



A study of using a bespoke database application over pre-packaged solutions will improve the operations of a small business.

by

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Abstract

The focus of this study is to discover and possibly prove that the use of bespoke software over pre-packaged solution within the context of small businesses can improve their operations by making small improvements such as displaying data using different formatting. Comparisons between different software packages that best meet the client's solution were carefully considered which resulted in Laravel & JavaScript. A mixture of interpretivism, deductive, action research, and interview strategies were applied to the research. The findings suggest that bespoke software can improve operations based on the way information is displayed, separating data in an optimized way. Recommendations suggest that having ample time and experience with developments will eventually result in bespoke software that can improve operations when applied correctly.

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Chapter 1 – Introduction

Client's business

The client's business offers with wall insulation extraction that is causing damp within homes. The client's current system is a mixture of paper-based documentation and digital storage using Microsoft Excel. The records contain information of customers, job history, employees, employee holidays, and job payments.

The old solution began as a temporary solution, but overtime has evolved as a sluggish process of viewing and entering data which the clients concerns suggested. Each record contains data of all aspects of personal details, housing, employees, and payments which causes issues on smaller monitors. This is causing the user confusion and interrupting the business process. The client wants a new application that solves these issues and make data more easily visible.

Project Aims & Objectives

Aims

- Plan and develop a bespoke software business solution
- Conduct a literature review on content relevant to the topic
- Determine if the solution meets the requirements of the old system
- Evaluate the success of the new system based on its usability

Objectives

- Collect and document the needs of the business in relation to the old system
- Assess which software packages and methods would be most appropriate for the development
- Design and build the system using the assessed software and methods
- Conduct interviews with employees to determine if the project was a success

Research Hypothesis

Using a bespoke database application over pre-packaged solutions will improve the operations of a small business.

Chapter 2 – Research & Review of Literature

Other business adopting similar digital processes

Tarmac Business solution

Due to the limitations that off the shelf software offers; bespoke software is often a safe choice for developing an application that will do what a business requires. Although it could be costly to develop and maintain. If the requirements have been identified well and current technologies support it, most solutions can be developed. The business “Tarmac” [\[1\]](#) which is a building materials manufacturer found themselves in need of a new system to fit their needs which included remote access, which focused on cost saving and higher efficiency with operational aspects. Their system much like the client was based on spreadsheeting software which they outlined was “cumbersome” and “time consuming” when handling data to obtain cost saving reports.

Their solution was built by “blueberry systems” [\[1\]](#) which developed a cloud-based application that mimics the functionality of the spreadsheet. Their solution allowed their staff to gain access remotely and enter proposal details along data relating to costing which can be forwarded to management and financial departments easier. A dashboard was setup which took advantage of existing data which highlights business operations not previously considered. The tools and technologies used are not highlighted in the study but further investigation into the company behind the solution suggests that they use several technologies such as “Microsoft .NET,” “SQL Server,” “SharePoint,” “Angular.js,” “Oracle,” “MySQL,” and mobile operating systems iOS and Android. [\[1\]](#)

Proveca Ltd Business solution

Proveca Ltd is a pharmaceutical company that are conducting clinical trials which involves paper-based case reporting which they noted can increase the risk of error due to the process of transcribing data from paper to a database. They assessed several existing data capturing software's for suitability but determined that they were too complex and could potentially be costly while many features were redundant. This results in them requiring bespoke software for their specific data entry requirements. Clinical studies within pharmaceutical industries are overseen by Good Clinical Practice (GCP) and thus to comply with patient confidentiality one of their requirements for the new system is diverse levels of access were needed depending on the user themselves. They also highlighted that the need for "granular data input," "assistance with final data analysis," "customer portals" and a company that has prior experience in handling sensitive medical data was required. [2]

BlackLight which is the company that produced the solution took their requirements into consideration and developed a solution that took advantage of technologies of ".NET" web portal which was hosted using "Azure" [2]. They claimed [2] that the mentioned software is flexible enough to build the content of a database while ensuring that the capturing, storing, and retrieving is done effortlessly. To ensure that compliance was met with governance regarding patient data records, the company establishes a separate SQL database to create the needed permissions for users which required diverse levels of access. User-friendliness was considered as part of the development which also included mobile and table support which futureproofs the solution. UI was created to set their users at Proveca to allow them to manage users' profiles, administrative rights, along with permissions which allows them to easily apply account to new recruits of the business.

Current tools

The literature review highlighted that many businesses including the UK government uses Excel because of how adaptable it can be with data entry and automation. If for example a business only relied on the need for financial tracking, software solutions such as QuickBooks would be more appropriate. QuickBooks is an accounting software which aims to track costs and profits accrued by the business which presents the data in useful graphs and summarisations using a dashboard. One selling point of the software is it having multiplatform support, especially with mobile. Their website outlines the types of businesses it supports "Retail, E-commerce, Construction, Professional services, and Hospitals" [3] to name a few.

There alternatives to QuickBooks such as “Xero,” “FreshBooks,” and “Wave” [\[4\]](#) which offer similar environments and features. One major benefit of using QuickBooks is their feature of third party application integrations which expands current systems of financial tracking with “Expensify” which handles “Expense Management [\[5\]](#). Adding additional functionality relating to “Time Tracking Apps” [\[5\]](#). Downfalls of the software relates to the limitation of file size and data which has often been reported of causing issues of the system being sluggish and prone to corruption. [\[6\]](#) One major concern is the limitation on the users which is heavily throttled by their subscription packages [\[7\]](#). Even when the limitations, the software appears to be focused towards smaller businesses with the number of billable users and accountant users it offers which is a limiting factor in an expansion of a business which later may need to change software if they require something more expansive.

Even though they can track financials for a business, that is but one aspect of business operations especially when it comes to the client which requires more than tracking financials but the creation and maintain of customer records and jobs.

Software more facing towards the usability that can replicate the use of Excel in terms of the client’s business process is databasing software. One of the most popular database solutions for both small and large businesses is “Oracle Database,” which “Netflix, LinkedIn, and eBay” use. [\[8\]](#) Their software is a multi-model relational database management system which come in several different editions ranging from Standard Edition One that is more suited to singular server setup. The standard edition does run closely to the level of Enterprise level but omits several higher-level functionalities such as “compression, encryption relating to backups and network, as well as offering greater CPU cores which the standard edition does not.” [\[9\]](#)

As Oracle is a DBMS (Database management system) it offers the expected functionality of a database with tables and data that generates outcomes relating to a business process such as the example of the client in creating a job record that relates to customer details, property details, employee details, and payment detail tables. Oracle also has the added benefit of supporting SQL (Structured Query Language) which is a powerful tool to pull data from a system to generate reports and queries that are important to the business process. Other benefits include backup and recovery tools which are present in many other software including Excel.

Some downfalls of the software are the complexity of creating the system to meet the needs of a client and maintaining that system over an extended period. Other than the learning curve of using the software it is difficult to highlight any major drawbacks of the software as it has been tailored towards all sizes of businesses hence the popularity it seems to have over all competing software’s such as MySQL and SQL Server. [\[10\]](#)

Pre-packaged vs bespoke software

Although bespoke software seems like the best choice for an application, the benefit of bespoke software does not entirely outweigh the negatives of pre-packaged solutions and are not always the best option to choose. Although a bespoke piece of software will cater to all the requirements, one of the major drawbacks of bespoke software is the time and cost aspect of the development, which could be out of the scope of the business.

Existing solutions

There may be packaged solutions that already exist that solve a business requirement that is low cost and easy to setup and maintain. In the case of examples given previously is Excel at one scale which acts as a very flexible spreadsheet software that can tackle many problems which is what the client wants to move away from. On the other end of the scale is something like Oracle Database which even is flexible in its use but is a Database and is often a popular choice among big technology companies such as “Bank of America” [\[11\]](#) which uses Oracle’s cloud-based ERP (enterprise resource planning) and financial applications to manage both their broker-dealer systems and ledger.[\[12\]](#)

The advantages that existing solutions such as Oracle Database being a web application is the benefit of any type of machine being able to access the system at any time and using any support web browser. They can be accessed both on personal computer hardware, using any operating system and mobile hardware if it is supported. The ability to access an application from any device and require no download provides the user with little hassle in jumping into using the application and not having to worry about keeping software up to date as updates will be maintained on the server itself and not a client’s machine. The minimal worry of system requirements is also a major benefit as the only requirement a machine would need is the ability to run a modern web browser.

There are always going to be choices available as a quick solution to a system which is often the easier method over choosing to develop something custom. In the case of many small businesses, they may not have the resources available to begin developing something purposefully made for their process.

Pre-packaged Benefits & Drawbacks

Pre-packaged is always a safe choice which always offer the benefits of trying software before purchasing, large community presence and support, tried and tested reviews that support the software’s functionality, and low initial cost. [\[13\]](#) Some key drawbacks to consider is the lack of control

and flexibility in the software which can be minimised by choosing the most appropriate software, lacking critical features, and depending on the company that developed it, and additional support available always walks the line of a benefit or drawback because the software may be old and has little support which would fall into being a drawback.

