



A5 – Final Product and Documentation

Supervisor

Team Members – NLe04

1. Letter to The Client

[REDACTED]

Team IDentify would like to present you with final documentation for you to review which will outline the achievement of IDentity in the final development sprint. This document will also be sent to Dr Mark Freeman for evaluation.

We would like to thank you for your support and supervision during the annual project. Your feedback and advice week to week has helped us to develop a high-quality product that we're proud of. Through this project and your insight, we've all gained significant knowledge through this project.

If you have any questions or concerns, don't hesitate to contact us.

Regards,

[REDACTED]

2.Executive Summary

Team IDentify have created IDentify as a demonstration for the potential for deploying a web application which utilises Machine Learning (ML) and Optical Character Recognition (OCR) to revolutionise the way customers and businesses interact.

The system will facilitate transactions between businesses that require information from customers which can be found on their identification (ID) cards. At its root functionality, IDentify can take images from customers of ID cards, transform them to be recognised by a trained ML model before being processed and the relevant data extracted in safe storage for the business. Furthermore, the backend application programming interface (API) we've developed as well as a fully scalable front end allows businesses to use IDentify as a whole package, attempting to be a solution aimed at overhauling existing solutions in the space to remove the laborious task of filling out paper forms to interact with a business.

We also acknowledge that the system has potential to be used in future as an online tool to sign up customers to businesses while guaranteeing their identity as well as making a far more efficient experience for both users.

A diagram of the basic functionality of the system can be seen at Figure 1.

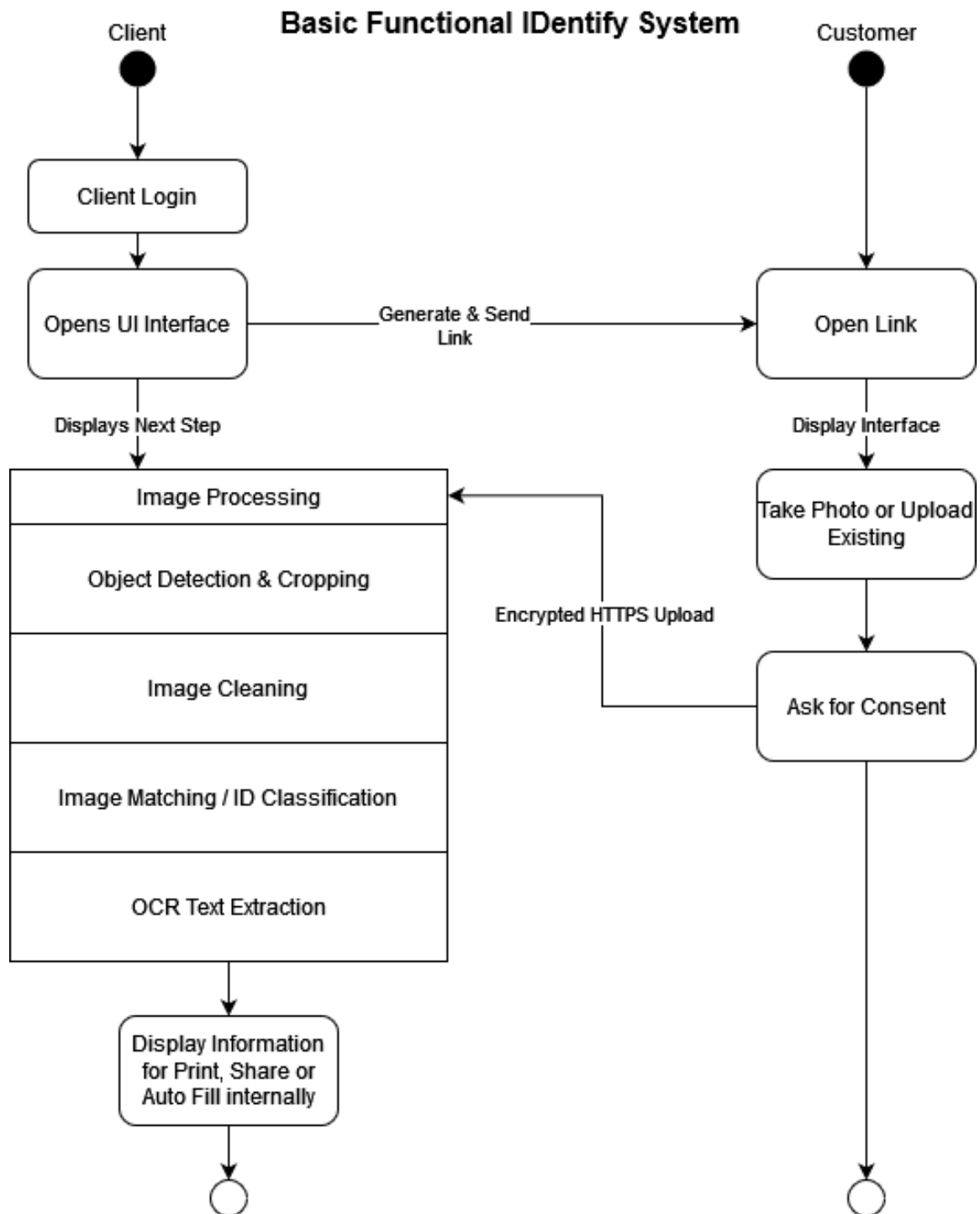


Figure 1: Basic Functionality of IDentify

3. Table of Contents

1. Letter to The Client	2
2. Executive Summary	3
3. Table of Contents	5
4. Need for IDentify	8
5. Critical Success Factors	10
5.1 Project Goal 1	10
5.1.1 Assumptions	10
5.1.2 Constraints	10
5.2 Project Goal 2	11
5.2.1 Assumptions	11
5.2.2 Constraints	11
5.3 Project Goal 3	12
5.3.1 Assumptions	12
5.3.2 Constraints	12
5.4 Additional Requirements	13
5.5 Stretch Goals	14
6. Requirements Analysis	15
6.1 User Stories	15
6.1.1 Businesses	15
6.1.2 Customers	15
6.2 Functional and Non-functional Requirements	16
6.2.1 Functional Requirements	16
6.2.2 Non-functional Requirements	17
7. Results of the Project	21
7.1 System Architecture	21

7.1.1 Image Processing Pipeline	22
7.1.2 System Security	24
7.2 Development Tools and Change Control	24
7.3 Delivered System Requirements	27
7.3.1 Requirements Traceability Matrix	27
7.4 Project Closure	32
7.4.1 Lessons Learned	32
7.4.2 Project Acceptance	33
7.4.3 System Installation	34
7.4.4 System Testing	35
8. Conclusion	37
9. Glossary	38
10. Appendices	39
10.1 Branding and Style Guide	39
10.1.1 What & Why	39
10.1.2 Specific Front-end Styling	40
10.2.1 Navigation Bar	41
10.2.2 Colour Palette	47
10.2.3 Text Style and Size	47
10.2.4 Graphics and Interactive Content	48
10.2.5 Accessibility	48
10.2 Branding and Advertising Strategy	49
10.2.1 Site Information	49
10.2.2 Logo	49
10.3 Market Research	50
10.3.1 Target Market Table	50
10.3.2 Target Market	51

10.3.3 Market Size	52
10.3.4 Competition	52
10.3.5 Marketing Materials	54
10.4 Example Company Form	57
10.5 Meeting Minutes	58
10.6 Table of Figures	59

4. Need for IDentify

IDentify aims to integrate a technical solution to a previously manual task, which involves using physical identity cards to interact with a business. Whether this be signing up to a business such as a gym or a doctor's office, providing proof of identity; a requirement for some businesses in a regulatory manner or, collecting data for their own systems.

Things such as data capture especially when manually entering customer information from ID cards can be a tedious task and can take a lot of time on a large scale. IDentify's goal is to provide an all-in-one system to businesses big or small to streamline their processes involving the tasks outlined above which does this by using modern artificial intelligence (AI) and ML technologies to do the hard lifting for these businesses.

Businesses that currently use ID scanning tools such as clubs still require the customer to use the in-house scanner to scan their ID card to sign in, IDentify provides a QR generation system where a business can provide a QR for a user to scan and take a picture of their own card to be loaded into the system. This is where IDentify would shine when these businesses are busy; this would provide a way to streamline their sign in process for their customers.

IDentify was developed with the intent to provide services to businesses which handle different forms of ID cards on a regular basis. It allows business users and their customers to submit images of different forms of ID which is then processed by our Image Processing Server (IPS) where it will handle the skew correction, cropping, card classification and extracting the text using an OCR model. The IPS has been developed in a way that allows easy implementation of new forms of ID if requested by business customers.

We provide a way for businesses to quickly create an account within the system and start using our product in a matter of minutes, which includes the previously mentioned services as well as a company management system, a way to view previously scanned ID cards, card collection points, QR generation and form

generation. The frontend system provides a way for businesses to access, interact and have control of these services.

In addition, we were also able to roll out form generation which allows businesses to upload their own forms as a word document where they can input unique IDs into different sections of the form and then generate the form using a customer's ID which will automatically input the customers data onto the form.

5. Critical Success Factors

This section will cover the Key Goals that Team Identify with the assistance of the supervisor set out at the start of the project. Each goal will build on the previous goal set.

5.1 Project Goal 1

Develop the Image Processor (i.e., the ML AI model) to successfully process an image of a card which will identify that there is a card in the image, correct the skew, crop the card, identify the card, and extract the text.

5.1.1 Assumptions

This goal is the main focus of the whole project, every other part of the project depends on completing this goal. Other major parts of the project wouldn't be able to begin until this was successfully completed and running.

5.1.2 Constraints

1. The team has never worked with ML previously, so it was going to be a difficult process in getting the full pipeline implemented and working as we wanted.
2. No available data sets for Australian ID cards for us to use for training the ML model.
3. Needing around 10,000 pictures of ID cards at different angles, noise, obstruction, and lighting conditions.
4. Given the time constraints we wouldn't have time to build a model from the ground up so we would have to review existing models online for us to modify to suit our needs.

5.2 Project Goal 2

Design and build the backend API, Database, and security for data to allow the frontend to communicate with the systems and properly secure sensitive data in the database.

5.2.1 Assumptions

- The different API entry points need to be setup so only authorised users for a particular service can access them.
- The ID information that we are storing needs to be secured properly through different layers such as Json Web Tokens (JWT's) and encryption of the data.
- Database to be properly designed to minimise the potential of redundancies.

