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Group Project

Project Initiation Document

November 5, 2015

Loughborough University

Contents

List of Figures

List of Tables

1   Introduction

1.1   Overview

1.1.1   Aim

The aim of this project is to create a mobile app that allows individuals and corporations to track and manage online data associated with them. In addition, the app should be able to bring added value to the data. As a result, the app will allow individuals and corporations to control the purposes for which data associated with them is used presenting them with an opportunity to create favourable impression of themselves online. The group must consider actions, functionalities or objectives that might be useful in the solution to protect personal data, for example: automatic de-subscription, notifications, deletion, or ensuring results do not appear in search engine top hits.

1.1.2   Objectives

To create a solution demonstrating an acceptable level of technical and business nous, the group must:

1. Design a user experience workflow document which highlights key aspects of the mobile app's UI

2. Create an Android mobile app with the following components:

   - Web crawler tool that will trawl the Internet to gather information related to a user

   - Sentiment analysis tool that will detect the contextual polarity of the user's social media posts

   - Image processing tool that will detect and describe features across two images

   - Social media profile tool that will allow the user to easily manage accounts connected to the app

3. Devise a business model utilising Maurya's Lean Canvas methodology consisting of:

   - The problem that the group is trying to solve

   - The features of the solution that solve the problem identified

   - The overall cost of commercialising the solution (over a 3-year span)

   - The identified target audience for the solution and the appropriate path to consumers

   - Potential revenue streams once the solution is bought to market (over a 3-year span)

   - Key metrics that will need to be measured to facilitate market growth

4. Consult with various stakeholders to determine the legibility of any ideas presented

5. Develop a risk assessment matrix to prevent small issues from becoming emergencies

6. Develop a project plan to guide task execution and control over the lifecyle of the assignment

7. Complete the competition entry form for the Atos IT Challenge by 30 November 2015

8. Define the roles and responsibilities of each individual involved in the project

9. Create a report documenting the development of the solution with the following sections:

- Introduction

- Literature Review

- Requirements

- Design

- Implementation

- Evaluation

- Conclusion

1.1.3 Constraints

The group must keep in mind the following project constraints while developing the solution:

- Time – the group has 8 months (October 2015 to May 2016) to meet the listed objectives

- Cost – the group has been set an initial budget of £100 which cannot be exceeded

- Resources – the group must develop the required technical competencies to develop the solution

1.2 The Client

Atos S.E. (ATO) is a France-based company that provides IT services (Reuters, 2015). The company provides an assortment of services, including: bespoke enterprise software, e-payment services, business integration solutions and cloud services. In addition, the company serves clients in various industries, including: energy and utilities, financial services, manufacturing, retail, public sector, healthcare and transport. Over time, Atos has developed strategic alliances with Cisco, Dell, EMC, Hitachi, Microsoft, Oracle, Samsung, SAP, Siemens and VMWare; and strategic business partnerships with HP and IBM (Bloomberg, 2015). This has allowed them to significantly leverage their service offerings and develop the credibility required to attract new trade. For example, the company was recently awarded a £6m contract to run Transport for London's service desk, a move that will see them responsible for logging, tracking and managing requests such as e-mail configuration, printing and remote access for 25 000 users across multiple locations (Jee, 2015).

1.3 The Team

The following section outlines the expected roles and responsibilities for each individual involved in this project. Due to the dynamic nature of the project, roles may be re-assigned to one or more individuals throughout the duration of the assignment. As a result, individuals may need to play a different role than that which was initially outlined. This approach to team development correlates to Ancona and Bresman (2007) ideas on adaptive team structure within organisations:

1.3.1 Jeansy Molanza – Project Management/Business Analyst

As a Project Manager, Jeansy will be responsible for the successful initiation, planning, execution, monitoring, controlling and closure of the project. As a Business Analyst, Jeansy will be responsible for the design of solutions that will deliver value to stakeholders – acting as an agent of change whenever necessary.

1.3.2 Gary Bennett – Front End Development/Business Analyst

As a Front End Developer, Gary will be responsible for implementing interactive elements, translating UI/UX wireframes to actual code that will produce the solution's interface that the end user engages with. As a Business Analyst, Gary will be responsible for the bridging the gap between technical and project requirements.

1.3.3 Jiefei Wei/Rawand Hawiz – Back End Development

As part of the Back End Development team, Jiefei and Rawand will be responsible for implementing server-side application logic; creating the application's API to facilitate database interaction, along with intelligent agents tasked with performing a service on a regular schedule. In addition, Jiefei and Rawand will be in charge of writing unit tests and source control.

2 Project Plan
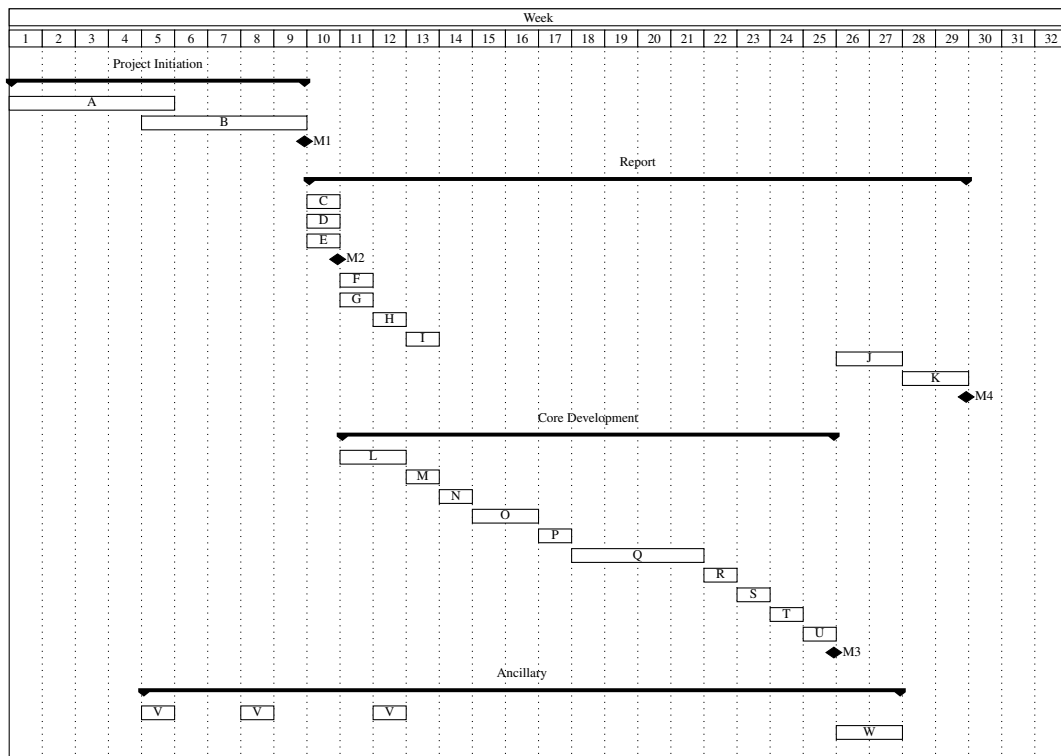
Figure 1 Project Plan

Table 1 Project Plan Key

Code	Task	Code	Task
A	Project Initiation Document	L	Map Application Flow
B	Atos Entry Form	M	Create Application UI
M1	Complete Project Initiation Document	N	Create Application Database
		O	Create Application API
C	Overview	P	Create Application Unit Tests
D	Problem Definition	Q	Create Intelligent Agents
E	Feasibility Study	R	Test Functional Usability
M2	Complete Introduction	S	Detect Security Holes
F	Functional Requirements	T	Correct Technical Issues
G	Non-Functional Requirements	U	Backlog Grooming
H	Architectural/Logical Design	M3	Complete Solution
I	Physical/Process Design		
J	Implementation Section	V	Get Feedback from Client
K	Evaluation Section	W	Prepare Client Documentation
M4	Complete Report		

3 Software Development Approach

3.1 Choice of Development Approach and Rationale

The group has decided to follow an agile development methodology throughout the software development stage. According to Boehm (1981), the cost of removing a software defect or implementing substantial change rises exponentially for each stage of the development cycle when it remains undiscovered. As a result, the group must start considering the best way to effectively handle inevitable change throughout the projects lifecycle. If the group opted to combat this change by following the traditional waterfall approach and anticipating the complete set of requirements early on then they could quickly be accused of being unresponsive to changing business conditions. Highsmith and Cockburn (2001) assert that a much better strategy can be espoused from the agile method, in which the group can attempt to reduce the cost of change throughout the project by:

- Producing weekly deliveries in order to achieve an early win and acquire rapid feedback

- Inventing simple solutions, so there is less to change and making those changes is easier

- Testing constantly in an automated manner, for earlier, less expensive, defect detection

Rizwan and Hussein (2008) assert that the main disadvantages of agile models are poor quality products, poor design and improper documentation. Fortunately, the group can effectively tackle the abovementioned issues in the following manner: disciplined sprint cycles, version control, automated unit testing, test or behaviour driven development, continuous integration, and adequate team structure.

3.2 Sprint Cycle
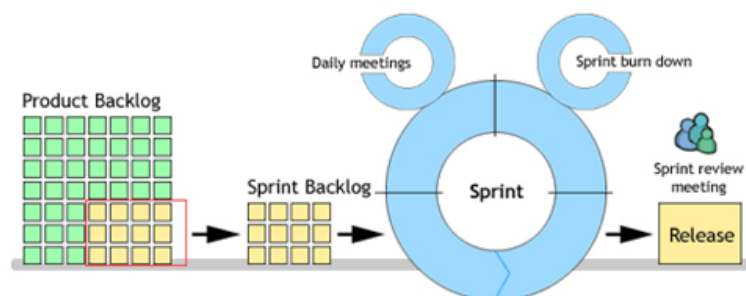
Figure 2 Sprint Cycle

A sprint is *"a regular, repeatable work cycle in scrum methodology during which work is completed and made ready for review"* (Techopedia, 2015). It is a core part of the agile approach and will see the group working to 1̃ week sprints over a 12 week period, consequently completing 12 sprints throughout the duration of the project. In addition, it will generate a sense of accountability and ownership within the group, as it promotes transparency, frequent review and constructive discussion.

Software requirements identified at the outset of the project will be maintained in a product backlog, where they are prioritised by business value (Cohen, 2010). The group will receive feedback on which items to prioritise after discussions with the target audience who have a vested interest in the product. Prior to commencing a sprint, the group will have a sprint planning meeting. During this meeting, the group will decide which items to add to the sprint, and identify the tasks necessary to

complete each item. If possible, the group will estimate how many hours each task will take someone to complete (Techopedia, 2015). As team engagement and morale is likely to fluctuate from sprint to sprint, it will be important to get verbal approval from everyone about the commitments being made at the time.

The sprint will commence immediately after the planning meeting. Throughout the sprint, the group will have daily meetings (Monday to Friday and excluding public holidays) on the WhatsApp messaging platform or face-to-face if possible. During this meeting, everyone will be asked:

- What did you do yesterday?

- What are you doing today?

- Are there any currently impediments in your way?

At the end of each sprint, the group will have a sprint review meeting. During this meeting, the group will show what they have accomplished during the sprint and demo any newly added features. In addition, the current state of the project will be assessed against the goal determined during the sprint planning meeting. Ideally, the team would have completed each product backlog item bought into the sprint, but if they have not then the item will be carried over into the next sprint (Techopedia, 2015).

3.3   Version Control
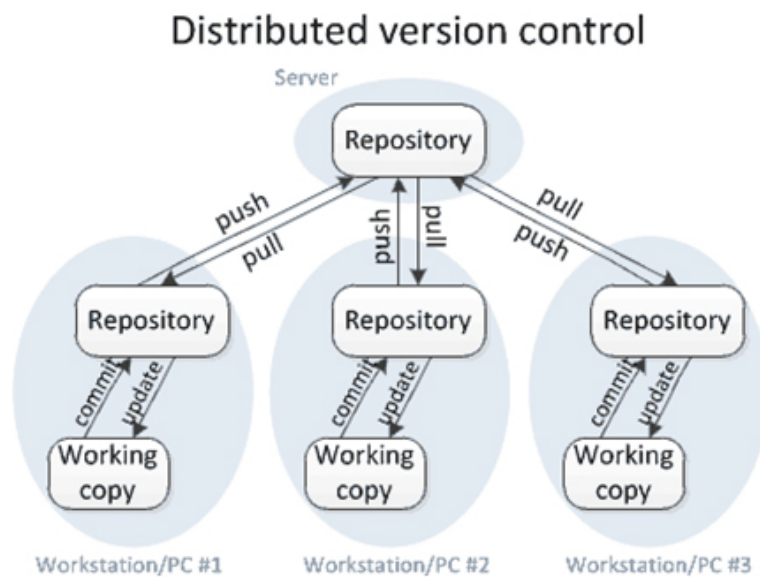
Figure 3 Distributed Version Control

Version control is *"a system that records changes to a file or set of files over time so that you can recall specific versions later"*. Consequently, a version control system will allow the group to revert files to a previous state, compare changes over time, and see who last modified something that might be causing a problem (Git, 2015). The group will be using GitHub, a distributed version control system. As a result, each group member will need to commit their changes to local repository on their computer before pushing them to a server, instead of directly checking them into the server repository (Jean and Brady, 2014). By splitting up the process into two steps, group members can carry out the necessary due diligence to ensure that their code does not break the solution by testing

their changes locally.