Bespoke Benefits & Drawbacks

Ultimately bespoke software is the correct choice for most businesses but is decided upon by budget, future for expansion and if the need for bespoke software functionality is required where packaged solutions fail at. The obvious benefit of using bespoke is the fact that it is purely designed for the business. Even though it may be expensive to develop it is cost effective with what you are getting and does not come with additional bloat that was paid for during development. Scalability with the business and its growth can be matched with the application whereas it may be difficult with something packaged. Depending on whether you hire a person to be a part of the team that develops the solution or going to a 3rd party, ongoing support will be an option if later down the line things need to be changed to better suit new requirements. [\[14\]](#)

Drawbacks include bespoke software may require upkeep in the future due to technologies packages needing to update to still be compatible or a vulnerability is discovered which will need to be patched to a latest version. Some prior research would have to be conducted to confirm that the new system would be fit for the business requirements. Going back and adding additional functionality after an iteration has been developed will not only cost a considerable sum of money but would take up a sizeable portion of time. [\[14\]](#)

Viable development strategies

OOP (Object Oriented Programming)

This type of programming gives hints to what it does in the name but the way it is achieved as defined by W3Schools is [\[15\]](#) “Procedural programming is about writing procedures or functions that perform operations on the data, while object-oriented programming is about creating object that contain both data and functions.” Classes is an aspect to describe data in a way of being more general, and objects classifies the data into more accurate names. For example, Class = Flower, Objects = Rose, Daisy, Lotus.

Several benefits to using OOP are encapsulation where it was previously mentioned that code can be bundled together which can be used to separate code into distinct functions. Abstraction which Code

Academy describes it as [\[16\]](#) by using classes, object types can be generalized which helps in making a program simpler. The last two benefits being inheritance which describes the process of reusing attributes and behaviours from various parts of the code which can save on space and optimise code, and polymorphism which describes many objects can be used by one class. Some popular languages that use OOP are Java, C++, C#, Python, PHP and, JavaScript to name a few. Languages like C# are multi-paradigm languages, meaning that it supports both OOP and procedural programming philosophies. [\[17\]](#) The same goes for PHP which began just supporting procedural but developed into multi-paradigm after objects was added in version 4. [\[17\]](#)

This method of programming will be used in the client system as PHP will be used in conjunction with other software packages to create a dynamic and interactive website, the reason behind the choice of PHP will be discussed in a later [section](#).

Frameworks

Frontend frameworks

These types of frameworks are important as they involve aspects of a web page that a user interacts with. Frontend technologies every time include HTML and CSS which is the main structure of a webpage and its appearance. Other technologies could include some JavaScript framework which aims to add interactivity to a webpage, can handle complex functions and introduces programmatic code which can enhance webpage functionality. [\[18\]](#)

Backend frameworks

These types of frameworks are important for most functionality an application will perform. As the software solution will be sending and receiving data to create dynamic web page content for the client, a backend framework needs to be used. One solution that can be used is PHP. Some competitors of backend technologies are PHP versus JavaScript. As PHP is more focused on server-side scripting, JavaScript is focused more on front-end development but often they are used in combination. According to clariontech [\[19\]](#) PHP dominates JavaScript when it comes to the usage it sees as a server-side language. Their data shows that overall, 79% of websites are built using PHP whereas JavaScript only accounts for 0.70% as a server-side language. [\[19\]](#)

There are several options for frameworks that takes advantage of PHP. CakePHP which is a popular web framework because it helps with user authentication, offers already existing templates, set towards larger programs or websites, and provides custom test functions which aids towards development. Some main uses for CakePHP are in e-commerce websites, one additional benefit is that

its open source, allows creation of reusable code, and no pre-configuration using MySQL is required.[\[20\]](#)

One alternative is Laravel which is more appropriate for MVC (model-viewer-controller) application development. Laravel helps in maintaining the restrictions that exist between various database objects. It provides an auto-loading facility. It does not require manual maintenance and inclusion roads.

The key differences between both frameworks are that CakePHP does require a license cost to operate whereas Laravel is free to use. Laravel works on object-oriented model which was mentioned before even though CakePHP uses a document-oriented database. Laravel is a better development choice due to Laravel being OOP, “compared to CakePHP, Laravel is a much better choice in case of data handling and backup viewpoints”[\[20\]](#) and lastly CakePHP does not offer compiler functionality where Laravel does [\[20\]](#) and lastly Laravel offers large community support.

Approaches to usability testing

The concept of usability testing a system relates to the UX (User Experience) of a system which incorporates both UI (User Interface) with functionality aspects. Usability testing can be used to evaluate the user experience of a system which could be judged against already existing standards.

The main purposes behind usability testing are to identify problems within a design or product. Using a large group of participants to test your design will hopefully reveal several issues relating to a design where a designer may have missed an essential element or did not consider the skill level of a user or make something more obvious to the user. [\[21\]](#)

Uncovering opportunities to improve is a follow-on point from problem identification where given an opportunity will let the designer improve upon a previous iteration. [\[21\]](#)

Lastly is learning about the behaviour of a target user. Assumptions can be made about certain users and designs could be applied to them but the discovery phase of allowing test users to interact with a system will hopefully produce some information that can help improve the design through certain user behavioural patterns. [\[21\]](#)

Designers may have assumptions about what is important to include in a design, but biases are going to come out where a designer will assume the knowledge a user has on the system and design something that conflicts with the instinct of a user. Nielsen Norman Group which is a main component

in studying UX design suggests that “psychology principles should be applied to predict and explain how your customers think and act” [\[22\]](#)

Psychology principles

Hick’s Law

One of the principles that could be applied to UX design is Hick’s Law [\[23\]](#) which suggests that when a user is presented with more choices, it requires them to contemplate which decision to choose. If the choices are expanded to a point where it overwhelms the user, they are more than likely not to choose any option at all. It is the responsibility of the designer to ensure that the user is supplied with a responsible number of decisions to allow the user to make an easier decision. They outline a method of applying this method [\[23\]](#) is by separating a large task or process into smaller steps for example, hiding options behind a menu.

Cognitive Load

This principle refers to the amount a user has to think to navigate a UI. This principle relates heavily to Hick’s Law where when presented with many options or information, the cognitive load is going to be high which is going to cause issues for the user and may result in the user being overwhelmed and confused which will either affect the time of completion of a task or may result in the user abandoning the task completely. Uxdesign website suggests [\[23\]](#) that “In UX Design, the most relevant types of cognitive load are intrinsic and extraneous.” Intrinsic load refers to the effort associated with a task whereas extraneous load refers to the way the content is presented to the [user](#). [\[24\]](#)

Types of Usability Testing

Methods of testing include both qualitative and quantitative usability testing methods. [\[21\]](#) Qualitative method focuses on the collection of more personal insights and situations of how participants use the software. Context and thought process behind choices made by participants is important to better understand the reasoning behind a participant’s actions. This method as mentioned by Nielsen Norman Group suggests that [\[21\]](#) “Qualitative is best used to find problems in the UX.”

Lastly are quantitative usability testing method focuses on the collection of metrics that better evaluate the UX. Whereas the previous method cared about the opinions, this method only cares about the percentage of task success and how long each task took to complete. This method is beneficial for [benchmarks](#).

Conclusion

There are numerous examples of bespoke applications being an advantage over pre-packaged solution which was highlighted in both case studies which shows that following through on development of the system benefited the overall process of the system and its users and which outlining their requirements clearly resolved most if not all issues the old system held.

Examples were given of existing pre-packaged solutions and the benefits of using a web application such as Oracle Database was highlighted as one of the main focuses of choosing a web application. Aspects such as being able to access from any machine and operating system by only requiring a web browser, no client side updating required, system requirements of a computer do not need to be considered past the ability to run a browser. Comparisons between pre-packaged and bespoke was made and determined that bespoke is the best option to go if the solution is appropriate for the user in terms of if there are no packaged solutions that meet their requirements and if the development of bespoke software is justified with a business's budget and time.

OOP was outlined as the method of development due to the application being a web-based application that takes advantage of PHP frameworks like Laravel vs CakePHP, where Laravel was seen more favourably because it uses OOP whereas CakePHP using uses a document-oriented database. Laravel is a much better choice in case of data handling and backup viewpoints”[20] and lastly CakePHP does not offer compiler functionality where Laravel does [20] and lastly Laravel offers large community support. HTML and CSS were outlined as part of being a requirement for a web application project. The last section covered aspects of usability testing and the psychology included in human action when responding to UI/UX designs. Concepts such as Hick’s Law and Cognitive load were outlined as reasons behind bad designs. Also including methods of usability testing with qualitative and quantitative testing methods and the type of information retrieved should be cleared further. These considerations need to be met when designing the client’s solution and taking into consideration the skill level of the user and how much knowledge they have of the system compared to the developer.