5.2.2 Constraints

- Team Identify needs to make sure that we adhere to the Australian Privacy Act 1988 in regard to storing sensitive customer data.
- Proper measures need to be taken with handling JWT's and backend permissions to ensure that only authorised users can access specific points of the API as well as providing access to specific points to customers who won't have an account in the system to allow the submission of images.
- The team doesn't have anyone that specialises with databases so we will need to review the best type of database to implement for our system.

5.3 Project Goal 3

Finish development of frontend, implement the QR generation and mobile submission landing page.

5.3.1 Assumptions

- Businesses will be able to manage ID collection points and be able to generate a QR code for their customers to use to submit their IDs to.
- Businesses will be able to interact with the backend API through the front-end system which will allow:
 - The submission of images directly through the frontend
 - The generation and management of QR codes
 - The management of permissions and API access from a user perspective

5.3.2 Constraints

- Multiple entry points for images will need to be created with different permissions depending on whether an image is submitted via the authenticated client dashboard or via the non-authenticated customer QR page.

5.4 Additional Requirements

This section is to outline the additional requirements that the team was aiming to achieve throughout the project:

1. The system should be able to process ID cards from multiple states:
 - a. Currently the system allows for Medicare cards and NSW Driver's Licences (DL) as well as UOW Student cards.
2. The system should be able to process multiple types of ID cards, such as DL's, Medicare, and photo ID cards:
3. The system should be able to process all types of photos at different angles and lighting conditions within reason.
4. The system should provide an easy-to-use interface for viewing extracted information and uploading photos.
5. The system should have an acceptable level of accuracy in identifying and extracting information from ID cards.
6. The system should allow a user to upload an image via mobile device.
7. The system should allow for business users to create a company in the system:
 - a. This would allow a user to create a company and provide them with expanded services which would allow for user management, roles, and permissions.
 - b. In addition, companies would be able to manage ID collection point API's and create a collection point for submitting images to the image processor.

5.5 Stretch Goals

This section aims to outline the goals that the team would like to achieve if we have enough time to implement them:

1. The system should be able to provide the ability to generate/prefill forms with information extracted from ID cards.
 - a. This would include a way for a user to upload their form as a word document (.docx) and annotate where in the form that want to fill certain information to then be used in the future.
2. The system should allow companies to add their own form of ID that can be extracted by the image processor.
 - a. This would include a way for a user to upload an image, our image processor would then segment and crop the card in the image. This would then allow the user to annotate the text in the image to be extracted.
3. The system should allow companies to add their own API to verify ID cards.

6.Requirements Analysis

6.1 User Stories

The following user stories outline the requirements and expectations of both businesses and customers in the system.

6.1.1 Businesses

- As a business, I want our customers to be able to easily provide an image such as through a link, QR code or some other method that I or the customer can choose.
- As a business, I only want my users to have access to the services and information they require.
- As a business, I want to be able to invite and manage employee users.
- As a business, I want to make sure only authorised users can access our customers' data such as through a login.

6.1.2 Customers

- As a user, I want to have reassurance that my data is not used or taken without my consent such as buttons to agree or not agree with uploading information.
- As a customer, I want to have reassurance that my data is not used or taken/hacked when stored.
- As a user, I want to be able to only have to upload an image whether from an existing photo or a taken through the camera on my phone or some other device.
- As a user, I want the extracted data/text to be accurate.
- As a user, I want the user interface to be very user-friendly with clear instructions on how to get the image of my ID to be processed.

6.2 Functional and Non-functional Requirements

6.2.1 Functional Requirements

Image input and processing

For the image input, the front end enables the ability to upload an image to be submitted to our backend API to be processed. One of the concerns that we had were when a large number of images are uploaded at a time we needed to make sure that our image processing pipeline doesn't get overloaded, which is why we have also implemented our image processing job queue using RabbitMQ, this allows these jobs to be captured and queued during high demand periods and ensures that they are eventually processed with the IPS when able to do so. This also tracks the status of the job to be tracked on the front end.

The image is then sent to our image processing pipeline which uses YOLACT for instance segmentation, OpenCV for skew and perspective correction as well as cropping the image, and Clip for image classification. After this process we are then able to use set labels/annotations based on the card type for our OCR model to then extract individual pieces of information from the card and store the information in the database in JavaScript Object Notation (JSON) format.

Security

Given the sensitivity of the data, security is a top priority. Our backend security relies on Spring Security with JWT, ensuring that only users with verified JWTs can access the APIs. Permissions are checked at controller and function levels, meaning users with a verified JWT may not have permission to access certain APIs within their company. Images are transferred securely, and the extracted card data is encrypted in the database using cryptography. The data can only be accessed by the company through their private key, and the original image is discarded. This stringent security measure ensures that end-user data remains properly secured and can only be accessed and decrypted by authorised users.

Front-end

Business users can register for accounts on the system and will provide them with basic access to our API's, mainly for submitting images. We are aiming to provide a simplistic design in which we're aiming for ease of use and minimal actions needed for work to be done by the user.

All core functionalities are directly available on the main dashboard through quick access panels and a sidebar, allowing for a user to submit a single image to be processed by the backend pipeline, with immediate feedback on the job being processed.

This also includes JWT authentication and session checking to ensure that the user stays logged in while the system is being used and refreshes their token if they are still using the system. The system ensures the user is logged out if their session expires to reduce security risks regarding unauthorised access.

6.2.2 Non-functional Requirements

Performance

The image processing process which includes both object recognition/categorisation, image cleaning/fixing, and OCR requires an intensive use of computational resources and thus is a concern for performance. The performance of the software should not drop below a certain agreed percentage which may result in loss of customer/client satisfaction, trust and need for a replacement software, a direct conflict of the business needs and objective.

The development of the software will thus require the constant mindfulness to program in such a way to minimise excessive code/intensive processes prior starting, during iterations and after deployment. More specifically, the use of following:

- Minimalist approach where focus is on the functional requirements as discussed earlier in the report.
- Industry standard software libraries where performance is a key concern.

- Graphics Processing Unit (GPU) programming taking advantage of the inherent performance of multicore processors for images and onboard ML functionality.

Data Safety & Security

The handling of ID is a sensitive matter which requires industry companies following best practice to be certified and accredited with ISO 27001 for ISMS and following the Australian Cybersecurity Guidelines.

This category can be broken down into multiple different fronts:

- 1) Direct malicious intent from hackers and the security of the software itself such as XSS, injections, social engineering, open ports, and other attack methods such as man in the middle. This prevented through code testing and use of industry standard authentication libraries, use of secure communication such as HTTPS with certificates or RSA and encryption for data at rest.
- 2) Internal fraud, revenge or plain negligence can affect the software function, reliability, and trust. An organisational policy and security model can mitigate such issues.
- 3) Unknown zero day or unknown programmatic defects are also an issue which can be prevented through pen-testing and code test cases through programs such as Postman.

Usability

The interface is to be easy to navigate and meets the needs of the user regardless of the user level of technical proficiency as follows:

- 1) Intuitive design: Clear and concise instructions provided on how to upload an ID for it to be processed and data gets extracted.
- 2) Error handling: Interface should provide clear instructions on how to correct any errors that occur during the verification process.

The hardware requirements for a software tool that utilises ML to scan ID cards and OCR tools, with the aim of facilitating user identity authentication, are as follows:

- 1) Camera: A camera is required to capture images of user IDs.
- 2) Storage: Storage capacity is a requirement to store the user's IDs and any related data. Amount of storage required will vary according to the number and size of the images that are to be processed.
- 3) Memory: Memory and Power requirements may be contingent on the elaboration of the ML and OCR algorithms employed. Specifications will be influenced by the software used and the size and complexity of the images processed.
- 4) Computer and Monitor: A monitor is required to display the interface of the system to the user and a computer is required to run the software system.
- 5) Internet connection: It is required to access any necessary software updates or cloud-based services.

Note, these requirements are required only if the software is being run on-site. If IDentify were to exist as a hosted service, this would be handled by cloud computation, users would simply need access to the internet, a computer and monitor as well as a camera for scanning cards.

Scalability, Reliability & Maintainability

The stakeholders of this project are organisational large in nature and having other future clients requires the program to be able to scale the operations, have reliability at scale and be maintainable at enterprise/global level of software infrastructure.

Portability & Compatibility

Portability and compatibility requirements are crucial in software development as they affect the maintainability and usability of software tools.

Portability requirements:

- Supports multiple image file formats (e.g., PNG & JPEG) for image capture and processing flexibility.
- For a consistent user experience, it should be designed to be responsive and tailored for various device form factors, such as desktops and mobile devices. This ensures that users can easily access and use the tool's features across different platforms, regardless of screen size or resolution.

Compatibility requirements:

- It is designed to be web-compatible and accessible through browsers like Chrome and Firefox to ensure cross-browser compatibility.
- Compatibility with hardware devices (e.g., Camera) for efficient data processing.

Ensuring compliance with relevant industry standards is crucial for enabling the software to be adopted by clients across a wide range of sectors and industries.

7. Results of the Project

7.1 System Architecture

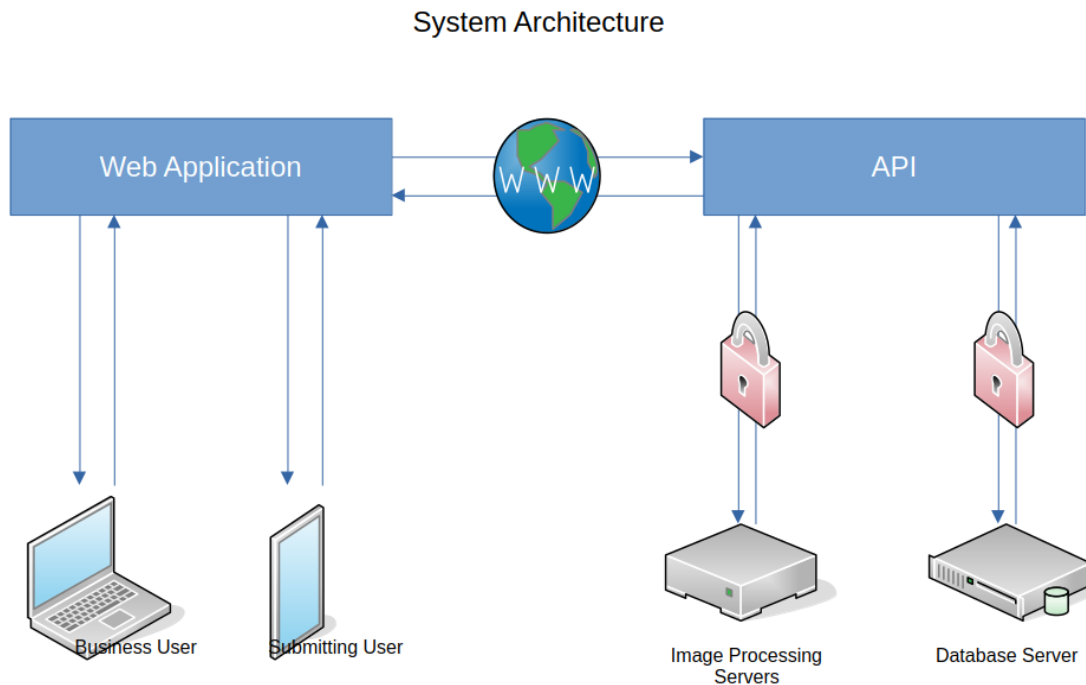


Figure 2: IDentify System Architecture

There are two main components of the backend system, the API and the IPS.

