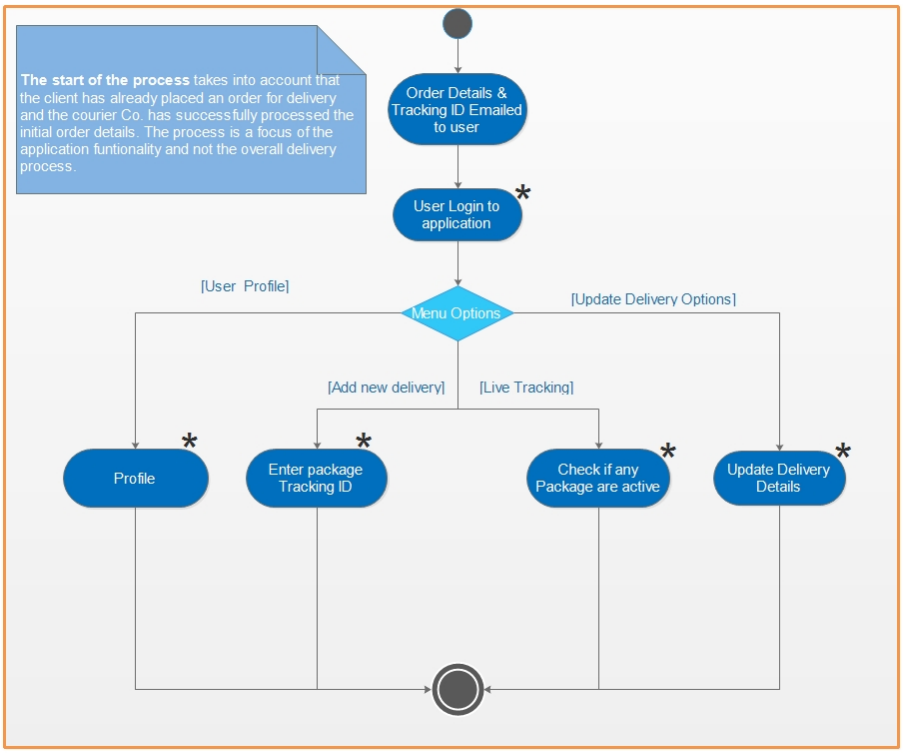
1.11 Special Requirements

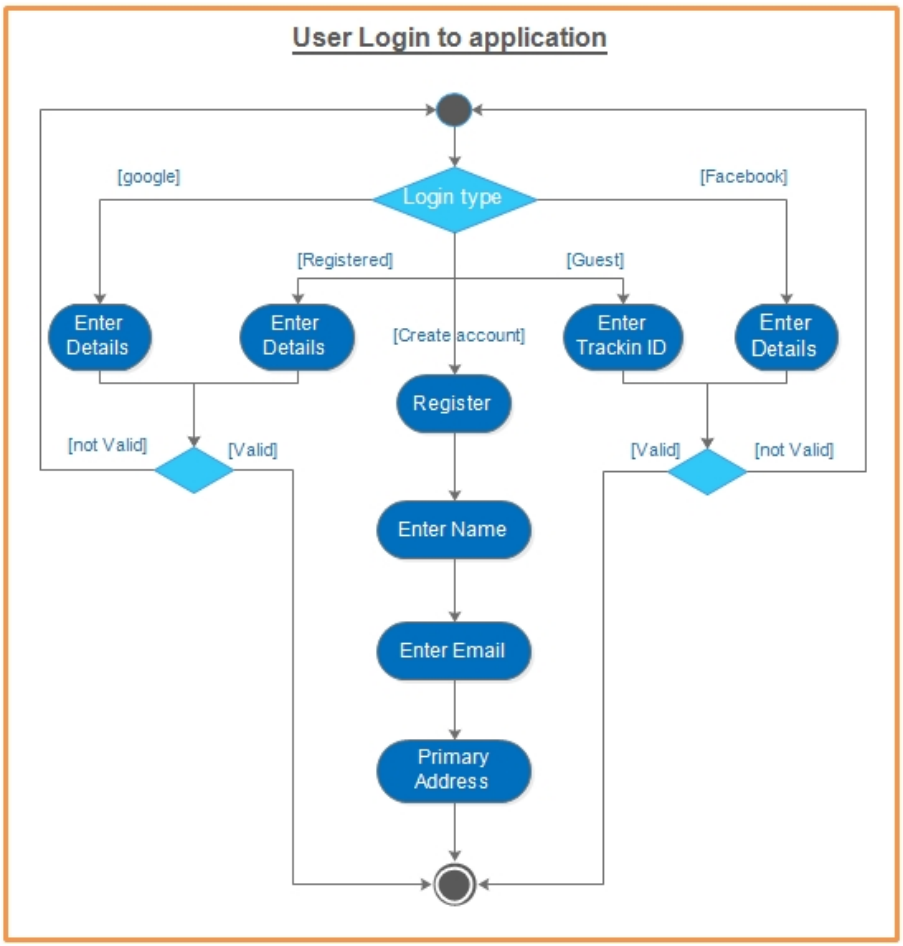
- Possible link to Traffic information API.
- Local area traffic congestion and bad weather factors can impede service provided.

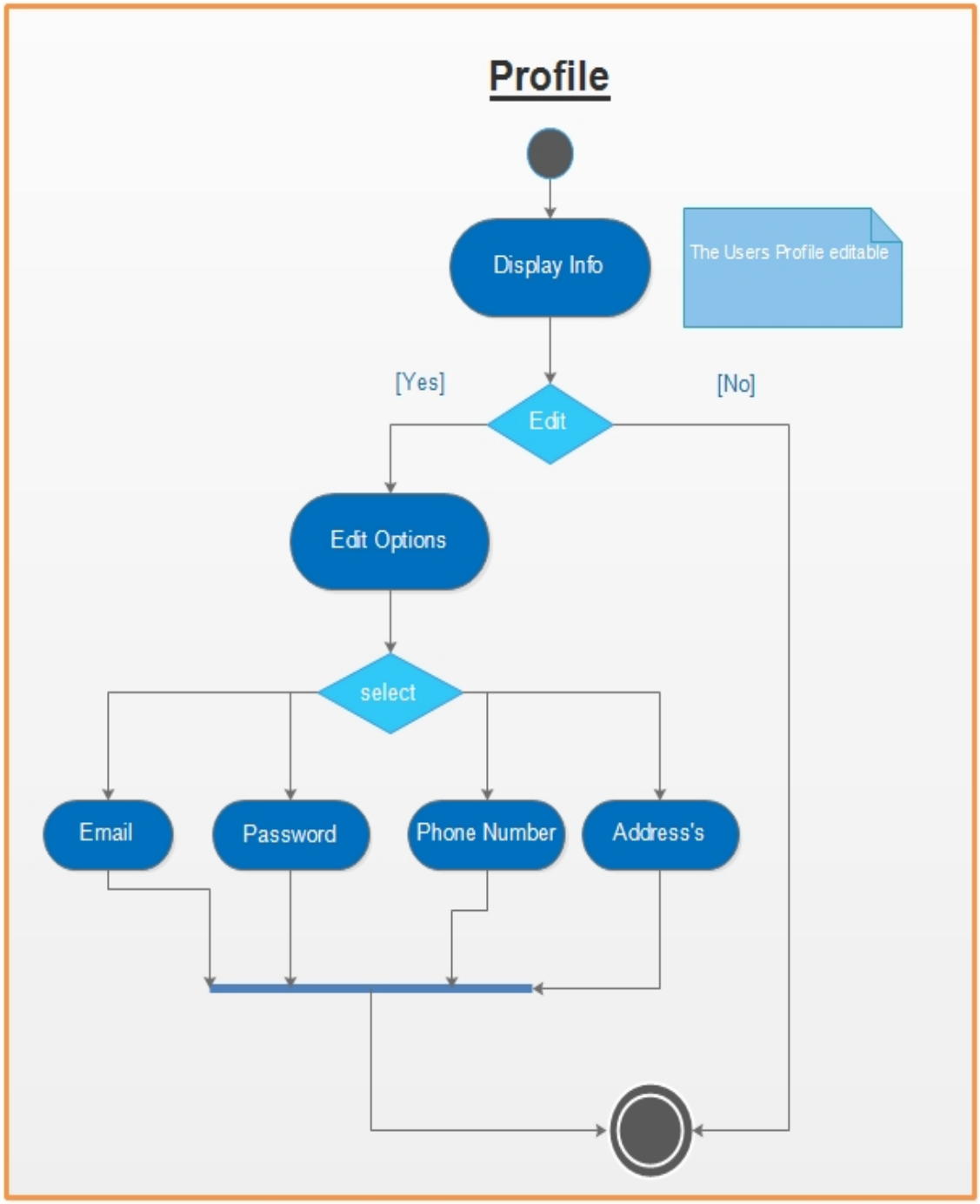
1.11.1 Security

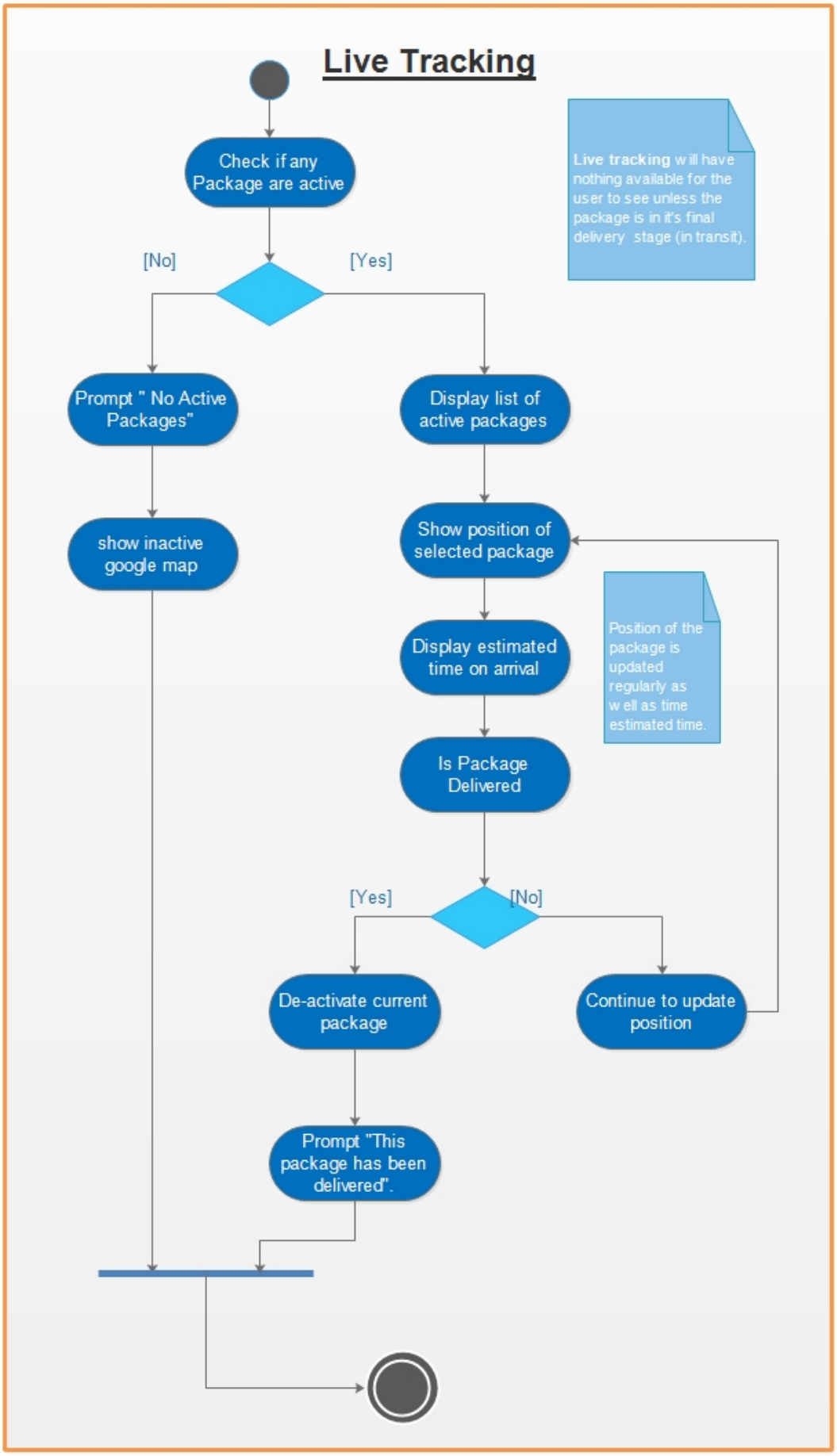
Customers will be able to manage their own login profiles. Personal details and e-signature will be encrypted.