Chapter 3 – Methodologies

3.1 Research Methodology

3.1.1 Philosophy

Research Onion

Layer One: Interpretivism

The choice of research philosophy was narrowed down to interpretivism due to the importance it places on social and cultural factors regarding an individual. [25] It heavily focuses on the ideas and recommendations of the individual. Not only does it play into their opinions it also enables and encourages background research surrounding their ideas and thoughts which can be obtained from research papers, case studies, and relevant technology.

One other consideration for a philosophy was positivism. [25] This philosophy provides the opportunity to gain knowledge that exists outside of what is being studied in an objective way but the main downfall of why it was not chosen is the fact that it does not consider or include personal or individualistic viewpoints which this project heavily relies on the opinions and feedback of individuals.

3.1.2 Approach

Layer Two: Deductive

The beginning of the project relies heavily on performing research into an area of interest and deriving either a theory or hypothesis from which acts as a focus for the project. The deductive approach was chosen because of the fact that a hypothesis is drawn from research which in the case of this project focuses on a real client and how their problem is going to be tackled.

The main structure of the deductive approach begins with an existing theory or hypothesis. Background research and data collection and finally is analysing the found results. [26] The inductive approach was considered as an alternative way of approaching the project research but was not chosen because of how the project should be structured. Inductive in a normal instance usually ends with a theory after many research steps [27] where deductive usually begins with a theory or hypothesis and ends with a confirmation through observation or similar methods. Which fits this project having a hypothesis.

3.1.3 Strategy

Layer Three: Action Research

This layer will utilize the method of Action Research. This method is useful in identification and understanding of a problem, research methods to resolve the problem and implementing set steps to overcome the problem, at the end the process repeats itself until it is not needed. This will be used throughout the entire process of the project, especially focusing on the development aspect. [28]

3.1.4 Time Horizon

Layer four: Time Horizon (Cross Sectional)

Time Horizon Cross Sectional method was chosen because the project spans a several month period where research is collected, development, testing and reflection takes place. Regarding the type of data being collected for time horizon will be both quantitative and qualitative data. Other methods were considered like longitudinal study where it focuses on several points in time rather than one time span. [29] It did not meet the needs of the project because it focuses on incremental changes through observations which the process does not need.

3.1.5 Data Collection

The use of semi-structured interviews will be used to gather information for data collection from participants of the business. This method of data collection was chosen as it can offer open ended discussion of client feedback and is not held to one type of area of the system that may not have been discussed prior. [30]

3.1.6 Evaluation Criteria

The evaluation criteria of the project are based on the research hypothesis of if using a bespoke system over pre-packed solutions which is currently Excel can improve the operations of that business. This will be determined by feedback and discussion with the client using semi structured interviews where they will answer questions based on experience with the new system prior to the interview. The question asked can be found in the appendix.

3.1.7 Methods of Testing

The data from the semi structured interview will need to be analysed and meaning will need to be derived from it. Other than taking the comments made from the interviewee at face value a form of structure will need to be applied to break down the responses. Due to the data being qualitative, applying the method of thematic analysis on the interview data will hopefully provide a better categorization of what feedback was provided. [\[31\]](#) Other considerations for analysis were the content analysis method as they are close in how they process and understand data. Thematic analysis breaks data down into larger categories and puts its focus is more on interviews and codifying data from people. Content analysis breaking things further into categories and subcategories and has a focus more on both quantitative and qualitative data which in the case of the project will not be appropriate because it will only produce qualitative data.

3.1 Development Methodology

3.2.1 Time boxing/ Feature Driven / Extreme Programming etc.

The development methodology that is most appropriate for this type of development is the Spiral model. This model was chosen as additional changes and functionality can be added at any stage in a systematic way from continuous customer feedback, and it puts a great focus on risk management. [\[32\]](#)

3.2.2 Software

HTML & CSS

As stated in the main document, the use of both HTML & CSS is needed to design and create webpages. To be more specific a form of bootstrap CSS will be used on the project as many repositories of code being used for the project will utilize this technology. Not only that but the ease of use with UI components and interactions as well as the overall clean design it offers makes it an attractive choice compared to other alternatives such as Skeleton whereas skeleton offers a minimalist design but is not as widely used. [\[33\]](#)

JavaScript

As mentioned above the use of bootstrap will be used which is a JavaScript plugin, which will be used for cross browser compatibility, interactive UI elements, responsive design and elements such as drop-down menus and animations. [\[34\]](#)

PHP

The backend server-side technology being used will be Laravel. This software provides a strong environment for a web application project which includes aspects that the client needs such as authentication and authorization systems with login to help keep information secure, security with CSRF tokens, protecting the application from security risks such as SQL injections. [35]

MySQL (PHPMYADMIN)

The data store of the project will be MySQL paired with the Laravel technology. As suggested in their documentation [36] using MySQL makes running queries simple which is what we need for the project. The requirements of the project are at most reading and writing data to and from the database with tables and login credentials which MySQL does support with the use of table creation.

3.2.3 Hardware

The only hardware required for the project is a computer running Windows 10. This is to host the development of the project which will be hosted from the machine for demonstration purposes.

Chapter 4 – Design & Implementation

4.1 Design

4.1.1 Initial client requirements

The client wanted a system that replicates similar functionality of entering data like what is offered in Microsoft Excel but in a different visual format that is easier to read and understand. They emphasized great importance on how the data should be visually represented and that the old system compacts the data in a way where it is hard to visually understand from a short-term perspective because the entire record is not visible using a stand computer monitor, the user needs to scroll across to see the information which makes things difficult for the client to understand context of records.

The client also put great importance on the new system must be used from multiple machines and from multiple locations with little to no setup. An understanding was met that a browser-based system would best be appropriate for their requirements due to the zero setup and maintenance required and the new system having multiple browser support.

4.1.2 Database overview

Main data tables

The image below shows each of the tables that store information relating a different data store of the business. The user will be able to interface with these records by entering data into a form which saves data to a MYSQL database which these tables are a part. For this iteration of the system, each data table is isolated from each other with no visible relationships.

The client requested they wanted a way of viewing data in an easier format. The data types from the old system was broken down into these tables instead of one big record. With this separation of data into different tables it hopefully solves the problem of all record data being packed into one line. Relationships between the tables were considered but ultimately for this iteration was not used as to allow more user control over data entered without the reliance of other tables.

The image displays four MySQL database tables in a grid layout. Each table is shown with its name at the top and its columns with data types below. The tables are: mortgages, jobs, jobstats, and employees.

mortgages
id: int(10) unsigned
ref: varchar(10)
name: varchar(10)
module: varchar(10)
email: varchar(10)
street: varchar(10)
town: varchar(10)
postcode: varchar(10)
property_type: varchar(10)
valuation_type: varchar(10)
value: varchar(10)
acknowled: varchar(10)
notes: varchar(10)

jobs
id: int(10) unsigned
ref: varchar(10)
customer_name: varchar(10)
employment: varchar(10)
start_date: date
end_date: date
payment_type: varchar(10)
cost: double(8,2)
deposit: double(8,2)
balance: double(8,2)
total_paid: double(8,2)
paid_foreach: []
job_status: string(1)

jobstats
id: int(10) unsigned
name: varchar(10)
start_date: date
end_date: date

employees
id: int(10) unsigned
name: varchar(10)
module: varchar(10)
email: varchar(10)
job_id: varchar(10)
notes: varchar(10)

Permissions data tables

Below displays tables relating to the permissions and roles given to user accounts. These tables were generated from an administration starter kit for [Laravel](#). Role and permissions management core logic was introduced into Laravel in version 5.1.11 [\[37\]](#) but this project is taking advantage of this feature in Laravel 8.



Users' data table

Below contains all data that relates to user accounts such as email, password, and timestamps. Also includes reference to a token that authenticates requests made to the application. The personal access token table issues store data relating to tokens issued to user for access to the system.

users id : bigint(20) unsigned name : varchar(191) email : varchar(191) email_verified_at : timestamp password : varchar(191) remember_token : varchar(100) created_at : timestamp updated_at : timestamp	activations email : varchar(191) token : varchar(191) used : tinyint(1) created_at : timestamp	personal_access_tokens id : bigint(20) unsigned tokenable_type : varchar(191) tokenable_id : bigint(20) unsigned name : varchar(191) token : varchar(64) abilities : text last_used_at : timestamp created_at : timestamp updated_at : timestamp
admin_activations email : varchar(191) token : varchar(191) used : tinyint(1) created_at : timestamp		

Password reset tables

Both tables below store data regarding unique tokens generated and email fields which are required for password reset requests.

admin_password_resets email : varchar(191) token : varchar(191) created_at : timestamp	password_resets email : varchar(191) token : varchar(191) created_at : timestamp
--	--

Media Table

The media table holds data regarding image file types uploaded to the system for example the profile pictures that are displayed and stored after uploading.

