BTECH 451
Final Year Report

Idphoto.co.nz

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Abstract

The aim of my project is about developing a functional website platform for online production of New Zealand passport photos. The report will address aspects about the ongoing development of the website development, evaluated solutions for a particular case issue and reasoning of the final selection. The project starts off with a redesign of the existing UI prototype, implementing necessary webpages, evaluate the possibility of additional functions to make the website more secure and efficient.

Chapter 1
Introduction

This report summarises the research findings prior development of the project, problem and solution with reasoning from the companies view and academic report information published online. The recorded work done started in March 2016 to October 2016.

The project I worked on is a service-based business website called “idphoto.co.nz” that was luanched on 18th October 2016 from WOW Digital Image. The website is an online servicing platform for producing standard ID photos targeting nationwide customers who are seeking for a quick and low cost photo production.

1.1 The company

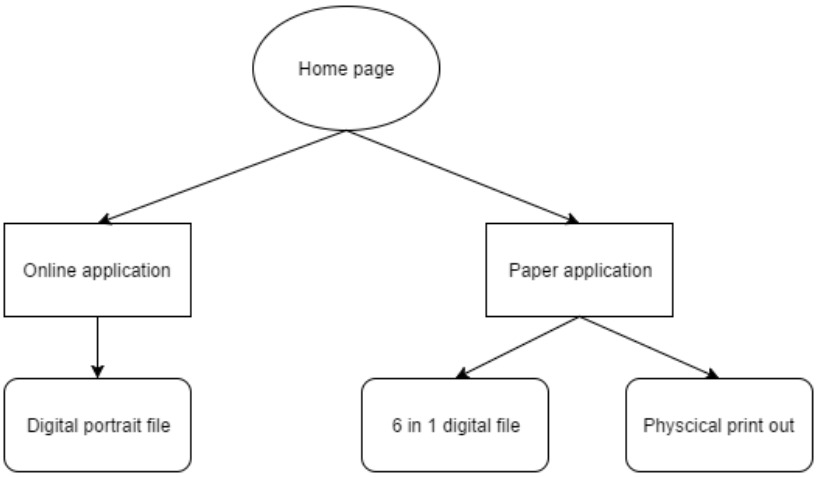
WOW Digital Image is a New Zealand photo-service company located in East Auckland. The company started in 1996, since then it has slowly increased its reputation around the area based on their quality assurance standard and has built a large local customer base. Recent years consumer demands in developing physical photos has greatly decreased as the idea of digitalised files was introduced and followed with the rapid growth of Internet has expedited people to store photos as digital files, post on social medias and online storage platforms such as iCloud, dropbox etc. As a result the majority of the customers come to WOW Digital Image for services like passport photo and studio photo taking where photography skills are showcased to meet the requirements of both officials and people.

Passport photo developed at WOW are well recognised by frequent customers of meeting both government official standards and the customer’s personal liking. Staffs of the company has developed photoshop skills to minimise the appearance of any blemishes or marks while maintaining the natural look of the person’s face. Staffs are also given full requirement list specified the officials to create the standard size passport photo.

Figure 1. Before and after.

1.2 idphoto.co.nz

In an advance Internet world, it is imperative for businesses today to understand the benefits utilising this borderless, resource abundant technology. Migrating services online also known as e-commerce has become a mandatory action in terms of broadening the company's targeting customer, efficiency of the service as well as keeping along with the current technology trend to stay in the competitive market. WOW Digital Image therefore came up with the idea of bringing its passport photo service online that scales perfectly with the online passport renewal service that was introduced in 2012 by the New Zealand government Internal Affairs department, however this service was limited to adults who are to renew their expired passports and not for the first time applicants. An update of their passport system in 2015 has included both adult first time applicants and adult renewal applicants as well as children renewals. The only population who is restricted to this service are children of first time applicants. On top of this government's new passport system which is already a paving the way for more people demanding a digitalised passport photo, the company has also offered a price that is relatively low comparing to the current photo lab pricing. With a website like idphoto.co.nz the production time is estimated to decrease to 5 minutes per passport photo product comparing to



reatail. benefiting both the customers and company expenses.

Figure 2. Brief website flow

The underlying concept is transforming the passport photo development service with WOW Digital Image online with mainly digitalised product. In this section I will briefly mention the service options offered at idphoto.co.nz. Application types are divided into online application and paper application. With online application, customer will receive a digitalised passport photo to be used on the government passport system. Where as with paper application, two product options are offered for the purpose of providing hassle free method to obtain physical printouts. 6 in 1 digital file as shown in figure 2 allow the customers who wish to save time and money by bringing the digital file to a local photo lab and print the physical at a price as low as 29 cents. Idphoto.co.nz working office can also print the physical and mail out to customers who are living in rural areas where photo labs are located at distance towns. Idphoto.co.nz is capable in enlarging the company's customer base to nation wide and along

with such maketing strategy in the service, idphoto.co.nz can potentially win over all passport photo taking labs in the future.

Figure 3. 6 in 1 digital file

Chapter 2

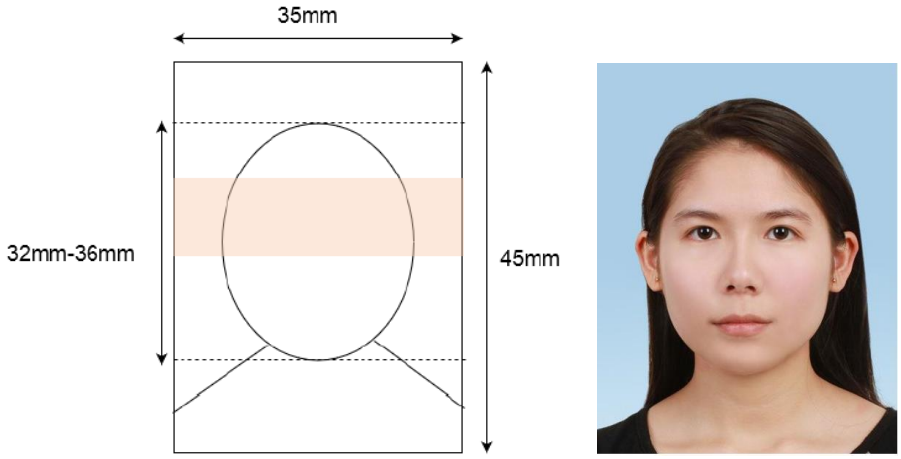
Background information and related technologies

2.1 New Zealand standard ID photo

ID photos may seem to be all the same that it is capturing one's head, however there are a few conditions for the photo to consider a valid passport photo. According to New Zealand's department of Internal Affairs, the requirements of a standard ID photo are specified differently between online and paper applications. Physical passport photos have the following rules:

- 35mm x 45mm size with blue background
- Head size limited to between 32mm and 36mm
- Eye height is also required to be within red area

Figure 4. Showing that the photo is meeting the requirement of a printout New Zealand passport photo.