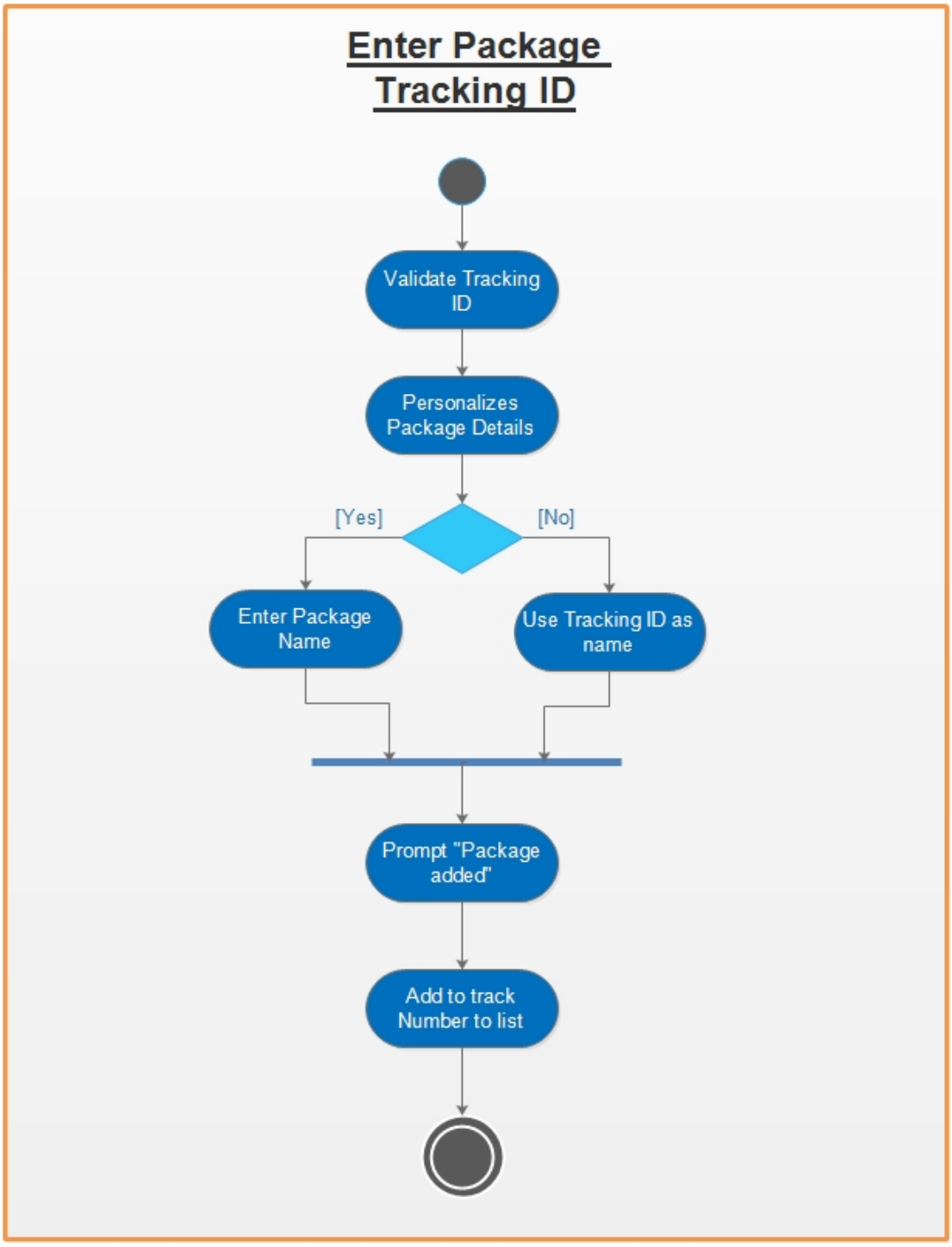
5.3.2 Activity Diagram

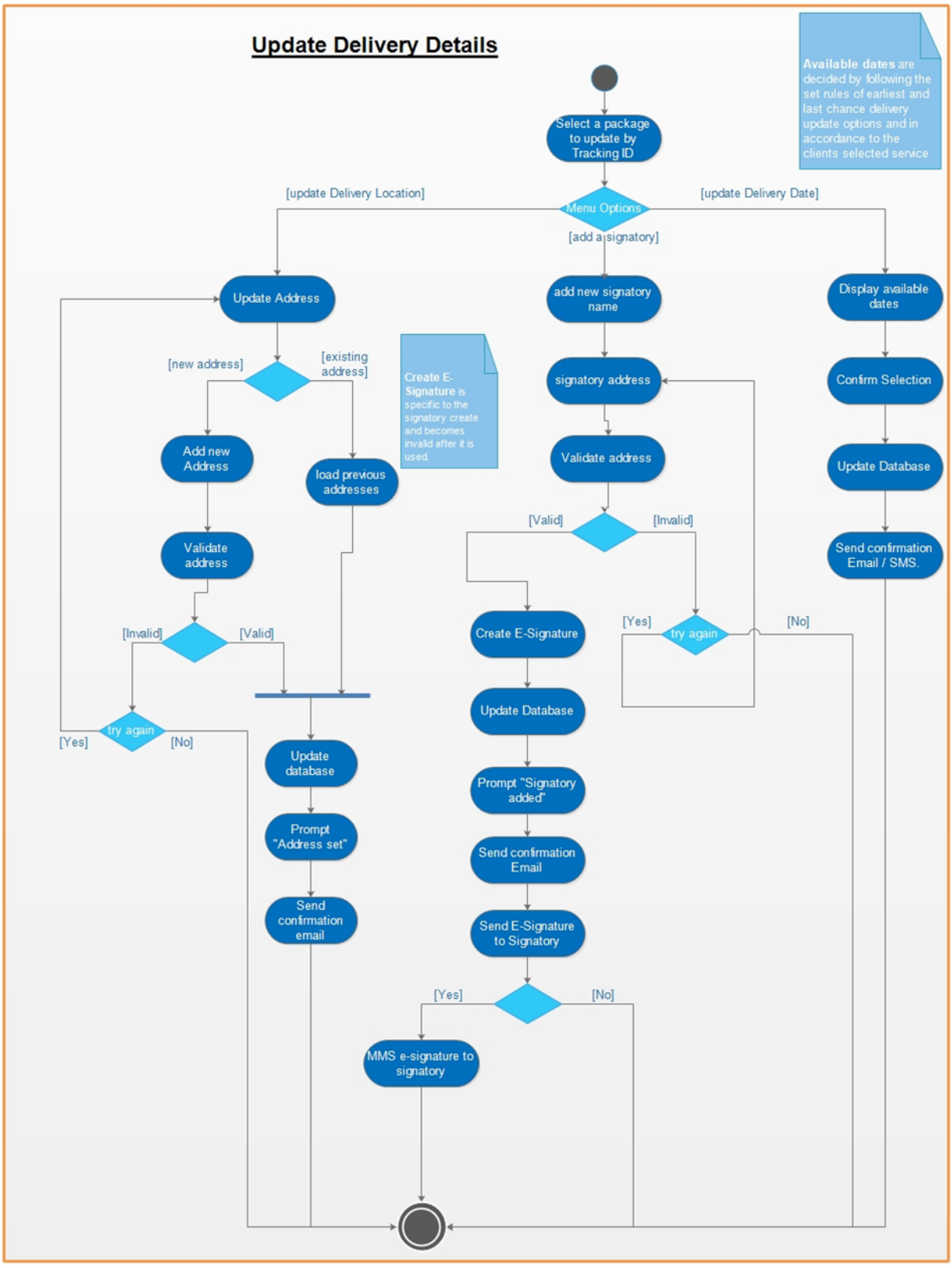





Profile
Display Info
The Users Profile editable
[Yes]
[No]
Edit
Edit Options
select
Email
Password
Phone Number
Address's

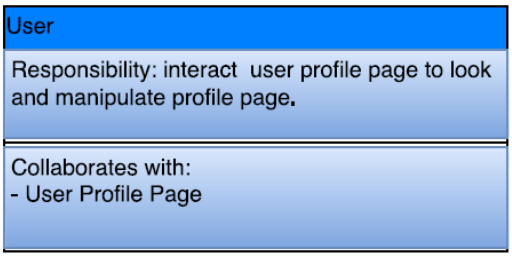

Live Tracking
Check if any Package are active
Live tracking will have nothing available for the user to see unless the package is in it's final delivery stage (in transit).
[No]
[Yes]
Prompt " No Active Packages"
Display list of active packages
show inactive google map
Show position of selected package
Position of the package is updated regularly as well as time estimated time.
Display estimated time on arrival
Is Package Delivered
[Yes]
[No]
De-activate current package
Continue to update position
Prompt "This package has been delivered".

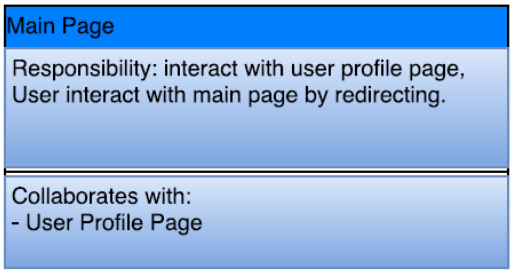

Enter Package Tracking ID
Validate Tracking ID
Personalizes Package Details
[Yes]
[No]
Enter Package Name
Use Tracking ID as name
Prompt "Package added"
Add to track Number to list

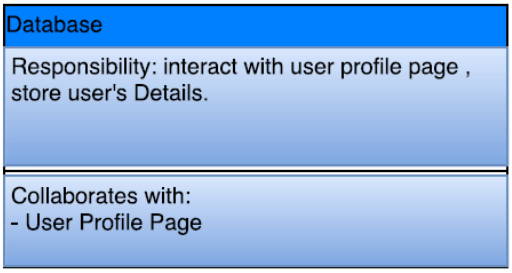

Update Delivery Details
Available dates are decided by following the set rules of earliest and last chance delivery update options and in accordance to the clients selected service
Select a package to update by Tracking ID
Menu Options
[update Delivery Location]
[update Delivery Date]
[add a signatory]
Update Address
add new signatory name
Display available dates
[new address]
[existing address]
Create E-Signature is specific to the signatory create and becomes invalid after it is used.
signatory address
Confirm Selection
Add new Address
load previous addresses
Validate address
Update Database
[Valid]
[Invalid]
Validate address
Send confirmation Email / SMS.
[Invalid]
[Valid]
Create E-Signature
[Yes]
try again
[No]
Update Database
try again
[Yes]
[No]
Update database
Prompt "Signatory added"
Prompt "Address set"
Send confirmation Email
Send confirmation email
Send E-Signature to Signatory
[Yes]
[No]
MMS e-signature to signatory

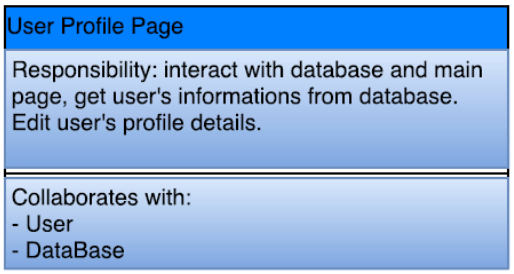
5.3.3 CRC Diagram

User:

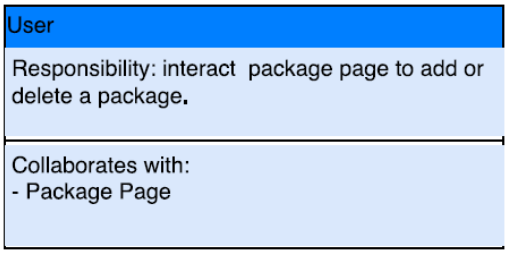


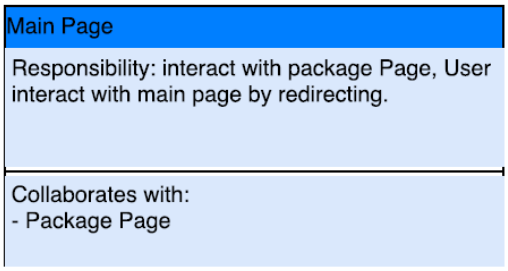


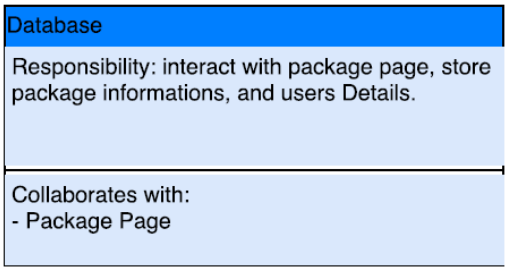


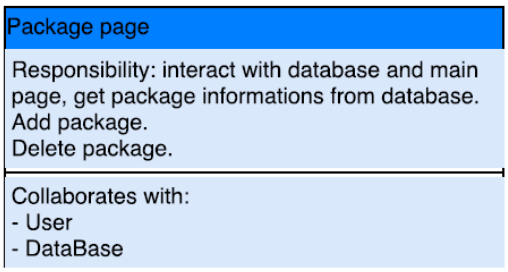


Package:



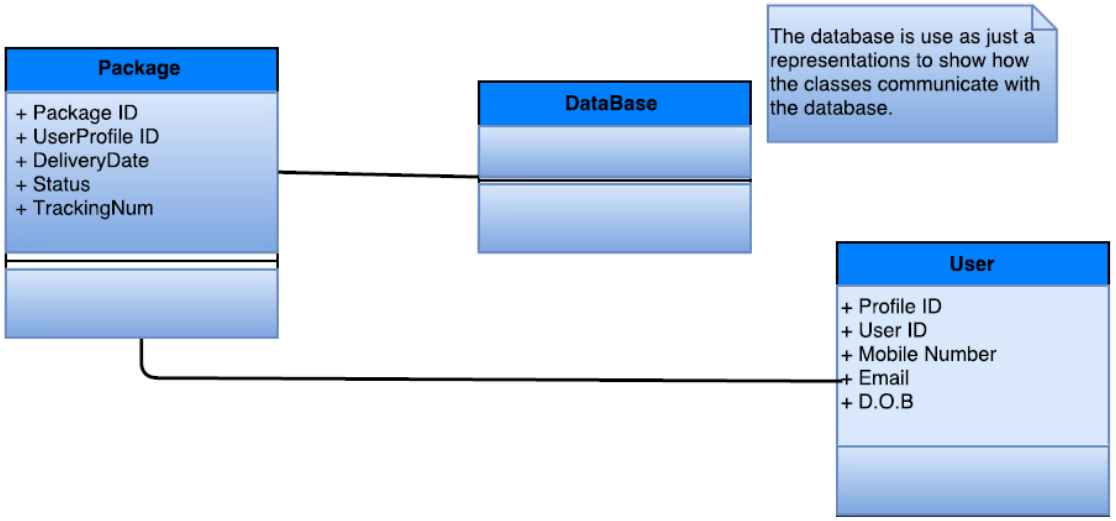




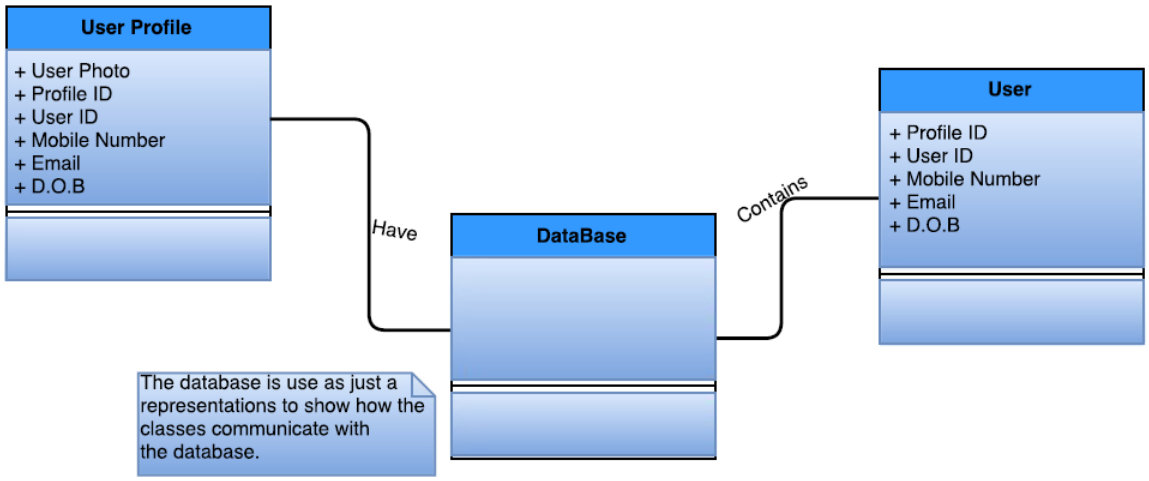


5.3.4 Class Diagram

Package:

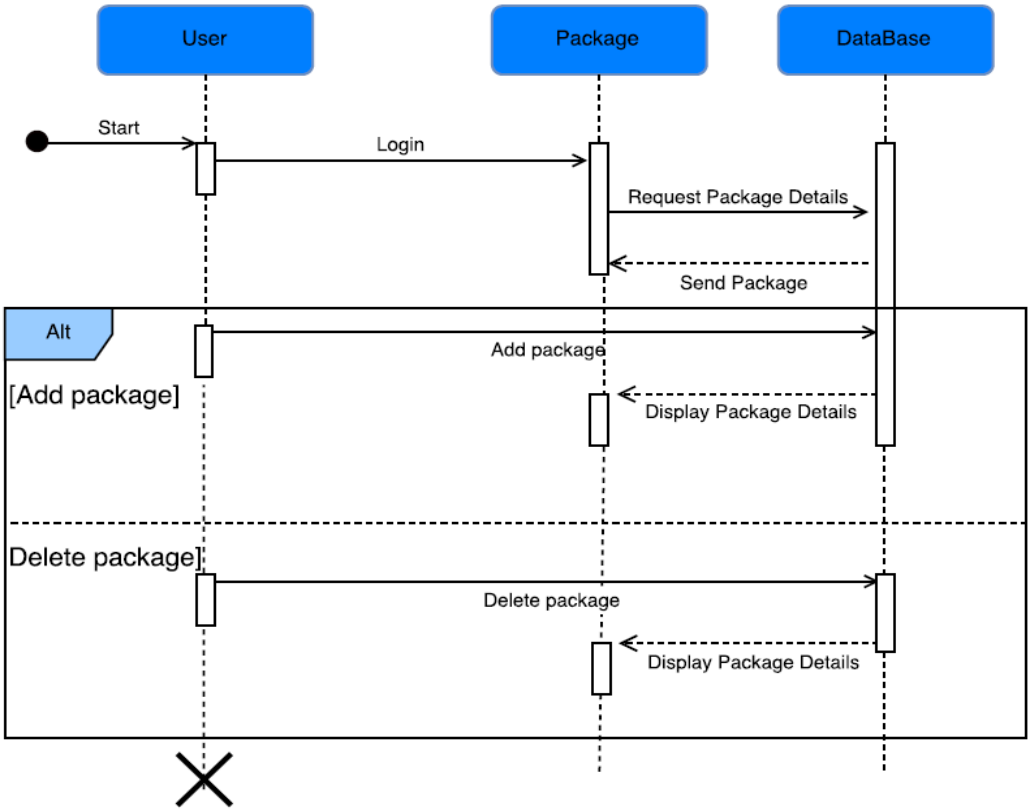


User Profile:

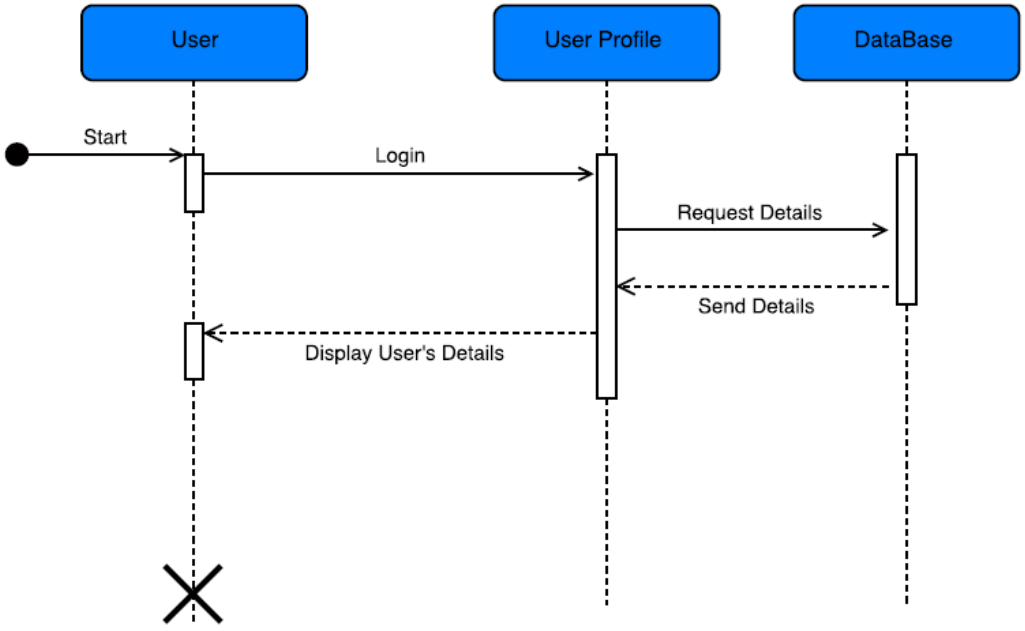


5.3.5 Sequence Diagram

Package

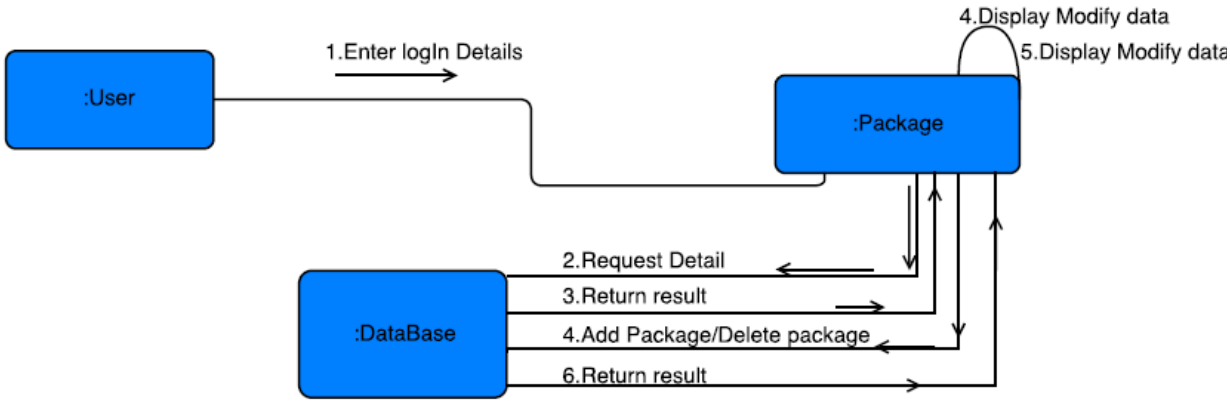


User Profile:

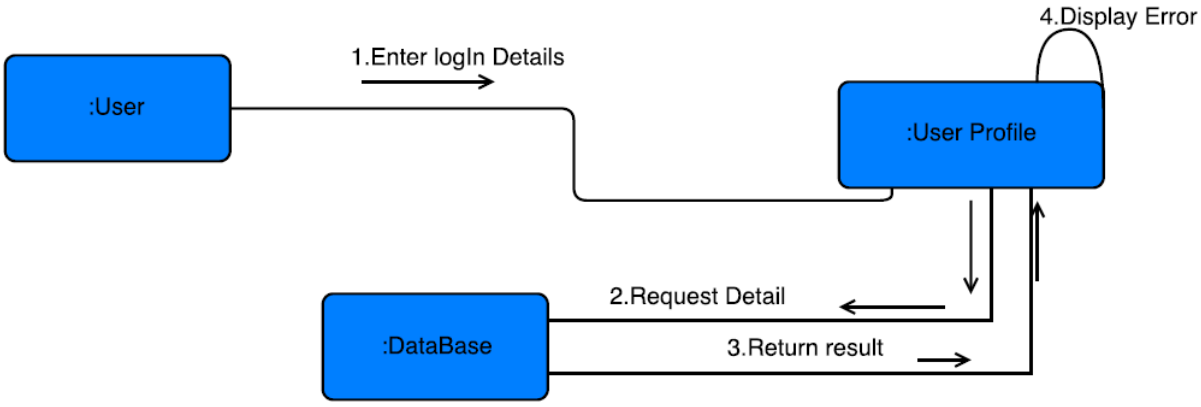


5.3.6 Communication Diagram

Package:



User:



5.4 DATABASE DESIGN

Xparcel Database Requirements

The application should allow the user to have saved preferences and editable details. The users details should be accessible through the users profile menu within the application. The clients' account should have the clients full name and contact details, mobile and email address linked to their account and the option of adding a profile picture. The users profile should be able to store the details of the preferred delivery address and a secondary delivery (optional) address for an alternative delivery destination option. With the accumulation of the users details an e-signature will be assigned to uniquely identify the user authorization on collection of the delivery. The user will be able to access their account through [two] different methods. The login options will be via a known google account, which will provide the details of the user's email, google ID or through a directly register account. The directly registered accounts will need the users email address as a user login field as well as a password for accessing their account.

Once the user has logged in to their account they will be able to add new packages identified by their unique Tracking ID. Each package will have a destination that it is to be delivered to and the estimated date that it is to be delivered on. Once a package has reached its last sorting Hub (Placed on its last transit path to the final destination) the Live Tracking system becomes active allowing the package to be track via a succession on Longitude and Latitude co-ordinates, updating the packages current location. The user should be able to authorize the package to be signed for, to confirm delivery by a second party. The details to identify the signatory should store the name and the address of the signatory and optional contact details from verification. The signatory details will generate an e-signature unique to the transaction and valid only for one-time use for delivery confirmation.

5.4.1 7 Steps of Normalization ER Model to Relational Model

Step 1: Mapping of Regular Entity Types

DirectLogin

UserID (PK)	Email	Password

GoogleLogin

UserID (PK)	Email	GoogleID

User

ProfileID (PK)	UserName	Email	DOB	Address

Packages

PackageID (PK)	Destination	DeliveryDate	Status	TrackingNum

Signatory

SignID (PK)	Address	Name

Step 2: Mapping of Weak Entity Types

We had no weak entity types to map.

Step 3: Mapping of Binary 1:1 Relationship Types

We have no 1:1 Binary Types to map

Step 4: Mapping of Binary 1: N Relationship Types

'DirectLogin' stays the same

'GoogleLogin' stays the same

'User' gets a FK of ***UserID***

'Packages' gets a FK of ***UserProfileID***

Step 5: Mapping of Binary M: N Relationship Types

Authorize

PackageID (PK)	SignID (PK)