Migrations table

The migrations table below is a common practice within Laravel which allows the creation of tables within the database. It allows for the modification of existing database schema.

```

id : int(10) unsigned
migration : varchar(191)
batch : int(11)

```

Failed jobs table

Like the migrations table, the failed jobs table is a part of Laravel to its core design. This is used to store any errors made by the system after many attempts of a failed job.

```
# connect to host  
conn = telnetlib.Telnet(  
    host, port,  
    timeout=timeout)
```

Translations table

The package that was used to help with the Laravel development generated a table that allows the translation of certain text within the application. The table below deals with this translation.

- ☒ `translations`
- ☐ `id: int(10) unsigned`
- ☐ `translation: varchar(255)`
- ☐ `original: varchar(100)`
- ☐ `is_yes: bool`
- ☐ `is_not_in_langue`
- ☐ `is_in_data: longtext`
- ☐ `created_at: timestamp`
- ☐ `updated_at: timestamp`
- ☐ `deleted_at: timestamp`

Data Dictionaries

Customers

The table's primary key (id) identifies each customer record as unique. This table stores general information about a customer's personal and property details which relates to a job in a different table.

Name	Type	Nullable	Default	Extra
id	int (10)	No	None	AUTO_INCREMENT
ref	varchar (191)	Yes	NULL	
name	varchar (191)	Yes	NULL	
mobile	varchar (191)	Yes	NULL	
email	varchar (191)	Yes	NULL	
street	varchar (191)	Yes	NULL	
town	varchar (191)	Yes	NULL	
postcode	varchar (191)	Yes	NULL	
property_type	varchar (191)	Yes	NULL	
insulation_type	varchar (191)	Yes	NULL	
walls	varchar (191)	Yes	NULL	
additions	varchar (191)	Yes	NULL	
notes	varchar (191)	Yes	NULL	

Jobs

The table's primary key (id) identifies each job record as unique; this table stores general information about a job from which customer it is, which employees are present, payment amounts and the dates the job takes place.

Name	Type	Nullable	Default	Extra
id	int (10)	No	None	AUTO_INCREMENT
ref	varchar (191)	Yes	NULL	
customer_name	varchar (191)	Yes	NULL	
Employees	varchar (191)	Yes	NULL	
start_date	date	Yes	NULL	
end_date	date	Yes	NULL	
payment_type	varchar (191)	Yes	NULL	
cost	double (8,2)	Yes	NULL	
deposit	double (8,2)	Yes	NULL	
balance	double (8,2)	Yes	NULL	
total_paid	double (8,2)	Yes	NULL	
paid	tinyint (1)	No	0	
job_status	tinyint (1)	No	0	

Holidays

The table's primary key (id) identifies each holiday record as unique; this table stores information recording when employees are booked off work which identifies them by their name.

Name	Type	Nullable	Default	Extra
id	int (10)	No	None	AUTO_INCREMENT
name	varchar (191)	Yes	NULL	
start_date	date	Yes	NULL	
end_date	date	Yes	NULL	

Employees

The table below is the employee's data table. The table's primary key (id) identifies each employee record as unique; this table stores general information like the customer table, but this is information recording the employees.

Name	Type	Nullable	Default	Extra
id	int (10)	No	None	AUTO_INCREMENT
name	varchar (191)	Yes	NULL	
mobile	varchar (191)	Yes	NULL	
email	varchar (191)	Yes	NULL	
job_title	varchar (191)	Yes	NULL	
notes	varchar (191)	Yes	NULL	

Development log

The frontend package used as part of the development in conjunction with other technologies is 'Craftable' [38]. This front end is a strong starting point in terms of what it offers with CRUD generation which allows quick module integration, login systems which are part of Laravel, and packages involving permissions and admin authentication. [39] What it offers supports what the client requested with the requirements of a secure system to hold data regarding the business.

Setup & Table generation

Craftable can be added to existing projects or can be used as a starting point for a new project. Following the process of installation, it was applied to a pre-existing project that was setup prior following the Laravel documentation. [40] The installation follows a set of commands which are displayed below.

```
composer require brackets/craftable
composer require --dev brackets/admin-generator
# here, make sure .env variables are correctly configured
php artisan craftable:install
npm install && npm run dev
```

[38]

The Craftable frontend as mentioned generates an environment already included with features that can be found within Laravel documentation such as the login system which covers Routing, Views, and Authentication. [39] The system uses this functionality in conjunction with CoreUI, which is a template & UI component library which boasts responsive cross browser and mobile views. [39] This provides enough visual clarity and responsive design for the client to be deemed appropriate for use.

After setting up the environment, development of tables can begin. The data names and data types of content was previously established in the planning phase. Tables need to be setup for migration to the database which can be done using the following command:

```
$ php artisan make:migration [name] --create [name]
```

Doing this generates migration files for this specific table namespace. The files can be found here: “Database -> Migrations”.

The files generated then need to be changed to suit the needs of the data. The image below shows an example of the ‘holidays’ migration file.

```
public function up()
{
    Schema::create('holidays', function (Blueprint $table) {
        $table->increments('id');
        $table->string('name')->nullable();
        $table->date('start_date')->nullable();
        $table->date('end_date')->nullable();
    });
}
```

Once the data names, data types, and nullable are set, the migration can be done which pushes this to the database. This is done using the standard ‘php artisan migrate’ command. The table exists within the database but not the application.

The command “\$ php artisan admin:generate [name]” does several things to generate the necessary files for the table to be usable within the application. Doing this appends this holidays model to the model factory. The code added is shown below.

```
/** @var \Illuminate\Database\Eloquent\Factory $factory */
$factory->define(App\Models\Holiday::class, static function (Faker\Generator $faker) {
    return [
        'name' => $faker->firstName(),
        'start_date' => $faker->date(),
        'end_date' => $faker->date(),
    ];
});
```

The model factory within Laravel is a framework that helps with analytics that combines multiple software products which cover features displayed below:

- Version control of models
- Automated testing
- Input data chaos
- Auditability
- Monitoring
- Performance
- Scraping

[41]

This generates a controller for the holidays table which is in “Http -> Controllers -> Admin”.

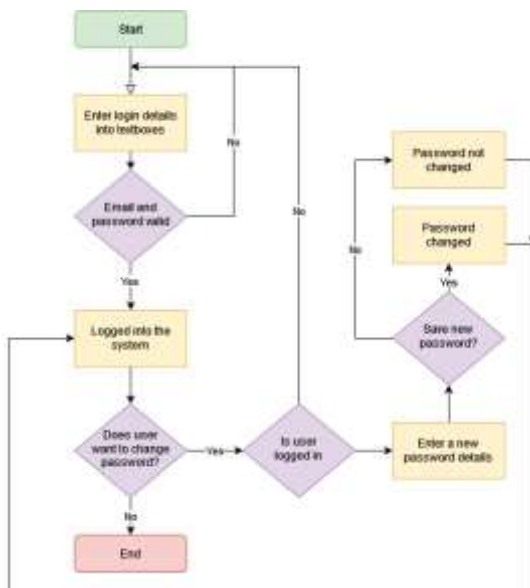
The controller is used for request handling for the class. The Holidays Controller is responsible for handling incoming requests by the user for storing, creating, updating, and deleting records relating to that table, hence the name CRUD. Following that the sidebar of the application is updated to include navigation for that table. Next a request folder is generated with files for authorisation and validation to ensure that a user can destroy, store or update records.

The routes files are updated to cater to the new tables and its navigation. The associated blade files are generated for the holidays page which are create, edit, and index. Along with the form elements blade file that allow for record views. This is responsible for creating the structure and responses by the system to generate layouts. Lastly the “npm run dev” command re compiles all assets that were generated. This command pushes all the changes made and should display the newly generated holiday page. The same process is applied to the remaining tables.

System function flow diagrams

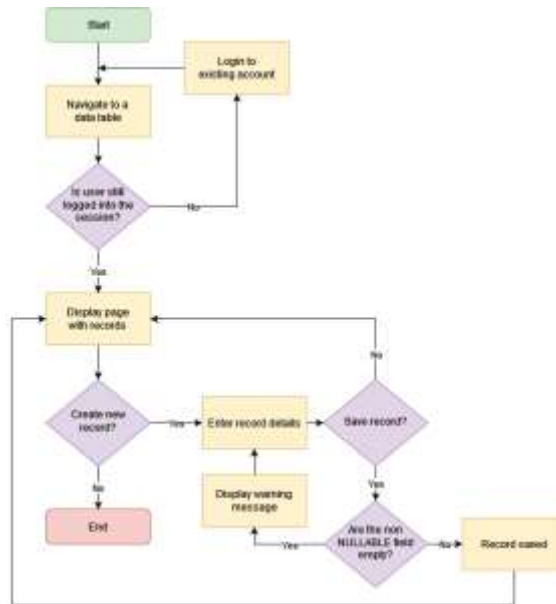
Login and password change

Below is a flow diagram showing the combined process of user login and changing the password to the account.