While online passport photo demonstrates a slight different in the size of the photo listed as follows:

- 3 inch x 4 inch
- File size is between 250 KB to 10MB
- Pixel requirement no less than 900 wide by 1200 high or no greater than 4500 wide by 6000 high

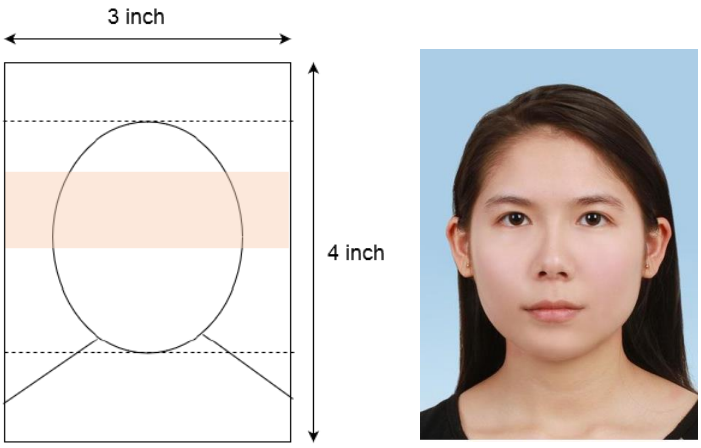


Figure 5. Showing that the photo is meeting the requirement of a New Zealand digital photo.

There is also a requirement that the passport used has to be taken within 6 month after that the photo is not valid for passport applications.

2.2 Passport photo checking system

Government of Internal affairs also introduced an auto photo checking system which checks photos against ICAO, ISO and local regulations before the applicants can successfully apply for their passports. The checking system uses biometric engine executing facial recognition technology. The following are the errors that the system is capable of identifying:

Check for	Error messages
Contrast/brightness/Exposures	The face must have good contrast to the background.
	The photo must not be too dark or too bright.
Colour accuracy	Skin tones are not accurate.
	The background must be plain and light coloured.
Photo quality/requirement	The photo must be of sufficient resolution.
	The picture must be in a passport portrait format.
	The image is out of focus.
	The picture is not a passport style portrait of suitable file size or otherwise does not meet our requirements

Appearance criteria	The eyes must be open and not in shadow.
	The face must be 70 to 80 per cent of the image with a clear gap around the head.
	The eye region must not be obscured by heavy framed glasses or shadow.
	There must be no shadows on the face.
	There must be no glare or reflection on glasses or face.
	The person is wearing dark glasses.
	The head must be centred and taking up 70 to 80 per cent of the frame.
	Looking straight at the camera.
	No tilted head
	There must be no objects or shadows in the background.
	Mouth must be closed.
	Only one face is allowed
	The image has red eye.

Table 1. List of conditions the auto photo checking system is checking.

Correction guidelines to the respective error message are given in their website so the applicants can correct their photo accurately.

2.3 Passport in the making

The employee is responsible for producing a valid NZ ID photo upon receiving an order for a certain type of application. They will be working with 2 image-editing softwares that is installed in the organisation computer. 1)Photoshop CS2. 2)CPAC Imaging Pro. The reason for using an older version of photoshop is because the newest Photoshop CC have removed certain features such as the extract filter that is used to changing the background of the image. The use of CPAC Imaging Pro is for a faster performance of skin smoothing. First thing is to check whether the uploaded photo meets image requirement rules. This image requirement is specified in the way that would decrease the probability of making an ID photo that does not pass the checking of the government's photo checking system and also the effort for employees

to spend adjusting the uploaded image before applying SOP. For example, the person's hair would be too puffy to fit within the specified size of the head and eye height. In this case, the person's hair will need to be retouched on to make it smaller to the point that everything fits to standard. This action could take some time and it will not be reasonable to be spending a relatively long time on an order that can be prevented through the customer her/himself by following the requirements like tieing up hair. The later step is going through the SOP for producing the ID photo.

SOP:

1. Check for fitting and crop to size with the right resolution.
2. Apply CPAC Imaging Pro smoothing skin effect.
3. Double check with the resolution and size of the photo.
4. Upload photo to the customer's order database.

2.4 Existing similar application

There are similar websites which already exist in the online passport photo development market. Some even can produce one that is completely free, however the majority of the website are going for a complete user control service. They provide the utility to edit, adjust photo brightness, cropping and rotation. The downside of this is that the user may not understand the full requirement of passport photo and one important requirement is often the background colour, the websites cannot make changes to the uploaded photo and so the resulting product from these websites are often not up to standard.

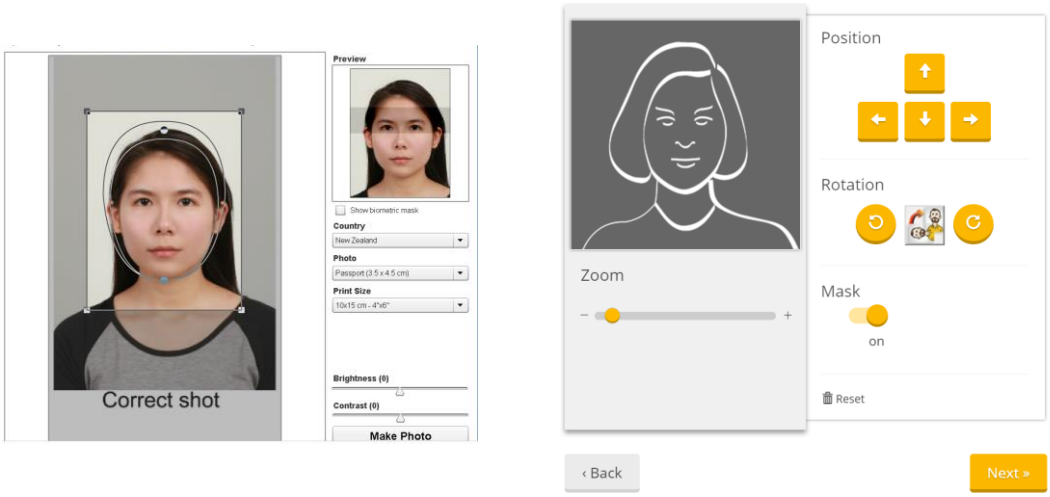


Figure 6. Existing websites with edit functions for users to make their own passport photo.

Also, most of the websites are from overseas and so the sizes they have set may not be up to date to the latest regulations of certain countries. Figure shows that there is mistake in the passport size.

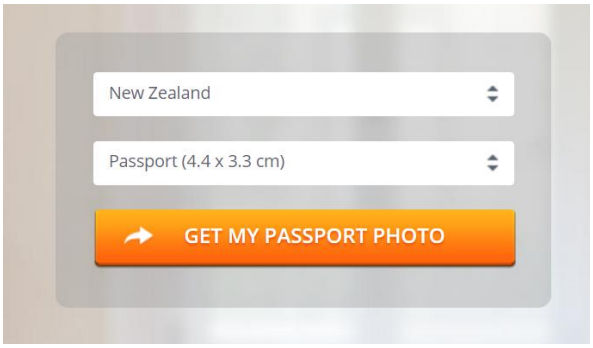


Figure 7. An incorrect specification of the passport size for New Zealand passport photo.

