

A2 Software Systems Development Report

A2:2 Implementing Solutions

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Chapter One: Analysis

Background

JD Dog Care is a business based outside Newtown, run by Jon and Diane, offering dog grooming, day care, mobile grooming, walking and training. They have grown considerably and as a result are now struggling to keep up with administration due to limitations with their current paper based system.

Administrating JD Dog Care is currently an extremely difficult task, and a complete review of their administrative systems is needed to help the business cope with their current and future expansion. They currently require a system to handle the dog grooming, day care, collection, delivery and mobile grooming, dog walking and dog training, ideally with the flexibility to handle future expansion.

John and Diane acknowledge the administrative deficiencies at JD Dog Care. They wish to implement a computer based system that can be built gradually with defined elements, developed separately but linked into an overall structure. They envisage this as the best way to develop a complete system that would enable the efficient management of JD Dog Care and help correct many major issues with their current system.

Grooming: Managing appointments of different lengths, can have up to 3 simultaneous appointments in different rooms.

Day Care: Manage present staff members, some dogs have special needs, emergency bookings.

Collection, Delivery and Mobile Grooming: Pets collected at specific time, van does both collection and mobile grooming.

Dog Walking: Scheduling is important, managing length of walk and travel time.

Dog training: Done in 6 week blocks, appointments on first come first serve basis, advanced programme available.

All subsections need to be able to create invoices to send to clients.

In my project I have decided to implement the Dog Grooming subsection.

Problems with the current system

There are several problems which currently exist and must be solved to help the business cope with its growth, and reduce the strain on John and Dianne. Once these issues are solved, John and Dianne could begin to think about their future planned expansions for a Residential Holiday Facility and a Rescue Centre.

1. Managing appointments

The current system has significant issues with data redundancy, as all client information must be kept beside the appointment information in their current system. This can easily lead to mistakes where incorrect information has been recorded in some places, leading to significant confusion.

Currently, data may not be recorded due to time constraints or other mistakes. This results in frustrated clients that had booked an appointment that was not recorded.

It is often difficult for John or Dianne to figure out if an appointment can be booked at a specific time to ensure it does not clash with other appointments. Given that there are many possible lengths of time for appointments, and that clients will wish to book for many different times, it is a nearly impossible task to efficiently pack these appointments together while preventing clashes. As this takes a significant amount of time, it means they have less time to spend actually running the business and working.

Records also have the significant danger of being misplaced or completely lost, which would create significant issues with serious effects on the business.

It may also currently be difficult for staff members to find out when they need to be at appointments, as currently they must flick through every page of the diary just to find the appointments related to them.

This also makes it very difficult, if not impossible, to change staff shifts, as currently Dianne would be required to go through every page of the diary to find a specific staff member's appointments, and it would be very easy to make mistakes and miss a few that need to be rescheduled.

It would also be nearly impossible to find a specific appointment if you did not know the date it was on, as manually flicking through every page of the diary would take far too long. This prevents customers from later asking about details of their appointments unless they know what date it is on.

2. Registering clients and dogs

Clients often leave a message booking an appointment giving very little personal information, such as only the name of their dog.

As John and Dianne are usually in a hurry, they can also write down incorrect information, leading to data inconsistency. This may result in the wrong clients being invoiced or the incorrect customer being expected for a booking. This loss in data integrity could result in further administrative errors and confusion later on.

3. Reporting

Currently, the only way for John or Dianne to see how the business is running is to look through every report and invoice, as there is currently no system in place for summarising this information. This makes it harder to make key decisions like which sections of the business to prioritize, if they can afford future expansion, and see if appointment times need changed due to how often they overrun.

Lack of concurrency - Their current system does not allow easy sharing of information, as it requires documents to be physically handed to the person it is to be shared with. This also means that only one person can access each record at a time.

4. Billing/invoices

Sometimes invoices are not marked as paid when the client pays, resulting in unnecessary and irritating duplicate invoices being sent.

Clients should be prevented from booking further appointments while they have unpaid invoices, but due to current administrative issues this does not always happen.