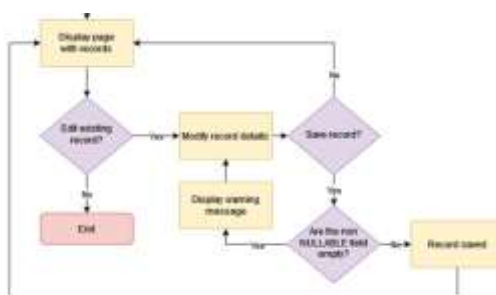
Create new record

The diagram below follows the process of navigating to a table and creating a new record. Whether the details meet the validation of each record determines if the user can save the record or get prompted that the non-NULLABLE field is required. This contains two small loops to check whether if the user is still logged into the active session and if the user would like to save the new record.



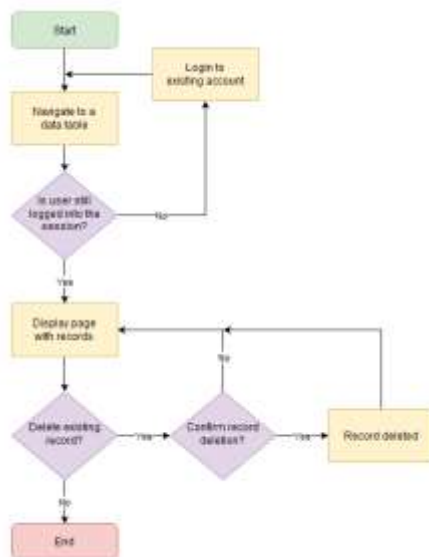
Existing record edit

This diagram displays the process of editing an existing record. The login process has not been displayed here but is still included as seen from the previous process diagram.



Existing record deletion

The below diagram shows the process of deleting an existing record. Again, the process is like previous diagrams but requires a confirmation decision after a record delete request.



Website Site Map

Below is a site map of the current design.



Implementation

4.2.1 Problems and Successes

Successes & failed iterations of the project

The project has seen several failed iterations. The first iteration used a front end Laravel stack Jetstream that includes authentication, registration, and profile management tools. [42] Jetstream offers two stack options Inertia (Vue) and Livewire (Blade), Inertia was used as a first attempt.

This successfully generated a blank template environment for development. A CRUD generation GitHub repository was used in conjunction to create data tables views and functionality. [43] This worked successfully but there was a technology conflict between JetStream and the CRUD generated files due to them using two different stacks. Attempting to fix this oversight set back the development time as the two file types were mixed into the project folder.

A fresh attempt using the same stack option as the CRUD generation was used instead which proved successful until further inspection. The “app.blade.php” was throwing an error suggesting in the \$slot component not being used correctly. Fixes online suggested changing it with ‘@yield(‘content’)', although this fixed the webpage loading, the page was missing many of the key views.

Copies of the database were made to test out major changes in the code, but a corruption issue resulted in the original copies of project files and database unusable. After name changing the database and attempting to revert it resulted in the error code #1025. This code claims that the tables do not exist, attempts were made to rectify the error but failed.

Second iteration

Further research online for alternative front-end packages that better support the requirements was done. Frontend package ‘Craftable’ was used in place of JetStream that exceeds the feature set. Development of this proved to be successful but at some stages mistakes occurred. As with the requirements online for the package, the PHP version installed on the machine did not match the requirement of 7.4 which resulted in breaking during the installation. A fresh version of XAMPP had to be installed with a version that matches the requirements.

The rest of the development did not run into any major errors apart from not correctly following naming conventions of data names which should not have included underscores and not spaces, doing this broke the migration of the data tables to the database.

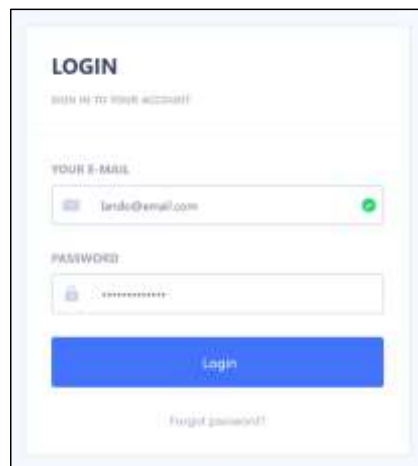
Website Page Views

Login Page

The login page below uses the frontend package 'Craftable'. The design they offer is "clear and concise" according to the clients feedback.

Users who are not logged in will see this page. An email and password are required to login. New account creation is not offered within this view but instead done through administrative accounts as to not allow access to unauthorised users. Checks are made throughout the application to ensure that information entered is valid such as the email field which checks for a legitimate formatting. Authentication package being used for the login is based on the standard package offered by Laravel.

[\[44\]](#)



LOGIN
SIGN IN TO YOUR ACCOUNT

YOUR E-MAIL
tando@email.com

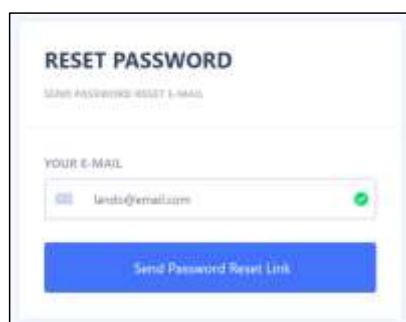
PASSWORD
.....

Login

[Forgot password?](#)

Reset Password Page

This page directly links from the login page. This follows the same design principles as the login page which are ensuring consistency with being clear and concise with what information to offer the user as suggested by Adobe web design principles. [\[45\]](#) This page is currently a placeholder for future development with attaching an SMTP (Simple Mail Transfer Protocol) server for email password resets.

A screenshot of a web form titled "RESET PASSWORD". Below the title is a subtitle "SEND PASSWORD RESET E-MAIL". The form has a section labeled "YOUR E-MAIL" containing a text input field with the email address "lando@gmail.com" and a green checkmark icon to its right. Below the input field is a blue button with the text "Send Password Reset Link".

RESET PASSWORD

SEND PASSWORD RESET E-MAIL

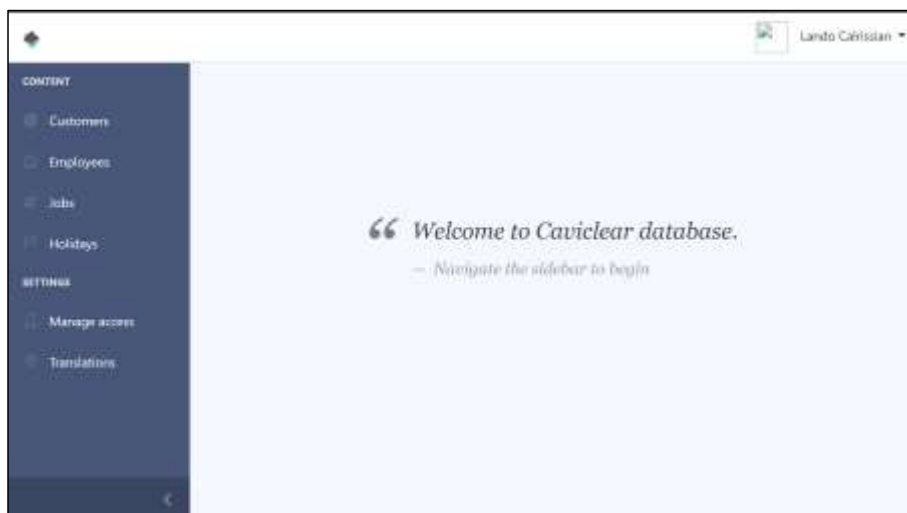
YOUR E-MAIL

lando@gmail.com

Send Password Reset Link

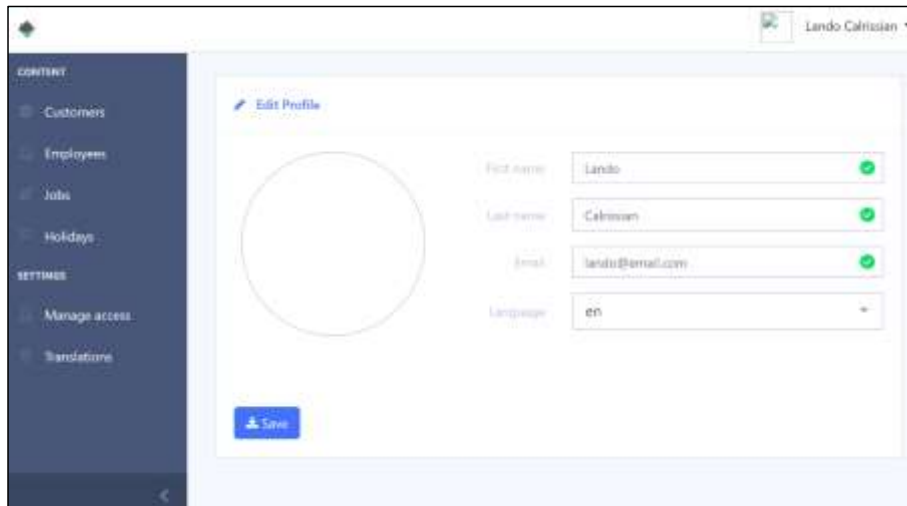
Home Page

Following a successful login from the user, they will be presented with this screen. This layout design is consistent throughout the rest of the screenshots but with additions of extra views filling the white space such as tables containing records relevant to the page.