2.5 Framework

Web frameworks have been widely used in development of web applications for a variety of device platforms. Developers rely on frameworks for fundamental concepts and to create a standard working website without the need to implement it from scratch, thereby reducing the overall development time. Front-end framework normally comes with packages of standardised code in HTML, CSS, JQuery, JavaScripts languages which aims to ease the development of dynamic websites and web applications. Frameworks that offer various functionality types are determined by the purpose of a specific user application's structure. Regarding to different browser platforms emerging, most of the frameworks available today have solved problems regarding to cross-browser incompatibility.

2.5.1 Structure

Model-View-Controller (MVC) is prominent on web based applications. It offers separation of concern (SoS) in that it separates data model which represents the underlying logic in data structure and view which is the user interface as well as controller that represent the classes acting as a middleman for communication between the model and view. With this structural approach client side is clearly differentiated with server side which provides the benefits of code reuse and allow semi parallel application development as a result greatly reduced development time and complexity of code. In testing perspective, the relationship with components are clearly defined and articulated.

Three-tier organisation revolves around three layers: presentation layer (Client), business logic layer and data access layer (server). It looks similar to MVC however with this architecture, the client tier never contacts directly with the server tier. In large applications MVC is the presentation tier of an N-tier architecture.

2.6 Web Application Programming Interface (API)

Provide a way to connect computer software components. It facilitates interactions between code modules, application and backend IT system. The API specifies the way in which these different software components can interact with each other and enables content and data to be shared between components.

2.7 Front-end

Front-end development is also known as client-side development which the user can see and interact with the business services directly. A successful front-end requires the user to easily navigate through the website and find information or services that are relevant to their search. Current trends in front-end design has taken into account that devices, browsers and operating systems varies widely with respect to the user and thus requires careful planning on the side of the developer.

2.7.1 Design concepts

Design principles for a website are one of the key factors that affects the way people are attracted the website and greatly affects the probability of visitors staying or revisiting the website. hus the web traffic into the website. Websites are strategic issue for organisations to increase their revenue for their service

There is a general underlying concept to all successful website that are simplicity, consistency, clarity of the design.

2.7.2 Programming concepts

Markup languages
It stores information and present them with various styling (fonts, sizes, colour, graphics) which the user can utilise. **HypterText Markup Language (HTML)** is one of the popular language that has been used for over 20 years to create web pages. It is simple to learn and easy to implement, however the problem with HTML is that new tags cannot be customized for developer's needs and communication with client/server is complex and not efficiently handled. **Extensible Markup Language (XML)** solves the HTML problem, which separates the presentation from content and allowing information to be in a ready state for passing between applications. XML are more popularly used in industries today.

Style sheet language
Cascading Style Sheets (CSS) integrates with HTML or XML to describe the presentation of web pages that includes fonts, layout, colors and effects. The primary advantage is that content and presentation are separated with formating on a separate

stylesheet therefore greatly improves the efficiency of implementing the website visual looks by reusing CSS rules across multiple pages. CSS can also render web pages to be correctly displayed on different devices and browsers.

Scripting Language

The use of scripting in web development adds interactivity and functionalities to enhance the website when added to HTML documents. **JavaScript (JS)**, also called the language of the Web, is the most popular programming language used in most if not all websites on the Internet today. Web developers often implement JS for its handy features for a number of reasons.

1. Simplicity: Comprises syntaxes that are close to English and the use of Document Object Model (DOM) for easy manipulation of elements and content.

2. Speed: Codes are executed on the client-side instead of the web server meaning the site is much more responsive with less processing strain on server.

3. Versatility: JS can be executed on web pages that uses other programming languages to extend functionalities.

However JS have issues with cross-browser compatibility so the display of the website varies between different browsers and become unpredictable to web developers. Security issue has also arise in the use of JS on website which will later be discussed in the security part of the section. There are few other scripting languages such as Python, Perl provide the same functions of JS but in the end industries have converge to JS as the one platform that meets the ECMAScript standard specification.

2.7.3 Framework Application

The most commonly used front-end framework is **Bootstrap**. It is known for offering a lightweight, beautiful, intuitive web design kit that contains CSS styles, Grid classes and JS components as well as supporting a large range of basic responsive functionalities. Open source Bootstrap-only template are made available for public access which greatly simplifies the development process and complexity. The most important feature that makes it so popular is that developers are allows to modify and customise the code bringing the developers a touch of their own preference in design aspects.

AngularJS is a javascript MVC framework that is operating not only with HTML/CSS as well as data on the web pages. Comparing to early MVC approach of having all data manipulated on the server-side, AngularJS allows MVC components and application logic to execute partly on the client providing greater server performance. It automatically synchronises data from the view with the model through data-binding. Client-side navigation, validation and deeplinking with hashbang urls or HTML

pushState are all important parts of providing a greater user experience. In testing phase, AngularJS comes with pre bundled test cases. Built in dependency injection feature allows a clear understanding of how application is wired and testing components can be easily replaced by another according to the developer's needs aligning with user's requirements. Without having to manipulate DOM directly and requests are simulated, test assertions can be tested in isolation.

jQuery was developed to change the traditional way people worked with JavaScript into a framework that allows manipulation of DOM at ease. On top of that libraries were released that offers many common scripting functions written in the common language JS. It has been optimized to work with a variety of browsers automatically.

Nowadays in which website is the main source of where people obtain information and more platforms for websites to be more of the frameworks have been developed to meet different criteria of what the developer and stakeholders look for.

2.8 Back-end

In general cases, the backend also called server-side consist of three primary parts: a server, an application and a database. These components interact by having an application which connects with a database to look up, store, update and return information to the user in the form of front-end code. The processing of these actions happen in the server which the database runs on. From this it is obvious that the back-end is responsible to handle data and therefore need to look into aspects of protection, management and the structure of the data in order to provide a secure dynamic site that is updated in real-time.

2.8.1 Application Building

In terms of dynamic web pages, efficient communication between back-end components are essential. The language chosen needs to consider the database used, server platform and software, budget of the organisation and what the organisation value the most. There is no one platform that is the 'best' but the chosen language and design components should be the most suitable one in the organisation's perspective.

PHP Hypertext Processor (PHP) is a general-purpose server-side scripting language. It works great with HTML by embedding PHP codes that works interchangeably within the page. With PHP's high flexibility in terms of compatibility with operating systems , web servers and database, it has the freedom to choose which one suits best. The chief advantage is that it has a large open source community which people contribute in making PHP resource files for easier development and support in making the website that uses combinations of various web template systems, frameworks or content management. Therefore, PHP is a language that beginner programmers can pick up easily.

.Net Framework

ASP.net is a set of technologies in the Microsoft .NET framework for building Web applications and XML Web Services. The approaches are Web forms, ASP.NET MVC and ASP.NET. Each of these approach will vary according to development style. Web Forms offers controls and components for building a UI-driven site with data access. MVC that offers clear separation of concerns. Web Pages working with Razor syntax for a fast and lightweight approach to combine server code with HTML. It differs from PHP in that it is on Object Oriented Programming (OOP) paradigm rather than a scripting paradigm.

2.9 Security measures

Website security is a major section to be focused on and planned carefully to prevent web vulnerabilities being exploited. There are common security approaches to mitigate or eliminate the possibility of an attack conducting on websites especially ones that consist of valuable databases. The following are lists of ideas that should be used for user login process.