On occasion, clients have been billed twice, or not billed at all. This

Their current paper based system is also insecure, as at risk of being stolen, and as JD Dog Care currently have no backup system in place, this would mean the loss of all their records, which could have disastrous consequences on the business.

The current system is overall far from ideal, as Jon and Dianne are currently having to spend significant time managing the administration of their business. If their current system were replaced with an electronic system, they would save significant time to spend on other aspects of their business.

User Requirements

General

1. The application should be intuitive to use
2. The application should be aesthetically pleasing
3. The application should contain no bugs

Appointment Management

1. Staff should be able to book new appointments
2. Staff should be able to edit existing appointments
3. Staff should receive clear feedback on why an appointment cannot be booked (No spare room at time, requested staff member unavailable, etc.)
4. If the requested time is unavailable, it should be easy to find the next free spot available
5. Appointments should be easy to reschedule/cancel if needed
6. Staff should be shown how long a given appointment is expected to take
7. Appointments cannot be booked when a staff member's shift does not cover that time/day
8. An appointment cannot be booked with a staff member who is on holiday
9. It should be clear who any appointment is with
10. Appointments that do not fit into staff shifts or clash with staff holidays should be clearly marked out
11. It should be easy to find a specific appointment if the user knows some details related to the appointment

Client Management

1. Allow staff to add new contacts/dogs
2. Allow staff to edit contact/dog information
3. Allow staff to search through contacts/dogs
4. Allow the user to easily see which dogs belong to each contact and vice versa

Statistics

1. See which service option is most popular
2. See how quickly business is growing
3. See how often are appointments cancelled
4. Check if specific time of day/day of week is more popular, requiring extra capacity on that day
5. Income over time
6. Check that no staff member is overworked and booked into significantly more appointments than any other staff member.
7. The user should be able to select which time period is shown for the graphs.

Shift Manager

1. View/edit/add new staff shifts
2. View/edit/add new staff holidays

Billing/Invoices

1. Support printing out invoices or directly emailing them to customers
2. Send reminders automatically to customers with unpaid invoices
3. Ensure clients with unpaid invoices cannot book further appointments
4. Check the client is charged the correct fee for their appointment choice

Methodologies

Use of methodologies is essential for the success of this project, as they help provide a structured approach to software development. It will help me establish adequate user requirements and help minimise the risk of the project not being completed before its deadline.

The Waterfall Model

As one of the first formal methodologies, its strengths and weaknesses have been well explored. It separates development into several discrete and distinct phases. As the waterfall model is a linear-sequential model, it requires completion of the current phase before moving on.

The requirements phase aims to establish the requirements and constraints of the system, which involves consultation with the client to figure out what their requirements are, including feasibility studies. This would result in a complete set of requirements for me to use at the start of the design stage, giving me a clear understanding of what is wanted. As this is the initial phase, it encourages complete analysis of the user requirements before starting to design/develop. This also gives the client a good idea of what to expect from the start, however as this project has no real client, this advantage is less relevant in this case. It can also be difficult to develop all requirements at the beginning of the project life cycle, which as this project must be completed as soon as possible due to time constraints, this may be an issue. This also means the project is fairly inflexible to changing requirements.

The design phase is a multi-stage process that helps translate the requirements into an approximate representation of the software that can be judged on quality before development begins.