3.4 Automated Unit Testing
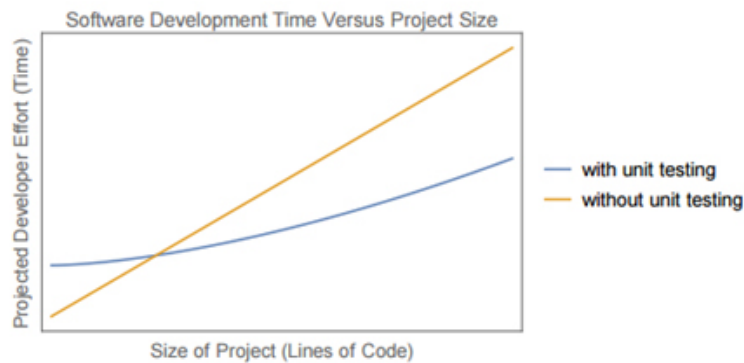
Figure 4 Development Time for a Software Project

According to Sharma et al. (2015), a unit test is a function that compares an input-output pair and then returns a Boolean value. A result of *True* indicates that he code is behaving as intended, but a result of *False* indicates that it is not, and consequently, that any program relying on that code cannot be trusted to behave as intended. To reduce the overall development time, the group will need to create unit tests in order to reduce the number of errors in the application. A well designed unit tests will allow the group to make sweeping changes to the code quickly, as everyone will better understand the design of the code being worked on. This will be helpful when the group starts to document the solution, as it will be easier to define what each part of the application is supposed to do.

3.5 Test/Behaviour Driven Development

Figure 5 Behaviour-Driven Development

The group will not write unit tests after all of the software is written. Instead, each unit test will be written beforehand in order to reduce the likelihood of producing bad code – employing a

test-driven development (TDD) approach which involves the following steps as suggested by Osherove (2009):

- Write a failing test to prove code or functionality is missing from the solution. For example, if a group member wanted to add a new feature to the solution that remembers the users age, then they would need to write a test that verifies that the age is indeed a number. At this point, the test should not pass because the solution currently lacks that functionality.

- Make the test pass by writing code that meets the expectations of the test.

- Re-factor the code to ensure that the piece of code is easier to read and maintain, while still passing all of the previously written tests.

Alternatively, the group can also experiment with a behaviour-driven development (BDD) approach, in which the intent of the system is tested. This is different to the TDD approach, as the group will be focused on writing scenarios that prove code or functionality is missing from the solution by writing a failing customer acceptance test that describes the behaviour of the system from the customer's point of view (Osherove, 2009). A scenario must be written in manner that can easily be read or written by any group member. North (2015) affirms that this can done by using a common vocabulary that spans the divide between business and technology. As a result, unit tests can become a communication and collaboration tool. Consequently, business stakeholders will be drawn into the software development process, helping the group better understand their requirements (North, 2015).

3.6   Continuous Integration
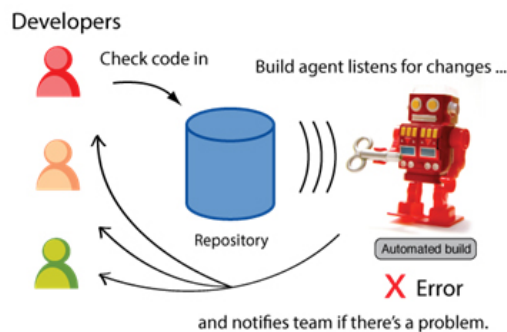
Figure 6 Continuous Integration Process

Continuous integration (CI) is a software development practice in which updates to the solution are immediately tested and reported on when they are added to the main codebase. In using CI, the group will receive rapid feedback so that if a defect is introduced, it can be identified and corrected as soon as possible (North, 2015). The group will be using Travis CI, an open-source continuous integration service to automatically build and test the solution hosted at GitHub. According to Kawalerowicz and Berntson (2011), if the group implements and maintains relatively good CI processes, they are more likely to create a better solution, as they would have done testing and integration consistently earlier in the process, reducing the chances of catching bugs later. Furthermore it promotes transparency, as each group member will be able to see the results of the build and know where the problems are.

3.7 Team Structure

The group is comprised of "generalising specialists" – individuals who have one or more technical speciality coupled with general knowledge of the business domain, so they can deliver direct value to the project in a numerous ways and easily change roles if required at a later stage. Furthermore, as a changing group structure is detrimental to achieving any set objectives, it is expected that the group will remain stable throughout the course of the project (Scott and Lines, 2015).

4 Risk Assessment Plan

This section identifies any risks associated with the project, determines the likelihood of their occurrence and predicts their overall impact on the project. Furthermore, an attempt is made to categorise each risk as either a technical or non-technical risk. (Dawson, 2009) asserts that technical risks refer to any risk associated with the software development process, whereas non-technical risks are associated with the project management process.

Table 2 Project Risk Assessment

Risk Item	Risk Management Technique	Risk Impact	Risk Category
Group loses sense of urgency during earlier stages. It could be because the project is not clearly understood yet.	Group must meet regularly and report back to one another on task progress to generate a sense of accountability.	$1 \times 5 = 5$	Non-Technical
As the project progresses, scope creep begins to threaten deadlines. The group over-promises but under-delivers.	No new item can be added to the product backlog or current sprint unless it is deemed critical to the projects success.	$2 \times 4 = 8$	Technical
The solution proposed by the group does not meet the end user's need as the business model is fundamentally flawed.	Group must thoroughly analyse and gather solution requirements during the early stages of the project.	$2 \times 5 = 10$	Non-Technical
Project files (reports, databases or code) are corrupted or lost, as a result the group needs to recreate the affected files.	Group must use a version control system to track code changes and backup documents on a cloud storage service.	$2 \times 5 = 10$	Technical
Group realises it lacks the technical skills required to develop certain features in the solution, so they are omitted.	Group must give itself enough time at the start of the project to properly understand the development environment.	$1 \times 5 = 5$	Technical
Group regularly moves onto the next sprint without finishing all items picked up in one or more previous sprints.	Group must ensure that they have enough time to complete assigned items per sprint and not over-promise anything.	$1 \times 5 = 5$	Non-Technical
Group does not meet regularly, and due to a lack of communication it is hard to know what everyone is doing.	Group must endeavor to consistently adopt working practices that promote transparency and accountability.	$2 \times 3 = 6$	Non-Technical
Group member accidentally overrides another members work because they didnt have the latest version of the code.	Group must use a version control system to track code changes and backup documents on a cloud storage service.	$1 \times 3 = 3$	Technical
Group spends too much time discussing what needs to be done, and as a result has no time to work on solution.	Group leader must have an agenda prepared prior to every meeting and draft a project plan that has everyones support.	$2 \times 4 = 8$	Non-Technical
Group does not make it to the competitions next round.	Make adjustments if necessary and continue development.	$2 \times 0 = 0$	Non-Technical

5   Literature Review

The concept of the *"right to be forgotten"* is based on the European ideal of an individual determining the development of their own life in an autonomous manner, without being periodically stigmatised as a consequence of a specific action performed in the past, especially when these events do not have any relationship with the contemporary context (Mantelero, 2013). However, does the *"right to be forgotten"* really have a sound basis? Mayes (2015) argues that the right to being forgotten is a figment of our imagination, describing it as an antisocial, nihilist act which could eventually signify the degradation of our power to act in the world. Fleischer (2015) extends this argument by asking the difficult question: who should be responsible for what should be remembered or forgotten? For example, if Italian courts decide that Italian murderers should be able to delete all references to their online convictions after a period of time, would this Italian standard apply to the entire Web or only be applied to *.it domains? Under the ruling in Article 12 of the Directive 95/46/EC, Europeans who feel that they are being misrepresented by search results that are no longer accurate or irrelevant can ask Google to de-link the material. If the request was approved, the information would remain online at the original site, but no longer come up under certain search engine queries (Manjoo, 2015).

It can be argued that certain ideas pertaining to the *"right to be forgotten"* are synonymous with those pertaining to self-presentation and self-disclosure. Goffman (1959) ideas on self-presentation asserts the ways in which an individual may partake in strategic activities *"to convey an impression others which it is in their best interests to convey"*. Online self-presentation is more malleable and subject to self-censorship, allowing individuals to express or make salient multiple aspects of their identity. Consequently under certain conditions, individuals may wish to express themselves more openly and honestly than in face to face contexts (Ellison, Heino, and Gibbs, 2006) or engage in misrepresentation.

Within the assigned context, the group will need to consider incorporating impression management features in order to create a marketable commercial solution. Impression management can be defined *"as the goal-directed activity of controlling information about a person, object, entity, idea or event"* (Connolly-Ahern and Broadway, 2007). As discussed above, the group considers impression management to be an expansion of the *"right to be forgotten"* concept, as it presents an opportunity for individuals and corporates to correct any misrepresentations of themselves online. Relationships are increasingly initiated and maintained online, providing individuals and corporates with an opportunity to create strategic images of themselves for social purposes (Rosenberg and Egbert, 2011).

Moreover, according to Pak and Paroubek (2010) it creates opportunities for data extracted from these sources to be used in opinion mining and sentiment analysis. Sentiment analysis can be defined as *"the computational study of opinions, sentiments and emotions expressed in texts"* (Liu, 2010). For example, during an election campaign, political parties may be interested to know if people support their candidate or not by analysing messages written across multiple social media networks in order to extract an aggregated sentiment which can be used to support decision-making. However in this case, complications may arise as the disclosure domain is boundless, and as a result all messages will need to be filtered as they can refer to any subject (Ortigosa, Martin, and Carro, 2014).
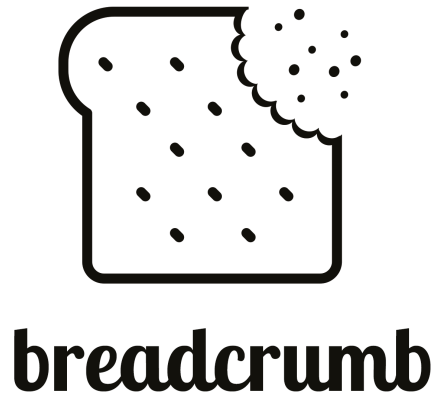
6 Ideas

6.1 Overview

Figure 7 Breadcrumb Logo

Breadcrumb, the title of group's proposed solution, is an impression management tool that helps individuals and corporates positively manage and optimise their online information. The name comes from the story of Hansel and Gretel, who left a trail of breadcrumbs as they walked through the forest so they could trace their way home. In the same way, the group noted individuals and corporates often leave a digital footprint that makes it easy for others to develop an opinion about their reputation from what they see online. Unlike footprints left in the sand at the beach, an online "breadcrumb trail" often sticks around long after the tide has gone, and can have negative implications for all involved.

6.2 Business Model

Breadcrumb will come in the form of three-tiered structured offering, which will provide clients with a customised level of service at different price points in order to appeal to a wider segment.

6.2.1 Tier 1: Personal

The Personal offering is geared towards individuals wanting to monitor and control their online information – for instance, prior to making a job application. In this case, when Breadcrumb is run for the first time, the user will be asked to connect all their social media accounts (i.e. Facebook and Twitter) and provide their personal information. Breadcrumb then scans each social media account for content it initially considers to be significantly positive or negative and collates a primary list. Further to this, it trawls the internet to find material that it initially considers to be significantly positive or negative and collates a secondary list. As Breadcrumb is an impression management tool, it is important for it to understand the entirety of someone's online profile, so that it can recommend ways in which the user can improve their digital footprint. Once both lists are collated, they are combined and presented to the user as a "graphical deck of cards". Each card contains information on the content Breadcrumb identified as significantly positive or negative. At this point, the user can swipe

through each card and decide whether they personally deem the content to be positive or negative. Consequently, Breadcrumb is trained to understand what the user wants their online profile to look like, so that in future scans, it will get better at flagging relevant material. Over time, this increases Breadcrumb's value or stickiness, making it rather difficult for users to switch.