The API allows external users to submit images and distributes these images to the IPS, the data returned by the IPS is encrypted at rest with encryption keys unique to each user, leaving the data inaccessible even if the database is compromised, and provides an interface for the Web Application to query and retrieve the stored data.

Communication with the IPS is done via the messaging service, RabbitMQ. RabbitMQ is used to distribute jobs in a round-robin fashion to any IPS with an active connection, enabling on-demand scalability.

7.1.1 Image Processing Pipeline

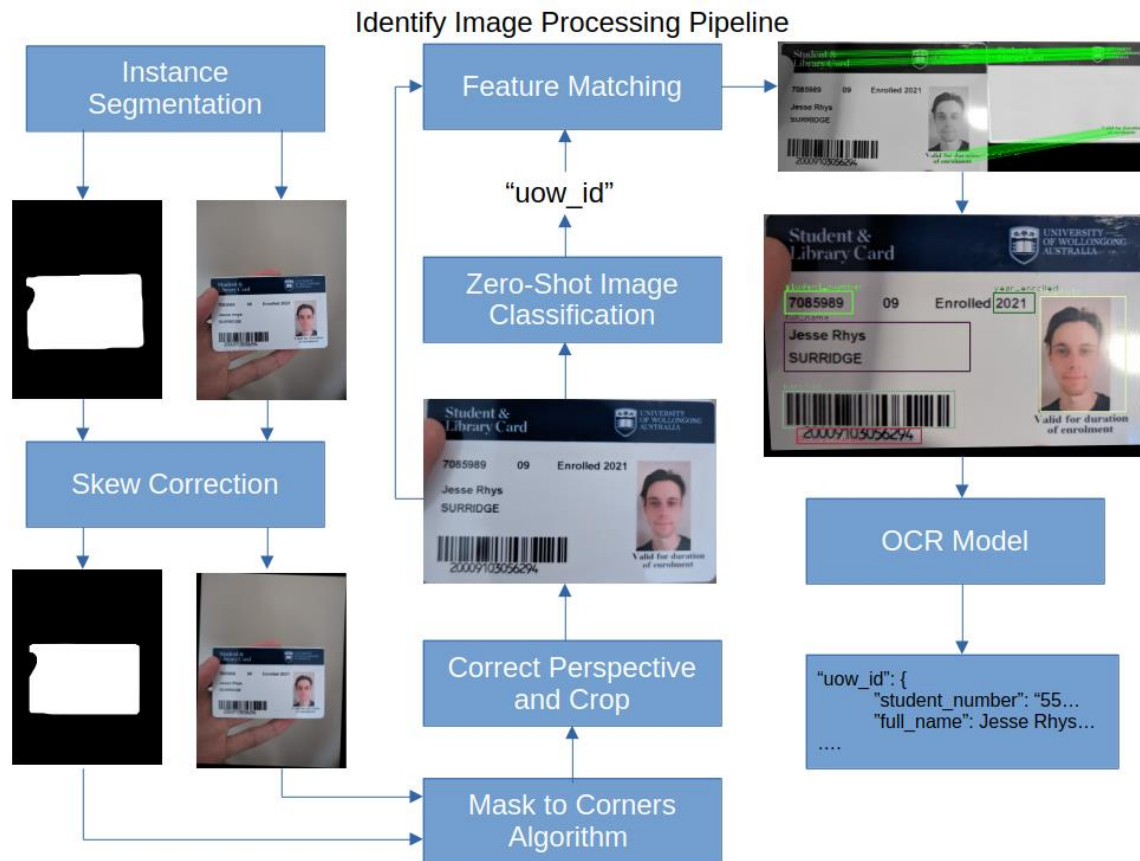


Figure 3: IDentify Image Processing Pipeline

Instance segmentation:

This stage uses an instance segmentation model, [YOLACT](#), to identify the segment of the image that contains the card, this outputs a binary mask which the mask to corners algorithm uses to calculate the four approximate corners of the card.

The image is then cropped to the four corner points and fed into the classification model.

Card classification:

The card is classified using the Contrastive Language-Image Pre-Training ([CLIP](#)) neural network, we do not use the natural language features of this model, only the image encoding part is used in order to compare the given image for similarity to known cards. This enables a 'zero-shot' classification for any new cards that are added to the system, meaning that the model does not require any retraining to classify the card image.

Feature matching:

This part of the pipeline uses the Scale-Invariant Feature Transform (SIFT) key point detection algorithm to find key points of the reference image and the submitted image, these key points are fed into the Fast Library for Approximate Nearest Neighbors (FLANN) library which transposes the submission image over the source image to allow a pixel-perfect match to the regions of interest from the source image.

Data Extraction:

With the processed images and the card classification we can then use an OCR model with predetermined regions on the card to extract the text on the card which can then be loaded accordingly into a database and made available for the front end to view.

7.1.2 System Security

The backend stores the card data using a hybrid method where both RSA and AES encryption algorithms are used, each card is encrypted with a unique key (AES) and a copy of this key is encrypted using each user's unique public key (RSA), their RSA keypair is generated using their password, leaving the data inaccessible even to internal IDentify administrators.

All data flows between the services are also encrypted using AES, authentication between services is done via Mutual TLS Authentication, ensuring that no bad actors can connect to the service and retrieve the submitted card images.

7.2 Development Tools and Change Control

Throughout development, team IDentify self-hosted using Gitea, which is a forge software package that uses git for development and version control. This tool would be used to track sprints, features, and issues during different stages of the project. This splits the project into 3 separate repositories:

- Image Processing/ML Model
- IDentify API
- IDentify Frontend

Sprint branches would be branched from the main branches of these repositories, then individuals would branch off the sprint branches to implement separate features. Once completed, a pull request (PR) would be created for these features. After a PR was made, the appropriate lead developer would view it, make any comments or updates before rejecting or accepting the PR. Once this was completed and we had completed the sprint, another PR would be created, and the sprint branch would be merged back into the main for further testing.

Figure 4 and **Error! Reference source not found.** shows a quick overview of the repositories and the issue tracker:

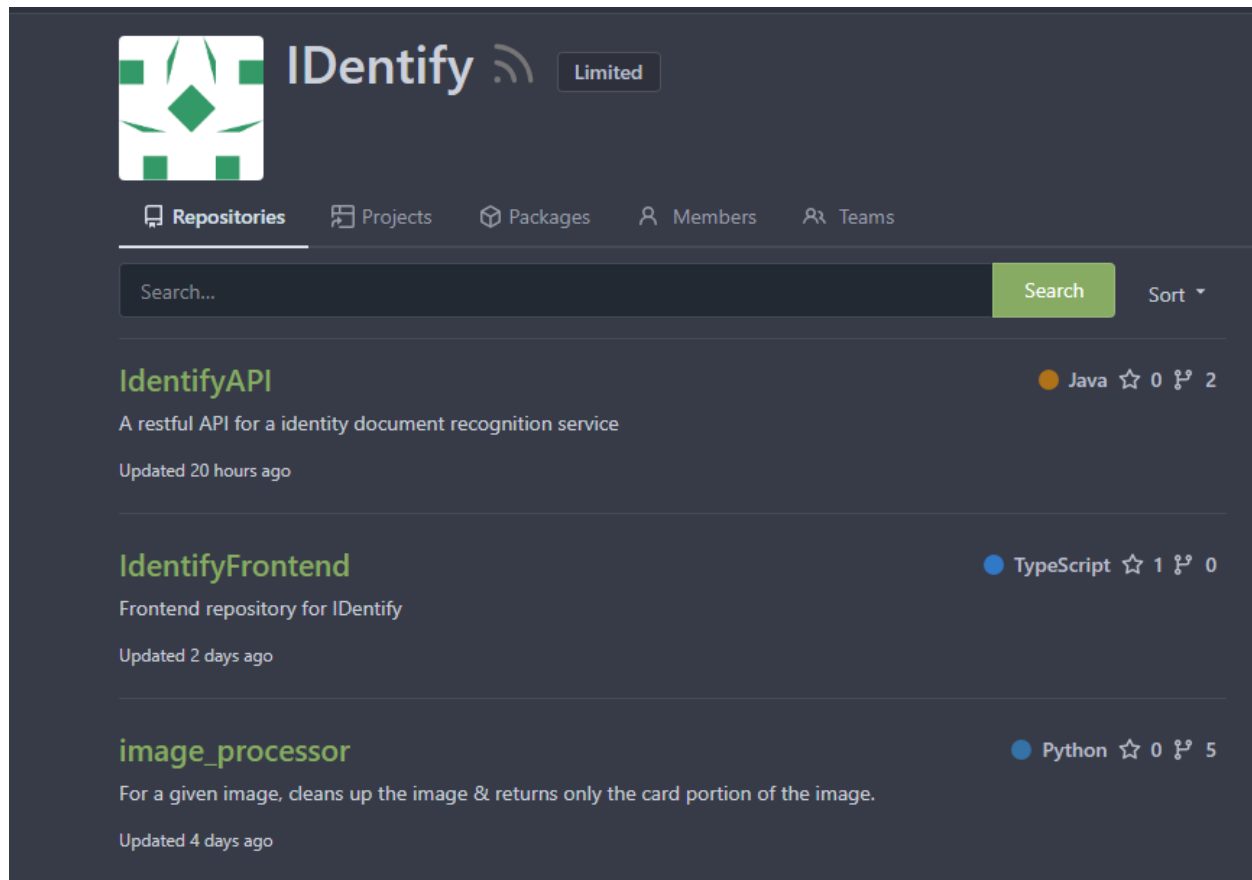


Figure 4: IDentify Gitea Repositories

The screenshot displays the Gitea Issues interface for the 'IDentify' project. On the left, a sidebar shows filters for 'In your repositories' (54), 'Assigned to you' (11), 'Created by you' (6), 'Mentioning you' (6), and 'All' (54). Below these are repository-specific counts: 'IDentify/IDentifyAPI' (28), 'IDentify/IDentifyFrontend' (21), and 'IDentify/image_processor' (5). The main area shows 21 open issues and 54 closed issues. A search bar is present at the top right. The list of issues includes titles, repository paths, authors, and closure dates. Some issues have labels like 'Kind/Enhancement', 'Priority: High', 'Kind/Bug', and 'Priority: Medium'. Each issue also shows a comment count and a 'Sort' dropdown menu.