Step 6: Mapping of Multivalued Attributes

UserAdd

AddressID (PK)	ProfileID (FK)	Address

PDesination

DestinationID (PK)	PackageID (FK)	Address

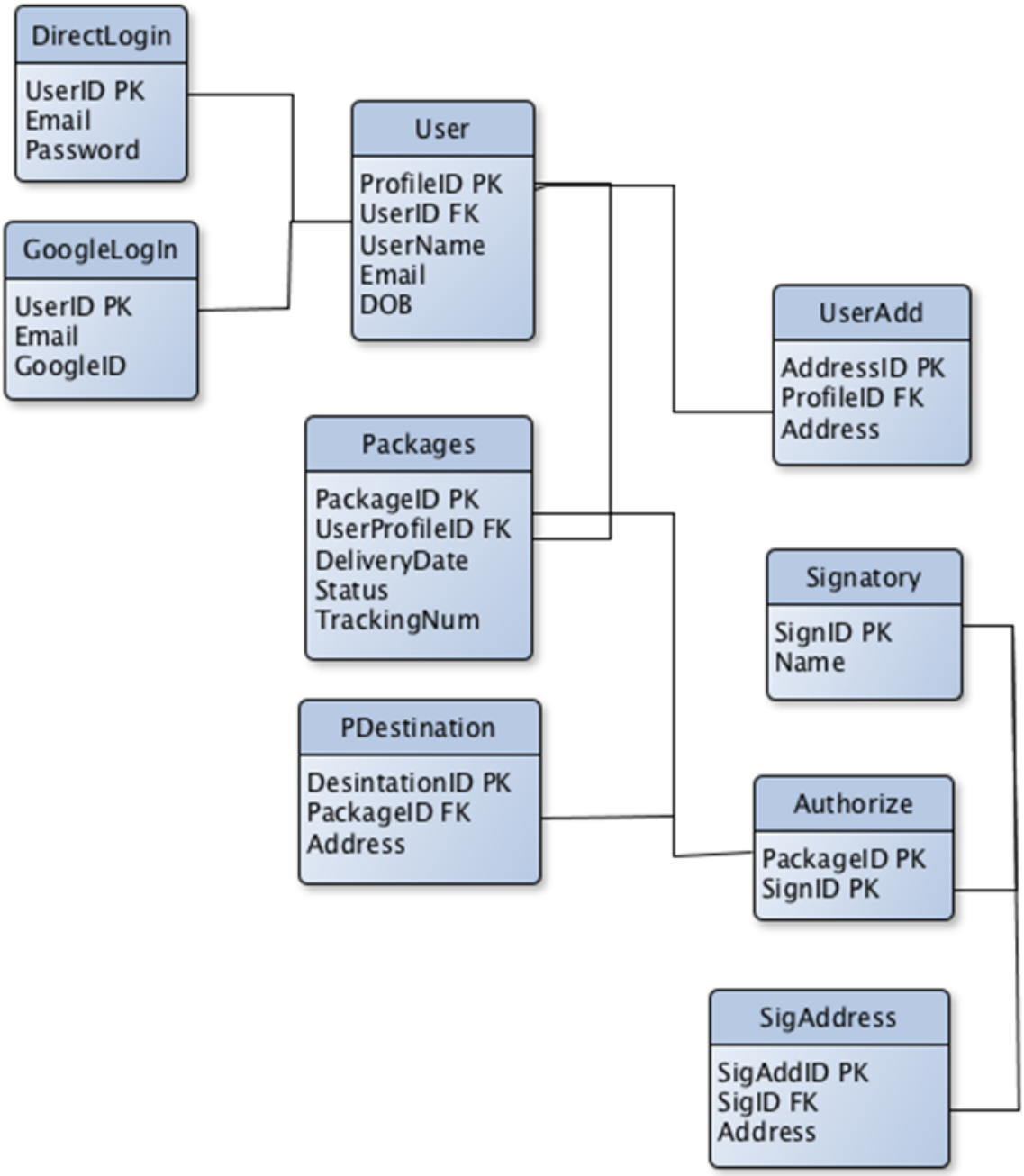
SigAddress

SigAddress (PK)	SignID (FK)	Address

Step 7: Mapping of N-ary Relationship Types

We have no N-ary Relationship Types to map

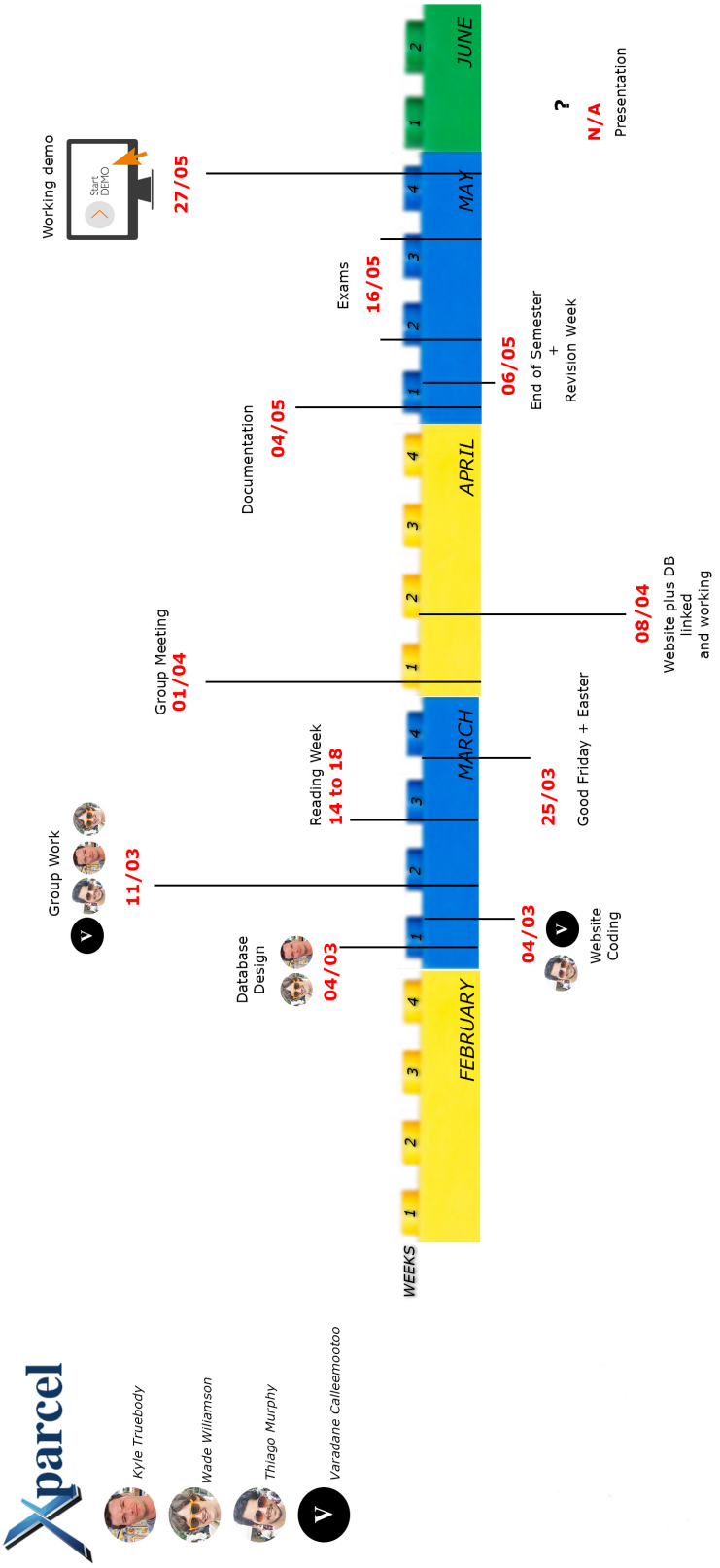
5.4.2 Entity Relation Diagram



5.4.3 Data Dictionary

Data Dictionary for Xparcel Database						
Table Name	**Attribute Name**	**Contents**	**Type**	**Format**	**Required**	**PK or FK**
DirectLogin	*UserID*	Users login ID	INTEGER	######	Y	PK
	Email	Users Email Address	VARCHAR	XXXXXXXXXXX	Y	Unique
	Password	Users login password	VARCHAR	XXXXXXXXXXX	Y	
User	*ProfileID*	Users Profile ID	INTEGER	######	Y	PK
	UserID	Users Login ID	INTEGER	######	Y	FK
	UserName	The Users full Name	CHAR	XXXXXXXXXXX	N	
	Email	The users Email Address	VARCHAR	XXXXXXXXXXX		
	DOB	The user date of birth	DATE	YYYY-MM--DD	N	
Packages	*PackageID*	The packages identification	INTEGER	#######	Y	PK
	UserProfileID	The users profile ID	INTEGER	#######	Y	FK
	DeliveryDate	The Package delivery date	DATE	YYYY-MM-DD	Y	
	Status	the delivery status of the package	CHAR	ACTIVE/ NOT	N	
	TrackingNumber	Unique package tracking number	VARCHAR	XX###########	Y	
PDestination	*DestinationID*	Packages Destination ID	INTEGER	######	Y	PK
	PackageID	The Packages identification	INTEGER	######	Y	FK
	Address	The delivery address	VARCHAR	XXXXXXXXXXX	Y	
UserAdd	*AddressID*	The Users Address ID	INTEGER	######	Y	PK
	ProfileID	The Users profile ID	INTEGER	######	Y	FK
	Address	The Users Address location	VARCHAR	XXXXXXXXXXX	Y	
Signatory	*SignID*	The signatory ID	INTEGER	######	Y	PK
	Name	The signatory 's full name	CHAR	XXXXXXXXXXX	Y	
Authorize	*PackageID*	The package Identification	INTEGER	######	Y	COMB
	sigID	The Signatory's Identification	INTEGER	######	Y	COMB
SigAddress	*SigAddID*	The Signatorys Address ID	INTEGER	######	Y	PK
	SigID	The Signatorys ID	INTEGER	######	Y	FK
	Address	The Signatory's address location	VARCHAR	XXXXXXXXXXX	Y	

5.5 Timeline


Xparcel
Kyle Truebody
Wade Williamson
Thiago Murphy
Varadane Calleemootoo
WEEKS
FEBRUARY
MARCH
APRIL
MAY
JUNE
Working demo
27/05
Exams
16/05
06/05
End of Semester
+
Revision Week
Documentation
04/05
Group Meeting
01/04
08/04
Website plus DB
linked
and working
Reading Week
14 to 18
25/03
Good Friday + Easter
Group Work
11/03
Database
Design
04/03
04/03
Website
Coding
?
N/A
Presentation

6 SECURITY

Throughout the implementation of the Xparcel application a number of security concerns began to emerge. In an effort to provide customers with protection of their assets we needed to address these vulnerabilities. The further we got into the implementation stage the more issues that seemed to present themselves.

A security issue we managed to address was the encryption and hashing of the user's password in the event that they used the applications native login sequence. We used SHA-1 hashing algorithm to further protect the user's password saved in the database. In the future we would have liked to upgrade the hashing algorithm to SHA-3 and add a Salt passphrase. This issue was one of the main reasons we included the Google Plus Oauth 2 login verification sequence and this way all the heavy work was done by the Google Plus API. In the future we would have liked to include the option to use Facebook Login and Twitter login, as they are statistically more popular than the Google login. When implementing the Google login API to our application we had trouble linking the Direct application login sequence and the Google login. The issue lay with how we designed our database. We could not figure out how to have two separate relations that could share the same auto-increment in each table to ensure that the 'userID' field would be able to identify each user individually. The compromise we came to was to retrieve the users Google ID through the Google login sequence and implement that as the user's password. This would have to be changed as we believe it poses a gap in security. We felt that we need to manage our own data persistence in order to have the users to have full advantage of customizing their profiles in order to manage their packages. In order to add encryption over the internet we would have liked to used HTTPS to further secure the traffic to and from the web application.

Other issues that we need to address would be verifying that a tracking number actually belongs to the users. This would be because each courier company has a standard format for their tracking numbers issued in the event that an intruder would try spoofing tracking numbers into the application to gain access to the package management features of a particular package. There would have to be a safeguard that helps mitigate the probable threat. In order to do this, we would have liked to implement a 2-step verification sequence. The users would receive a randomly generated access code after entering the tracking number into the application. The access code would be sent to the originally registered email address or mobile number of the initial package's delivery details.

To further protect the code of the application we would have liked to learn and implement '.htaccess' files. The configuration of this files would help stop unwanted URL-Redirects to scripts we would not like the client side users to see. This would allow us to hide most of the sensitive files and make it more difficult for hackers to find security gaps. Because the file extension starts with a full stop this hides the file from plain view in the file explorer. The '.htaccess' files allow use to specify security restrictions for a directory and is usually accompanied with a '.htpasswd' password file. The file can hold configurations to help block bad bots, rippers and restrict web crawlers. The reason we would want these features are based on the Incapsula 2014 bot traffic report. In 2014 Incapsula investigated over 20,000 websites and found that bots account for 56% of the internet's traffic and of that 56% they found 29% to be of a malicious nature.

7 IMPLEMENTATION

When implementing the code for the application, we split up each section of functionality and built them. Our source code is available to view on GitHub at https://github.com/Xparcel/Xparcel-Project.git .We started with the HTML and the page layouts and how the interface would look. We used JQuery-UI, Bootstrap and JQuery to support multiple device sizes. Below is an extract of code from our landing page show the linking of a few of these libraries.

Landing Page for Xparcel:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <?php
    //used for the google OAuth 2.0
    include "php/googleSign.php";
    ?>
    <meta charset="UTF-8">
    <title>Xparcel Tracking</title>
    <!-- Latest compiled and minified CSS -->
    <link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.6/css/bootstrap.min.css">
    <link rel="stylesheet" href="css/style.css">
    <link rel="stylesheet" href="css/loginstyle.css">
    <link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/font-awesome/4.5.0/css/font-awesome.min.css">
  </head>
  <body>
    <div class = "bodytest">
      <nav class="navbar navbar-default navbar-fixed-top">
        <div class="navbar-header">
          <button type="button" class="navbar-toggle" data-toggle="collapse" data-target=".navbar-collapse">
          <span class="icon-bar"></span>
          <span class="icon-bar"></span>
          <span class="icon-bar"></span>
          </button>
          <!-- Login Dropdown - Facebook and Twitter -->
          <div class="login">
            <?php
            //set the error message if login is unsuccessfull
            if(isset($_GET['error'])){
            ?>
            <div id = "loginError">
              <h5>Incorrect Login details!</h5>
            </div>
            <?php
            }
            ?>
            <ul>
              <li class="firstline">Already have an account?</li>
              <li class="dropdown firstline">
                <a href="#" class="dropdown-toggle" data-toggle="dropdown"><b>Login</b> <span class="caret"></span></a>
                <ul id="login-dp" class="dropdown-menu">
                  <li>
                    <div class="row">
                      <div class="col-md-12">
                        Login via
                        <div class="social-buttons">
                          <a href="facebookAuth.html" class="btn btn-fb"><i class="fa fa-facebook"></i> Facebook</a>
                          <?php
                          //load html for google signin
                          echo $string;
                          ?>
```

As well as using the JQuery libraries to help style the pages we used our own CSS style sheets to refine the details we wanted.

CSS Style Sheet for the Parcel Manger page:

```
/* Nav styling and position */
@media (max-width: 200000px) {
    .navbar-header {
        float: none;
        padding: 0 20px;
    }
    .navbar-left,.navbar-right {
        float: none !important;
    }
    .navbar-toggle {
        display: block;
        padding: 13px 13px;
        float: left;
    }
    .navbar-collapse {
        border-top: 1px solid transparent;
        box-shadow: inset 0 1px 0 rgba(255,255,255,0.1);
    }
    .navbar-fixed-top {
        top: 0;
        border-width: 0 0 1px;
    }
    .navbar-collapse.collapse {
        display: none!important;
    }
    .navbar-nav {
        float: none!important;
        margin-top: 7.5px;
    }
    .navbar-nav>li {
        float: none;
    }
```

To connect to the databases, we used PHP PDO Library to handle the protected connection and binding of data. Below is the function used to connect to the database.

PHP database connect:

```
<?php
/* function is used to connect to the users database*/

    function connect(){
        try {
                # MySQL with
                PDO_MYSQL
                $DBH = new PDO("mysql:host=127.0.0.1;dbname=xparceldb", '
                    root', '');
            }
            catch(PDOException $e) {
                die("ERROR : " .$e->getMessage());
            }
        //returns the PDO connection to be used in other functions
        return $DBH;
    }
?>
```

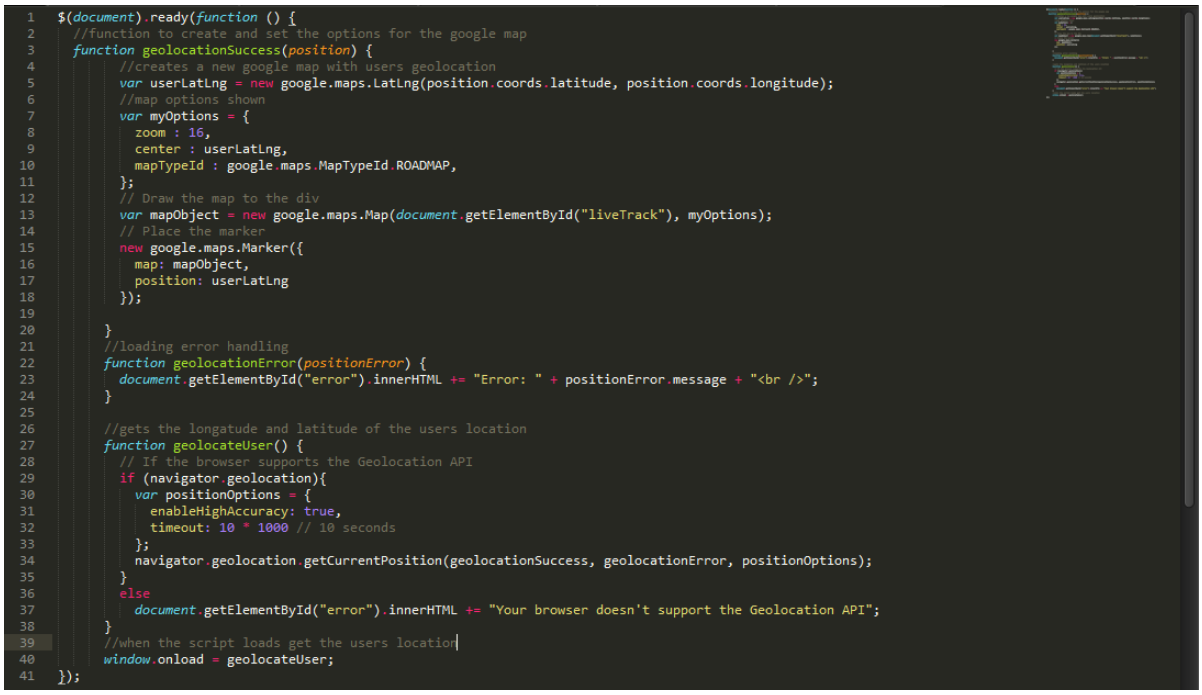
Below is an example showing the database connect function used in the Add a Package function. The data is sent to the PHP function via the use of Ajax post methods.

Add A package PHP:

```php
<?php
    if(session_id()){
    }
    else{
        session_start();
        include "connection.php";
    }
    //if a post has occured
    if(strtolower($_SERVER['REQUEST_METHOD']) == 'post'){
        //if the post method is testing the tracking number
        if(isset($_POST['method']) && ($_POST['method'])=="testTrackNum"){
            $trackingNum = $_POST['trackingNum'];

            //returns true or false
            $Exsists = validateTrackNum();
            //send info for client to validate and /or add to user DB
            if($Exsists){
                setPackageDetails();
            }
            else{
                echo False;
            }
        }
    }

    //get the details related to the tracking number
    function getPackageDetails(){

        include_once "connectionMock.php";
        //connect to mock database
        $DBH = connectMock();

        $trackingNum = $_POST['trackingNum'];