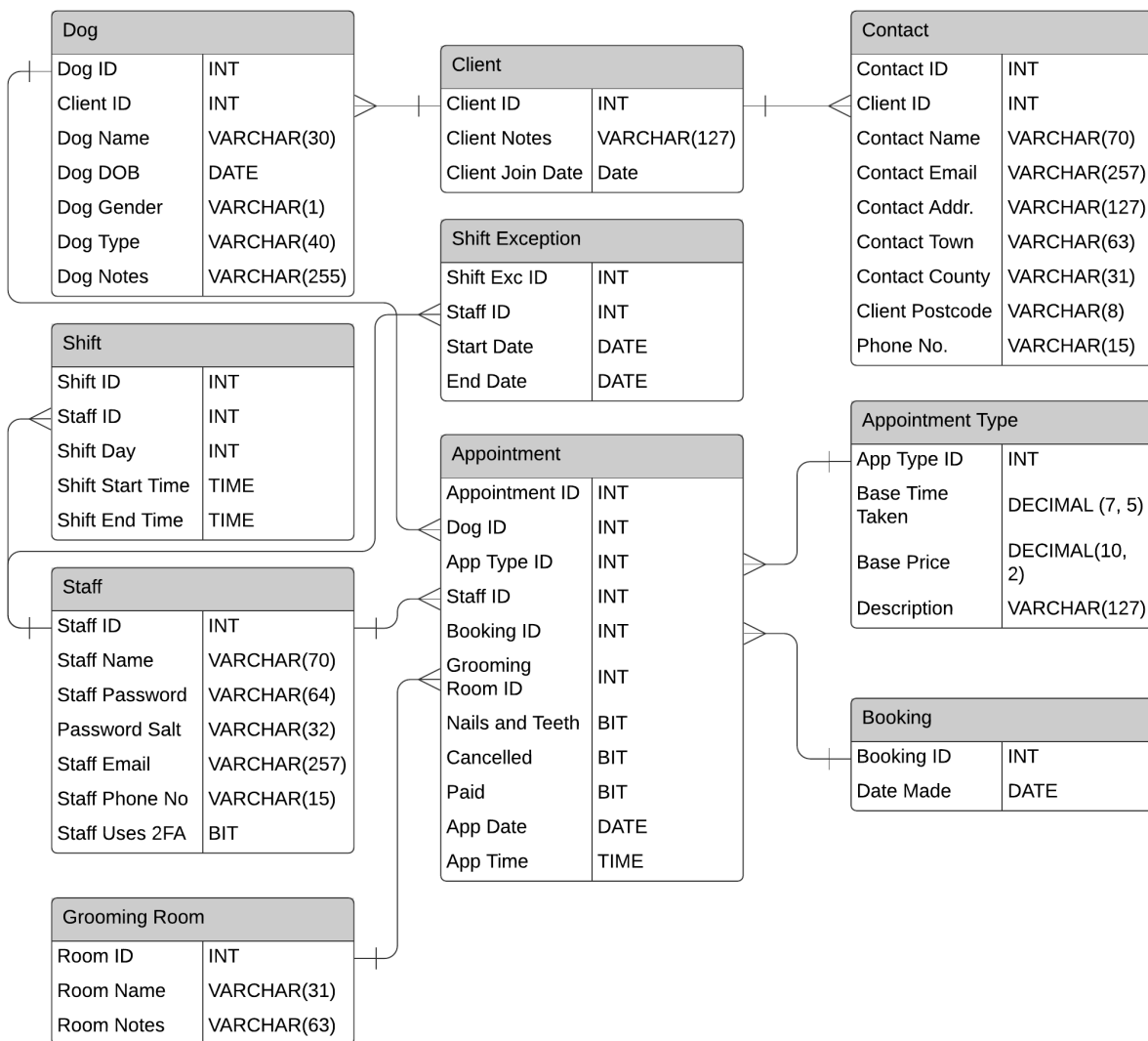
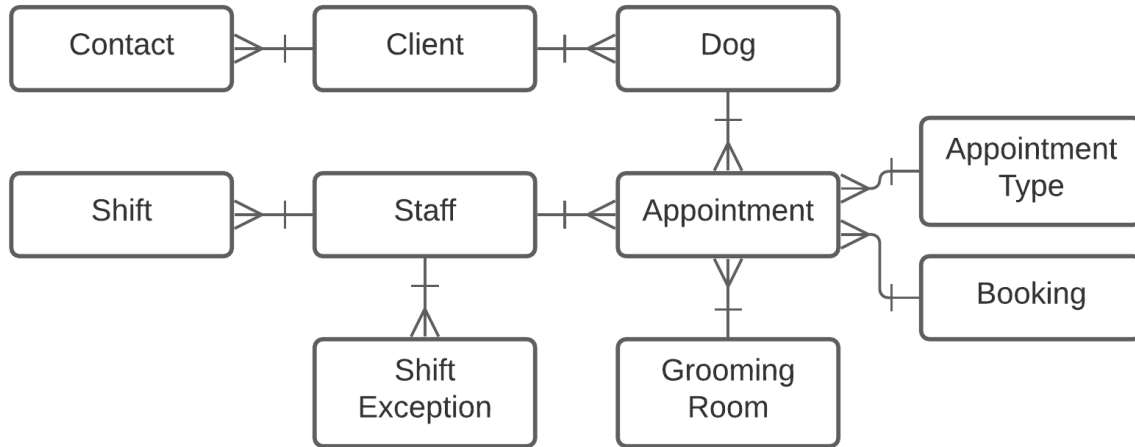
The development phase is where a program is made to try to meet the requirements and the designs from the design phase. This requires unit tests to ensure each part of the application meets its requirements. Unfortunately, this phase has no customer involvement, and as a result the finished product may not meet the client's actual needs.