Filter	Count
In your repositories	54
Assigned to you	11
Created by you	6
Mentioning you	6
All	54
IDentify/IDentifyAPI	28
IDentify/IDentifyFrontend	21
IDentify/image_processor	5

Issue Title	Repository	Author	Closed	Labels	Comments
Create How It Works Page	IDentify/IDentifyFrontend#21	by damon	1 week ago		4
PDF Generation for companies	IDentify/IDentifyFrontend#35	by damon	1 week ago		7
Another Sidebar Bug	IDentify/IDentifyFrontend#19	by damon	3 weeks ago		1
Fix Scan History Issue	IDentify/IDentifyFrontend#46	by damon	3 weeks ago		1
Fix PC submission	IDentify/IDentifyFrontend#41	by damon	3 weeks ago		2
Sidebar Bugs	IDentify/IDentifyFrontend#18	by damon	4 weeks ago		1
RefreshTokenService should ensure that a user has a limited number of tokens	IDentify/IDentifyAPI#30	by batesy	4 weeks ago		1
Password encryption for getting card information	IDentify/IDentifyFrontend#5	by damon	1 month ago		5
API should allow to retrieve 1 card data record at a time	IDentify/IDentifyAPI#58	by jesses	1 month ago	Kind/Enhancement, Priority: High	3
ABN Lookup on frontend, could also implement backend validation	IDentify/IDentifyFrontend#34	by damon	1 month ago		2
User should be able to edit card data after submission	IDentify/IDentifyAPI#59	by jesses	1 month ago	Kind/Feature, Priority: High	1
IDCollectionPoint should return UUID's with card information	IDentify/IDentifyAPI#63	by jesses	1 month ago	Kind/Enhancement, Priority: High	
Update Storage of Company Variables and Selected Company	IDentify/IDentifyFrontend#33	by damon	1 month ago		2
Implement Refresh Token	IDentify/IDentifyFrontend#31	by damon	1 month ago		1
Refresh Token Bug	IDentify/IDentifyAPI#66	by damon	1 month ago	Kind/Bug, Priority: Medium	1
Company Management - Create Company	IDentify/IDentifyFrontend#12	by damon	1 month ago		2
Adding edit scanned card ability	IDentify/IDentifyFrontend#7	by damon	1 month ago		1

Figure 5: IDentify Gitea Issues

7.3 Delivered System Requirements

7.3.1 Requirements Traceability Matrix

Figure 6 outlines requirements of the project, whether we achieved them and how we achieved them with the system:

Requirement	Description:	Achieved:	Priority Type:
Create an image processor using ML to identify different types of ID cards.	The main goal of the project was to create a ML model to identify different forms of ID to be used in whatever way we thought would be best.	This was Achieved , an image processor was created and trained with 1000's of images using YOLACT for instance segmentation for us to then identify the type of card.	Required
Image Processor to extract text from pictures of ID cards.	After being able to identify the type of card, the image processor should be able to then extract the text/information from the card.	This was Achieved , using EasyOCR, after proper skew correction and cropping of the image, using EasyOCR we could extract the information from the card.	Required
Allow for business to interact with the image processor.	Businesses should be able to communicate with the backend systems, most importantly the image processor.	This was Achieved , creating a backend API for businesses to either integrate or access via our frontend system.	Required
Securely store sensitive customer and company data.	As we are handling sensitive customer information it is important that we properly secure it in the database.	This was Achieved , using RSA/AES encryption, customer information can only be accessed by the business users and their private key which is securely stored within the database which can only be decrypted by the business user.	Required

Create a frontend system for businesses to interact with.	A front-end system needs to be developed to allow businesses an easy way to get started and start interacting with the image processing system.	This was Achieved , IDentify was able to develop a front end system which allows easy sign up for businesses to start interacting with the image processor.	Required
Create a QR system to allow customers to submit images to the image processor.	A QR service should be created to allow customers of businesses to easily scan the QR and submit a photo of their ID for processing.	This was Achieved , a QR system was created. QR's can be generated, disabled, and deleted by the business users. These QR's allow non-signed users (customers) to submit photos to specific QR's.	Required
Image processor should be able to process cards from different states.	Since this could be used by businesses around Australia, the system should be able to process ID from different states.	This was not Achieved , the system allows for Medicare to be processed which is universal, but currently only allows NSW DL's to be processed. This is mostly due to Team IDentify not being able to get our hands on drivers' licences from other states; however, the system could easily be updated to accept this information.	Nice to have
Image processor should be able to process different types of cards.	There are multiple different forms of ID, the system should be able to process multiple types of ID.	This was Achieved , the image processor allows for NSW Photo ID cards, NSW DL, Medicare card, and UOW Student cards.	Nice to have

Users should be able to upload a batch of images	Businesses may need to upload more than 1 photo at a time, a batch upload to be allowed.	This was Achieved , IDentify allows for a batch upload of images and using RabbitMQ it carefully queues each image as a job in the system to be processed.	Nice to have
Business users should be able to create/manage a company.	We intend businesses to use this system, so we need to create some form of company management system which provides expanded services such as user management/permissions.	This was partially Achieved , IDentify allows for creation of a company, the owner of that company can then invite users to their company to have access to their collection points however, due to time restrictions we weren't able to implement the full user permissions management. By default, the creator of the company is given the OWNER role where any other person invited to the company is provided the EMPLOYEE role.	Nice to have
The system should be able to provide the ability to generate/prefill forms.	An additional service to be created which allows businesses to upload their own forms to the system which can then be used to prefill users' information that the image processor extracts to the form to be used by the company.	This was Achieved , the system allows the business user to upload a word document (after filling it with the keys used to prefill the data), this is then stored in the database and can be accessed by the business to generate a form.	Bonus feature

The system should verify IDs by cross checking the extracted data with a verified database of ID information.	As part of ID verification, it would be possible to check the customers ID information with an authorised party to confirm if an ID is legitimate.	This was not Achieved , after some research, Team IDentify has found that due to not only costs but the lack of proper business, we were unable to get approved to have access to the resources that would allow this feature. However, if a company that uses this system already has access to verified ID services, we could integrate that into the API.	Bonus feature
The system should allow companies to add their own form of ID.	Some companies may have a unique ID that they want to be processed as part of the system, so the system should allow companies to upload a scan of the idea and annotate sections of the card of the information they want to extract.	This was not Achieved , solely due to time restrictions Team IDentify was unable to expand and implement on this feature.	Bonus feature

Figure 6: IDentify Requirements Matrix

7.4 Project Closure

7.4.1 Lessons Learned

Team IDentify over the past year have used our foundational knowledge that we've obtained from university to adapt and learn the backend and frontend of the development throughout our time on this project. Using tools and frameworks that were new to us such as Spring boot, Angular, and YOLACT, this forced us into uncomfortable positions however pushed us to learn about these systems to ensure that we were able to finish the project.

Spring Boot was new to most of us however, we were able to configure and set up our API and Database quickly, and the team working with our backend system, although slightly intimidated, were able to pick up and learn Spring Boot on the go. This allowed us to quickly set up services and controllers which were able to communicate with our IPS system as well as quick integration of other services such as our RabbitMQ server.

The team working on the front-end had also originally never touched Angular but had experience in other frameworks such as React. This provided them something to go off however, Angular was still difficult for them to learn originally. After using it for the first month they were then confident in their abilities moving forward when implementing features.

Overall, every member from the team seemed to have knowledge in separate areas of development, and was able to share their knowledge with the rest of us, meaning we weren't able to gain experience through the team. We worked well as a team, ensuring everyone was kept updated on the progress of work, regular team meetings and backlog reviews.

7.4.2 Project Acceptance

Students of Team IIdentify will have Figure 7 signed at their earliest convenience:

Project Acceptance Document

Project Supervisor: Dr Ngoc Thuy Le

Student Project Team: Team IIdentify

Project Sign-off conditions:

- Dr Ngoc Thuy Le is satisfied with the results of the project and agree that the requirements of the project proposal have been met.
- Dr Ngoc Thuy Le has received copies of all relevant documents and files.
- Dr Ngoc Thuy Le has received all deliverables in an appropriate working condition.
 - Any external libraries, frameworks and/or plugins have been used within the scope of their respective licences.
- The student project team (listed above) retains exclusive joint ownership of the source code for the system developed, restricting external distribution and the reselling of the code.
- Dr Ngoc Thuy Le has permission to modify, customise, update, and expand the source code for future usage within the organisation.

By signing this document, I acknowledge that I have received all stated deliverables and agree to the above terms.

Client Representative: _____ Date: _____

By signing this document, I acknowledge that I have delivered all stated deliverables and agree to the above terms.

Student team: _____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

Figure 7: IIdentify Project Sign Off

7.4.3 System Installation

On the day of the Trade Show, the system will be accessible online at <https://identify.rodeo>. Shortly after, backend systems will most likely be disabled due to hosting costs.

Key Requirements:

- NVIDIA RTX GPU with at least 12GB of VRAM
- Linux (tested on Ubuntu 22.04)
- Proprietary NVIDIA drivers & CUDA
- OpenSSL 3.0.0+
- Python 3.8+
- OpenJDK 17 installed & available on path as the default JDK.
- Docker, privileges to run docker as your user account, docker compose plugin

To run the system:

The main system folder will have a deployment script, you'll need to go to this folder and run it. Configuration instructions are located in individual README's. Instructions for the deployment script can be found in the IdentifyAPI README.