        $sql = $DBH->prepare("SELECT * FROM `packagerecords` WHERE `trackingNum` = :trackingnum LIMIT 1;");

        $sql->bindValue(':trackingnum',$trackingNum);
        $sql->execute();

        return $sql;
    }
```

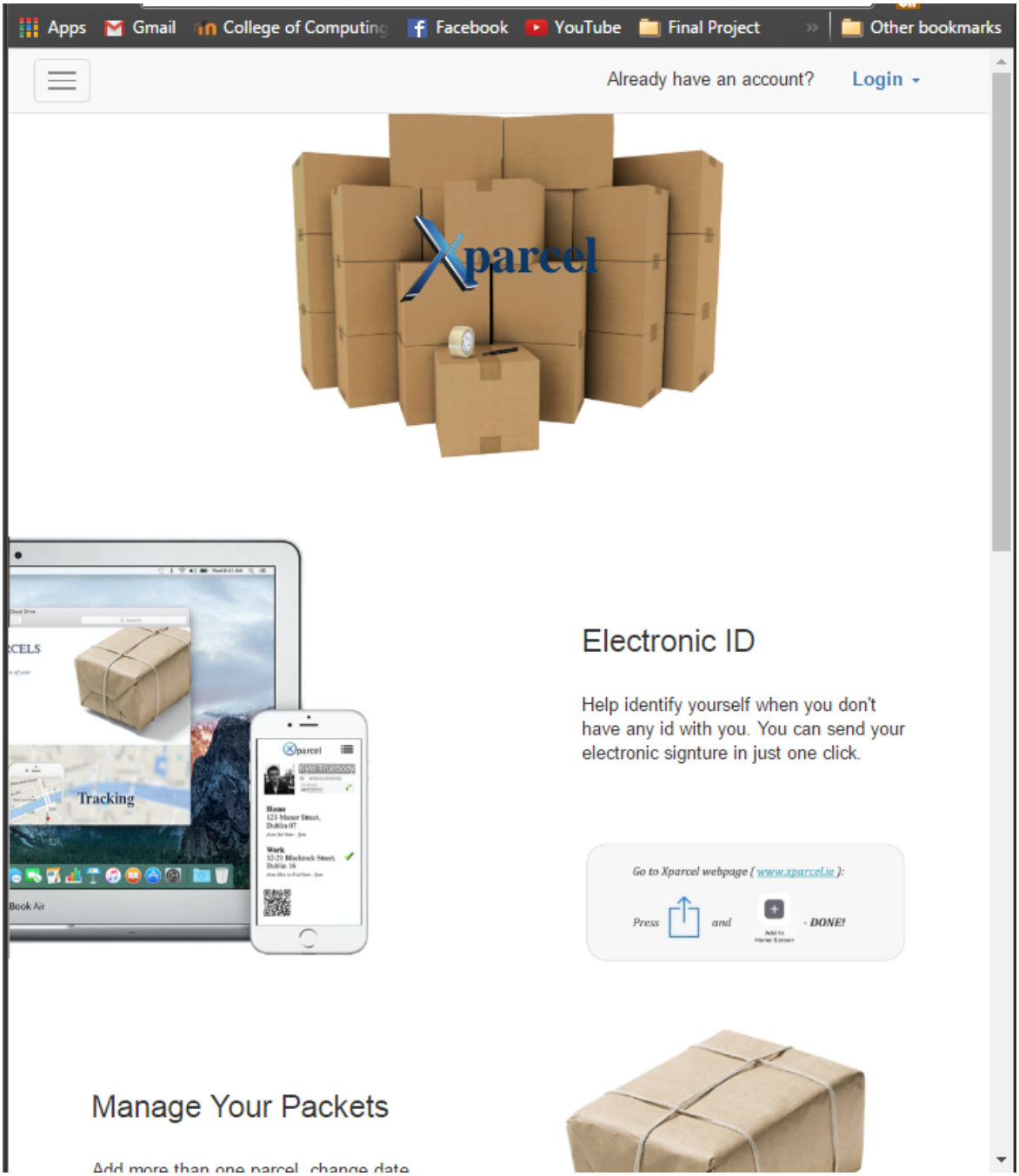
Below is an extract of code that is used to implement the google map to the HTML page. The location of the user is gathered and displayed on the map.

Google Maps Javascript:

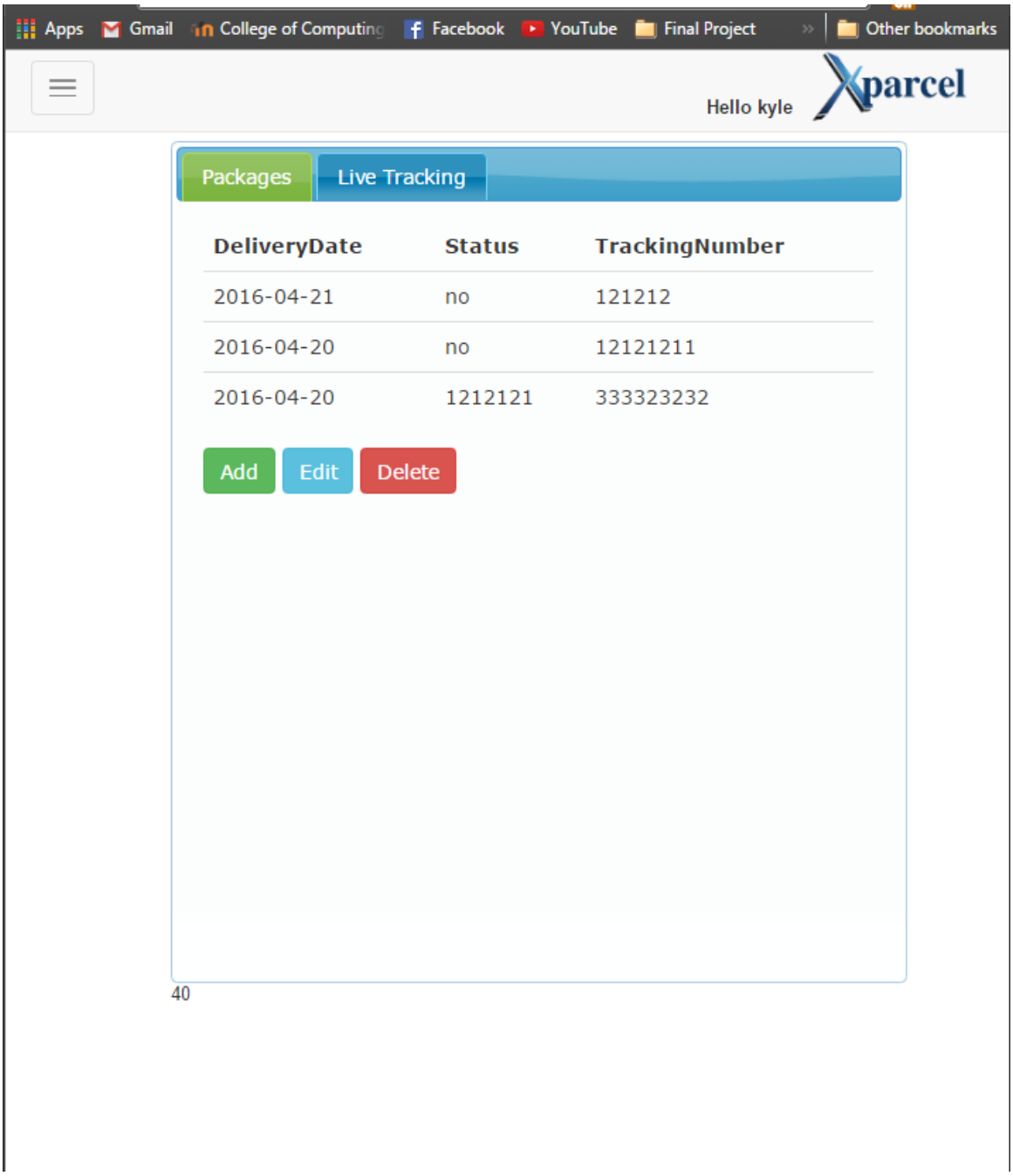


```javascript
$(document).ready(function () {
  //function to create and set the options for the google map
  function geolocationSuccess(position) {
        //creates a new google map with users geolocation
        var userLatLng = new google.maps.LatLng(position.coords.latitude, position.coords.longitude);
        //map options shown
        var myOptions = {
          zoom : 16,
          center : userLatLng,
          mapTypeId : google.maps.MapTypeId.ROADMAP,
        };
        // Draw the map to the div
        var mapObject = new google.maps.Map(document.getElementById("liveTrack"), myOptions);
        // Place the marker
        new google.maps.Marker({
          map: mapObject,
          position: userLatLng
        });

      }
      //loading error handling
      function geolocationError(positionError) {
        document.getElementById("error").innerHTML += "Error: " + positionError.message + "<br />";
      }