Profile General Details Page

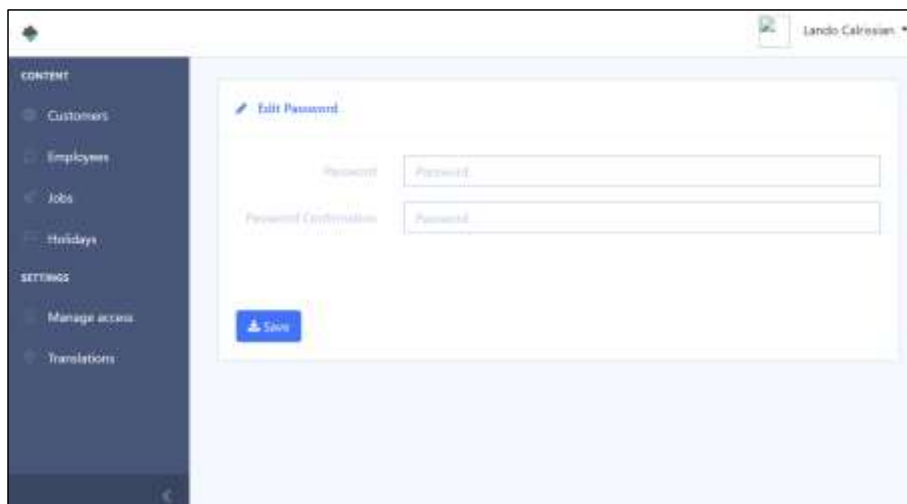
This is accessed through the menu at the top menu. This offers customization of the user account.



The screenshot shows the 'Edit Profile' page of a web application. On the left is a dark blue sidebar with a 'CONTENT' section containing 'Customers', 'Employees', 'Jobs', and 'Holidays', and a 'SETTINGS' section containing 'Manage access' and 'Translations'. The 'Jobs' item is selected. The main content area has a light blue header with a user profile icon and the name 'Lando Calrissian'. Below this is a white box titled 'Edit Profile' with a pencil icon. Inside the box, there is a circular placeholder for a profile picture on the left. To the right are four input fields: 'First name' with the value 'Lando', 'Last name' with 'Calrissian', 'Email' with 'lando@email.com', and 'Language' with a dropdown menu showing 'en'. Each of the first three fields has a green checkmark icon to its right. At the bottom left of the white box is a blue 'Save' button with a white floppy disk icon.

Profile Password Page

This is accessed through the top right menu. This offers password changes for the logged in account.



The screenshot shows the 'Edit Password' page of the same web application. The sidebar is identical to the previous page, with 'Jobs' selected. The main content area has a light blue header with the user profile icon and name 'Lando Calrissian'. Below this is a white box titled 'Edit Password' with a pencil icon. Inside the box, there are two input fields: 'Password' and 'Password Confirmation', both with the placeholder text 'Password'. At the bottom left of the white box is a blue 'Save' button with a white floppy disk icon.

Customers table page

This displays records contained in the customers table. This design is consistent across the other table views as to promote consistent visual design as alluded to earlier by Adobe's principles [45]. Filtering and searching options are available, also limiting the number of records per view. New records can be added using the 'New Customer' button highlighted in blue. Each record contains controls to edit and delete that record.

#	ID	Ref	Name	Mobile	Email	Street	Town	Postcode	Property type	Insulation type	Walls	Additions	Notes
1	807601		James Davis	0987675341	james.davis@gmail.com	4040 Jacobson Drive	Cardiff	SA11 1BB	Garage	Brick	2	None	None
2	807602		Emily Kennedy	0986607567	emily@gmail.com	1 New Street	Merthyr	AB22 2JJ	Detached	Brick	6	Extension	Difficult access

Employees Table Page

This table view handles the Employee records which are also stored in the MYSQL database.

#	ID	Name	Mobile	Email	Job title	Notes
1		Jeff Williams	0123456789	jeffwilliams@email.com	Team Lead	Page 2 of 100/100
2		James	0123456789	james@email.com	person	no

Jobs Table Page

The data types 'Paid', and Job Status' are Boolean values which suggests to the user that in the context of if a customer has paid for a job, the value of '1' suggests that they have paid the invoice, the same applied for 'job status'.

Job ID	Job name	Employee	Start date	End date	Payment type	Cost	Budget	Balance	Total paid	Paid	Job status
1	Job 1	John Thomas	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
2	Job 2	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
3	Job 3	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
4	Job 4	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
5	Job 5	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
6	Job 6	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
7	Job 7	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
8	Job 8	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
9	Job 9	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
10	Job 10	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
11	Job 11	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
12	Job 12	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
13	Job 13	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
14	Job 14	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1
15	Job 15	William Payne	2022-01-01	2022-01-01	Job	1000	1000	0	0	1	1

Holidays Table Page

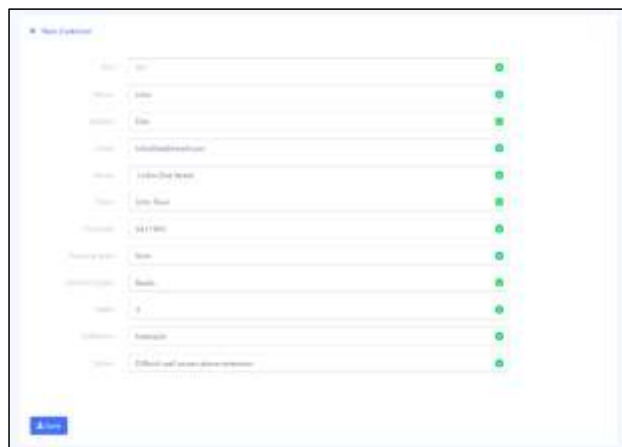
Below stores the holidays records for employees.



ID	Name	Start date	End date
1	John	2023-01-01	2023-01-01
2	John	2023-01-01	2023-01-01
3	John	2023-01-01	2023-01-01
4	John	2023-01-01	2023-01-01

Customer Record Page

Each table that contains information about the business will generate this type of view to enter data into a record associated with that table. This view is consistent between all record pages.



Name		☐
Address		☐
Email		☐
Phone		☐
Website		☐
City		☐
State		☐
Zip		☐
Country		☐
Is a customer	☐	☐

Employee Record Page

The below image is of Employee records.

A screenshot of the 'New Employee' form. The form contains the following fields and values:

Field	Value	Status
Name	John Doe	✓
ID	0123456789	✓
Email	john.doe@company.com	✓
Title	Site Manager	✓
Salary	Payment per day is \$100	✓

A blue 'Save' button is located at the bottom left of the form.

Job Record Page

The below image is of Job records.

A screenshot of the 'New Job' form. The form contains the following fields and values:

Field	Value	Status
Job	0001	✓
Department name	John Doe	✓
Location	John Doe	✓
Start date	01/01/2022	✓
End date	01/01/2022	✓
Department name	John Doe	✓
Job	0001	✓
Department	0001	✓
Location	0001	✓
Job	0001	✓

A blue 'Save' button is located at the bottom left of the form.

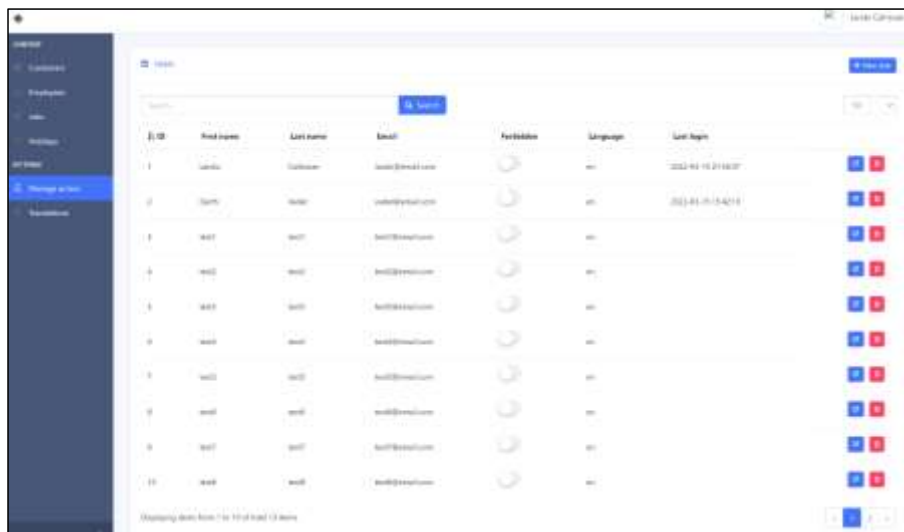
Holiday Record Page

The below image is of Job records.