As the group expects the Personal offering to be used infrequently, it will employ a freemium pricing strategy for this portion of the service. As this service is new to market, offering a freemium version to individual users can be a quick way to drive trial usage and generate feedback before scaling up because of the low barrier to entry.

In order to convert free users into paying users, Breadcrumb will only display a limited number of results but charge users a small fee in order to unlock the rest. Moreover, Breadcrumb will regularly provide the user with recommendations on how to improve their online profile, which can be unlocked for another small fee. These recommendations will be derived from what Breadcrumb understands about the user and may involve ideas around content production. All of these features will be presented to the user in a gamified manner, often with the promise of "rewards" that motivate the user to keep returning due to their perceived fairness of the transaction. In addition, such a system will also give the user a sense of control over their continued investment.
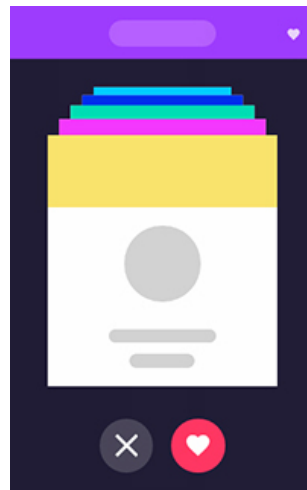

Figure 8 Card User Interface

6.2.2 Tier 2: Premier

The Premier offering is geared towards individuals wanting to understand and shape public opinion, create compelling narratives and develop initiatives that persuade people to act – for instance, a agent aiming to maximise the market value of their client (in this case, a football player) would want to have them conveyed in the media as a skilful player in order to inspire a bid from a particular football club.

The Premier offering contains the same features as the Personal offering, but also provides users the opportunity to review multiple online profiles at once and derive a sentiment score which measures the emotional tone of the information found, along with current public perception. This allows for a variety of interesting use cases – for example, a spin-doctor coordinating a political campaign in the build-up to a presidential election can compare the sentiment score between two competing candidates in order to better understand how the public is reacting to their clients recent activities.

Further to this, Breadcrumb can provide the spin-doctor or agent with a unique, in-depth impression management strategy that can help improve their clients sentiment score and overall public image.

The group envisions that the Premier offering could also be used by corporates seeking to maintain the online reputation of their executives, and by celebrities in order to identify instances of copyright infringement, wherein their work or likeness have been used without prior permission.

As the group expects the Premier offering to be regularly used, it will employ a subscription pricing strategy for this portion of the service. Users have the chance to use Breadcrumb free for 30 days in order to determine whether it is suitable for them, but beyond that they will need to pay a monthly fee.

6.2.3 Tier 3: Enterprise

The Enterprise offering is geared towards small, medium and large corporates wanting to aggregate relevant content, analyse the sentiment of each mention and derive information about the individuals hosting discussions about the brand. Breadcrumb will provide corporates with tailored, brand amplification strategies. The group also envisions that the Enterprise offering could also be used by corporates screening job applicants, subsequently providing human resource departments with insights into whether or not an individual is a fit for the organisation based on their online profile.

As the group expects the Enterprise offering to be regularly used, it will employ a subscription pricing strategy for this portion of the service identical to the Premier offering, as it builds upon that package.
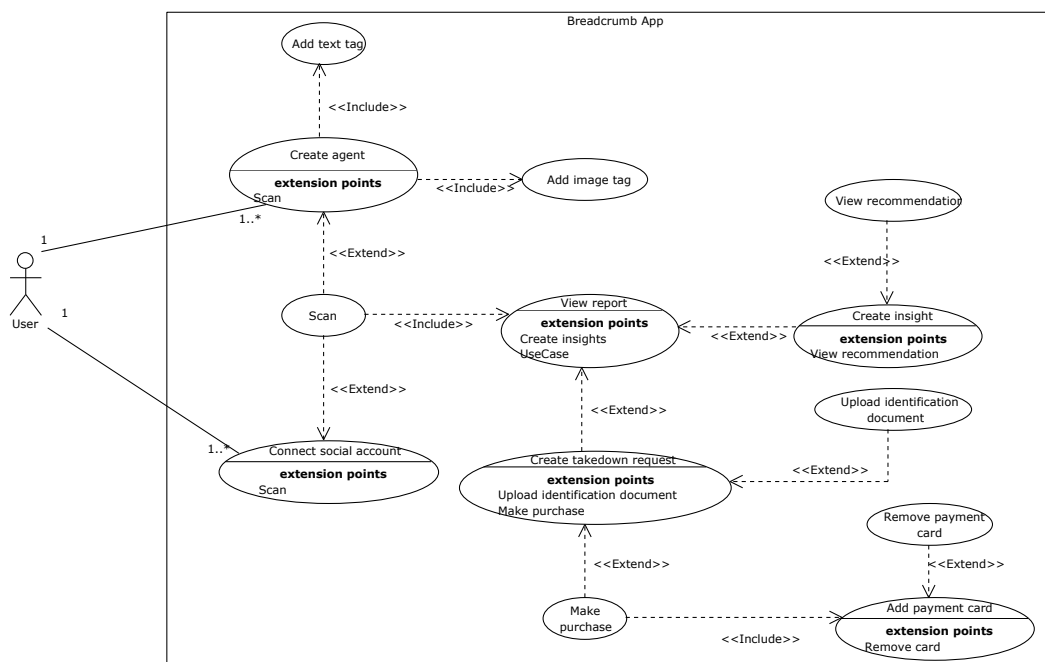
6.3 Use Case Diagram

Figure 9 Use Case Diagram

6.4 Lean Canvas

The group considers Maurya's Lean Canvas to be the best choice in modelling the business case. It is part of a methodology called "lean start-up", which favours iterative design over "big design up front" development, and does not begin with a business plan, but rather in search for a business model. Given the close overlap between business and technology in the assigned context, it is very important to identify any synergy potential early on.

Problem	Solution	Unique Value Proposition	Unfair Advantage	Customer Segments
The group must create an Android smart mobile device app to help track and manage personal data. In addition, it should also: • Secure, filter or bring added value to personal data • Contain functionalities to protect personal data e.g. automatic de-subscription, notifications, deletion, or ensuring results do not appear in search engine top hits. • Meet needs of individuals/corporates • Provide education to user of their right to be forgotten	Breadcrumb is an impression management tool that will help individuals and corporates: • Optimise and improve their online profile • Create tactical content about themselves • Gain access to detailed analytics on persons of interest **Key Metrics** The following metrics will need to be measured: • Cumulative number of user sign-ups • Monthly profit from micro-transactions • Annual profit from subscriptions	Breadcrumb will come in the form of three-tiered structured offering: • Personal – you can monitor and control a single user's social media account and web presence. Moreover, you can derive the sentiment of each post • Premier – all of the above and the ability to issue takedown notices to search engines automatically • Enterprise – all of the above and access to brand amplification strategies. Can also use the service to screen job applicants	Breadcrumb implements a value creating strategy not concurrently implemented by any current or potential competitors. At the time of writing, the proposed system offers a synergy of services not seen elsewhere, "theoretically" giving it the service an unfair advantage if implemented correctly. **Channels** The service will be marketed through the following channels: • Word of mouth – as customers are likely to trust recommendations from friends • Social media	Breadcrumb will be targeted towards the following customer segments: • Individuals – using the Personal offering, they can improve their online profile prior to applying for a job or degree • Agents – using the Premier offering, they can monitor the online profiles of their clients and issue takedown notices • Small to medium businesses – using the Enterprise offering, they can preserve the company's image if they lack the resources to do it themselves

Cost Structure	Revenue Stream

Y1-Y3 cost based on provisional launch date of Jan 2017:
• Employee salary: £25,000 x 4 staff per annum = £300,000
• Cost of hosting on Google App Engine: £27.50 per month = £990
• Office rent and bills in Loughborough: £750 per month = £27,000
• Legal (company incorporation, once off cost): £150
• Domain name purchase and web hosting: £90 per annum = £270
• Employee liability insurance: £20 x 4 staff per month = £2,880
• Marketing (Google AdWords and Facebook): £60 per month = £2,160
Funding required for Y1-Y3: £500,000
Total cost: £333,450
	Y1-Y3 revenue if service hits 30,000 users between 2017-20:
	• Premier offering: £29 per month (12 month contract)
	• Enterprise offering: £49 per month (12 month contract)
	• Micro-transaction cost: £0.99 per request
	   ○ 300 users on premier offering in Y2: £104,400
	   ○ 500 users on premier offering in Y3: £174,000
	   ○ 60 users on enterprise offering in Y2: £35,280
	   ○ 200 users on enterprise offering in Y3: £117,600
	   ○ 10,000 micro-transactions by Y3 (~9 per day): £9,900
	Total revenue: £441,180 (Total profit: £107,730)

Figure 10 Lean Canvas
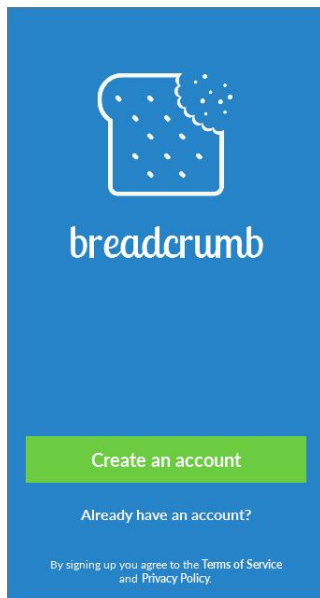
7 User Interface Design

7.1 Registration

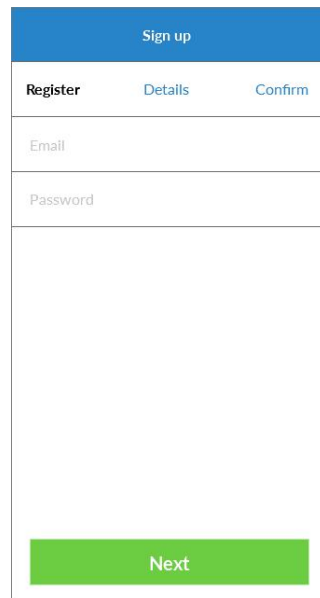**Figure 11a** Registration – Step 1
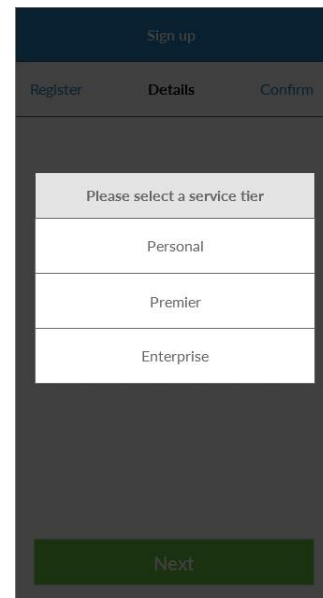

Figure 11b Registration – Step 2

Figure 11c Registration – Step 3

The user presses on the "create an account" button when on the app's splash screen.

The user enters their email address and password. Once done, they press the next button.