The testing phase is one of the final phases, and involves testing the application as a complete product to ensure all the requirements have been met. However, by only testing the product at the end of its lifecycle, this can result in significant errors being found that may be more difficult to fix now than if they were discovered earlier. This also means that the working software is only delivered late in the life cycle, however in this case it is not a significant issue, as this project is being completed for a specific deadline.

A maintenance phase may also be involved for some projects, however for this application it is not needed.

Chapter Two: Design

ER Model



Normalisation

UNF

CLIENT(Client ID, Client Notes, Client Join Date, Contact ID, Contact Name, Contact Email, Contact Address, Contact Town, Contact County, Contact Postcode, Contact Phone No, Dog ID, Dog Name, Dog DOB, Dog Gender, Dog Type, Dog Notes, Appointment ID, Nails And Teeth, Cancelled, Paid, App Date, App Time, Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description, Booking ID, Booking Date Made, Grooming Room ID, Grooming Room Name, Grooming Room Notes, Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA, Shift ID, Shift Day, Shift Start Time, Shift End Time, Shift Exception ID, Shift Exception Start Date, Shift Exception End Date)

1NF

Removing repeating groups

DOG and CONTACT are both repeating groups in UNF so they can be moved to their own tables:
CLIENT(Client ID, Client Notes, Client Join Date)

CONTACT(Contact ID, Client ID*, Contact Name, Contact Email, Contact Address, Contact Town, Contact County, Contact Postcode, Contact Phone No)

DOG(Dog ID, Client ID*, Dog Name, Dog DOB, Dog Gender, Dog Type, Dog Notes, Appointment ID, Nails And Teeth, Cancelled, Paid, App Date, App Time, Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description, Booking ID, Booking Date Made, Grooming Room ID, Grooming Room Name, Grooming Room Notes, Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA, Shift ID, Shift Day, Shift Start Time, Shift End Time, Shift Exception ID, Shift Exception Start Date, Shift Exception End Date)

The DOG table also contains APPOINTMENT as a repeating group.

DOG(Dog ID, Client ID*, Dog Name, Dog DOB, Dog Gender, Dog Type, Dog Notes)

APPOINTMENT(Appointment ID, Dog ID*, Nails And Teeth, Cancelled, Paid, App Date, App Time, Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description, Booking ID, Booking Date Made, Grooming Room ID, Grooming Room Name, Grooming Room Notes, Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA, Shift ID, Shift Day, Shift Start Time, Shift End Time, Shift Exception ID, Shift Exception Start Date, Shift Exception End Date)

APPOINTMENT also contains SHIFT and SHIFT EXCEPTION as repeating groups

APPOINTMENT(Appointment ID, Dog ID*, Nails And Teeth, Cancelled, Paid, App Date, App Time, Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description, Booking ID, Booking Date Made, Grooming Room ID, Grooming

Room Name, Grooming Room Notes, Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA)

SHIFT(Shift ID, Staff ID*, Shift Day, Shift Start Time, Shift End Time)

SHIFT EXCEPTION(Shift Exception ID, Staff ID*, Shift Exception Start Date, Shift Exception End Date)

With the final result of 1NF being:

CLIENT(Client ID, Client Notes, Client Join Date)