      //gets the longatude and latitude of the users location
      function geolocateUser() {
        // If the browser supports the Geolocation API
        if (navigator.geolocation){
          var positionOptions = {
            enableHighAccuracy: true,
            timeout: 10 * 1000 // 10 seconds
          };
          navigator.geolocation.getCurrentPosition(geolocationSuccess, geolocationError, positionOptions);
        }
        else
          document.getElementById("error").innerHTML += "Your browser doesn't support the Geolocation API";
      }
      //when the script loads get the users location
      window.onload = geolocateUser;
});
```

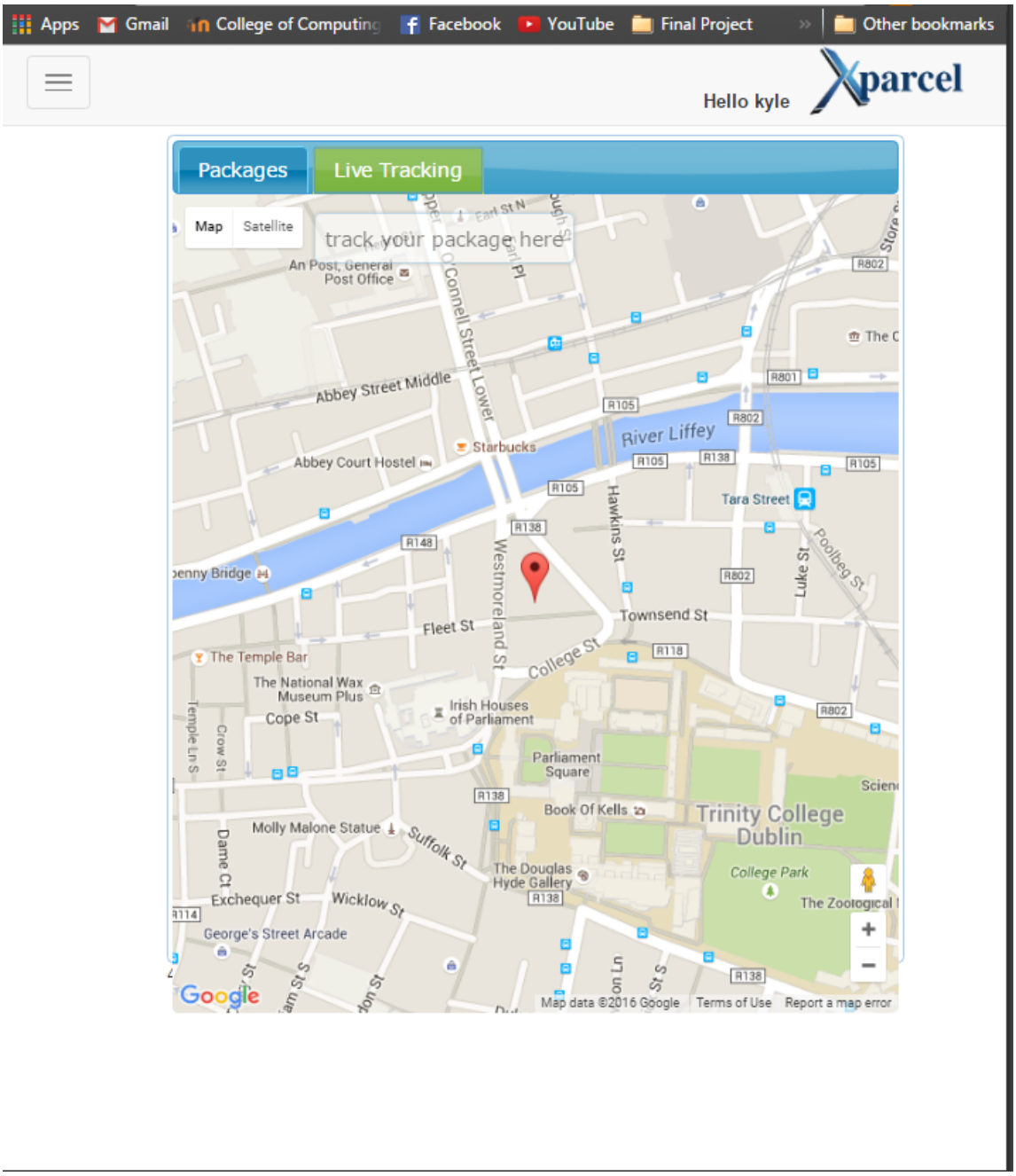
Xparcel Landing page:



Package Managing:



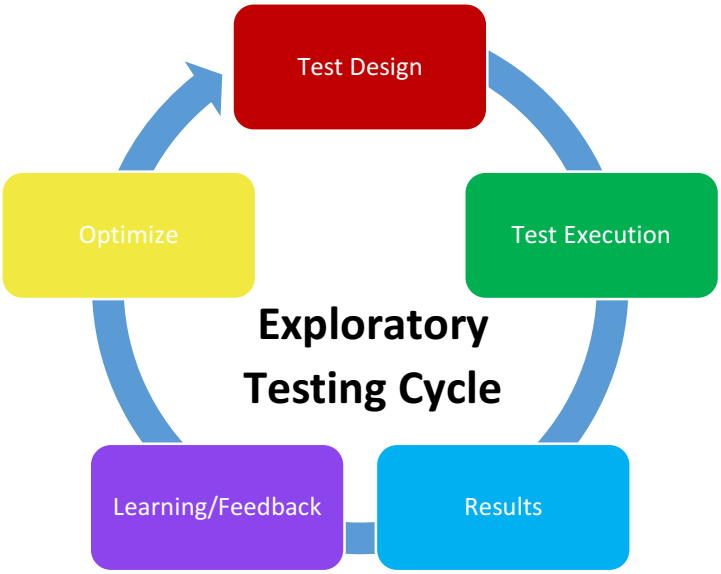
Live Tracking:



7.1 TESTING

During the process of implementation of the application we adopted the principles of the Agile Testing practice. The reasoning for choosing said method was in essence based on our time frame. The Agile Testing method saves time and does not rely on heavily documentation. In order to work well, it does require regular feedback between the development team to be effective.

Our approach is recognised closest as Exploratory Testing. This is when the design is tested and the application execution is tested at the same time. We all agreed to keep our code clean and well commented in an effort to make testing easier. Testing happened within each break down of the code to keep the project continuously progressing. Each member responsible for task would complete the task and test it as completed. Then the finished section was shared with the group to gather feedback or any opinions and suggestion. The idea was for everyone to be involved with testing for deeper understanding and broader idea of the applications possibilities.



Future testing of the application we would have setup User Testing. User testing would have provided the team with information in regards to the success of our goal of an intuitive application design. The tests would have consisted of having volunteers taking a series of timed tests. We would ask the users to navigate and

complete a series of task on both the existing application and our application. Each task will be timed by an assessor. The time it takes for a user to complete a task will provide information as to the intuitiveness of the application. If the user has to ask for help or does not understand the objective, this would raise a red flag as to the effectiveness of the design.

8 GROUP WORK

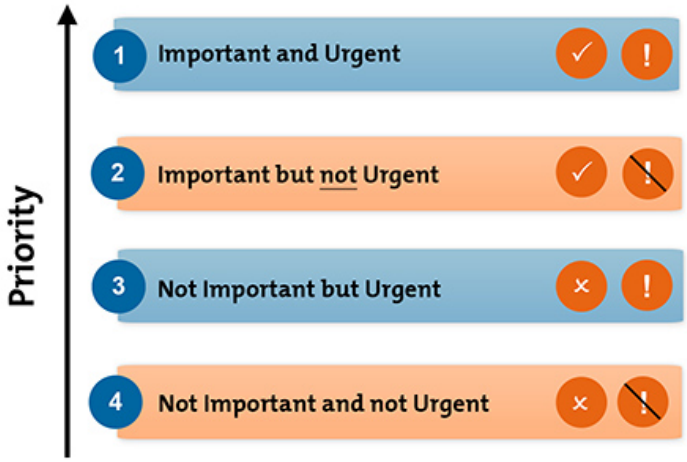
Our group met on Friday March 4 2016 to discuss and assign tasks. We divided those tasks into 3 categories: 'Important', 'Less important' and 'Not important'. Those categories were based on due date, what we thought needed to be done first in relation with the level of importance and what was required to have our first demo running. These sections were categorized as 'Important'.

Sections added to the 'less important' category were deemed to be parts that could be done and added onto 'Important' sections. These included the google log in button, the Facebook functionality as well as adding tracking number PHP code.

The 'Not Important' Parts were sections we could change and add once the first 2 sections had been done. They would only enhance and make for a better service.

The three above mentioned categories were chosen based on Dwight Eisenhower's Urgent/Important Principle. To use this principle, Eisenhower suggested the following: "*list all of the activities and projects that you feel you have to do. Try to include everything that takes up your time at work, however unimportant. (If you manage your time using a To-Do List Add to My Personal Learning Plan or Action Program, add to My Personal Learning Plan you will have done this already.)*"

The next step was to think about each activity and assign it to one of four categories. We chose to do three of these. The figure below is what Eisenhower suggested.



What tasks should be in each category?

1. **Important**

   Tasks that need a lot of time to complete should be done first to stop them from becoming urgent tasks. Tasks here that may have unforeseen problems and might require more time.

2. **Less Important**

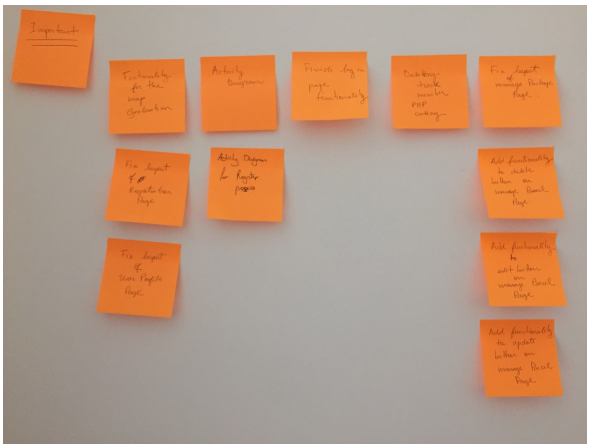
   Tasks that require less time to complete and that will add on to any tasks already completed first. These do require time but have a less chance of unforeseen problems later.

3. **Not Important**

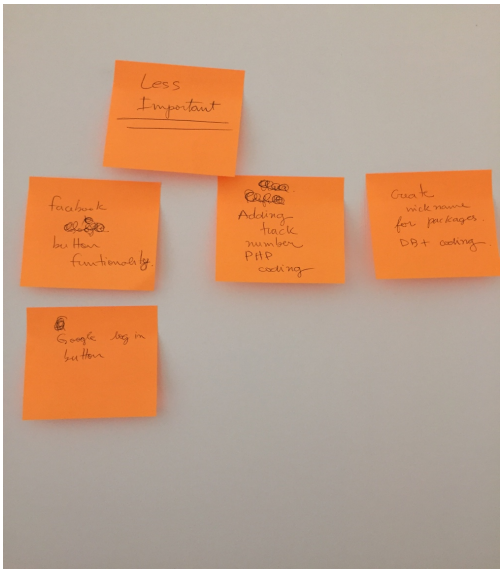
Tasks that can be left for later in the development that will further enhance and/or add quality to your final product.

<u>Below are our tasks divided into the 3 categories:</u>

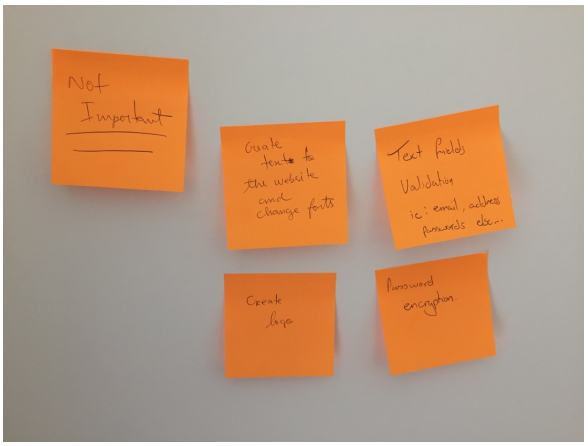
Important:



Less Important:



Not Important:



Xparcel Team at work

9 CONCLUSION

When we were first given this project and we had to decide on what we wanted to create, our minds were immediately filled with all these thoughts of amazing websites, complex applications, using all the latest technologies and all the knowledge we have learnt over the past three years. Once we had got our team together we sat down and narrowed down our choices and finally we decided on Xparcel. This service does already exist with courier companies at present but we felt that certain aspects of it were missing such as change of delivery addresses and real time tracking.

We did our research and created a proposal which we presented to our lecturers and based on this assigned to a supervisor. We were assigned to Padraig McDonagh. A lot was learnt from this project from teamwork, being able to work within a team, assigning tasks and all agreeing on what direction the project should take. The biggest challenge we faced was time management. We had regular Supervisor meetings with Padraig, as often as once a week, for him to guide us on the correct path and see what stage of the project we were at. As well as supervisor meetings we had regular group meetings to assign tasks and set deadlines between the group members. These were very important to discuss any changes that needed to be made and to help one another out if any problems arose.

Given more time we feel that we could have implemented everything we wanted into our system but we focused on the most important aspects such as letting users change their delivery locations, delivery times and date of the delivery. With the ever expanding market as well as the advances in technologies this system can be improved and adapted to suit different courier companies.

This project was a great learning experience for all of us as well as very rewarding to see the end product knowing the amount of hours that we spent working on it.

Finally, we would like to say thank you to our lecturers for their guidance and patience and especially our supervisor Padraig who guided us in the right direction.

10 MEETINGS

PROJECT GROUP MEETINGS

[25/11/2015]

GROUP: EXPARCEL

ATTENDEES: KYLE TRUEBODY (2013620), THIAGO MURPHY(2013359), WADE WILLIAMSON (2012832) AND VARADANE CALLEEMOOTOO (2013638)

MINUTES OF THE LAST MEETING

First group meeting.

ITEMS OF DISCUSSION

1. Meeting will take place on Friday afternoons from now on.
2. We all need individual research of other companies by next Friday – 04/12/2015

ACTIONS

Action	Assigned To	Due Date
Customer Survey	All	
UML Software. Each find a piece of software to use	All	04/12

ACTIONS

Action	Assigned To	Due Date
Customer Survey	All	
UML Software. Each find a piece of software to use	All	04/12

PROJECT GROUP MEETINGS

[04/12/2015]

GROUP: EXPARCEL

ATTENDEES: KYLE TRUEBODY (2013620), THIAGO MURPHY(2013359), WADE WILLIAMSON (2012832) AND VARADANE CALLEEMOOTOO (2013638)

MINUTES OF THE LAST MEETING

1. Meeting will take place on Friday afternoons from now on.
2. We all need individual research of other companies by next Friday – 04/12/2015

ITEMS OF DISCUSSION

1. What questions are to be in our survey
2. UML Software. We chose the following:
    a. Varadane – Draw.io
    b. Thiago – EDrawMax
    c. Wade and Kyle – Gliffy.com
3. We have chosen to use EDrawMax as our UML Software

ACTIONS

Action	Assigned To	Due Date
Asana Report	Wade	
Find about database and Web hosting	Varadane	
Management Report	Thiago	
Intuitive Design Report	Kyle	

PROJECT GROUP MEETINGS

[16/12/2015]

GROUP: EXPARCEL

ATTENDEES: KYLE TRUEBODY (2013620), THIAGO MURPHY(2013359), WADE WILLIAMSON (2012832) AND VARADANE CALLEEMOOTOO (2013638)

MINUTES OF THE LAST MEETING

1. What questions are to be in our survey
2. UML Software. We chose the following:
    a. Varadane – Draw.io
    b. Thiago – EDrawMax
    c. Wade and Kyle – Gliffy.com
3. We have chosen to use EDrawMax as our UML Software

ITEMS OF DISCUSSION

1. Research Paper.
2. Whiteboard technology / Use task about type of technology we are going to use.

ACTIONS

Action	Assigned To	Due Date
Schedule Supervisor Meeting	Kyle	23/12/2015
Meeting with Cleber – "Discussion about how the courier system works"	Group	23/12/2015
On the website	Thiago	23/12/2015
Report about the standard parcel process	Group	23/12/2015
Real world diagram process	Group	05/02/2016
Add new and old tasks to Asana	Kyle	23/12/2015

PROJECT GROUP MEETINGS

[22/01/2016]

GROUP: EXPARCEL

ATTENDEES: KYLE TRUEBODY (2013620), THIAGO MURPHY(2013359), WADE WILLIAMSON (2012832) AND VARADANE CALLEEMOOTOO (2013638)

MINUTES OF THE LAST MEETING

1. Research Paper.
2. Whiteboard technology / Use task about type of technology we are going to use.

ITEMS OF DISCUSSION

1. Discussed functionality of the applications.
2. Login Page – Google or Facebook sign in.
3. User Profile:
   - Photo.
   - Name.
   - App ID number.
   - Email address.
   - Address and secondary address.
   - Tracking history.