1) Login pages should be encrypted:
   The basic way is the use of SSL after user authentication which may work back 20 years ago but with technologies becoming more sophisticated, attackers method to retrieve user's login details are more easy as well. Encrypting the session after login is useful to prevent malicious security cracker to gain access to sensitive data.

2) Data validation should be done server-side:
   Web forms usually comes with data validation however this will not be enough to prevent attacks as the attackers can easily gain access to client-side and validate the data by themselves. If it is done at server-side then it is harder for attackers to gain access and compromise the server.

3) Key-based authentication is better over password authentication:
   Password authentication are easier to guess if the user is thinking the password logically. Cryptographic key-based authentication are more difficult to crack, keeping authorized system to authorized users.

Studies have shown that browser based attacks are closely tied with JavaScript, which is a very popular scripting language for website development on the client's side. A great deal of attention has been paid to the JS related security vulnerabilities such as cross-site scripting that could directly lead to security breaches. Insecure JS practices may not necessarily result in direct security breaches, but could definitely cultivate the creation of new attack vectors.
Insecure JavaScript inclusion and insecure JavaScript dynamic generation.

Insecure JavaScript inclusion is the practice of using the src attribute of a <script> tag to include a JavaScript file from an external domain into the top-level document of a webpage. An easy

way to avoid this form of attacks formation is the separation of JavaScript code with HTML markups as well as keeping external sources at a low number.

With JavaScript dynamic generation, it refers to unawareness of using dangerous JavaScript functions including the eval() to dynamically generate new scripts. It makes the website prone to attacks including cross-site scripting and cross-site request forgery which both are used to conduct malicious activities. The use of Document Object Model methods can replace the use of eval() to dynamically generate and execute (DOM) various JavaScript statements.

2.9.1 Data transmission using HTTPS

SSL/TLS encryption is generally used to protect data sent via HTTP between client and servers also known as the term HTTPS. It verifies that the client request is communication to the right server and the request and response information is only exclusively to the two parties. The SSL connection is setup by confirming the client knows that it is talking to the correct server. Both client and server agreed on a cipher suite or the algorithm they use to exchange data. Also, forming an agreement on the keys used. The components involved in HTTPS are SSL certificate and digital signatures. These are used to verify that the server is who they say they are provided that the certificate is signed by trusted organisations. Secure data transmission process starts from client side verifying the server forming an initial connection and confirm on the type of encryption they will use establishing a secure communication channel. When the user is sending data it is encrypted and upon arriving to the server side it decrypts.

Chapter 3
Work done for idphoto.co.nz

In this section, working and development of idphoto.co.nz will be explained in detail, discussing the service flow, basic features. Proposed changes and evaluated solutions for practical issues are also presented in this section. Functionalities such as payment transactions and management of database are demonstrated with program code.

Before joining the company's development team , the front-end UI and some basic functionalities of the backend had already been implemented. My task was to analyse the existing design and suggest changes or additional functions for the website.

3.1 Previous design

The existing implementations are listed as follows:

Front-end	Back-end
Logo design	Order detail management
Home page with product selection -online application -paper application *these option further lead to selection of the photo product	User detail management -name -address
User login/register interface	Photo storage
User account management -personal detail -order history	
Administrator login	
Administrator UI -view new orders -view new customer registers	

Table 2. List of existing implementation aspects in front-end and back-end.

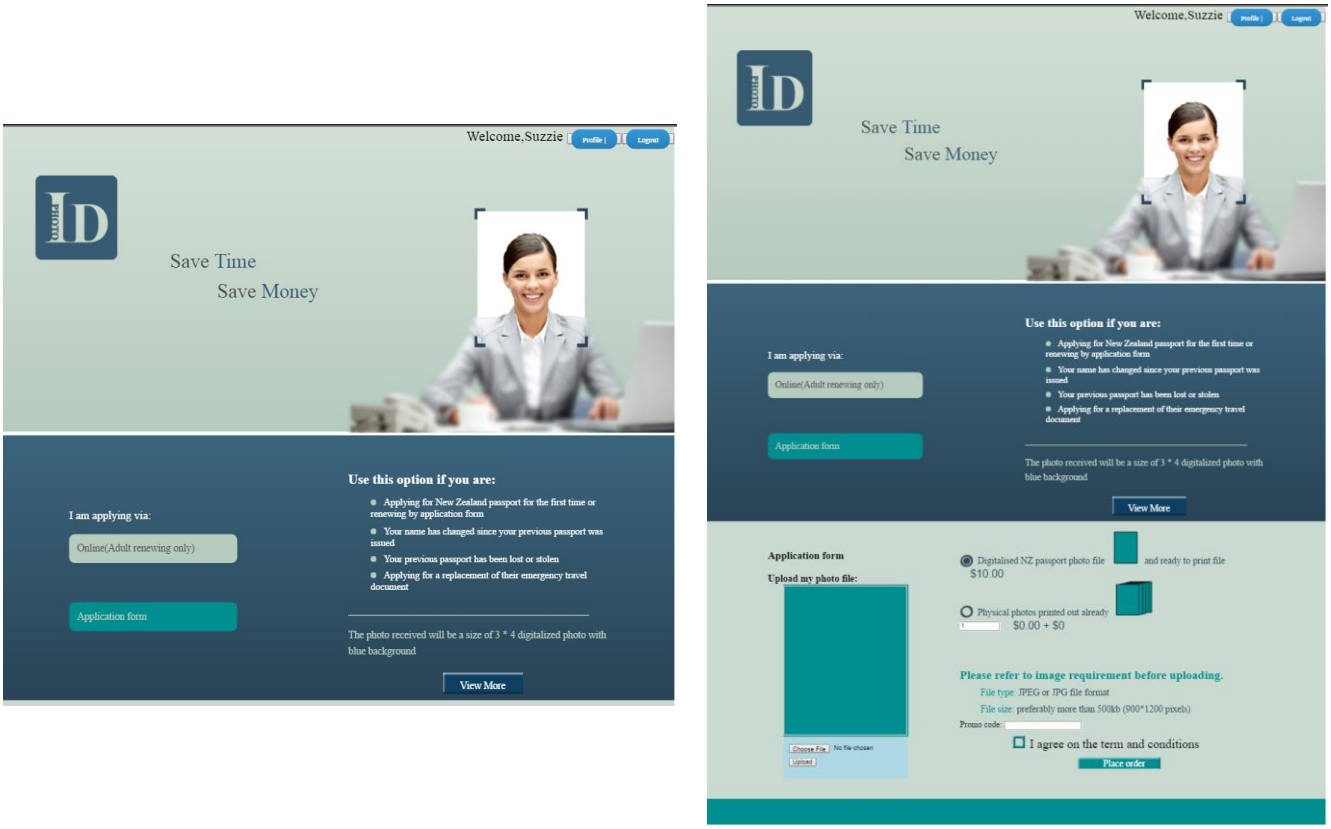


Figure 8. A screenshot of the home page (left) and navigated webpage (right-application form) of the previous design.