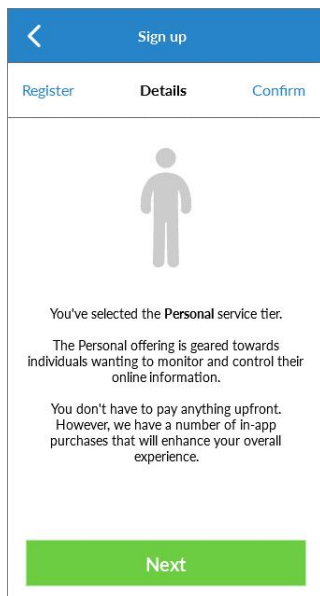The user selects a service tier that is appropriate to their present context.
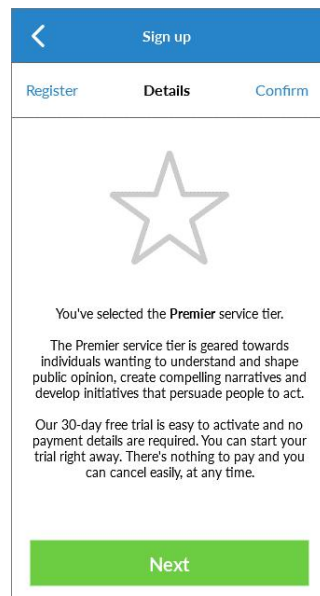

Figure 12a Registration – Step 4a

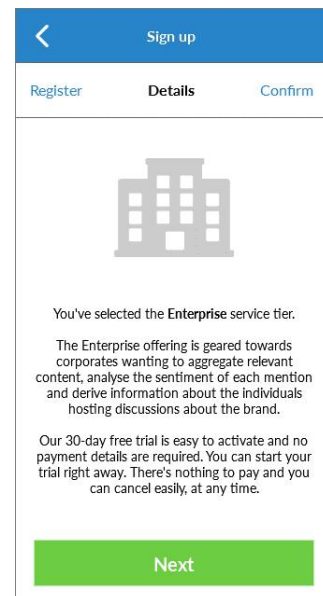**Figure 12b** Registration – Step 4b

Figure 12c Registration – Step 4c

The user is directed to a screen with details on the selected offering, so that they can be assured of their decision. If they are not – they can press the back button and select another service tier (see Figure 11c). Otherwise, they must press next to carry on.
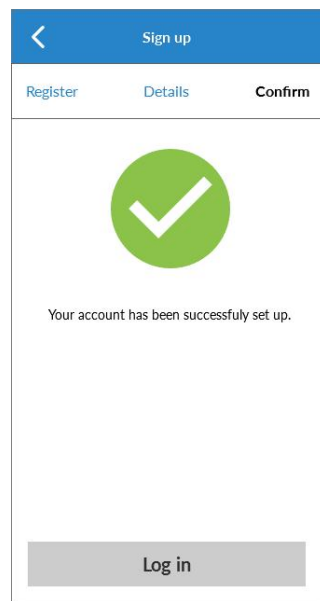
16

Figure 13 Registration – Step 5

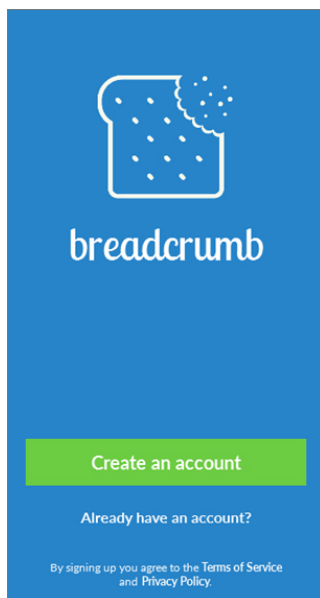Once the account has been set up, the user can sign in (cf. 11b).

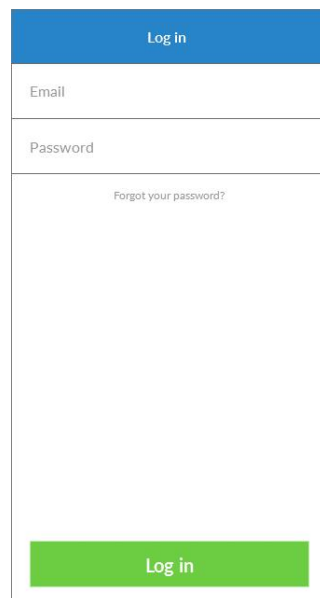## 7.2 *Login*

Figure 14a Login – Step 1
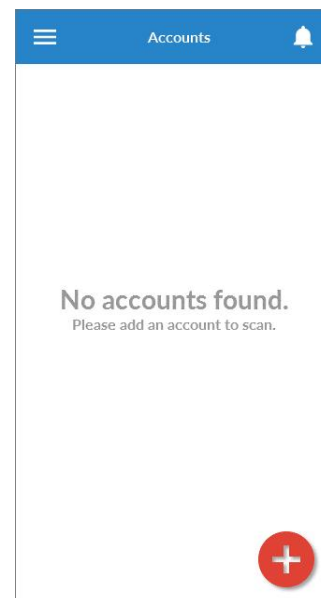

Figure 14b Login – Step 2

Figure 14c Login – Step 3

The user presses on the "already have an account" text link when on the splash screen.

The user enters their email address and password. Once done, they press the "log in" button.

The user is directed to the accounts screen.

7.3   Sidebar Menu

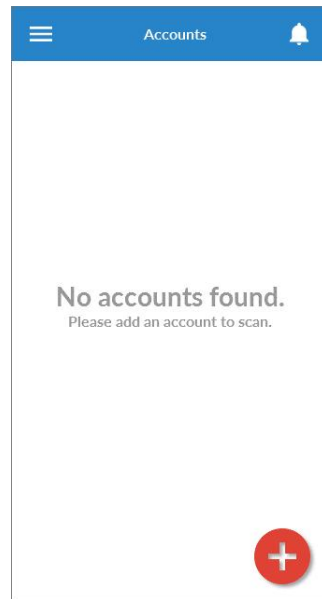**Figure 15a** View Sidebar Menu –
Step 1

Figure 15b View Sidebar Menu –
Step 2

The user presses on the hamburger icon located in the top left corner.
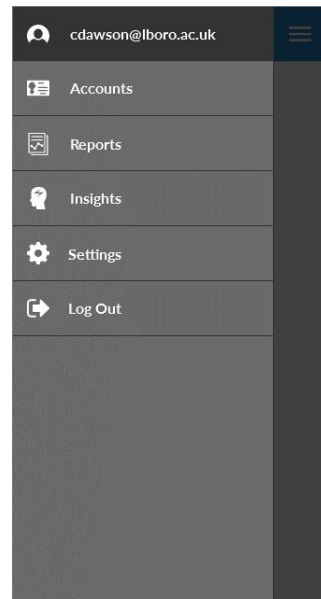
The sidebar menu slides out from the left, and the user can switch to a different part of the app.

7.4 Notifications

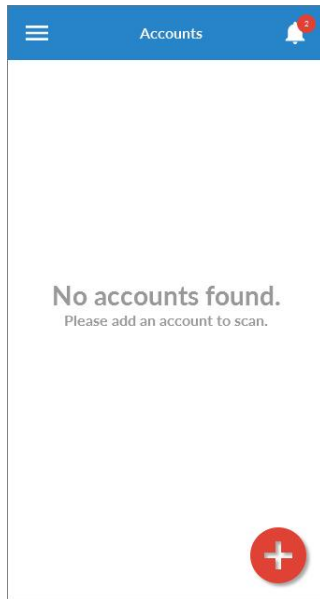**Figure 16a** Notifications – Step 1
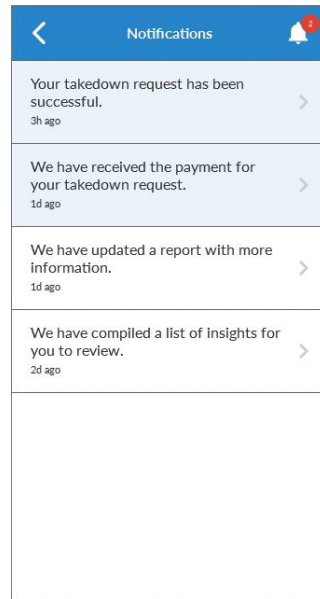
Figure 16b Notifications – Step 2

Figure 16c Notifications – Step 3

The user presses on the bell icon located in the top right corner whenever they have a notification.

The user is presented with a list of notifications. Items in light blue have not yet been viewed.

Once the user presses on a notification item, more information on the item is displayed.

7.5   Add Account
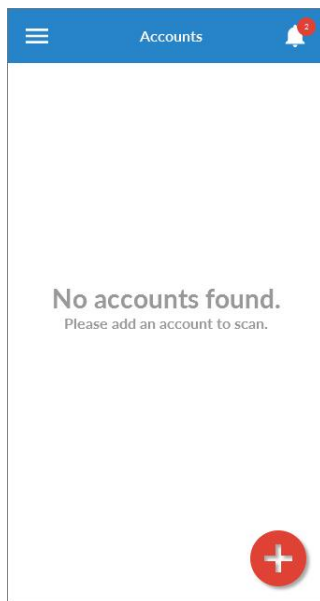
Figure 17a Add Account – Step 1

Figure 17b Add Account – Step 2

Figure 17c Add Account – Step 3

The user presses on the plus icon located in the bottom right corner to set up a new account.

The user is then presented with a list of account types which can be added to the app.

Once the account has been added, it appears as a persistent entry on the accounts screen.

7.6   Scan Account
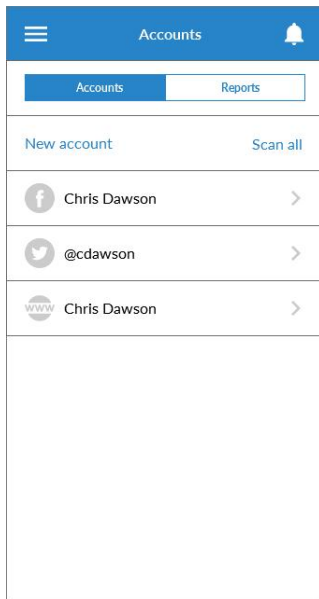
Figure 18a Scan Account – Step 1

In order to start a scan across all accounts, the user presses on the "scan all" link.
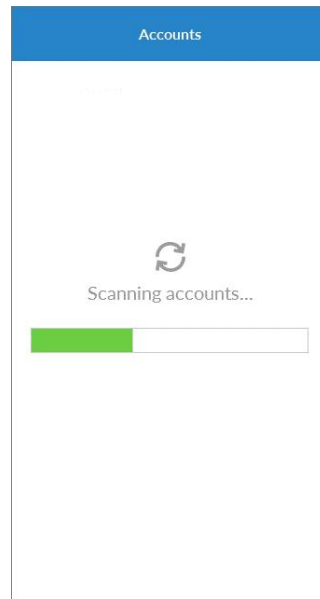
Figure 18b Scan Account – Step 2

The app then scans all accounts in the background, leaving the user to carry on doing other things.
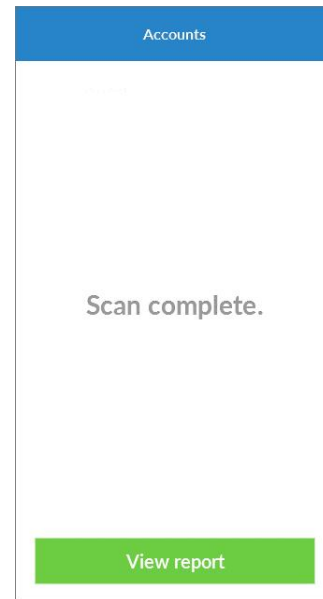
Figure 18c Scan Account – Step 3

Once a scan is completed, a report summarising the user's current online profile is generated.

7.7   View Accounts
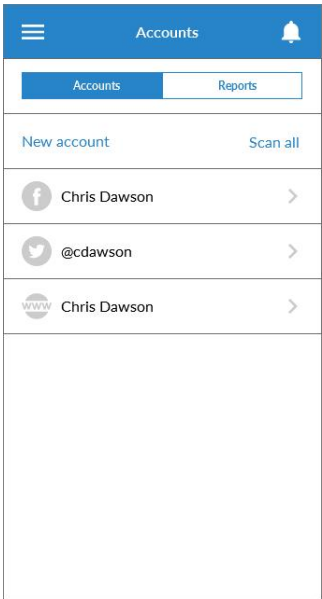
Figure 19a View Accounts – Step 1
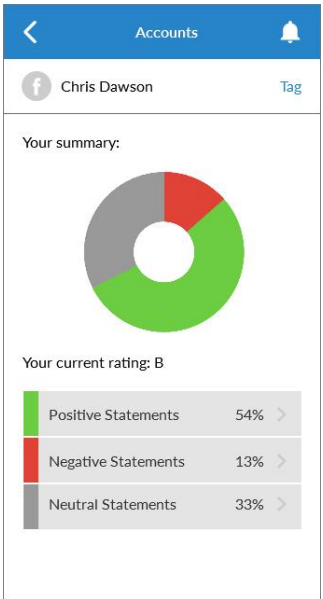
Figure 19b View Accounts – Step 2
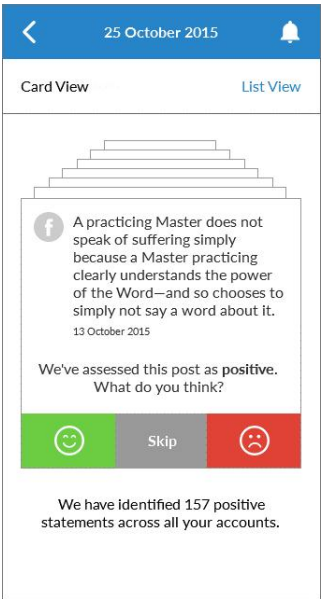
Figure 19c View Accounts – Step 3

Once a scan is run across all accounts, the user can view the status of a single account.