CONTACT(Contact ID, Client ID*, Contact Name, Contact Email, Contact Address, Contact Town, Contact County, Contact Postcode, Contact Phone No)

DOG(Dog ID, Client ID*, Dog Name, Dog DOB, Dog Gender, Dog Type, Dog Notes)

APPOINTMENT(Appointment ID, Dog ID*, Nails And Teeth, Cancelled, Paid, App Date, App Time, Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description, Booking ID, Booking Date Made, Grooming Room ID, Grooming Room Name, Grooming Room Notes, Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA)

SHIFT(Shift ID, Staff ID*, Shift Day, Shift Start Time, Shift End Time)

SHIFT EXCEPTION(Shift Exception ID, Staff ID*, Shift Exception Start Date, Shift Exception End Date)

2NF

Remove partial dependencies

As all tables have only 1 primary key with 1 attribute, they are all already in 2NF

CLIENT(Client ID, Client Notes, Client Join Date)

CONTACT(Contact ID, Client ID*, Contact Name, Contact Email, Contact Address, Contact Town, Contact County, Contact Postcode, Contact Phone No)

DOG(Dog ID, Client ID*, Dog Name, Dog DOB, Dog Gender, Dog Type, Dog Notes)

APPOINTMENT(Appointment ID, Dog ID*, Nails And Teeth, Cancelled, Paid, App Date, App Time, Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description, Booking ID, Booking Date Made, Grooming Room ID, Grooming Room Name, Grooming Room Notes, Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA)

SHIFT(Shift ID, Staff ID*, Shift Day, Shift Start Time, Shift End Time)

SHIFT EXCEPTION(Shift Exception ID, Staff ID*, Shift Exception Start Date, Shift Exception End Date)

3NF

Remove transitive dependencies

APPOINTMENT contains APPOINTMENT TYPE, BOOKING, STAFF and GROOMING ROOM as transitive dependencies, so in 3NF they can be separated into their own tables.

APPOINTMENT (Appointment ID, Dog ID*, Appointment Type ID*, Staff ID*, Booking ID*, Grooming Room ID*, Nails and Teeth, Cancelled, Paid, Appointment Date, Appointment Time)

BOOKING (Booking ID, Booking Date Made)

APPOINTMENT TYPE (Appointment Type ID, Appointment Type Base Time Taken, Appointment Type Base Price, Appointment Type Description)

GROOMING ROOM (Grooming Room ID, Grooming Room Name, Grooming Room Notes)

STAFF (Staff ID, Staff Name, Staff Password, Staff Password Salt, Staff Email, Staff Phone No, Staff Uses 2FA)

SHIFT (Shift ID, Staff ID*, Shift Day, Shift Start Time, Shift End Time)

SHIFT EXCEPTION (Shift Exception ID, Staff ID*, Shift Exception Start Date, Shift Exception End Date)

DOG (Dog ID, Client ID*, Dog Name, Dog DOB, Dog Gender, Dog Types, Dog Notes)

CLIENT (Client ID, Client Notes, Client Join Date)

CONTACT (Contact ID, Client ID*, Contact Name, Contact Email, Contact Address, Contact Town, Contact County, Contact Postcode, Contact Phone No.)

Data Structures

Appointment Table

Field	Data Type	Constraints	Purpose
Appointment ID	INT	Primary Key Not Null	Uniquely identifies each appointment
Dog ID	INT	Foreign Key Not Null	References the dog that is at the appointment
Appointment Type ID	INT	Foreign Key Not Null	References the type of appointment
Staff ID	INT	Foreign Key Not Null	References the staff member managing the appointment
Booking ID	INT	Foreign Key Not Null	References the booking group which the appointment was made in (Used to calculate discounts)
Grooming Room ID	INT	Foreign Key Not Null	The room the appointment is scheduled to be in
Nails And Teeth	BIT	Not Null	If the appointment is supposed to include nails and teeth or not
Cancelled	BIT	Not Null	Has the appointment been cancelled?
Paid	BIT	Not Null	Has the appointment been paid for?
Appointment Date	DATE	Not Null	The date the appointment is scheduled for
Appointment Time	TIME	Not Null	The time of day the appointment is scheduled for