Firstly, I looked into analysing the previous design concept. The UI design was going for a single-page navigation to keep the service simple with easy scroll and click action. Information was presented all in one page so that user does not need to navigate to other pages. It was understandable that the previous design team wanted to go for a website that does not require a lot of navigation actions however when implemented, the overall feel of the way information was presented has the tendency of information overload. The flow of the page was arranged in a way that was confusing and not easy to follow. Upon accessing the website, the user is given the description requirement for applying for a certain type of service. From the user's point of view, presented a chunk of work description in the beginning not only decreases the overall simplicity of the website and also force the user to read something that might not be necessary for them. Secondly, from a personal perspective, the colour matchup has an overall dark, greenish-blue dull combination which resulted the website and thus affecting the user's' perspective on the company as lacking professionalism. This aspect was also the main problem my industry supervisor had with the website as it is important to have a user-friendly and visually attractive site to attract users.

3.2 New front-end design

Figure 9. Screenshot of the new design of the website.

My approach to the change is mostly going for simply, clean and trendy look for the website. The colour scheme has been recombined, pairing dark blue and white/grey colour and minor orange/light blue elements for a more vibrant and professional look for the website. The implementation of an advertisement image slider is to display important information so when the user first enters the website, the information is there for them to read. Necessary information is only displayed when the user hovers over the selection button solving information overloading issue.

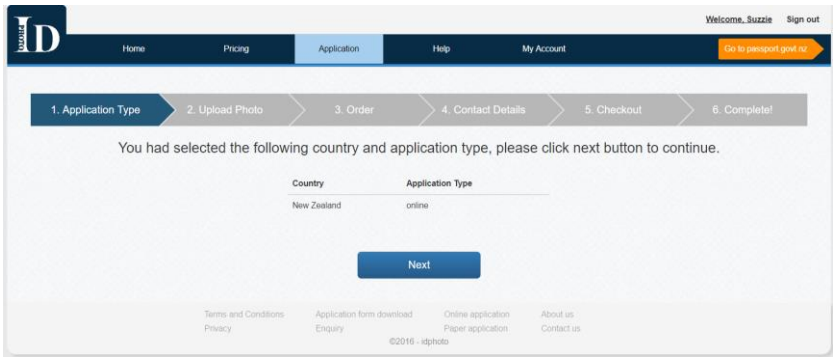


Figure 10. Screenshot of the website respect of the service flow.

3.2.1 Service flow

I have identified the service flow and each stages have its own section in the website and navigated according to the user's click button.

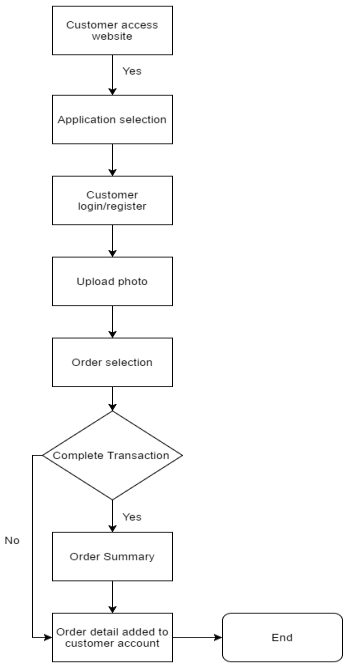


Figure 11. Service flow

The main flow starts off with customers select their application type they are applying for (online/paper). Either selection will take them to a user login webpage. Assume the user has already logged in, the page will lead them to an upload photo webpage which user will need to upload a portrait photo that meets our specified image requirement and agree to our terms and conditions to proceed to the next step where the user select their order.

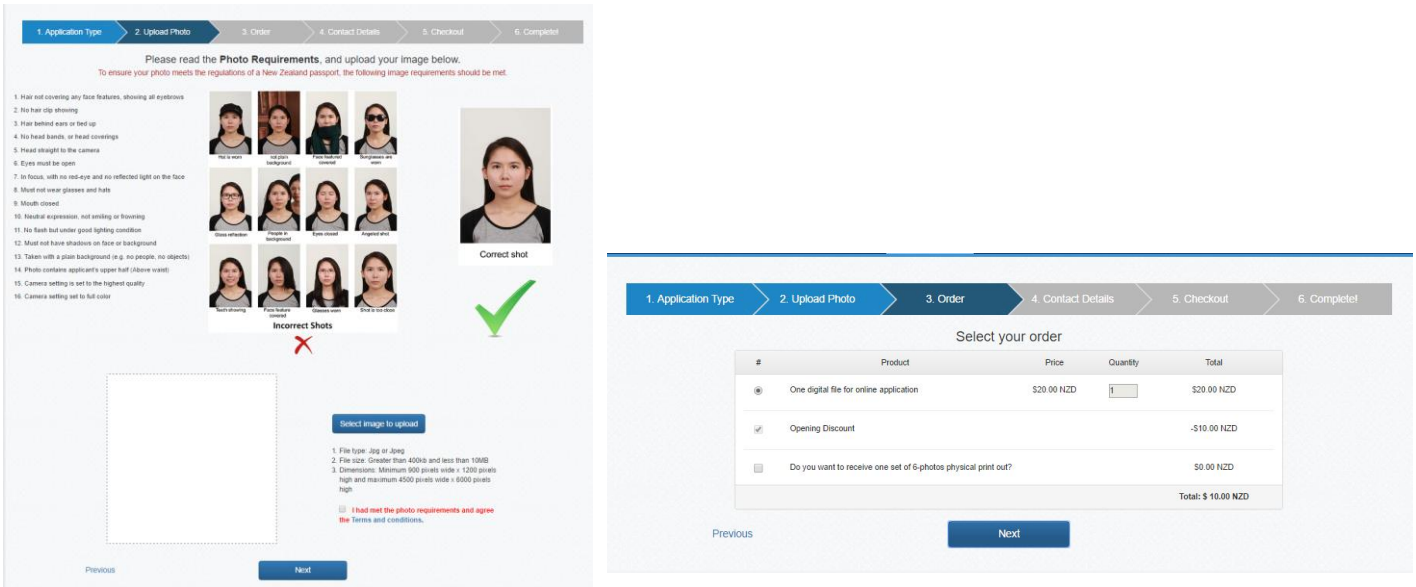


Figure 12. Upload page and order selection page.

The user are linked to a third party payment system. There are two case outcomes from this page:

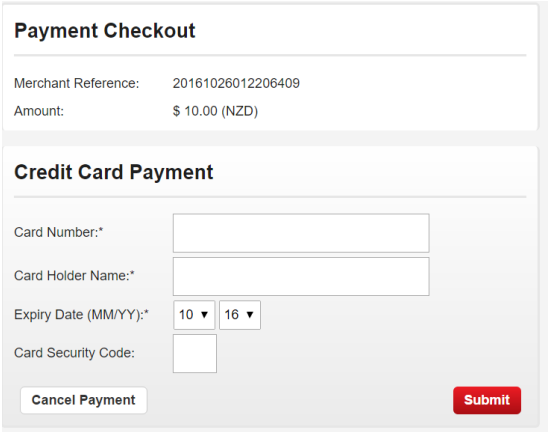


Figure 13. Payment Express third party payment system.

1) Paid: Successful transaction, the order will be placed into the customer's account as well as the system database.

2) Not Paid: Unsuccessful transaction or an unexpected error, the order will still be placed into the customer's account with an unpaid status which the customer can choose to continue for payment in the future by logging into their account.