After the user selects an account, they are presented with a breakdown of its current status.

The user can then assess whether the app has grouped each statement correctly.

7.8   Add Text Tag
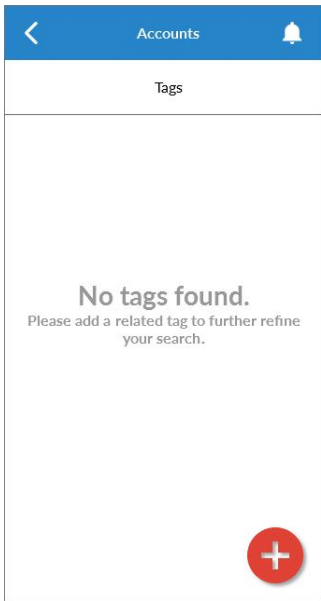
Figure 20a Add Text Tag – Step 1

Figure 20b Add Text Tag – Step 2
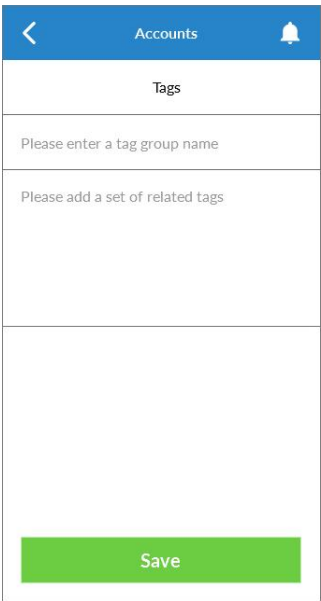
Figure 20c Add Text Tag – Step 3

Agent accounts are web scrapers that trawl the Internet and return any requested data to the user.

Text tags can be added to agent accounts in order to refine the quality of results gathered.

Each tag must be assigned a group name and related words (e.g. bio → Chris, Loughborough).

7.9 Add Image Tag
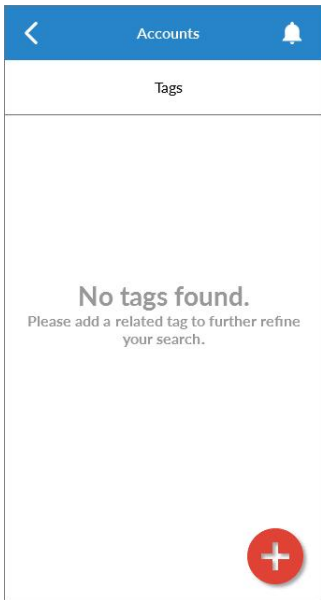
Figure 21a Add Image Tag – Step 1

Figure 21b Add Image Tag – Step 2
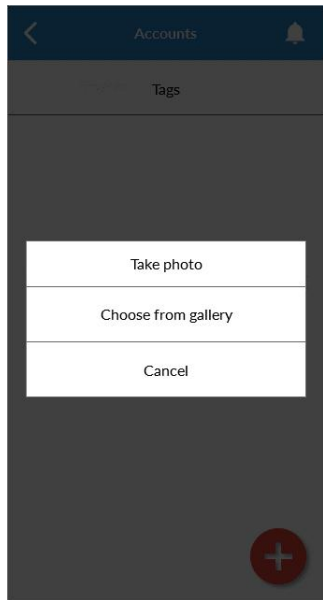
Figure 21c Add Image Tag – Step 3

The user presses on the plus icon located in the bottom right corner to set up a new tag.

Image tags can be used whenever the user wants to detect any occurrences of copyright abuse.

The user can either select to take a new photo or select one from their phones gallery.

Figure 22a Add Image Tag – Step 4
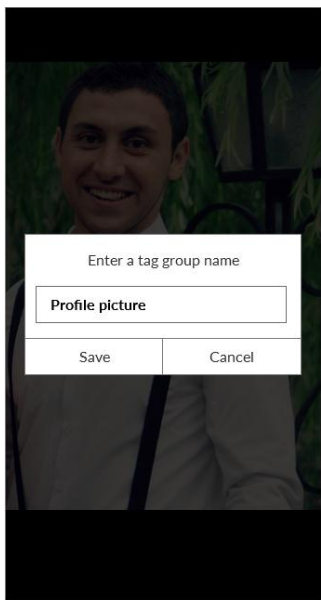
Figure 22b Add Image Tag – Step 5
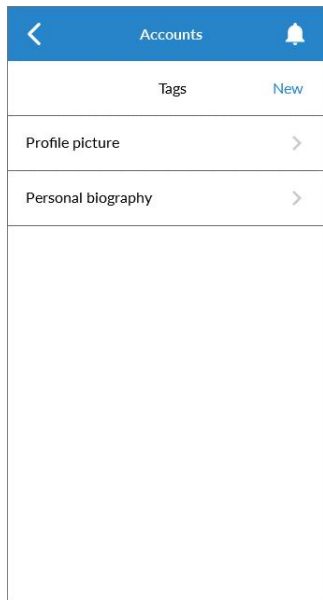
Figure 22c Add Image Tag – Step 6

In this case, the user has opted to select a profile shot from their phone's gallery for upload.

The user must specify a tag group for the image. Multiple images can be added to one tag group.

Once image and text tags are added, they appear as an entry on the corresponding agent's screen.

24
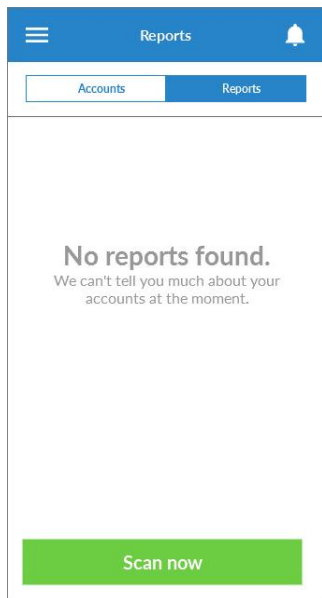
7.10   Create Report

Figure 23a Create Report – Step 1
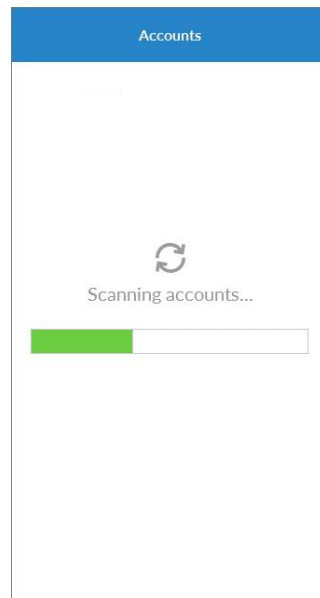
Figure 23b Create Report – Step 2
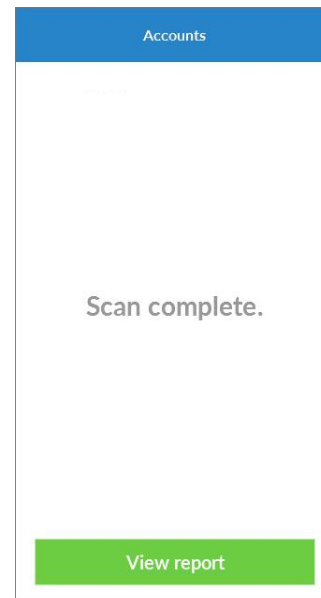
Figure 23c Create Report – Step 3

In order to create a new report for all accounts, the user must press on the "scan now" button.

After pressing the "scan now" button, a new report is compiled for the user in the background.

Once a scan is completed, a report summarising the user's current online profile is generated.

7.11   View Reports (Card Mode)

Figure 24a View Reports (Card Mode) – Step 1
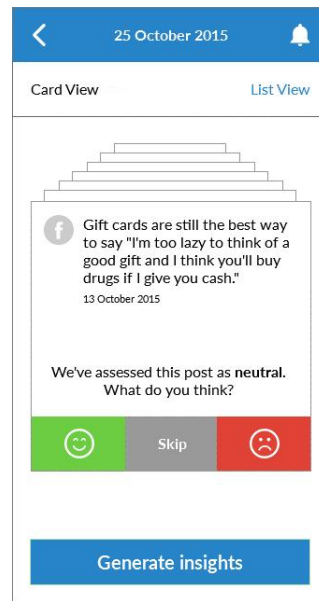
Figure 24b View Reports (Card Mode) – Step 2

After a scan is completed, a new report item appears as an entry on the accounts screen.

Once a report is selected, the user must go through each post to assess if it was grouped correctly.

7.12   View Reports (List Mode)

Figure 25a View Reports (List Mode) – Step 1
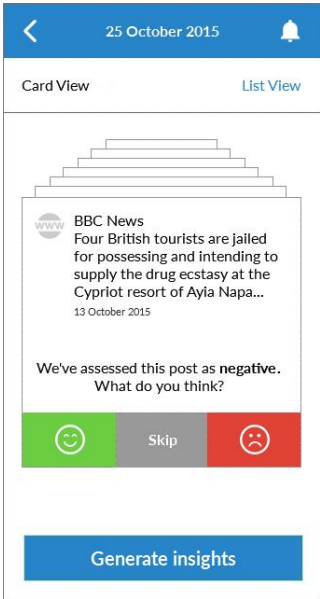
Figure 25b View Reports (List Mode) – Step 2
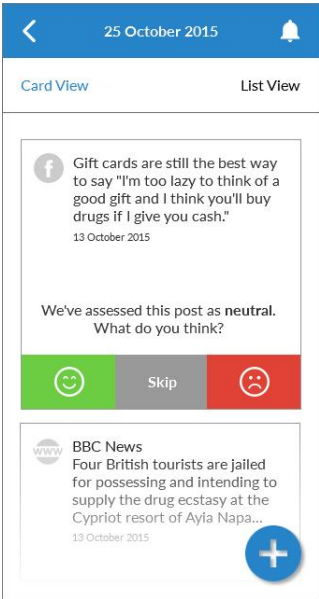
Figure 25c View Reports (List Mode) – Step 3

After a scan is completed, a new report item appears as an entry on the accounts screen.

The user must manually check each post in order to help the app learn more about them.

If the user does not like the card view in step 2, then they can quickly switch to a list view.

7.13   Request Takedown

Figure 26a Takedown – Step 1

Figure 26b Takedown – Step 2
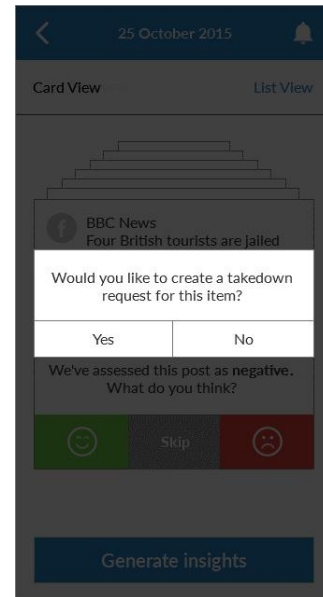
Figure 26c Takedown – Step 3

If the user wants to access additional detail on a post, they need to "long press" the card.

Long pressing a card related to a web link opens up a new screen with the article in full view.