Booking Table

Field	Data Type	Constraints	Purpose
Booking ID	INT	Primary Key Not Null	The unique key which identifies each booking
Date Made	DATE	Not Null	The date the booking was made on

Grooming Room Table

Field	Data Type	Constraints	Purpose
Grooming Room ID	INT	Primary Key Not Null	The unique key which identifies each grooming room
Grooming Room Name	VARCHAR	Max Length 31 Not Null	The name of the grooming room
Grooming Room Notes	VARCHAR	Max Length 63	Any other notes on the grooming room

Appointment Type Table

Field	Data Type	Constraints	Purpose
Appointment Type ID	INT	Primary Key Not Null	The unique key which identifies each appointment type
Base Time Taken	DECIMAL	Max 7 digits 5 after decimal point Not Null	The base amount of time this appointment takes, in hours
Base Price	DECIMAL	Max 10 digits 2 after decimal points Not Null	The base price of this appointment type, in pounds
Description	VARCHAR	Max Length 127	A description of the appointment type

Staff Table

Field	Data Type	Constraints	Purpose
Staff ID	INT	Primary Key Not Null	The unique key which identifies each staff member
Staff Name	VARCHAR	Max Length 70 Not Null	The name/username of the staff member
Staff Password	VARCHAR	Max Length 64 Not Null	The salted and hashed staff's password
Password Salt	VARCHAR	Max Length 32 Not Null	The per-user randomly generated salt used to help securely store passwords
Staff Email	VARCHAR	Max Length 257 Not Null	The email address of the staff member
Staff Phone No	VARCHAR	Max Length 15 Not Null	The phone number of the staff member
Staff Uses 2FA	BIT	Not Null	Does the staff member use 2FA (Email)?

Dog Table

Field	Data Type	Constraints	Purpose
Dog ID	INT	Primary Key Not Null	The unique key which identifies each dog
Client ID	INT	Foreign Key Not Null	References the client the dog belongs to
Dog Name	VARCHAR	Max Length 30 Not Null	The name of the dog
Dog DOB	DATE	Not Null	The dog's date of birth
Dog Gender	VARCHAR	Max Length 1	The dog's gender
Dog Type	VARCHAR	Max Length 40	The type of dog
Dog Notes	VARCHAR	Max Length 255	Any other notes on the dog

Contact Table

Field	Data Type	Constraints	Purpose
Contact ID	INT	Primary Key Not Null	The unique key which identifies each contact
Client ID	INT	Foreign Key Not Null	References the client the contact belongs to
Client Name	VARCHAR	Max Length 70 Not Null	The name of the contact
Contact Email	VARCHAR	Max Length 257 Not Null	The email address of the contact
Contact Address	VARCHAR	Max Length 127	The address of the contact
Contact Postcode	VARCHAR	Max Length 8	The postcode of the contact
Contact Phone No	VARCHAR	Max Length 15 Not Null	The phone number of the contact

Client Table

Field	Data Type	Constraints	Purpose
Client ID	INT	Primary Key Not Null	The unique key which identifies each client
Client Notes	VARCHAR	Max Length 100	Any notes on the client
Client Join Date	DATE	Not Null	The date the client joined on

Shift Table

Field	Data Type	Constraints	Purpose
Shift ID	INT	Primary Key Not Null	The unique key which identifies each shift
Staff ID	INT	Foreign Key Not Null	References the staff member the shift applies to
Shift Day	INT	Not Null	The day of the week the shift is on as a number
Shift Start Time	TIME	Not Null	The time the shift starts at
Shift End Time	TIME	Not Null	The time the shift ends at

Chapter Three: Evaluation

Record of work:

10/11/20 - Started! Writing background section of report.
12/11/20 - Testing viability of printing invoices - it works!
14/11/20 - Writing problems with current system report
16/11/20 - Programming a system to email the contents of a DataGridView
18/11/20 - Started planning of SQL tables
22/11/20 - Started generating valid data to fill tables
25/11/20 - Started UI design and continued development on data creation
27/11/20 - As above, continued UI development and increasing accuracy of data creation
03/12/20 - Log in menu completed, working on calendar view, continued work on data generation
05/12/20 - Busy with exams, project paused.
15/12/20 - Resumed! Started statistics window
17/12/20 - Continued work on statistics window
19/12/20 - Finished registration window, some work on contact editing window
26/12/20 - Significant work on window to allow editing, creating and deleting for all tables
29/12/20 - Working on calendar view window, split editing sidebar into its own window so it can be used later in other windows
31/12/20 - Continued work on calendar view and database layout
07/01/21 - Continued to work on calendar and statistics, bug fixes, work on report
15/01/21 - Some general bug fixes, further work on statistics view and calendar view
18/01/21 - Created invoice management window, further work on report
22/01/21 - Improvements to general UX and statistics window - added pie chart
02/02/21 - Work on client management
06/02/21 - Bug fixes and improvements to validation. Started to add new window for adding items
10/02/21 - More work on new window
18/02/21 - Massively improved searchable datagrid to now work with filters instead. Added ability to find specific appointment
20/02/21 - UI improvements and bug fixes
13/03/21 - Added ability to book new appointments. Started to add shift manager
15/03/21 - More work on shift manager
16/03/21 - Booking an appointment now takes staff shifts into consideration. Error messages are shown as to why an appointment cannot be booked
21/03/21 - Added ability to book staff holidays
25/03/21 - General UX improvements
26/03/21 - Added ability to add new clients, contacts and dogs in client management window
27/03/21 - Added allergy appointments. Removed unfinished window dedicated to adding new clients/contacts/dogs as this functionality was moved to the client management window instead
28/03/21 - Many bug fixes and minor polish tweaks based on feedback. Added DB Builder window to allow test data to be generated more easily
29/03/21 - Many more bug fixes and general tweaks.
30/03/21 - More work on report. Improved user requirements and did most of the evaluation of user requirements.
06/03/21 - More work on report. Finished everything but normalisation.
10/03/21 - More work on report, tweaking programme based on feedback and bug fixing
14/03/21 - Completed and handed in programme, more work on report
19/03/21 - Report completed and handed in.

Evaluation Against User Requirements

General

Req No.	Description	Met?																		
1	The application should be intuitive to use	Fully Met																		
<p>Evidence:</p> <p>User feedback shows that although users were happy with the application and found it easy enough to use, there is still room to improve in this aspect. Some users reported that there were a few small aspects that they found unintuitive, for example clicking and dragging from the “booking” section to book a new appointment. However, I was unable to make these tweaks due to time constraints.</p> <p>How easy to use did you find the application? 4 responses</p> <table border="1"><thead><tr><th>Rating</th><th>Count</th><th>Percentage</th></tr></thead><tbody><tr><td>1</td><td>0</td><td>0%</td></tr><tr><td>2</td><td>0</td><td>0%</td></tr><tr><td>3</td><td>0</td><td>0%</td></tr><tr><td>4</td><td>3</td><td>75%</td></tr><tr><td>5</td><td>1</td><td>25%</td></tr></tbody></table>			Rating	Count	Percentage	1	0	0%	2	0	0%	3	0	0%	4	3	75%	5	1	25%
Rating	Count	Percentage																		
1	0	0%																		
2	0	0%																		
3	0	0%																		
4	3	75%																		
5	1	25%																		
2	The application should be aesthetically pleasing	Fully Met																		
<p>Evidence:</p> <p>All users reported that they found the design of the application visually appealing. This was achieved through keeping a clear design in mind throughout the designing of my application, and regularly referring back to previous designs to keep it consistent throughout my application.</p> <p>How visually appealing did you find the application? 4 responses</p> <table border="1"><thead><tr><th>Rating</th><th>Count</th><th>Percentage</th></tr></thead><tbody><tr><td>1</td><td>0</td><td>0%</td></tr><tr><td>2</td><td>0</td><td>0%</td></tr><tr><td>3</td><td>0</td><td>0%</td></tr><tr><td>4</td><td>0</td><td>0%</td></tr><tr><td>5</td><td>4</td><td>100%</td></tr></tbody></table>			Rating	Count	Percentage	1	0	0%	2	0	0%	3	0	0%	4	0	0%	5	4	100%
Rating	Count	Percentage																		
1	0	0%																		
2	0	0%																		
3	0	0%																		
4	0	0%																		
5	4	100%																		
3	The application should contain no bugs	Fully Met																		
<p>Evidence:</p> <p>Users reported few bugs, and all bugs that were reported and found have since been fixed. I also spent plenty of time testing the application myself to ensure it is as bug free as possible. Although it is likely that some still exist, user feedback suggests that they are very uncommon. [Redacted For Github]</p>																				