The detail recording is designed so that whether or not the user has paid for his order or not the order is recorded in our database and the user's account. The purpose of this is the user may go back and click on "Unpaid" and continue his checkout procedure, all his details about his order are retained so he does not need to place a new order again due to change of mind. This concludes the service flow.

View Order

reference	date	type	total	status	original	after
20161024205935989	2016-10-24 08:59:35pm	online	$10.00 NZD	Unpaid		Uncompleted

Figure 14. User's order detail and payment status.

3.2.2 User account

User's account page is used to record his order histories, order status, change of password and most importantly his downloadable files.

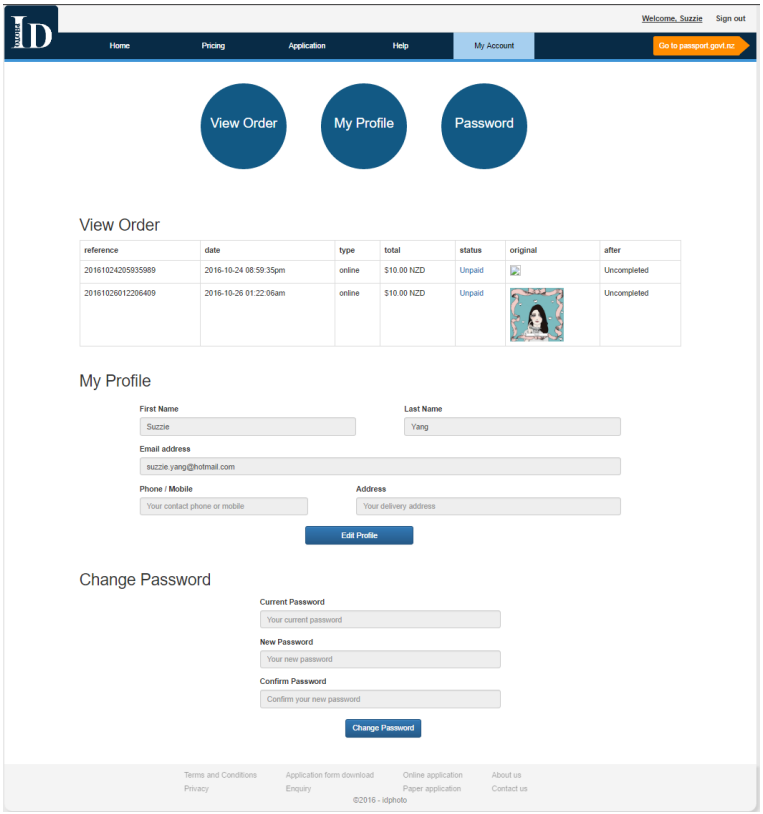


Figure 15. Screenshot of the user account page.

Additional pages including features, about us, contact us, terms and conditions and privacy are created to provide the necessary information for the customers to know. Hyper links to the government's official website are created on the website mostly for the purpose of easy access to the auto photo checking system for customers to double check their photo's validity.

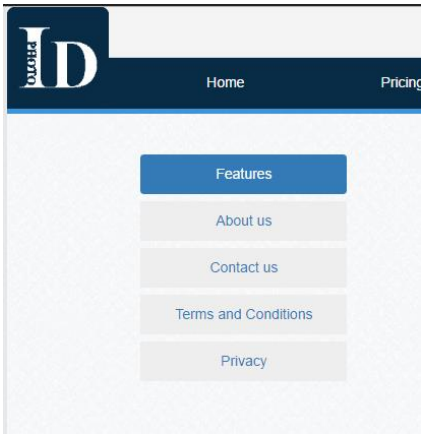


Figure 16. The addition web pages.

Overall I think this new design is user friendly and an improvement to the previous design.

3.3 Back-end

This administrator UI is created so that workers may access the required information easily to complete orders. The UI starts with a login interface for administrators to verify them as an administrator. The back end consists of functionalities to manage user's account and orders including editing and deleting. Order information such as reference number, image, status of the order, who processed the order and payment details are recorded inside the order panel. Order expiration time is also implemented so that user's images and retained for 6 months which is also the time when a particular passport photo is not valid to be used.

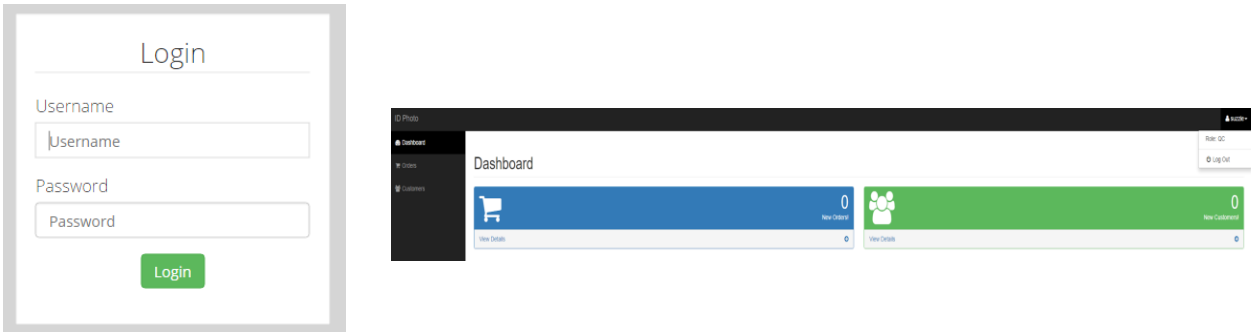


Figure 17. A screenshot of the administrator login interface (left) and the management interface (right).