If the user wants to create a takedown request, then they need to press the red "sad face".
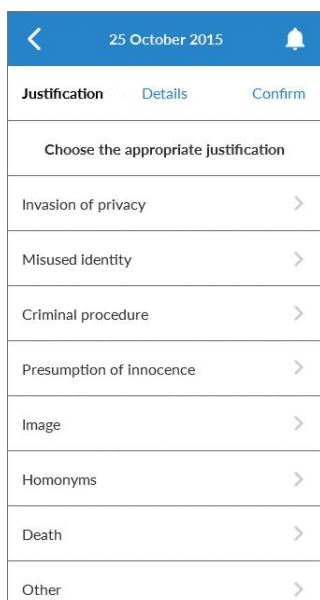
Figure 27a Takedown – Step 4
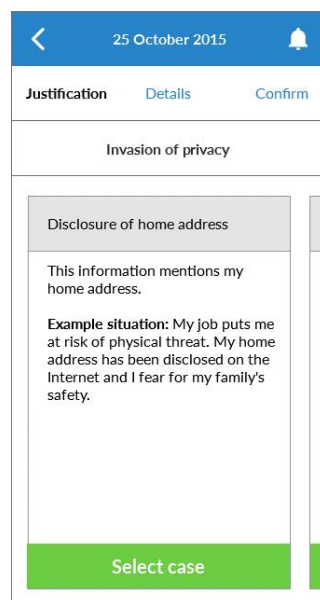
Figure 27b Takedown – Step 5
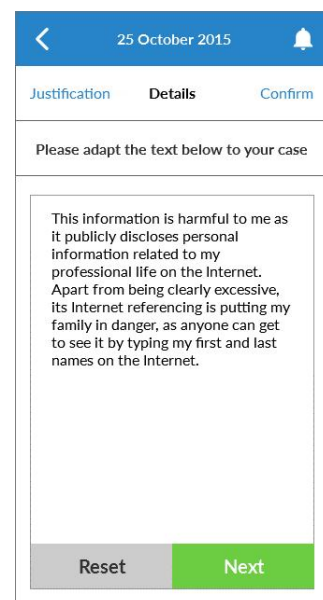
Figure 27c Takedown – Step 6

The user must then select a justification category for the takedown request. It is important that it complements the content of the referenced article.

Each category has a number of subcategories which can help the user find an appropriate case that complements the content of the referenced article.

After a case has been selected, the user is provided with sample text that will be placed in the takedown request to supplement the claim.

Figure 28a Takedown – Step 7
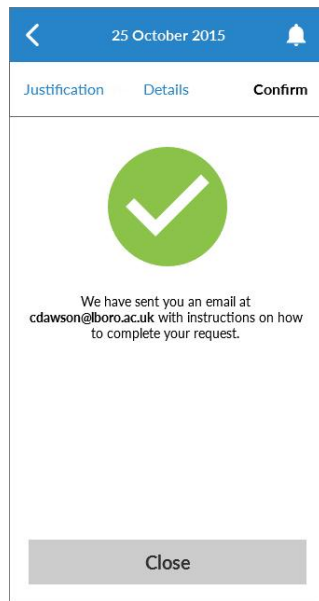
Figure 28b Takedown – Step 8a
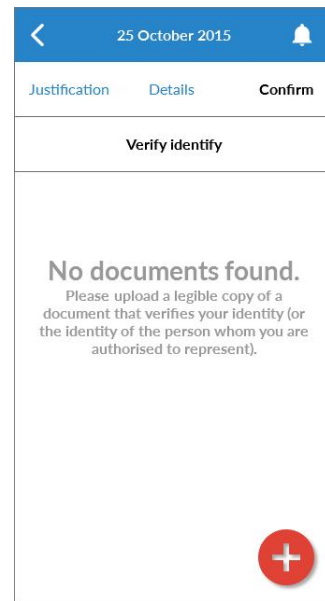
Figure 28c Takedown – Step 8b

The user can either delegate the job of submitting the request to the app or decide to do it themselves.

If the user opts to do it themselves, then they are emailed a guide on how to complete the request.

If the user delegates the task to the app, then they will need to upload a photo that proves their identity.
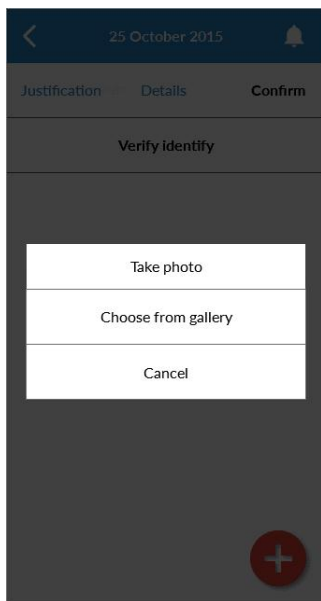
Figure 29a Takedown – Step 9

Figure 29b Takedown – Step 10
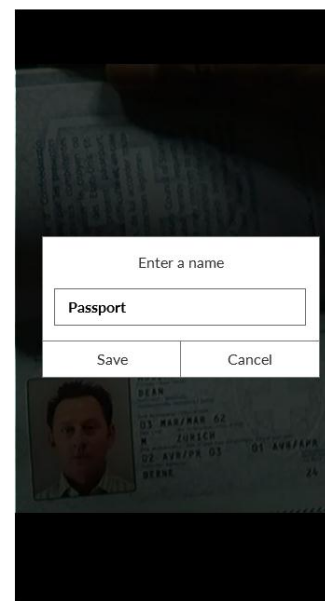
Figure 29c Takedown – Step 11

The user can either select to take a new photo or select one from their phone's gallery.

In this example, the user has opted to take a photo of their passport document.

The user can name the photo so that it can be saved and used in other takedown requests.
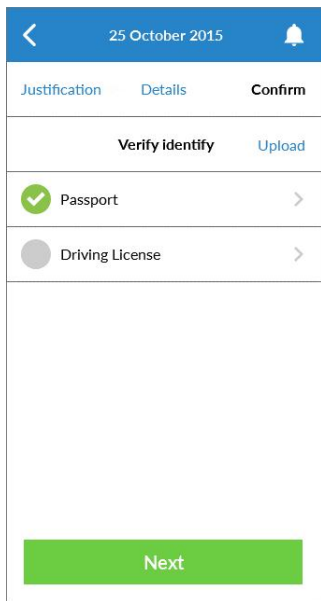
Figure 30a Takedown – Step 12a

Figure 30b Takedown – Step 12b
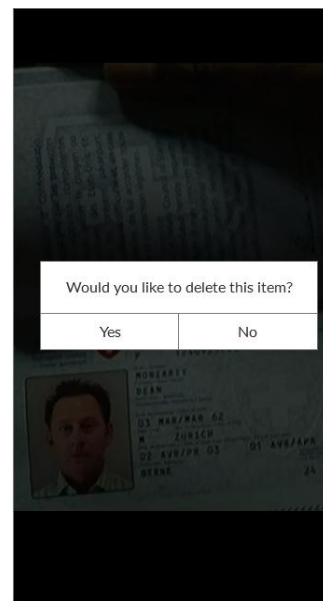
Figure 30c Takedown – Step 12c

If necessary, the user can attach one or more documents to the takedown request.

The user can also review their documents. If necessary, documents can be renamed or deleted.

All documents will be encrypted when stored and permanently destroyed when no longer required.

7.14   Add Payment Method
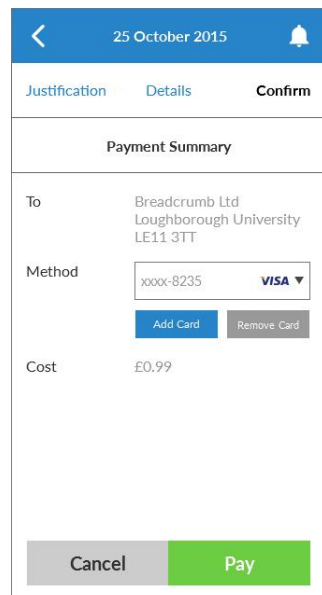
Figure 31a Add Method – Step 1
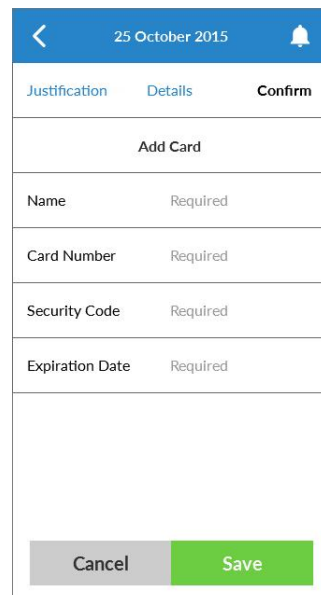
Figure 31b Add Method – Step 2

If the user wants to provide new payment details, then they must press the "add card" button.

After filling in the required fields, the user must press on the save button.

7.15   Remove Payment Method
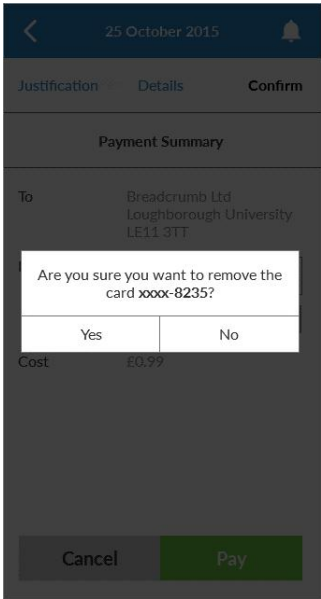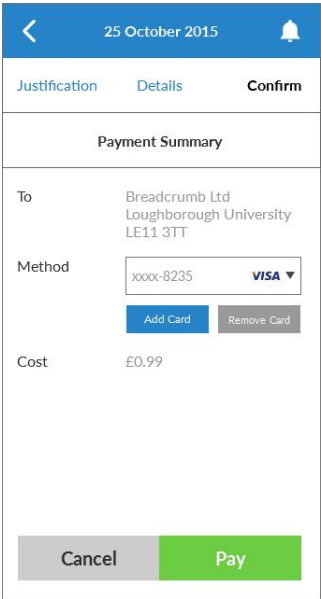
Figure 32a Remove Method – Step 1

Figure 32b Remove Method – Step 2

If the user wants to remove new payment details, then they must press the "remove card" button.

The user is then asked if to confirm whether or not they want to remove the card.

7.16   Make Payment

Figure 33a Make Payment – Step 1

Figure 33b Make Payment – Step 2

In order to make a payment for a service, the user must press the "pay" button.

Once done, a receipt is sent to the users email address as record of payment.

7.17 Generate Insights

Figure 34a Generate Insights – Step 1
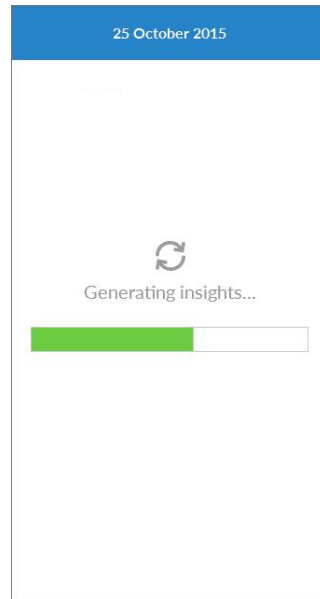
Figure 34b Generate Insights – Step 2
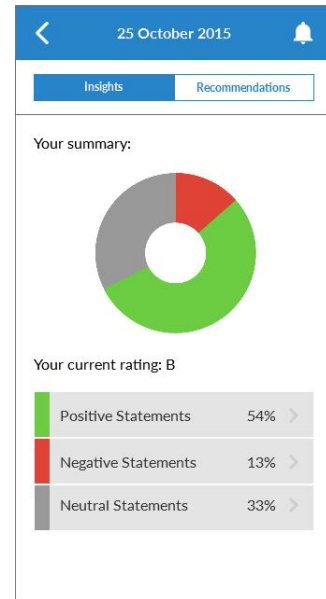
Figure 34c Generate Insights – Step 3

Once a report is collated, it is possible to compile a set of insights based on the data gathered.

After pressing the "generate insights" button, a set of insights is compiled for the user.

The app groups the users posts to date into three categories and then grades their online profile.

7.18   View Recommendations
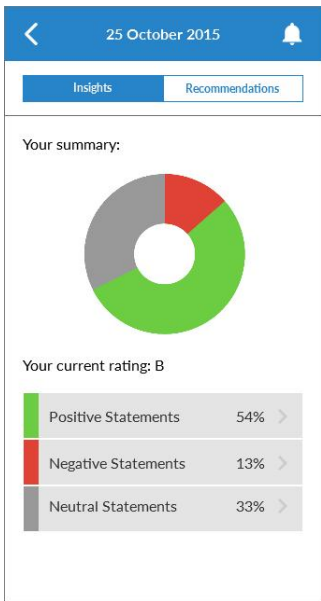
Figure 35a View Recommendations – Step 1
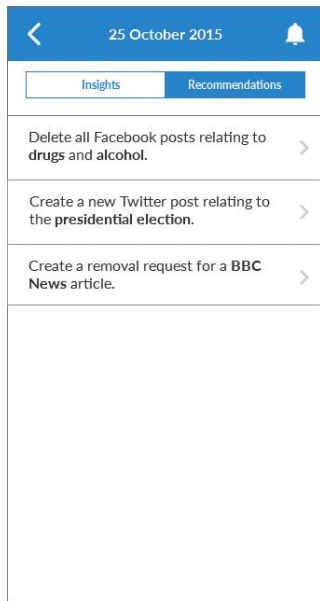
Figure 35b View Recommendations – Step 2
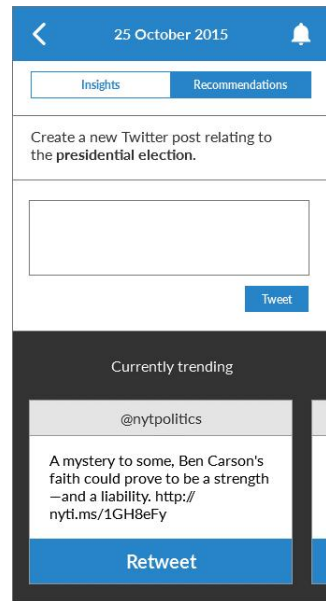
Figure 35c View Recommendations – Step 3

Once the user has acquired a grade for their online profile, they can explore ways to improve it.