Back-end:

System installation for the back-end systems are included in their respective README files as well as, configuration instructions, requirements and prerequisites for the software in the README.

Front-end:

If you are required to run the front-end locally, instructions are provided in the IdentifyFrontend README, as well as configuration instructions for environment variables if needed. The site may be available hosted at [IDentify](#).

Note: The IPS and backend may not be hosted after the 26/10/23 due to hosting costs. If this is the case, the frontend will not work, you must run it locally.

7.4.4 System Testing

Front-end:

This section of the document will outline a step through of our system, testing all functionality from a user point of view. The test will be conducted locally as well as hosted to ensure there are no problems or breaks in the web application. The testing document will be outlined in dot point form below and has used the user manual as a point of reference for this.

Note: For testing purposes, either use two separate browsers or two separate incognito windows, this is to replicate a real scenario of two users

For the testing, we need two users to actively test the user management aspects of the code, we will refer to our users as User A and User B

1. Sign Up for account for User A, verify the email and set password.
2. Sign Up for account for User B, verify the email and set password.
3. Login to the User B account, should be given a login dialog and a welcome onboarding tutorial.
4. Logout of User B and login to User A, should be given a login dialog and welcome onboarding tutorial.

User 'A' Instructions

1. Create a company for User A called 'User A Company', use '50 110 219 460' as the ABN.
2. Create a new collection point for User A called 'A collection'.
3. Invite User B to 'User A Company'
4. Grant User B access to 'A collection' collection point
5. In form management, create a form from the provided template and call it 'User A Form'.
6. In Capture New Card, upload 20 card images for processing to 'A collection'.
7. Resize the window to mobile view and upload an additional image to the same collection point.
8. On an external device (mobile phone), test the following:

- a. Scan the collection point QR for 'Collection Point A' and upload an image to it. On the testing device, disable the 'Collection Point A' and then try to submit another image to the same collection point on an external device.
9. View the scan history, ensure we have the adequate results for Collection Point A
10. Edit some results, delete some records to ensure working properly.
11. Use User A Form to generate a pdf and a docx file.
12. Update email and password

User 'B' Instructions (complete only after User 'A' Instructions)

1. Login to User B (account set should be User A Company)
2. Go to company management, notice all User B can do in this company is create their own company, they can't make new collection points, modify the status, or delete collection points. They also can't invite or view users to the company.
3. View card results for User A Collection in the Scan History tab.
4. In Capture New Card, select collection A and submit a card to it, ensure it processes correctly and is added to previous results in Scan History.
5. Delete the User A Form and create a new one called User A form (B)
6. Test this form with card results in Collection A
7. Edit some results, delete some records to ensure working properly.
8. Use User A form (B) to generate a pdf and docx file.
9. Update email and password

If you wish to do extended testing for User 'B' we suggest creating a new company that they're the owner of. Call it User B company and run through the steps suggested prior. The key thing to notice is the real time company permissions switching between companies. To do this use the company management page, and you'll see that if you switch between the company User B owns and the one, they're an employee of, that they have access to all four tabs in their own company but not the invited one. You can also see this in any page section that uses collection points, as the dropdown to select one will be populated with different collection points based on which company, they're in.

8.Conclusion

Team IDentify throughout the course of this project has shown their dedication to the project and resilience when faced with issues. What started as a simple idea for a project, the team was quickly able to review and come up with unique and innovative ways to take the base idea and technology and turn it into a service.

As a team we've been able to not only meet our main goals but meet additional goals and provide additional features that weren't originally discussed in the main goals of the project.

We all have shown our professionalism in being able to work within a team to discuss ideas, assign tasks and complete goals to get the project to a state that we're all happy with.

9. Glossary

- AI: Artificial Intelligence
- API: Application Programming Interface
- DL: Driver's Licence
- HCI: Human Computer Interaction
- GPU: Graphics Processing Unit
- ID: Identification
- IPS: Image Processing Server
- ML: Machine Learning
- MVC: Model, View, Controller
- OCR: Optical Character Recognition
- PR: Pull Request
- JSON: JavaScript Object Notation
- JWT: Json Web Token

10. Appendices

10.1 Branding and Style Guide

10.1.1 What & Why

We designed a minimalistic site for ease of use while scanning, taking into consideration both the Model-View-Controller (MVC) architecture and the principles of Human-Computer Interface (HCI). By adopting the MVC model, we separated the concerns of our web application, enabling a clear distinction between data (Model), presentation (View), and application logic (Controller). This separation allowed us to focus specifically on the visual aspects and user interaction.

For our components we used a library based on Material Angular. This allowed the use of a minimalistic design approach that emphasises simplicity and decluttered layouts, allowing users to navigate and interact with the content effortlessly. The pre-styled components allowed us to use components that users will often already be familiar with, such as buttons, sidebar menus, etc. While we implemented these components, our focus was on eliminating unnecessary elements and distractions, we aimed to create a clean and intuitive user interface that enhances the overall user experience. The user should be able to see the software for the first time and know exactly how to use it, especially in our use case where many users of the software will be one-time users.

This user-centric design philosophy aligns with the principles of HCI, as it prioritises users' needs and preferences, ensuring that the site's content is easily accessible and free flowing when in use. Through this modern minimalistic design, we sought to provide our customer base with a seamless, enjoyable, and efficient interaction, promoting better understanding and engagement.

10.1.2 Specific Front-end Styling



Figure 8: IDentify Header

Hex Code Colours:

- #006064 (Header Bar)
- #FFFFFF (Menu Icon)
- CFD8DC (Logo Arrow)

Text Font and Size

- IDentify (Roboto Bold, 32)

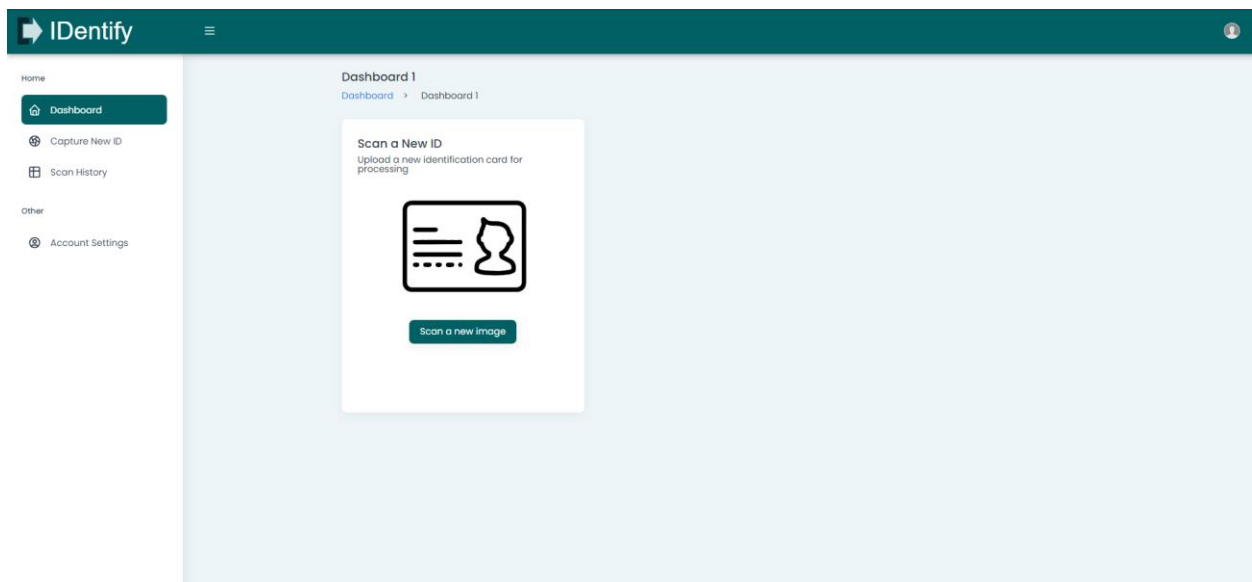


Figure 9: IDentify Dashboard

IDentify Dashboard

Colour

- #006064 (Header Bar)
- #FFFFFF (Menu Icon)
- #CFD8DC (Logo Arrow)
- #006064 (Button Active)
- #000000 (Button Inactive, Opacity 12%)

Text Font and Size

- Headings/Subject Text (Poppins, 21)
- General Text (Poppins, 14)
- Button Text (Poppins, 16)
- Navigation Bar Text (Inter, 16)

10.2.1 Navigation Bar

IDentify features a responsive and collapsible sidebar, closed and opened via the hamburger icon. (Figure 10). The navigation bar. will highlight the currently opened. page indicated by the identifiable site colour on selection.



Figure 10: IDentify
Hamburger Menu
Icon

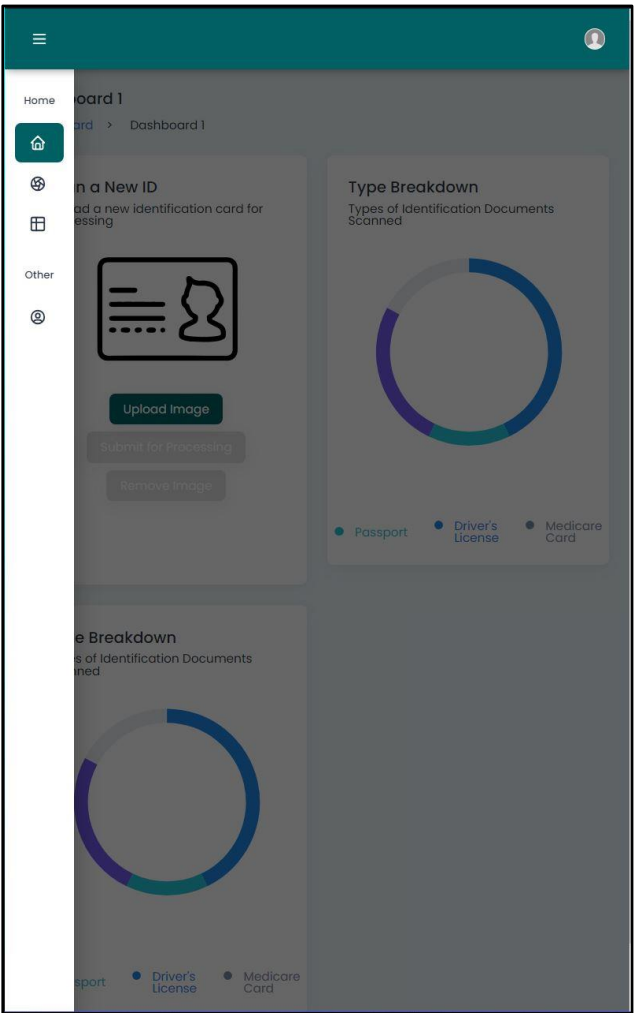


Figure 11: IDentify Sidebar

Expanded sidebar view, system default on page load.