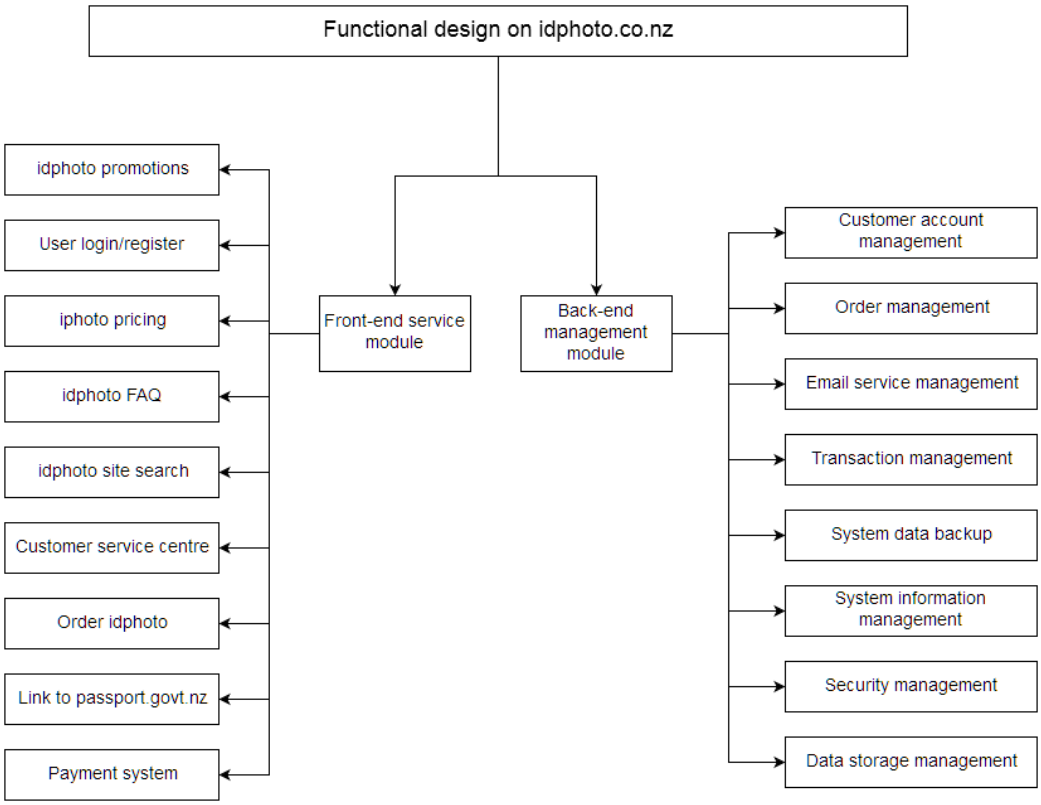


Figure 18. Functional design of idphoto.co.nz.

3.4 System implementations

The front-end module is developed in the integrated development environment (IDE) called Brackets. Brackets carry features and functionalities that made building website projects much more productive, eliminating redundant tasks that takes up too much time the development's daily basis. It supports HTML/CSS/JavaScript and additional language supporting through extensions. On top of that, quick edits in CSS are displayed clearly showing the corresponding HTML section. For my development I have used JQuery and Bootstrap css framework components for the UI. Instant changes in the CSS implementation are reflected instantly on browser with the use of live preview that Brackets has offered.

3.4.1 Responsive website

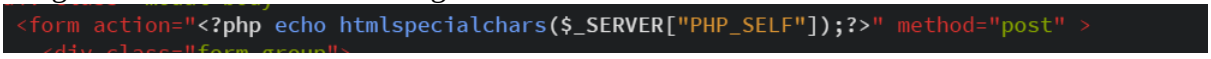
A responsive website is achieved by several methods. Using Bootstrap grid system, columns will re-arrange depending on the screen size. There are many elements such as container, rows and columns, to manage the display of the page. Classes defined to display the elements in different sizes. This features brings great flexibility to the display of a webpage on a variety devices including tablet, phone and computer. The implementation of the bootstrap responsiveness is from the css @media rule controlling width, height or colour. It let the presentation of content be tailored to a specific range of output devices without having to change the content itself, provides customisable appearance even with the use of Bootstrap framework.

Figure 19. Screenshot of css responsive website codes.

3.4.2 Prevention of website attacks

The use of htmlspecialchars() prevent cross-site scripting (XSS) including SQL attacks by replacing certain characters with special significance to HTML entities. Escaping the execution of <script> tagged files.

Figure 20 screenshot of handling website attacks.



Character	Replacement
& (ampersand)	&
" (double quote)	", unless **ENT_NOQUOTES** is set
' (single quote)	' (for **ENT_HTML401**) or ' (for **ENT_XML1**, **ENT_XHTML** or **ENT_HTML5**), but only when **ENT_QUOTES** is set
< (less than)	<
> (greater than)	>

Figure 21. A screenshot of character and corresponding html entities.

3.4.3 Payment system

The payment system's files are publicly published for people who are to use a third party payment system. PX Pay interface is a platform indecently hosted payments page (HPP) which provides a secure channel to capture user's credit card information. There are three fundamental information to supply in order for the payment system to work. PxPay_Url is the third party payment system the company is using in this case we're using Payment Express. The URL is specified to initiate a transaction. The merchant posts the Generate Request to that URL address. Once the Generate Request has been processed a request will be returned. The URI retuned can then be used to redirect the customer to the DPS Hosted Payments page. One the user has submitted the payment information and the transaction has been processed, the merchant now need to the obtain the transaction outcome and details.
In order to obtain the transaction details from the encrypted URI string, the merchant sends the encrypted string with their PxPay_Userid and PxPay_Key in the process Response. The response will return the decrypted transaction result for the merchant to interpret.

```
session_start();
# This file is a sample demonstrating integration with the PxPay interface using PHP with the cURL extension installed.
#Inlcude PxPay objects
include "PxPay_Curl.inc.php";
include "conn.php";

date_default_timezone_set('Pacific/Auckland');


  $PxPay_Url    = "https://sec.paymentexpress.com/pxaccess/pxpay.aspx";
  $PxPay_Userid = "WOWDigitalImages"; #Important! Update with your UserId
  $PxPay_Key    =  "[redacted]"; #Important! Update with your Key

  #
  # MAIN
  #

  $pxpay = new PxPay_Curl( $PxPay_Url, $PxPay_Userid, $PxPay_Key );

  if (isset($_REQUEST["result"]))
  {
    # this is a redirection from the payments page.
    print_result();
  }
  elseif (isset($_REQUEST["dpsSub"]))
  {
    # this is a post back -- redirect to payments page.

   redirect_form();
  }
```

Figure 22. Screenshot of the payment coding information.

Chapter 4 Issue and choices

4.1 Development framework choice PHP VS JAVA VS ASP

Having many website back-end query handling choices are maining juggling between the use of PHP, JAVA and ASP. Each of these technology are chosen with respect to traffic load of the website, query processing speed, code reusability and most importantly the company's emphasised aspect that would value them the most. In general, PHP-SQL are the go to technology for low traffic load websites and thus the processing time in executing queries in the database are relatively quick that displays a better website performance relative to JAVA. According to Sönmez et al, execution times of PHP and ASP are compared by executing database "select" and "insert" query for 10000 cycles. The result shows that PHP was faster than ASP WITH both query commands. In addition to the fast command execution time, PHP is an open source software that is compatible with more operating systems such as Linux, Solaris and windows servers. Whereas ASP is only compatible with Windows platforms as a result additional hardware and software are required to allow compatibility with other operating systems (Sönmez, 2015). This may be a disadvantage when creating websites with ASP in the sense that extra investment is required for additional hardware and software. ASP is a good option when dealing with large applications as the abundant options available for a faster development of the application (Bounnady,2016).

4.2 Payment system choice

When dealing with customer and merchandise transactions it is crucial that the payment gateway is highly secured. Companies generally invest in third party online payment services, reason being is that the third party payment platform has already packaged up the required components that includes the technical security, economic and legal aspects with banks and the merchandise. Most importantly well-known third party payment services are specialised in maintaining anti-fraud transactions. Every third party payment system is required to follow the PCI DSS(Payment Card Security Standard) specifying a set of requirements to ensure the security of credit card data online. The reason for picking Payment Express is because is widely used in New Zealand and most of our targeted customers in the same country so transaction error handling is easier comparing to other big third party payment systems like PayPal.

Chapter 5
Future work and hypothetical issue

In this section, and the potential features it can incorporate to increase efficiency, accuracy and security.