Manage Access Page

This is for managing existing user accounts that have been created. This page is only viewable by accounts which have the role of 'Administrator'. This is done for security reasons to prevent tampering with account details by unauthorised users.



ID	First Name	Last Name	Email	Permissions	Language	Last Login
1	John	Doe	john.doe@company.com		en	2020-01-01 10:10:10
2	Jane	Doe	jane.doe@company.com		en	2020-01-01 10:10:10
3	John	Doe	john.doe@company.com		en	
4	John	Doe	john.doe@company.com		en	
5	John	Doe	john.doe@company.com		en	
6	John	Doe	john.doe@company.com		en	
7	John	Doe	john.doe@company.com		en	
8	John	Doe	john.doe@company.com		en	
9	John	Doe	john.doe@company.com		en	
10	John	Doe	john.doe@company.com		en	

Manage Access Record Page

This is responsible for displaying information of a user account. This view is separate from the user account details of previous screenshots as this view can displays account which are not currently logged in.

[illegible]

Translations Page

This page allows for translations of the content using imported packages. [46] The language displayed is based on the user's settings.

[illegible]

4.2.3 User Acceptance Testing

The new system required some form of testing to ensure that each aspect of the system works as intended. The user acceptance testing method has been chosen to test each area of the website to ensure that the functionality works as intended which has been included in the appendices.

Chapter 5 – Evaluation

The focus of this project was a discovery process using a hypothesis. Looking back at the aims and objectives of the project gives us a better understanding of how the project was planned out if those items were met or not.

Aim 1 & 2

First aim was to “plan and develop a bespoke software business solution”. Based on the final solution a solution was made for the client which tailors to their needs as suggested from information gathered from the interviews. Their main needs were a solution separate from Excel which displays data into an easier format and provide some layer of security to protect data. Many steps were taken during early planning to tailor the solution to the client, this was achieved through meetings with the client to obtain requirements and suggestions, follow up meetings were established to confirm designs and features. Second aim was to conduct a literature review which was achieved in previous sections which involved investigation and research into areas concerning the hypothesis and surrounding topics.

Aim 3

Third aim was to determine if the solution meets the requirements of the old system. As covered before, regular meetings were had with the client to establish requirements for the new system. functionality from the old system was derived and implemented into the new solution. Later testing was done with the client and a follow up interview was held which covered questions concerning aspects of missing functionality, user experience, and if their expectations were met. Responses from the client suggested that their expectations were exceeded with what the solution offers in terms of searching and modifying records. They described the visual appearance as “clear and concise”. A question of “if they found any aspects confusing or frustrating” was posed. Their response was “no”, but they highlighted that their first confusion on where the function was to add a new record, but they claimed that that was down to their inexperience with the system. Ultimately as question was asked “if they would use this solution in its current state with the business”, they response was “definitely”. This highlights that the user requirements were met, and the project succeeded in planning and implementing a business solution for the client and in fact that it did meet the requirements enough where they are willing to use it.

Aim 4

The last aim of the project was to “evaluate the success of the system based on its usability”. This was achieved through user acceptance testing, and sessions with the client for testing and feedback which

suggests that in the eyes of the client the system works for them from a usability standpoint. Tests were set out to test the functionality of the system which is outlined in the appendix.

The objectives of the project were to “collect and document the needs of the business in relation to the old system” which was achieved as outlined in ‘Aim 3’ sectioned where this was achieved through regular meetings.

Objective two regarding assessing which software packages and methods most appropriate for the development was achieved through online research determining which methods were most appropriate based on the requirements of the client which resulted in it being a combination of front-end technologies such as Craftable and Laravel in combination with MYSQL to store data. This seemed like the most appropriate solution based on the requirement of it being a browser-based application.

The last objective was to use everything previously researched and assessed and apply that knowledge in the development of a bespoke application which was achieved and documented throughout this document.

To summarise, the hypothesis was to discover whether business operations can be improved with bespoke software. Basing the main concerns of the client with the old system was causing troubles with viewability of records. The poor visibility caused issues of daily business operations with the limited view of records. This new solution changes the way in which the client can view records in a more understandable manner. Based on this change and the feedback provided by the client the daily operations of the business will be enhanced using this new view of data and with the added benefit of extra search and filtering functions to find records at a faster rate.

If a second chance at going through the process of developing a solution, the differences that could be made would be adding further functionality to the system in form of file storage relating to customer jobs. Property photos for customers can be uploaded and retrieved using the same system which could again enhance the operation of the business through having a central and easy to use section for accessing photos.

Chapter 6 – Conclusions and Recommendations

6.1 Conclusions

The literature review stage of the project involves the discovery phase of related content that is relevant to the hypothesis. The case studies looked at established support for the hypothesis where previous businesses that aimed to enhance their operations by transferring to a bespoke solution confirmed that by doing so, if done right would enhance their operations by having software that tailors to their needs. The feedback from the client in the final stage of interviews supports the evidence that the case study provided where if done cautiously and correctly, custom software can and does enhance the operations of a smaller business. The methodologies used were interpretivism with a deductive approach where this was applied throughout the projects investigation especially listening to the needs and requirements of the client and both background research into topics relating to the hypothesis which resulted in the discovery of case studies. Action research method was applied throughout development to overcome hurdles especially focusing on the development stage with the failed iteration and that push to discover more appropriate materials online to finalise the software solution which resulted in being a combination of HTML, JavaScript and PHP technologies which was outlined in the software assessed for development.

The evaluation put forward comparisons of the proposed requirements against the final solution and put great importance on the requirements being met with reference to the client's feedback from interviews which was received positively. This positive feedback does suggest that the operations of a smaller business can be enhanced using bespoke software which was the focus of this study to begin with.

Further avenues of research could be implementing a new solution using the same software that the client used for many years prior. Perhaps this research could have discovered whether the possibly of enhancing the business using the same technology could be met. The current knowledge that the client had when setting up their solution may have been limited and that resulted in their old system not meeting their needs due to that knowledge. An investigate in what enhancements can a business receives through overhauling their old system with the same software but with greater understanding of the technology.

6.2 Recommendations

Recommendations to make in this project would be to do further practice and research into how Laravel functions as a technology. Having a greater understanding of the software before any development begun would have directed the development down a much easier path.

Chapter 7 – Reflection

Things to take from the development process is to understand and ensure that the requirements of what is being coded should be analysed thoroughly and not be left to chance as with the setbacks of having to reinstall software. Managing the planning better would have allowed more development time with the prior context of having many setbacks during development.

In the future putting more time into planning what software is needed and ensuring all the requirements are met before diving into the development of the project.

Chapter 8 – References

[1] Case Studies [Internet]. Blueberry Systems. 2022 [cited 18 March 2022]. Available from: <https://www.blueberrysystems.co.uk/projects/case-studies/>

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Chapter 9 – Bibliography

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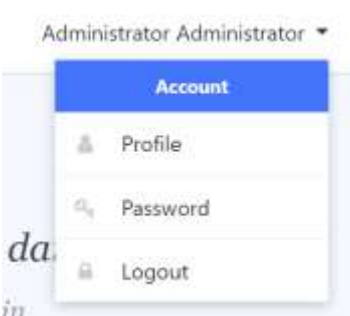
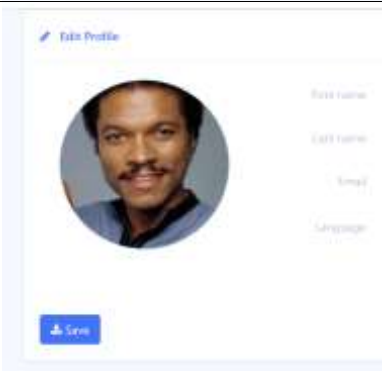
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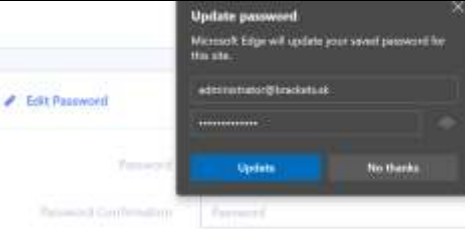
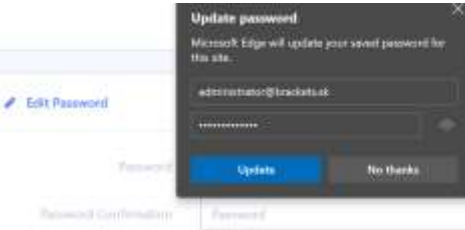
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Appendices

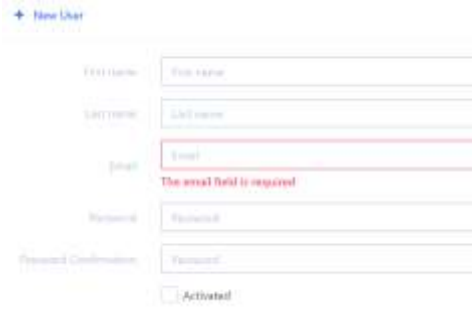
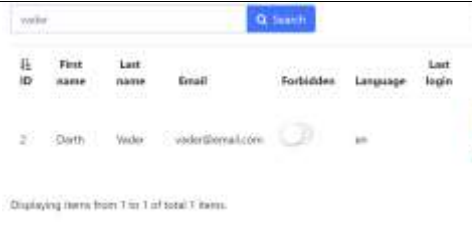
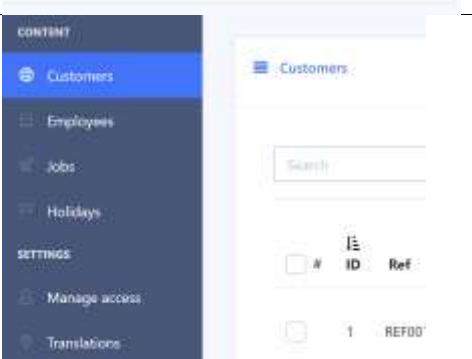
Testing the software solution is important to ensure that the functionality of the system works as intended. Below is a table with various tests that were set against the system.