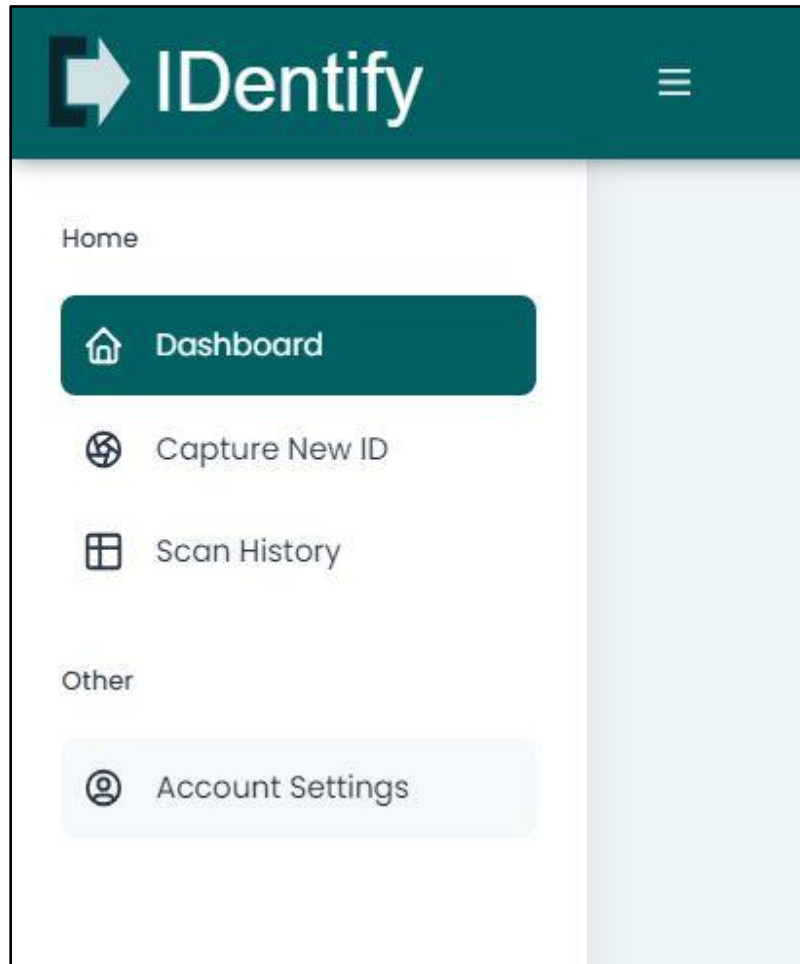


Figure 12: IDentify Sidebar (additional options now available, screenshot taken during a development sprint)

IDentify also features a fully scalable website design, ensuring seamless accessibility across various devices. Whether the user is using a smartphone, tablet, laptop, or desktop computer, the website will dynamically adjust to fit any screen size or resolution. This adaptability guarantees an optimal user experience. This allows IDentify to remain fluid and user-friendly, allowing the end user to access the site's content. We can see this function in Figure 13 and Figure 14, with the examples of the IDentify's login page.

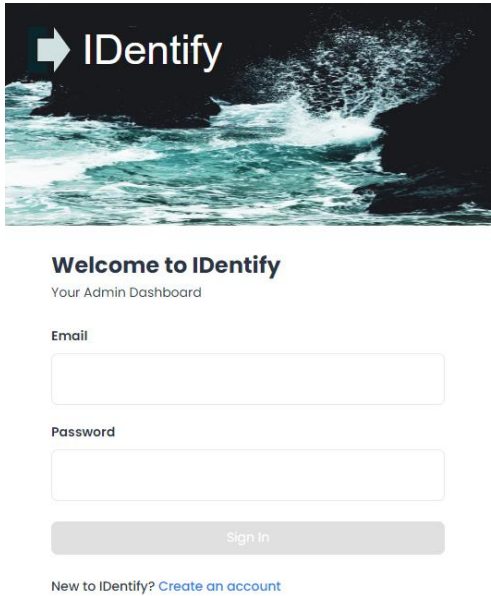


Figure 13: IDentify Login, Mobile View

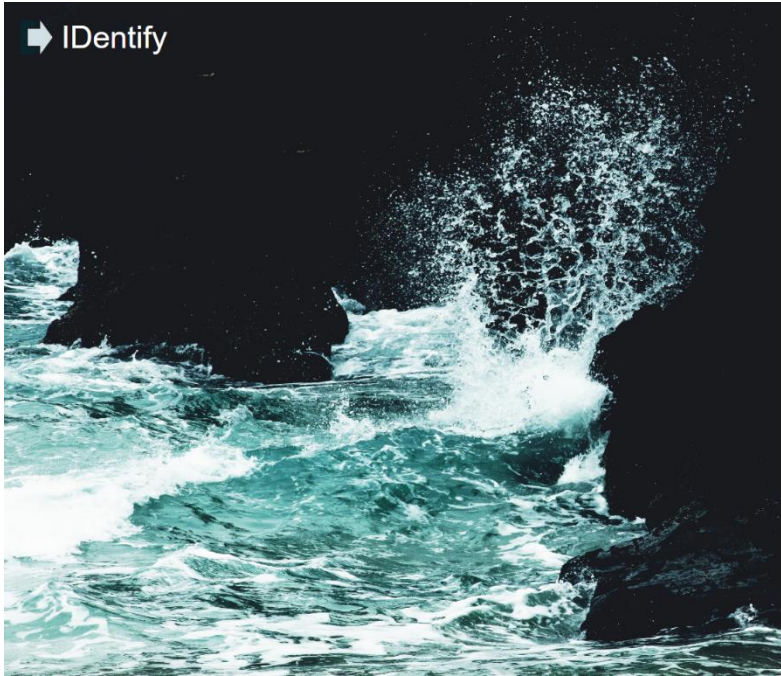


Figure 14: IDentify Login, Desktop View

IDentify features a dropdown menu for its profile picture function, also including a logout, and setting option. By grouping essential actions, the drop menu conserves screen space and creates an organised and clutter-free layout, leading to an improved user experience. The familiarity and usability of this design pattern reduces the learning curve for users, while its responsiveness and customizability ensure consistency and visual appeal across various devices. This is seen below in Figure 15

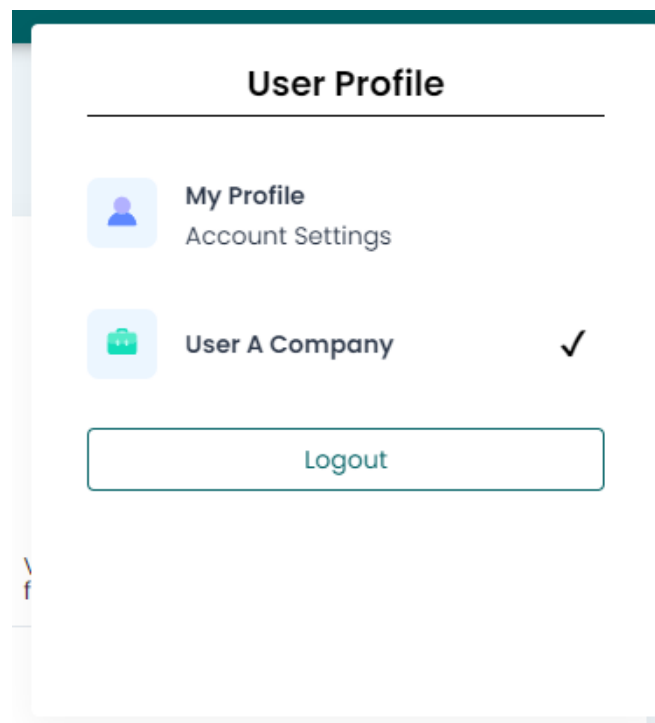


Figure 15: IDentify Profile Dropdown

Scan History

[Dashboard](#) > [Scan History](#)

Scanned ID Cards

View Scanned Information Cards

Select a Collection Point

default

Search Here

Name	Card Type	View additional fields, edit	Use Forms
Example USER Demo	NSW Drivers License	Expand	Select Form
Example USER Demo	NSW Drivers License	Expand	Select Form
Example USER Demo	NSW Drivers License	Expand	Select Form
Example USER Demo	NSW Drivers License	Expand	Select Form
Example USER Demo	NSW Drivers License	Expand	Select Form

Items per page:

5

1 - 5 of 20

<

>

Figure 16: Card Data Table

Figure 16 shows a table displaying all extracted data from the site. The table simply represents user data using Name and Card Type. Using just these fields reduces the number of visual stimuli a user can encounter, meaning they can quickly find the information they need, rather than seeing all information when they don't need to. Furthermore, users can the search bar to assist refining results and pagination to increase / decrease the number of results shown.

To expand further on the given overview of card information, we provide the user with a dialog popup with editable text fields (Figure 17). They can edit the card data or delete the record if they choose.

Edit Data

name:

Example USER Demo

expiry_date:

02 DEC

1999

dob:

07 SEP 1900

address:

21 LEDGE AVE

SYDNEY NSW 2000

licence_no:

7666XY

licence_conditions:

C

card_number:

2 051 000 000

Save Changes

Delete Record

Cancel

Figure 17: IDentify Dialog

Simplified icons in minimised view Figure 18, allowing the user to still identify functions in this mode. This allows smaller devices such as mobile phones to still have an interactive experience with the navigation sidebar.

IDentify uses simplistic greyed out button options to convey status to the end user (Figure 19).