5.1 Autocheck for photos

Current method to verify whether the customer's uploaded photo is valid to be made into a proper New Zealand passport photo that passes the government's online checking system and officials is by manually checking the photo and the hope of the customers follow the guidelines specified in the image requirement. If there is a way to implement an automated checking system for the photos the user uploads, then the efficiency of the service will improve. From some research papers studied, it may be possible to implement a sensor web which is based on quick query algorithm and digital image processing (DIP) technique. DIP can be used in detecting differences in the standard image in terms of contrast level, file size and whether the person's head fits into a certain region of the image. Each one of these aspects have a standard level presented as a numeric value, when tested image is processed, the pixels will give the numeric data and is stored in a database which is compared to the standard level. If the data falls out of the specified level using some algorithm then the output will give out a not pass to the image, vice versa.
Another method is having a sampling database for the uploaded image to compare to and validate the image. The accuracy of the checking system depends on the amount of samples existing in the database. This is not a problem as the company already have over several years of customer data image stored in the database and would be feasible to use it as a check-up against the newly uploaded image. The downside of having mass sampling comparison is that the process speed takes up a long time so finding a balancing data sampling size for quality and processing time is significant.

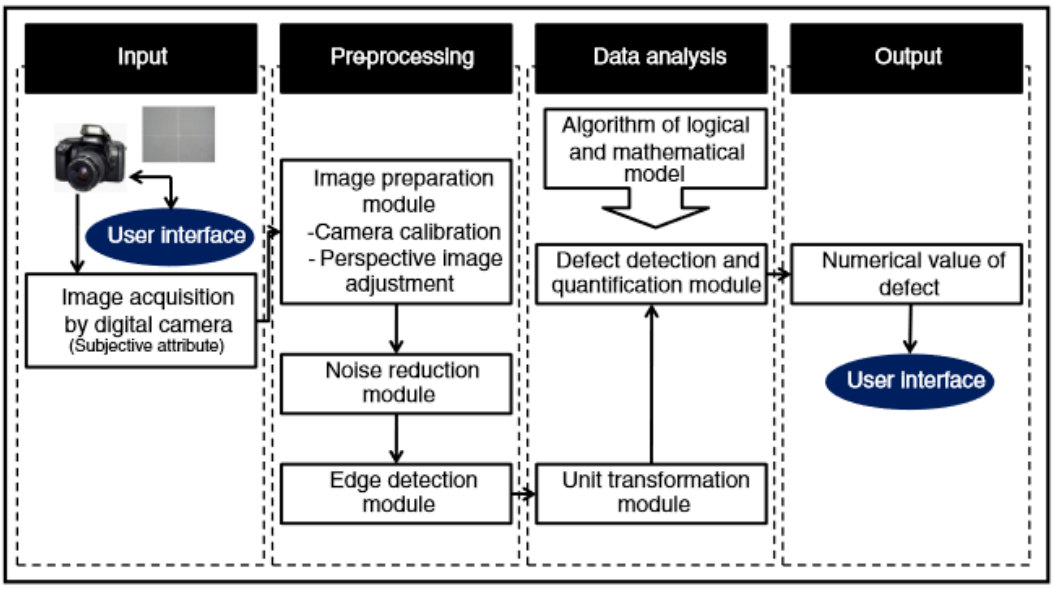


Figure. Figure Stages of defect detection and quantification system.

5.2 Encryption of image at the server side.

Consider the security of the user's uploaded image, HTTPS is able to provide a secure connection for transmitting user details across the internet to the server-side. However the problem is that there are no protection on the user image once decrypted and stored at the server-side database meaning if the server-side happen to be exploited by an attacker, it has unlimited access to all the data and no prevention of the image. Lacking management of the image subvert the wide benefits the overall website provides.

The solution is to have server-side encryption on the image when it is stored into the database, so that even if the image data is disclosed it is difficult to decrypt by the attacker. I start off by discussing ways to encrypt an image by comparing between widely used Advanced Encryption Standard (AES) and chaos-based encryption. Factors that are taken into account for comparison are working on the algorithm, computational complexity, scalability with size of the image processed and degree of protection against attacks. The encryption process of both algorithms are the same that encryption process starts off from generation a randomised key sequence that is used for encrypting the original image into cipher image. The degree of randomisation of the key sequence effects the security level protection against brute-force attack. Permutation on the cipher image is performed to eliminate correlation of two adjacent image pixels. If image pixels of regions have high correlation, attackers are capable of exploiting this characteristic and gain information about the image and possibility experience statistical attacks. By decreasing correlation of pixels, it lowers the chances of such attack and provide better security.

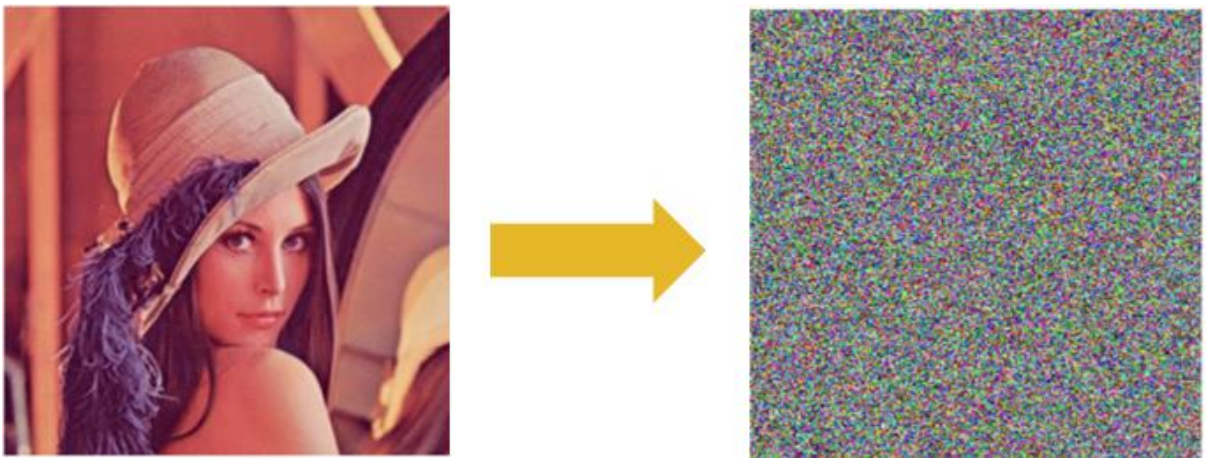


Figure. Original photo to encrypted image.

In a study of Koscina et al it proposes AES-128 has is a better option in terms of the overall factor consideration. The differential point is computation time and security level, in AES it holds a better encryption time as it is using a smaller key space mapping system to generate the randomised key sequence and because of having a smaller key space computational time for AES is reduced. Performance wise AES dominates chaos-based encryptions however it is arguable that chaos-based encryption provides a better security level with its use of logistic map that generates a broader range from the AES standard map. From the author's point of view AES's generation of randomised key sequence is sufficient to prevent brute-force attack.

Since all image requires a key to be decrypted. The problem now is how the keys should be managed for decrypting the image when it is being accessed. There are trades offs between management and security that with one encryption key sequence for decrypting all image uploads. If an attacker exploits the database and obtain the key sequence all image files will be stolen. In the case of having unique key sequence for decrypting each image upload. The management of the keys will need to be carefully organised to work out which key sequence belongs to which uploaded image.

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