After selecting the recommendations tab, the user is given strategies to help boost their grade.

In this case, the user is advised to tweet and is given an overview of popular tweets on a subject.

8   System Architecture Diagram
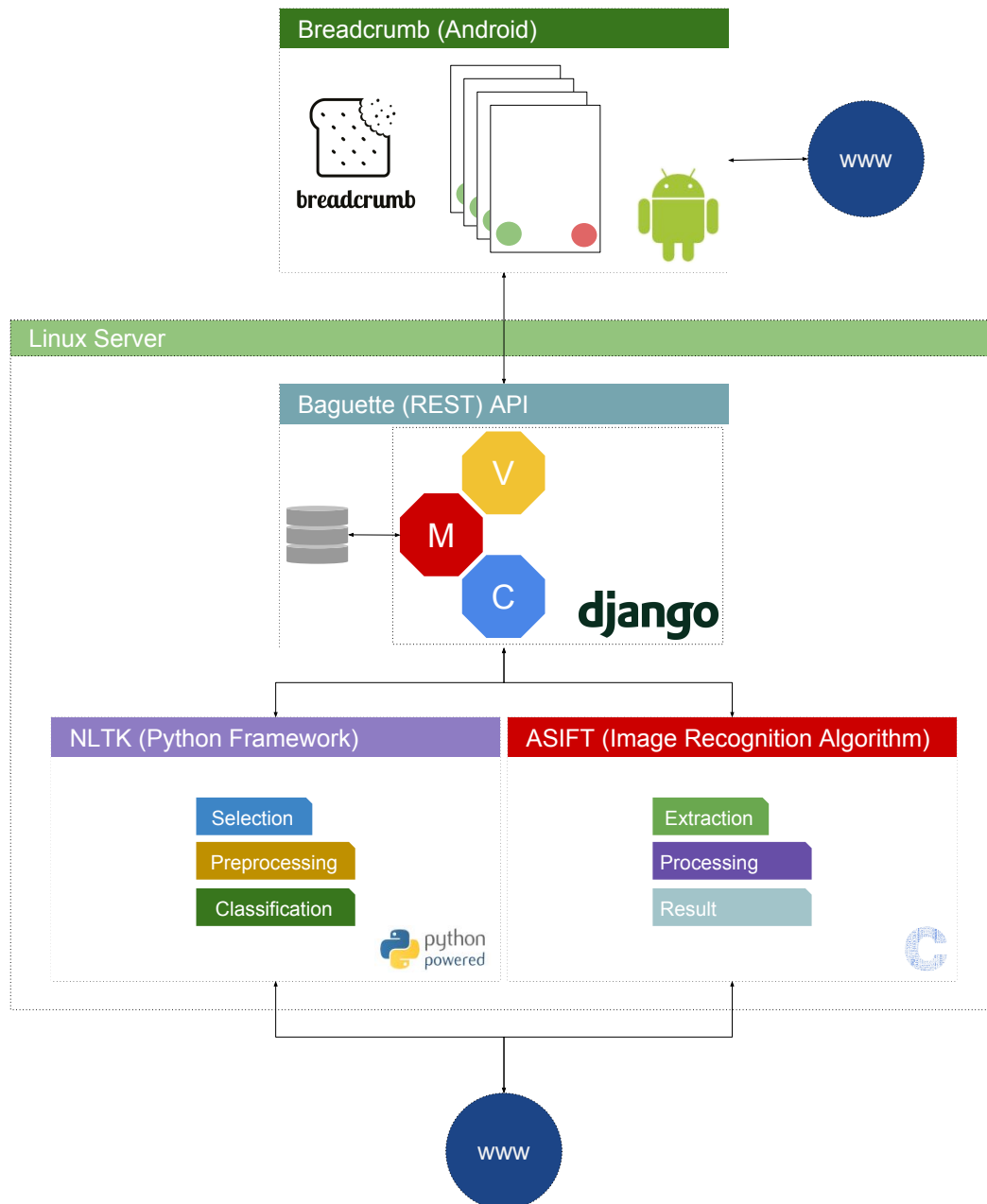
Figure 36 System Architecture Diagram

9 Technical Considerations

9.1 Data Extraction

In order to extract content from multiple web pages, a web crawler will need to be created using the Python programming language. The group plans on using Scrapy, a Python library which when provided with a sufficient list of hosts, will handle the "visiting" of websites. Scrapy crawls through each directory within the host (as defined by the site's *robots.txt* file). After visiting a URL, the content will be extracted and analysed using the information retrieval methods available in the Python Natural Language Toolkit (NLTK) library.
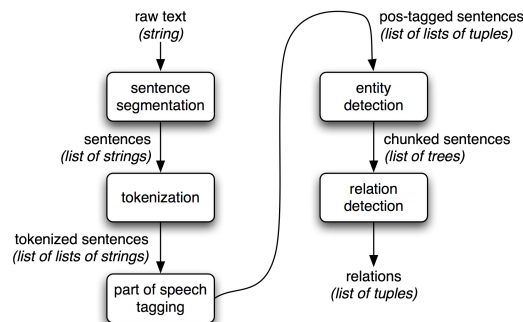
Figure 37 Python Natural Language Tookit Information Retrieval Flow Diagram

Many websites implement measures to prevent web crawlers from crawling due to the number of requests made as they utilise their server resources. Quite often, this results in the crawler being banned. However, the group can take the following measures to prevent this:

- Disabling cookies may prevent getting banned, but only if it's the method used by the website to detect crawlers

- Using Google cached pages instead of visiting the websites directly

- Using different IP addresses by rotating from a list when making a request to the same host

- Setting a delay between requests

9.2 Sentiment Analysis

Once the user's online content has been extracted, it will be placed into one of the following categories: negative, positive or neutral. This can be achieved by performing sentiment analysis on the content. However, the app's back-end has to be first be trained by supplying sufficient training data.

The language used for the sentiment analysis will be Python. In addition, the group will also make use of the Natural Language Toolkit (NLTK) Python library.

9.2.1   Data Collection & Pre-Processing

The first step is to collect existing positive, negative and neutral content and store them in an array.

```python
positive_content = [
    ("I love this car", "positive"),
    ("This view is amazing", "positive"),
    ("I feel great this morning", "positive"),
    ("I am so excited about the concert", "positive"),
    ("He is my best friend", "positive")
]

negative_content = [
    ("I do not like this car", "negative"),
    ("This view is horrible", "negative"),
    ("I feel tired this morning", "negative"),
    ("I am not looking forward to the concert", "negative"),
    ("He is my enemy", "negative"),
    ("John is so annoying", "negative")
]

neutral_content = [
    ("He is okay", "neutral"),
    ("The weather is just right", "neutral"),
    ("We have a deadline tomorrow", "neutral"),
    ("There is someone at the door", "neutral"),
    ("The doorkeeper was dressed in red", "neutral"),
    ("The review is concerned with the first three volumes", "neutral")
]
```

Figure 38 Content Collection

These words are then collected into a single list of tuples, each of which contain two elements.

```python
content = []

for (words, sentiment) in positive_content + negative_content + neutral_content:
    words_filtered = [e.lower() for e in words.split() if len(e) >= 3]
    content.append((words_filtered, sentiment))
```

Figure 39 Content Pre-Processing

9.2.2   Classifier Creation

Once sufficient content has been attained, a list of each word extracted needs to be collected and then ordered based on frequency of occurrence.

```python
def get_words_in_content(content):
        all_words = []
        for (words, sentiment in content):
                all_words.extend(words)
        return all_words

def get_word_features(wordlist):
        wordlist = nltk.FreqDist(wordlist)
        word_features = wordlist.keys()
        return word_features

word_features  = get_word_features(get_words_in_content(content))
```

Figure 40 Word Frequency

To create the classifier, relevant features must be captured via a feature extractor.

```python
def extract_features(document):
        document_words = set(document)
        features = {}
        for word in word_features:
                features['contains(%s)' % word] = (word in document_words)
        return features
```

Figure 41 Feature Extraction

A training set will then be created using the NLTK library. Furthermore, a classifier object can be instantiated.

```python
training_set = nltk.classify.apply_features(extract_features, content)
classify = nltk.NaiveBayesClassifier.train(training_set)
```

Figure 42 Classifier Training

9.2.3 Classifier Testing

Now that the classifier has been created and trained, the sentiment analyser can be tested.

```python
content = "You're so annoying"
print classifier.classify(extract_features(content.split()))
# $ negative

content = "I really love you"
print classifier.classify(extract_features(content.split()))
# $ positive
```

Figure 43 Classifier Testing

9.3   Pattern Matching and Image Recognition Algorithms

This section contains information on the pattern matching and image recognition algorithms that could be utilised in the solution in order to help individuals devise a strategy for which data linked with them could be used for.

9.3.1   Pattern Matching

The bitap algorithm is an approximate or exact string matching algorithm that is one of the underlying algorithms of the UNIX "agrep" utility (Wu, 2012). It determines whether a given text contains a substring which is equal to a given pattern, where approximate equality is defined in terms of the Levenshtein distance a complementary algorithm which determines how many changes must be made to a string or phrase in order to turn it into another string or phrase (Bryden, 2011). In comparison to other algorithms, bitap does most of the work with bitwise operations, therefore making it run super-fast.

```
algorithm bitap_search(text : string, pattern : string) returns string
    m := length(pattern)

    if m == 0
        return text

    /* Initialize the bit array R. */
    R := new array[m+1] of bit, initially all 0
    R[0] = 1

    for i = 0; i < length(text); i += 1:
        /* Update the bit array. */
        for k = m; k >= 1; k -= 1:
          R[k] = R[k-1] & (text[i] == pattern[k-1])

        if R[m]:
            return (text+i - m) + 1

    return nil
```

Figure 44 Bitap Algorithm Pseudocode

9.3.2   Application

The solution will require access to two predefined data sets for classifying the information returned by search engine. The first data set contains some sensitive keywords that will make a significant influence on public impression, such as drug abuse or achievement. The other data set stores the words with a neutral, negative or positive emotion, and each word has a corresponding score, for example: disappointment with score -5, humiliation with score -8, honour with score +8 and success with score +6.

The steps for implementing this algorithm are as follows:

1. Search website articles for sensitive keywords and their relative location

2. Search for "emotional words" that appear within the spatial locality of the sensitive keyword

3. Calculate the score of the article or website based on the number of emotional words found

9.4   Image Recognition

9.4.1   Description

Affine scale-invariant feature transform (or ASIFT) is computer vision algorithm that is used to detect and describe local features in images. It is regarded as an efficient method for determining matches between two arbitrarily-selected points within two widely separated views. Moreover, ASIFT is capable of finding a correspondence, even for pixels within an area with certain uniform properties, such as similar colours and textures (Podbreznik and Potocnik, 2014).

Figure 45 Comparison of Image Recognition Algorithms

9.4.2   Application

During the text processing stage, a pattern matching algorithm can attempt to detect the purpose of an article or website. If it is determined that the page is an advertisement, then the image and face recognition algorithm can attempt to match the image with the relevant person's face. Once matched, a check can be carried out to determine whether or not the website has the right to use the portraiture.

9.5 Encryption and Security

Data and device encryption are critical pieces of an overall mobile security initiative. Implementing the correct level of encryption is vital to ensuring that sensitive data is kept safe. Consequently, the group will need to tackle mobile data encryption from two angles: data on devices and data transmitted to and from those devices.