Figure 19: IDentify Disabled Buttons

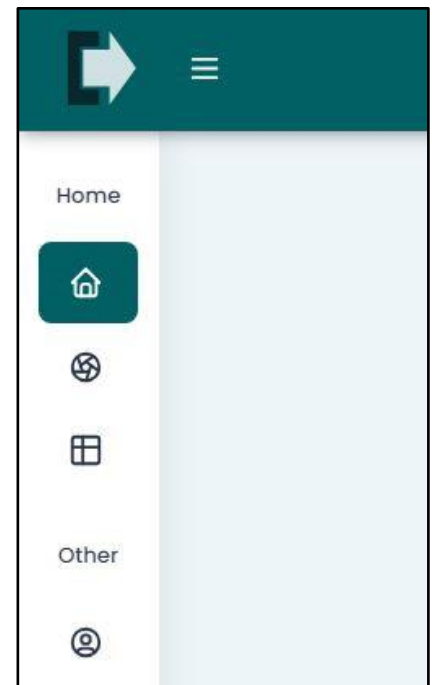


Figure 18: IDentify Sidebar Minimised Icons

Element is highlighted with a familiar IDentify colour palette to indicate the button is active (Figure 20).



Figure 20: IDentify Enabled Button

10.2.2 Colour Palette

Colour Palette

A darker monochromatic palette blends well to create a seamless viewing experience.

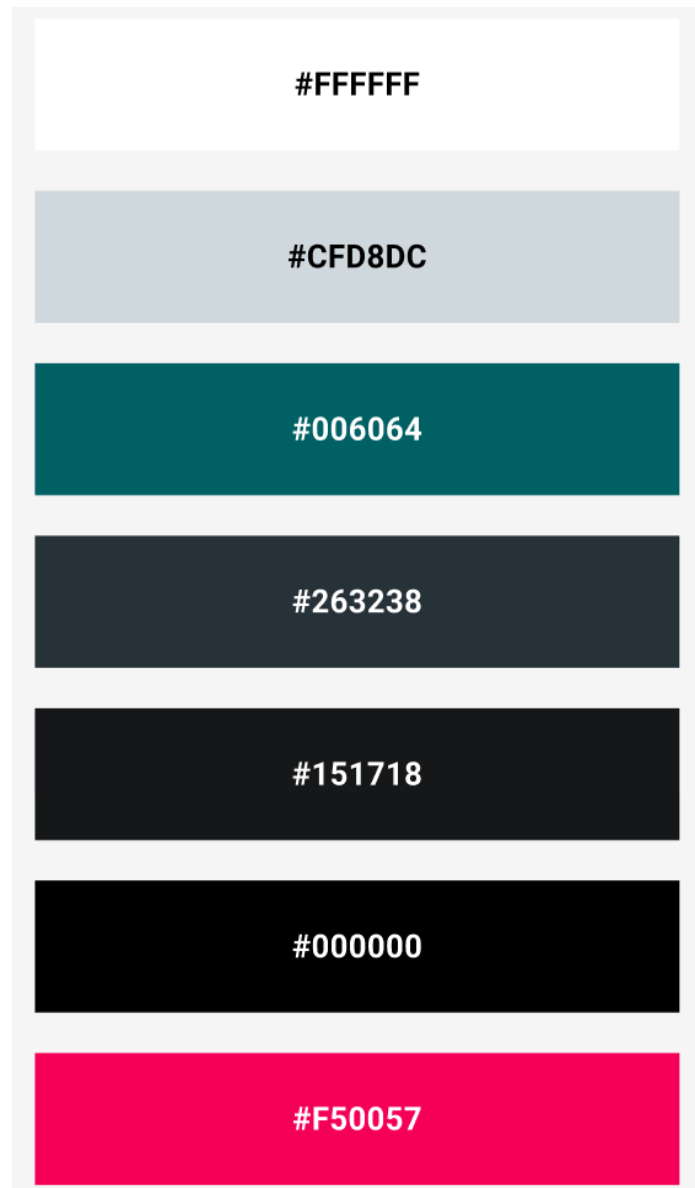


Figure 21: IDentify Colour Palette

10.2.3 Text Style and Size

- Headings/Subject Text (Poppins, 21)
- General Text (Poppins, 14)
- Button Text (Poppins, 16)
- Navigation Bar Text (Inter, 16)

10.2.4 Graphics and Interactive Content

Adaptive navigation bar on each site page

10.2.5 Accessibility

Negative space and contrast are employed to enhance accessibility in IDentify's design. Contrast plays a crucial role in guiding users' focus towards images, text, and essential buttons, ultimately reducing cognitive overload within the user interface. An illustrative instance of this is the integration of negative space in the main dashboard design of IDentify, which serves to diminish sensory input. This is particularly valuable when it comes to reading text, as a surplus of on-screen elements can make it challenging to comprehend the information. It's important to note that all design decisions in IDentify's interface have been thoughtfully aligned with the principles outlined in the Web Content Accessibility Guidelines (WCAG), with the primary goal of enhancing accessibility for all users.

10.2 Branding and Advertising Strategy

10.2.1 Site Information

Name: IDentify



Figure 22: IDentify Logo

10.2.2 Logo

Logo is displayed either with solo simplistic logo or text, coloured #000000 (Black) or #FFFFFF (White) depending on other site elements.

- IDentify (Poppins Bold, 32)

The design and familiar colour palette reduce visual clutter and increases recognition throughout the project. The arrow symbolism employed represents the system's ability to extract information from ID cards.



*Figure 23: IDentify
Logo Without Text*

10.3 Market Research

10.3.1 Target Market Table

Target Market	Intended Uses
Financial institutions	Outlined in the business case, financial institutes such as banks need to adhere to the Anti-Money Laundering and Counter-Terrorism Financing Act 2006 which requires them to confirm the identity of their customers. Our system can be used to not only collect their customers data but we can also offer the service of confirming their identities using the collected information.
Small to Medium enterprises	Smaller businesses may also take advantage of our software for data extraction, with some may wanting the functionality of ID confirmation. As well as the possibility to provide a way to generate sign up forms for the customer.
Individual users	Although our main targets are businesses that can take advantage of this software, there is a possibility of providing access to individual users especially those who may have disabilities which provide difficulties with writing so they can take advantage of easily extracting their personal data and providing it digitally.

Figure 24: Target Market Table

The target market for IDentify is businesses and venues in Australia, particularly in New South Wales (NSW), that require ID verification for entry or membership. This includes businesses in the hospitality industry such as bars, clubs, and restaurants, as well as gyms, casinos, and other establishments that require age verification.

In terms of intended use, IDentify is focused on developing ID verification technology that can read and interpret data from various forms of ID, such as DL's and other government-issued ID cards, to verify the identity and age of individuals entering a business or venue. The technology is intended to streamline the ID verification process, reduce wait times, and improve security and compliance with relevant laws and regulations.

Therefore, IDentify will target businesses and venues that require reliable and efficient ID verification processes to ensure compliance with the relevant laws and regulations. These businesses and venues may include bars, clubs, restaurants, casinos, gyms, and other establishments that require age verification or ID checks for entry or membership. IDentify's technology can help these businesses and venues to verify the identity and age of individuals more quickly and accurately, which can improve customer experience and reduce the risk of fraudulent activity.

10.3.2 Target Market

- IDentify's target market is businesses and venues in Australia, particularly in New South Wales (NSW), that require ID verification for entry or membership. This could include, GP's, Gyms, Clubs, etc.
- IDentify's primary focus will be on businesses in the hospitality industry, such as bars, clubs, and restaurants, but we could also target gyms, casinos, and other establishments that require ID verification.

10.3.3 Market Size

- The market size for IDentify will depend on the number of businesses in NSW that require the use of ID verification.
- According to the NSW government (<https://www.transport.nsw.gov.au/data-and-research>), there are over 5 million DL's in circulation in NSW. However, not all of these licence holders will be using them for ID verification.
- The number of businesses that require ID verification is difficult to determine but will cover various industries.

10.3.4 Competition

There are other companies that offer similar ID verification technologies.

Eventbrite Australia is a ticketing and event technology platform that uses AI-powered card scanners to check-in attendees at events.

Eventbrite uses AI to check in attendees through facial recognition technology. Attendees can have their faces scanned at the event entrance, and the AI system can match the scan with the attendee's registration information to verify their identity and check them in. This can help to streamline the check-in process and reduce wait times. I would assume this is a form of facial recognition in contrast to something like IDentify, which would use the card for scanning said information. Also brings up the point of fraudulent use. What if someone were to get hold of someone else's card and use it in our system.

The system is capable of reading through attendees' registration emails and automatically identifying key information such as their name, email address, and ticket type. This information can then be used to check them in automatically or assist the event staff in checking them in more efficiently. Unsure as to how this works, how would AI have access to the users' emails, furthermore, is this not just taking key fields of already available information instead of scanning and interpreting said information.

IDentify will be unique in the fact it reads the information and interprets the data scanned without the use of predetermined information/datasets.

10.3.5 Marketing Materials

Pull Up Banner (Figure 25)

- #263238 (Background)
- Headings/Subject Text (Poppins, 21)
- #FFFFFF (Icons)

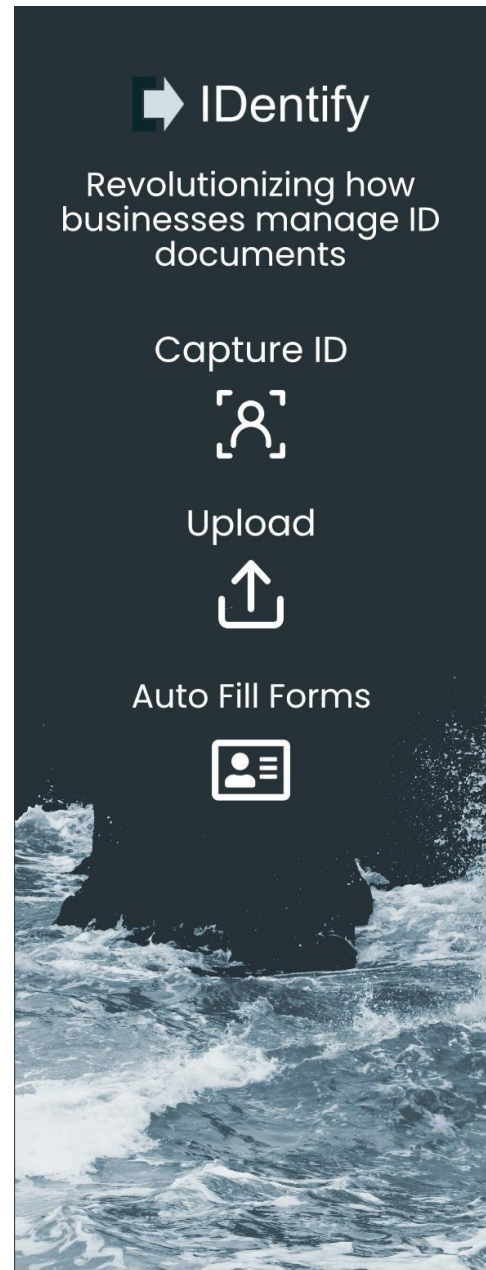


Figure 25: IDentify Pull Up Banner

IDentify Advertising Poster

Poster 1 (Figure 26)