   - E-signature (QR-Code – stores details and digital signature of the user)

4. Functions:

   - Live Track (Using Google Maps API)

   - Delivery location update.

   - Delivery Date update

   - Electronic ID (E-ID)

   - Update delivery service (ie: Express / rush service)

ACTIONS

Action	Assigned To	Due Date
Facebook and Google sign in	Kyle	
Wireframe Design	Thiago	
Research functionalities	Wade	

PROJECT GROUP MEETINGS

04/03/2016

GROUP: XPARCEL

ATTENDEES: KYLE, WADE, VARADANE, THIAGO

MINUTES OF THE LAST MEETING

1. Discussed functionality of the applications.
2. Login Page – Google or Facebook sign in.
3. User Profile - Photo.
   - Name.
   - App ID number.
   - Email address.
   - Address and secondary address.
   - Tracking history.
   - E-signature (QR-Code – stores details and digital signature of the user)
4. Functions: - Live track (Using Google Maps API)
   - Delivery location update.
   - Delivery Date update.
   - E-ID.
   - Update delivery service (ie: express / rush service).
5. Marketing elements to the app design.
6. Wire frame design.

ITEMS OF DISCUSSION

1. Divide UML design case to each member.
2. Design the logged in page.
3. SQL Database implementation and testing.
4. Database dictionary
5. Iteration process- First scheduled iteration completion week of April 4th.
6. Project Documentation Draft and chapters discussed and set (open to changes).
7. Next group meeting Week of March 28th.

ACTIONS

Action	Assigned To	Due Date
Design Logged in page	Thiago/Varadane	8/03/2016
SQL implementation	Wade	13/03/2016
Data Dictionary	Kyle	13/03/2016
Code Logged in page (HTML & CSS)	Thiago	20/03/2016
Login in PHP	Varadane	13/03/2016
Add Package PHP	Kyle	13/03/2016
User Profile PHP	Wade	13/03/2016

PROJECT GROUP MEETINGS

05/02/2016

GROUP: EXPARCEL

ATTENDEES: WADE, THIAGO, VARADANE, KYLE

MINUTES OF THE LAST MEETING

1. Divide UML design case to each member.
2. Design the logged in page.
3. SQL Database implementation and testing.
4. Database dictionary
5. Iteration process- First scheduled iteration completion week of April 4th.
6. Project Documentation Draft and chapters discussed and set (open to changes).
7. Next group meeting Week of March 28th.

ITEMS OF DISCUSSION

1. Discussed functionality of the applications.
2. Login Page – Google or Facebook sign in.
3. User Profile - Photo.
   - Name.
   - App ID number.
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   - Address and secondary address.
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   - E-signature (QR-Code – stores details and digital signature of the user)
4. Functions: - Live track (Using Google Maps API)
   - Delivery location update.
   - Delivery Date update.
   - E-ID.
   - Update delivery service (ie: express / rush service).
5. Marketing elements to the app design.
6. Wire frame design.

ACTIONS

Action	Assigned To	Due Date
Wire Frame design	Thiago	19/02/2016
Server investigation	Varadone	17/02/2016
Database investigation	Wade	17/02/2016
Use case documentation	Kyle	17/02/2016

10.1 Supervisor Meetings

PROJECT SUPERVISION MEETINGS

[25/11/2015]

GROUP: EXPARCEL

ATTENDEES: KYLE TRUEBODY (2013620), THIAGO MURPHY (2013359) AND VARADANE CALLEEMOOTOO (2013638)

MINUTES OF THE LAST MEETING

First supervisor meeting.

ITEMS OF DISCUSSION

1. Elect project manager.
2. Discussion about the material needed to get presented for the project.
3. Creating a web platform application.
4. Identify the technologies needed for the project.
5. Discussion of how the system is going to work.
6. Discussion of how asana works.
7. Extending project proposal.
8. Look for an XML software/application to use

ACTIONS

Action	Assigned To	Due Date
Add Padraig to Asana	Kyle	04/12/2015
Add Padraig to Dropbox	Thiago	04/12/2015
Create a survey questions focus towards the company and the clients	Group	04/12/2015
Create a report on Asana	Wade	04/12/2015
Find out who work for a courier company("Cleber")	Group	04/12/2015
Upload the research document that everybody did on chosen company	Group	04/12/2015

PROJECT SUPERVISION MEETINGS

[04/12/2015]

GROUP: EXPARCEL

ATTENDEES: KYLE TRUEBODY (2013620), THIAGO MURPHY (2013359) AND VARADANE CALLEEMOOTOO (2013638)

MINUTES OF THE LAST MEETING

1. Elect project manager.
2. Discussion about the material needed to get presented for the project.
3. Creating a web platform application.
4. Identify the technologies needed for the project.
5. Discussion of how the system is going to work.
6. Discussion of how asana works.
7. Extending project proposal.
8. Look for an XML software/application to use

ITEMS OF DISCUSSION

1. Possible piece of software will need to be written
2. Will use Github for file sharing
3. Cleber (class mate) has contacts with a courier company.
4. Advice on approaching courier companies for questions
5. We don't necessarily need to go to a courier company
6. Ftai.ie for statistics

ACTIONS

Action	Assigned To	Due Date
What we need to have done by end of semester 1	Group	
Information about web and database hosting – Graham?	Group	

PROJECT SUPERVISION MEETINGS

12/02/2016

GROUP: EXPARCEL

ATTENDEES: WADE, THIAGO, KYLE, VARADANE

MINUTES OF THE LAST MEETING

1. Possible piece of software will need to be written
2. Will use Git for file sharing
3. Cleber (class mate) has contacts with a courier company.
4. Advice on approaching courier companies for questions
5. We don't necessarily need to go to a courier company
6. Ftai.ie for statistics

ITEMS OF DISCUSSION

1. Discussed web hosting and database hosting (Will be provided by Padraig).
2. Server location storage.
3. Initial configuration of the server and remote access discussed. TeamViewer and Windows Server 2012.
4. Server software preparation for installation on Wednesday 17th Feb.
5. Database enquiry, MySQL hosting.
6. Web application wire frame design proposals. Mobile and Web.
7. High level and low level Use Case.
8. Question of implementation style (Agile iterations).
9. Discussion of the questionnaire topic relevant or not.
10. Discussion of technologies for implementation, JavaScript, JQuery, Ajax, PHP, HTML, CSS, Bootstrap, MySQL.

ACTIONS

Action	Assigned To	Due Date
Server software prep and justification report	Varadane	17/02/2016
Database requirements	Wade	17/02/2016
Finalize wire frame design	Thiago	19/02/2016
Use Case completion	Kyle	17/02/2016

PROJECT SUPERVISION MEETINGS

[19/02/2016]

GROUP: EXPARCEL

ATTENDEES: WADE, THIAGO, KYLE, VARADANE

MINUTES OF THE LAST MEETING

1. Discussed web hosting and database hosting (Will be provided by Padraig).
2. Server location storage.
3. Initial configuration of the server and remote access discussed. TeamViewer and Windows Server 2012.
4. Server software preparation for installation on Wednesday 17th Feb.
5. Database enquiry, MySQL hosting.
6. Web application wire frame design proposals. Mobile and Web.
7. High level and low level Use Case.
8. Question of implementation style (Agile iterations).
9. Discussion of the questionnaire topic relevant or not.
10. Discussion of technologies for implementation, JavaScript, JQuery, Ajax, PHP, HTML, CSS, Bootstrap, MySQL.

ITEMS OF DISCUSSION

1. Server up at 3pm
2. Update Asana
3. Finish Use case.
4. Design website (front-end)
5. Make a time line of work that must to be done.
6. Documentation and chapters must be hand over 1 week before the deadline.

ACTIONS

Action	Assigned To	Due Date
UML	Kyle	16/02/2016
Wireframe Design	Thiago	16/02/2016
Database Design	Wade	04/03/2016
Set up Xparcel Server	Varadone	17/02/2016

PROJECT SUPERVISION MEETINGS

[26/02/2016]

GROUP: EXPARCEL

ATTENDEES: WADE, THIAGO, KYLE, VARADANE

MINUTES OF THE LAST MEETING

1. Server up at 3pm
2. Update Asana
3. Finish Use case.
4. Design website (front-end)
5. Make a time line of work that must to be done.
6. Documentation and chapters must be hand over 1 week before the deadline.

ITEMS OF DISCUSSION

7. Turn off automatic updates from the server.
8. Database design and implementation.
9. Website and Database server testing .
10. Webpage coding
11. Show the database design to Rory
12. Presentation: 10 minutes preparation + 20 minutes presentation + 10 minutes questions = 40 minutes overall.
13. Prepare slide or video for the presentation ("our journey")

ACTIONS

Action	Assigned To	Due Date
Database Design and Implementation	Wade	04/03/2016
Minutes Meeting 19/02 and 26/02	Thiago	28/02/2016
Old Minutes documentation	Varadone	04/03/2016
Database Design and Implementation	Kyle	04/03/2016
Home page coding	Thiago	04/03/2016
Website and database server testing	Varadone	04/03/2016
Turn off automatic updates from the server	Varadone	04/03/2016

PROJECT SUPERVISION MEETINGS

[04/03/2016]

GROUP: EXPARCEL

ATTENDEES: KYLE, THIAGO, WADE AND VARADANE

MINUTES OF THE LAST MEETING

1. Turn off automatic updates from the server.
2. Database design and implementation.
3. Website and Database server testing.
4. Webpage coding
5. Show the database design to Rory
6. Presentation: 10 minutes' preparation + 20 minutes' presentation + 10 minutes' questions = 40 minutes overall.
7. Prepare slide or video for the presentation ("our journey")

ITEMS OF DISCUSSION

1. Data Base Discussion of complexity (Feedback from Padraig).
2. Web page discussion, layout and estimated completion date.
3. Backup server and server configurations
4. Programming process, splitting up into teams, each handling a segment of the code.
5. Geolocation for package tracking. Proposal on demonstration for presentation.

ACTIONS

Action	Assigned To	Due Date
Group meeting with Rory about DB schema	Group	10/03/2016
Backup, updates and configurations of the server	Varadane	
Geolocation for package tracking	Kyle	
Webpage Wireframe, HTML and CSS	Thiago	
DB documentation and implementation / research	Wade	

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