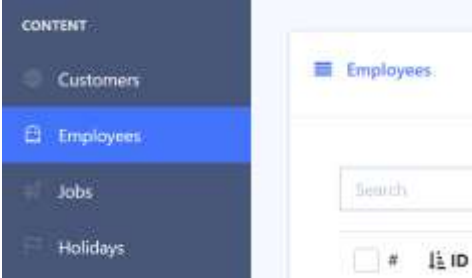
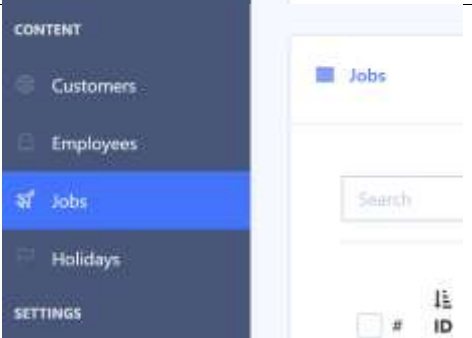
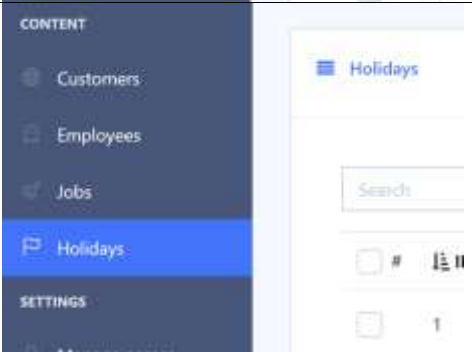
Test No	Description	Expected outcome	Test Outcome	Relevant Evidence
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1	System login using user details	Login successfully and redirect to the home page	Successfully logged in and it redirected to the home page	
2	Testing Account dropdown menu	Accessing the account login dropdown menu	Menu successfully opened upon clicking	
3	Access the profile page	Pressing the profile menu button to access the profile page	Successfully navigated to the Profile page from the dropdown menu	
4	Upload profile photo	Upload a custom profile photo local file	Successfully upload a photo stored locally on the machine	

5	Alter profile details	Change the personal details of the profile account	It successfully changed the personal details but broke the profile picture	
6	Alter account password	Successfully change the password to something different	Successfully changed the password to "password12345"	
7	Alter account password	Attempt to change the password to what it was previously, expect it to fail	Unfortunately allowed me to change the password to the previous iteration	
8	Altar account password	Test the limitations of password creation with a password that is too short	Successfully stopped the user from entering a password that is too short	

9	Altar account password	Stops the user from creating a password that does not match the confirmation	Successfully stopped the user from entering an invalid confirmation	
10	Navigation	Pressing the icon to go to the home page	Successfully navigated to the home page via the icon	
11	Navigation	Pressing the logout button and navigate to login page	Successfully logged out of the application	
12	Navigation	Navigate to the manage access page	Successfully navigated to the Manage access page	

13	Navigation	Press the new user button and navigate to the user creation	Button successfully works	
14	Account creation	Create a new account with valid details	Successfully created an account	
15	Record search	Searching for a specific record	Record successfully filtered to that search	
16	Record Filter	Limit the number of records shown	Successfully limited the records shown at once to 10	
17	Navigation	Navigate to the customer page via the side menu	Successfully navigate to the customer page	

18	Navigation	Navigate to the Employees page via the side menu	Successfully navigate to the Employees page	
19	Navigation	Navigate to the Jobs page via the side menu	Successfully navigate to the Jobs page	
20	Navigation	Navigate to the Holidays page via the side menu	Successfully navigate to the Holidays page	
21	Record creation	Create a new record with valid details	Successfully create a new record	

				Employees martin Q Search ☐ # ID Name Mobile ☐ 3 martin robbin Displaying items from 1 to 1 of total 1 items. Jobs Jane Thomas Q Search ☐ # ID Ref Customer name Employees Start date ☐ 1 SEP001 Jane Thomas Jeff 2022-03-01 Holidays Jeff Q Search ☐ # ID Name Start date ☐ 1 Jeff 2022-03-06 ☐ 3 Jeff 2022-03-24 Displaying items from 1 to 2 of total 2 items.
22	Edit record	Edit an existing record	Successfully edit an existing record	Customers john Q Search ☐ # ID Ref Name Mobile Email ☐ 21 Two John1 One JDoe@Email.com Displaying items from 1 to 1 of total 1 items.

Employees

martin

Search

☐	#	ID	Name	Mobile
☐	3		martin robin1	

Displaying items from 1 to 1 of total 1 items.

Holidays

Jeff

Search

☐	#	ID	Ref	Customer name	Employees	Start date
☐	1	REF001		Jane1 Thomas	Jeff	2022-03-03

Displaying items from 1 to 1 of total 1 items.

Holidays

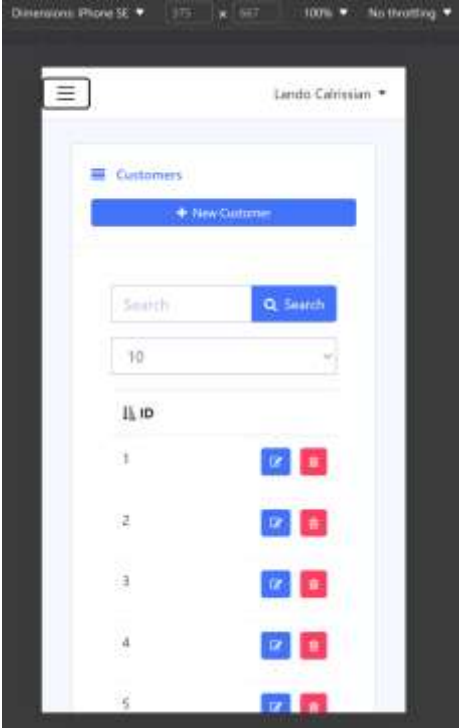
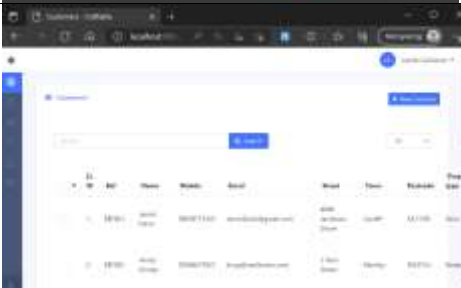
Jeff

Search

☐	#	ID	Name	Start date
☐	1		Jeff1	2022-03-06

23	Delete record	Deleted existing record	Successfully delete an existing record	Customers john Search # ID Ref Name Mobile Email Street Ti Employees martin Search # ID Name Mobile Jobs jane Search # ID Ref Customer name Employees Start date Holidays jeff Search # ID Name Start date 3 Jeff 2022-03-24 Displaying items from 1 to 1 of total 1 items.
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24	Browser compatibility	Firefox Compatibility	Successfully test Firefox compatibility	
25	Browser compatibility	Google Chrome Compatibility	Successfully test Google Chrome compatibility	
26	Browser compatibility	Edge Compatibility	Successfully test Edge compatibility	

27	Responsive	Test mobile view	Successfully test iPhone SE mobile view	
28	Responsive	Sidebar toggle check	Successfully expand and shrink sidebar	

1. What were your first impressions of the system?
2. How was your experience navigating the website?
3. What are your thoughts on the user account features of the website?
4. What are your thoughts about the visual appearance of the website?
5. What was your experience like finding, modifying, and creating new records?
6. Do you feel like the data entry in the new system meets your expectations over the older system?
7. Do you think the new system succeeds in displaying information in an easier way?
8. Were there any areas of the website confusing or frustrating?
9. Were there any features missing that you expected to be in the design?
10. What improvements do you think could be applied to a future iteration?

11. Did the new system meet your personal expectations and expectations of the business?
12. Could you see yourself using this new system over the older system?
13. Do you think this new system is at a stage where you would use it over your old system?