- Headings/Subject Text (Poppins)
- #006064, #CFD8DC, #FFFFFF, Poster colours

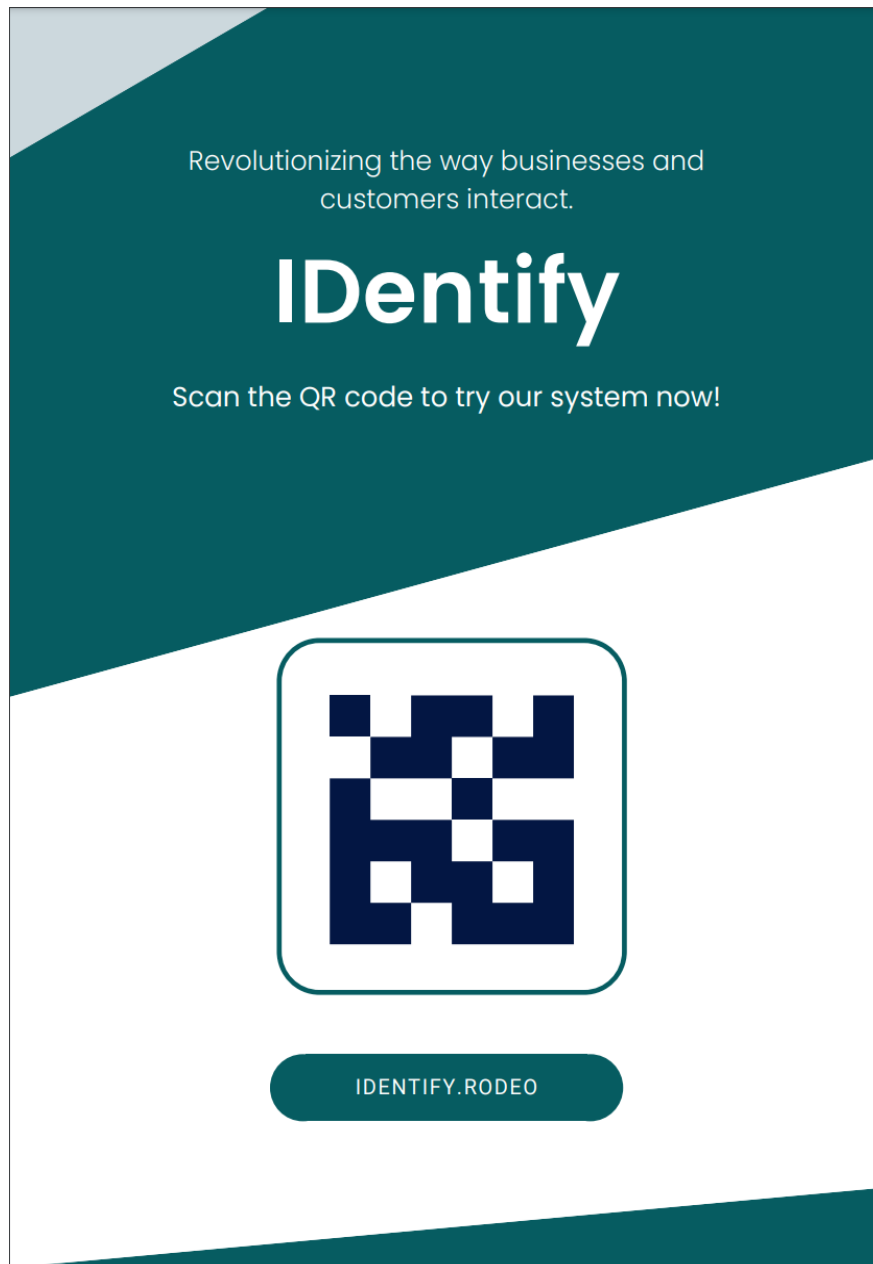


Figure 26: IDentify Poster 1

Poster 2 (Figure 27)

- Headings/Subject Text (Poppins)
- #006064, #FFFFFF, Poster colours

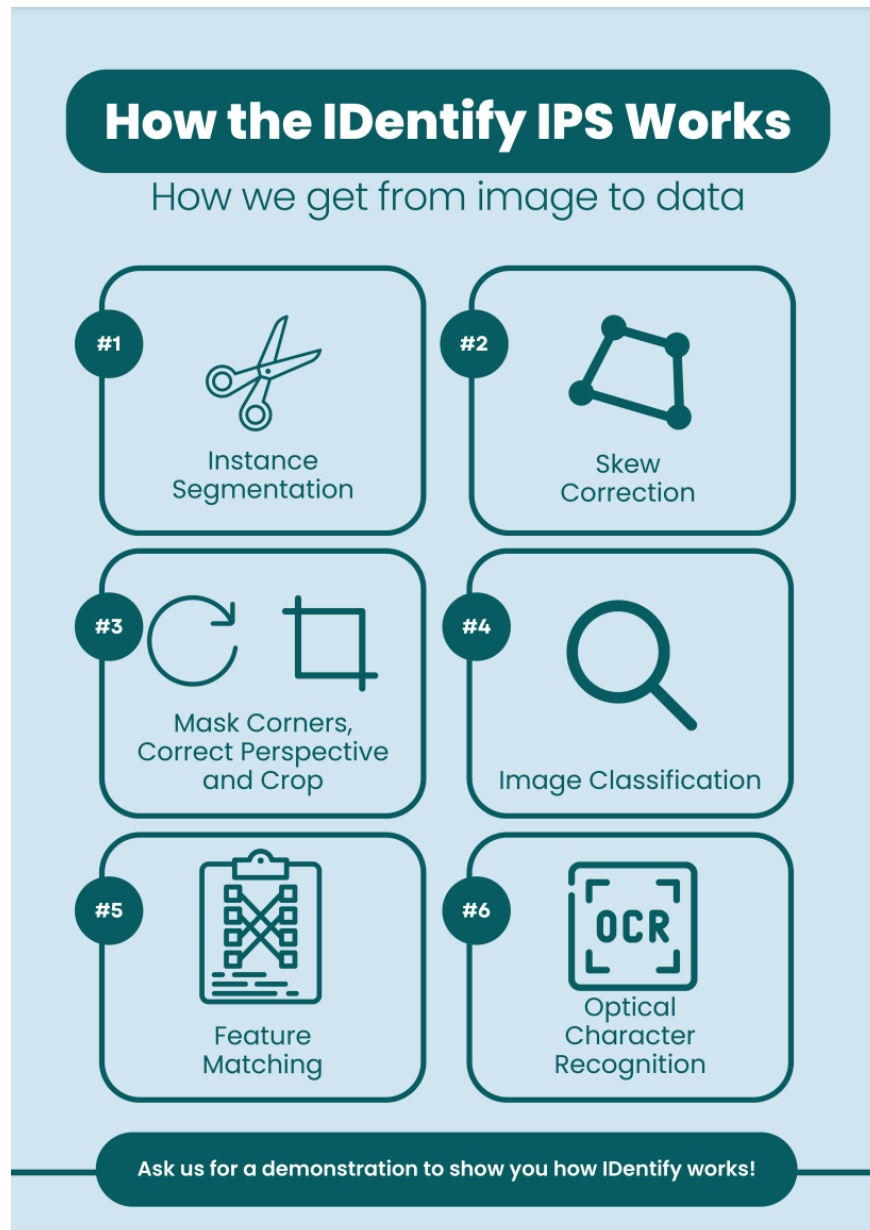


Figure 27: IDentify Poster 2

10.4 Example Company Form

Your form may look something like this after editing:

Name: {name}

Address: {address}

Date of Birth: {dob}

License Number: {license_no}

Insert the above into a word document, save it to use with your site.

In this example, your selected customers' information would be inserted to the curly brackets with corresponding data. For example if we had a user:

- John Doe
- 123 Identify Lane,
- date of birth 06/09/2001 and a
- license number of 123456

The form would generate to look something like this:

Name: John Doe

Address: 123 Identify Lane

Date of Birth: 06/09/2001

License Number: 123456

10.5 Meeting Minutes

Meeting minutes have been zipped and uploaded to One Drive:

[Meeting Minutes.zip](#)

Note: Must have a UoW email to access it.

Please keep in mind the provided meeting minutes are for official planned team meetings, there were a lot of ad-hoc meetings that were documented as part of these meeting minutes.

10.6 Table of Figures

Figure 1: Basic Functionality of IDentify	4
Figure 2: IDentify System Architecture	21
Figure 3: IDentify Image Processing Pipeline	22
Figure 4: IDentify Gitea Repositories	25
Figure 5: IDentify Gitea Issues	26
Figure 6: IDentify Requirements Matrix	31
Figure 7: IDentify Project Sign Off	33
Figure 8: IDentify Header	40
Figure 9: IDentify Dashboard	40
Figure 10: IDentify Hamburger Menu Icon	41
Figure 11: IDentify Sidebar	41
Figure 12: IDentify Sidebar (additional options now available, screenshot taken during a development sprint)	42
Figure 13: IDentify Login, Mobile View	43
Figure 14: IDentify Login, Desktop View	43
Figure 15: IDentify Profile Dropdown	44
Figure 16: Card Data Table	45
Figure 17: IDentify Dialog	45
Figure 18: IDentify Sidebar Minimised Icons	46
Figure 19: IDentify Disabled Buttons	46
Figure 20: IDentify Enabled Button	46
Figure 21: IDentify Colour Palette	47
Figure 22: IDentify Logo	49
Figure 23: IDentify Logo Without Text	49
Figure 24: Target Market Table	50
Figure 25: IDentify Pull Up Banner	54
Figure 26: IDentify Poster 1	55
Figure 27: IDentify Poster 2	56