9.5.1 Data Encryption Techniques for On-Device Data

The latest version of the Android OS offers on-device encryption capabilities, as long as users enable it on their devices. When device encryption is enabled, the entire phone's file system is protected. However, turning encryption on does not mean that other supplementary file systems are protected. For instance, most Android devices have MicroSD cards which have to be deliberately secured. Securing MicroSD cards is a challenging prospect, as it makes the media difficult to plug into other devices, as both units require the same security keys in order to interact coherently. Therefore, the group will need to make sure that the app will be installed on the internal storage component of the a mobile device (Sheldon, 2015).

9.5.2 Data Encryption Techniques for Transmitted Data

The group must also make sure that any sensitive data transmitted between mobile app and the server is encrypted. To prevent eavesdropping of network traffic by unauthorised users, all data must be transmitted over a Secure Sockets Layer (SSL), using only strong security protocols such as Transport Layer Security (TLS) to reduce the likelihood of a data breach (Berkeley, 2015).

TLS and SSL are cryptographic protocols designed to provide communications security over a computer network. According to Dierks and Rescorla (2009), the primary goal of the TLS protocol is to provide *"privacy and data integrity between two communicating applications"*. Moreover Dierks and Rescorla (2009) asserts that TLS is application protocol independent, meaning that higher-level protocols can layer on top of the TLS protocol transparently. In order to test whether the mobile app is correctly using TLS prior to general release, the group will need to capture network packets from the device it is running off of using Wireshark or a similar tool. As a result of doing this, it should be possible to determine whether any confidential data is being sent unencrypted. This will need to form part of the testing strategy once the group starts to develop the solution, as there is currently nothing in the Android OS which enforces the use of TLS.

10 Stakeholder Feedback

In order to determine the business viability of the proposed ideas, the group drafted a proposal and sent it to multiple stakeholders in an attempt to get some feedback. Their responses are as follows:

10.1 Stakeholder 1

I think your solution is rather complex. Implementing context/grammar checking and analysing the intent of language statements sounds very difficult. How are you going to go about doing it?

Why not simply provide a service that will scan the Internet for all traces of your existence through your multiple identities and then automatically remove them. I think that is a sellable service. The Breadcrumb concept has the connotations of a CV service which still requires manual intervention to make things fit. I cannot see this being automated as I think you are hoping for.

10.2 Stakeholder 2

I gave this a read and found it really interesting. Some of the examples have some relevance to me so I really liked the idea. As someone coming to the business proposal with completely fresh eyes, I'll try to highlight the areas I particularly liked and the areas that need a bit more explanation.

10.2.1 Overview and Business Model

Firstly, I really liked the name and the explanation for this. I think that you make a really good link to technology and the internet. With regards to the business idea, I liked the idea of having packages for different users. I also liked the pricing structure proposed, along with the add-ons available.

10.2.2 Personal Offering

I understand that this is geared at someone like me that wants to understand and control their online presence on social media? I think that here you probably need to expand on the selling point. Why would I really need this? There needs to be a reason why this will really benefit an ordinary person like me. For example, if I wanted to improve my presence and performance on social media, maybe the app would help to collate my previous posts which have been most successful or received the most likes so that I know what style of posts are popular and where my profile has been "positive".

With the idea of it creating two lists, I don't understand the difference between the primary and secondary list that the app creates. I don't understand the difference between the two lists or the need for these.

In addition, I think you could perhaps explain a bit more how it decides what information is significantly positive or negative. Does it scan for trigger words or consider the number of likes?

10.2.3 Premier Offering

I really liked the celebrity example and the idea of them wanting to maintain a reputation or check for copyright. I think that this example differentiates it from just an advanced search engine. I feel there is danger in the other examples that it is just a search engine. I could be wrong. I think with the football agent situation you need to again tighten up the reasons why they are using it and the reason it would benefit them. Are they using it to find out about what is said on a player or to find information to put together a profile? Again, is this just a search engine? What makes it less of a search engine is the "sentiment score" feature. How does it pick up sentiment? Again, is this from trigger words? You might want to explain.

10.2.4 Enterprise Offering

I like this tier. My sister is setting up her own business so when I think about the app from her perspective, I can see how it would be useful. I think it would be good for a small business to be able to see where people are talking about your brand and the "sentiment" of their feedback.

I think that in this tier, there should be differentiation between small businesses and larger organisations using it as HR screening. The idea of large organisations using this app is huge and a separate tier to small businesses. And, are you suggesting that we should be searching someone's social media when they apply for a job? That's scary!

10.3 Stakeholder 3

- It's an impression management tool which, if I'm correct, aims to alter the perception others have of you based on what can be found on the internet. Could the software consider the presentation of statistical data of regularity at which the deemed positive and negative situations appear to subconsciously make the user more conscious of their online behaviour? I suggest this because if people try hard enough the information can still be found online so to reduce this reduces the risk.

- I quite like the name "Breadcrumb". Great marketing by the team here. Fairy tales are generally told to children, however, the idea relates a story known by many, from the young to the old, so makes the purpose of the product easy to understand for all and applicable to the majority. I like how it takes present day issue where people are becoming more aware of their digital footprint.

- Not sure about following statement: *"Breadcrumb then scans each social media account for content it initially considers to be significantly positive or negative and collates a primary list. Further to this, it trawls the internet to find material that it initially considers to be significantly positive or negative and collates a secondary list"*. It appears to be a very subjective statement. Can the specification as to what this is be initiated by the user or will this be purely general and on the basis of parameters set by the app?

- It's not been stated what is then done with the information. What does the group actively do to ensure the better representation of an individual online?

- With regards to the Premier offering, how would you ensure that the sources of review were unbiased, relevant and respected?

10.4 Stakeholder 4

I love the name - seriously cool. I'm not sure what stage in the development you're at, but I'm not entirely sure how the application will allow users to 'be forgotten' from what I'm reading in the document. This may be intentional, but thought it was worth mentioning.

10.5 Stakeholder 5

- Have you thought about scanning LinkedIn profiles for the Enterprise offering?

- Will the application be available on desktop? In the example of a HR department using it to screen job applicants this may incur further IT costs if it can only be used on smartphones.

- For the enterprise offering, are you able to ensure corporates that their data will be protected? I think this would be important within the investment banking sector as regulators are on everyone's back.

10.6 Stakeholder 6

It's difficult to understand the landscape that this has been set in a business plan would need financial projections, market research, an action plan and henceforth, which I assume is not part of the scope of this, so I'll ignore. If that isn't the case, let me know and I'll try to help. Also, there is no mention of any challenges foreseen with the implementation of this along with how they would be overcome. This would tell the prospective stakeholders that you are realistic with expectations and have thought through the proposal.

Also, the style of writing is individual I personally get frustrated with the marketing spiel, wanting a more direct black and white description, but I doubt the judges are looking for the same style. I had to read the proposal several times to fully understand the idea.

Having said that, I like the idea. I don't understand the need to capture the personal account details, as (I understand) the added value is identifying what is in the public domain, and logging in to a restricted account is only looking at a restricted area.

I think you need to think about the added value for example, ability to automatically request removal of information, subscribe to credit checking or police checking, extending the checking to contacts, memberships, directorships everything that would give confidence that an employer check (both ways, for employee and employer) is comprehensive.

Full corporations would have teams of people responsible for preserving the company's image so you should target smaller companies who do not have the resources to do it themselves.

10.7 Stakeholder 7

- Depending on the exact brief, it could be worth adding figures, as a means of providing rough estimates over the commerciality of your app. If the brief said short business plan, highlighting

commerciality could score you extra brownie points. So if possible, please expand upon the potential revenue generated by each tiered offering. However, if the brief simply says create an app, then ignore the commerical aspect. Furthermore, if you do need to write a business plan and you're worried about word limit, simply make a table outlining your estimates, and then stick it in as an image.

- The brief states, that your app plan should cover the perspectives from the view of different stakeholders. I don't feel your current plan directly addresses these stakeholders. I advise that you include a stakeholder perspective section in your finalised business plan. For example:

    - For the individual, the service provides a better understanding of their digital footprint

    - For the citizen, the service collates public records on them, and exercises their right to be forgotten if negative posts keep coming up

    - For the employee, the service improves and cleans up their digital footprint in order to make them more employable

10.8 Stakeholder 8

I don't know what my rights within this context are at all. Can there be an educational element built into the the app?

I guess I can see myself using the app to track and monitor my information online. But can I actually take any actions to improve my profile as it stands? For me to take this seriously, the app needs to either have that level of functionality or provide me with the information needed to do it myself.

10.9 Stakeholder 9

Great idea. There is a gap in the market for this.

A few positives:

- Freemium business model is a good way to drive sales and promote the business

- Interface is simple, clear and easy to understand; works well as a mobile interface and can later be developed to fit a web interface

- Good that the service targets more than one audience

Areas for improvement:

- Clarify whether the app retains any information for future use

- Interface is similar to Tinder... how do you undo a *"swipe"*? If so, does it come with an extra charge?

- Scrap the *"sand at the beach"* marketing pull as it does not have much relevance to the idea

10.10   Stakeholder 10

- What guarantee do you offer or who has signed your application off as a trusted source for adding such personal information and social media accounts? Will people know that I have even used Breadcrumb? I might be embarrassed if they did know I was using it to clean up my past history as it may be stuff I am not proud of.

- How can the app tell if something is positive or negative? Does it take into account the audience that the message is targeted at. How would it classify the following status updates: *"I was on the beers last week got wrecked but had a good time"* versus *"I failed my exam have to spend another year at university..."*

- Which market are you targeting? Have you got some case study examples as to why people would want this? It may only appeal to those who have a bad past and need to tidy up their act or want to remove elements of their history online?

- Under the Personal offering section, you mentioned giving rewards to the user that will motivate them to keep using the app. What rewards exactly? Barclays Premier League tickets? A raffle entered into a competition to meet Bill Gates or have dinner with a super model? You need to clarify this.

- As for the Premier offering, sounds like you have got a good market to target. Think about American sports as well. There is potential to expand the service worldwide if you provided the service to some world class sportsmen such as Wayne Rooney who may not want to see a *boxing match* on social media.

11 Conclusion

The purpose of this document was to define the solution, act as a pit-stop for new ideas and set the benchmark for future success. As a result, the group can now easily determine:

- What the solution is aiming to achieve

- Why it is important to achieve the stated aims and objectives

- How quality will be maintained throughout the course of the project

- Which role and responsibility each team member has been assigned

- How and when the arrangements discussed in this document will be put into effect

The group spent a considerable amount of time interacting with stakeholders in order to determine whether each idea presented was viable. Although these conversations were constructive, and from this the group determined that there are still areas of improvements for the group to take into consideration moving forward.
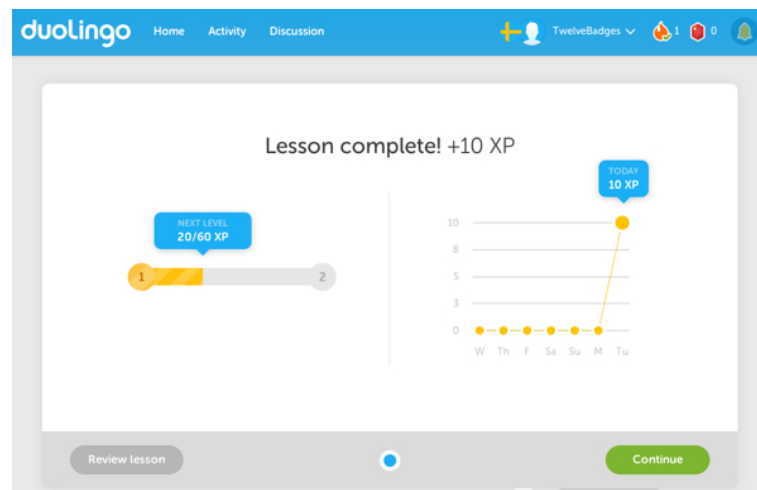

Figure 46 Duolingo's Gamification Feature

For instance, not much thought has been put into the gamification element of the app, which was initially seen as a means of *"motivating the user to keep returning due to their perceived fairness of the transaction"*, especially to increase repeat, regular usage amongst users on the Personal offering. Gamification is an umbrella term describing the use of game elements in non-gaming systems to improve user experience and user engagement (Deterding et al., 2011). Introducing game mechanics into the context of the solution will make menial tasks such as manually grading the sentiment of each post more fun, rewarding and desirable, as most people enjoy participating in some form of game (Hgglund, 2012). Consequently, the group think of ways to implement gamification into the solution.

Furthermore, the group must consider further leveraging the educational component of the solution. It should be expected that not many parties are fluent with the concept of the right-to-forgotten, hence every attempt must be made to inform them of what options are available to them within this legal context.

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