Appointment Management

Req No.	Description	Met?
1	Staff should be able to book new appointments	Fully Met

Evidence:

The booking sidebar allows the user to add single or recurring appointments, along with allergy therapy appointments. They can then confirm the booking by clicking the "Confirm Booking" button. The system allows multiple appointments to be made as part of the same booking.

Editing

Booking

Booking ID: 3620
Dog ID: ☒ ?
Staff Member:
Book:
Go to appointment
Book:
Repeating every months 4 times.
Starting at ☒

+ Add new part to booking

Editing

Booking

Booking ID: 3620
Dog ID: ☒ ?
Staff Member:
Book:
Repeating every weeks 4 times.
Starting at ☒

Book:

2	Staff should be able to edit existing appointments	Fully Met
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Evidence:

The editing sidebar allows changes to easily be made and saved. It makes use of combo boxes and check boxes to allow the user to easily select from a list of options. If the user hovers over an item like "Dog ID", a tooltip containing the dog's name is displayed. The user can also click on the question mark button to select a dog without having to know its dog ID. The user can then click the "Save Changes" button to save their changes.

Sunday

Editing

Booking

Appointment ID: 9381
Dog ID: ☒ ?
Appointment Type:
Staff Member:
Booking ID: ☒ ?
Grooming Room:

Sunday

Editing

Booking

Appointment ID: 9381
Dog ID: ☒ ?
Appointment Type:
Staff Member:
Booking ID: ☒ ?
Grooming Room:

3	Staff should receive clear feedback on why an appointment cannot be booked (No spare room at time, requested staff member unavailable, etc.)	Fully Met
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Evidence:

If the user is trying to reschedule an appointment to an invalid time/room, they are given a clear error message telling the user why they cannot place an appointment at the given time/place. You are also unable to move an appointment to a place where it would clash with another appointment or staff schedules. If staff schedules are changed, then any clashing appointments will be marked out with a thick white border.

4	If the requested time is unavailable, it should be easy to find the next free spot available	Fully Met
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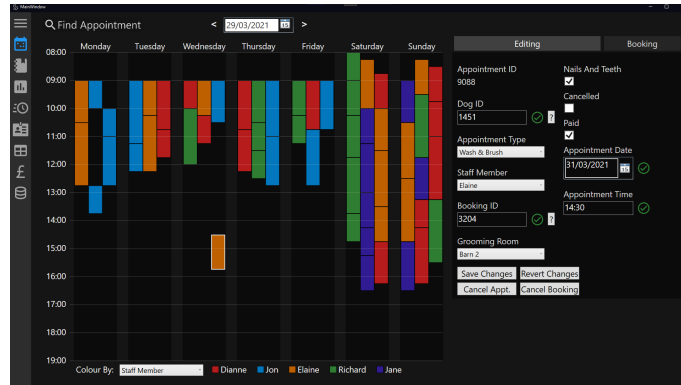
Evidence:

The free spaces and coloured rectangles allow you to easily see when is free, and when each staff member is working. Based on user feedback, this allows plenty of information at a glance. The user can also navigate between weeks by clicking on the arrows either side of the date picker at the top, or select a specific week to display using the datepicker.

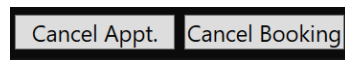
5	Appointments should be easy to reschedule/cancel if needed	Fully Met
---	--	-----------

Evidence:

You can easily reschedule an appointment by dragging it to a different time slot.



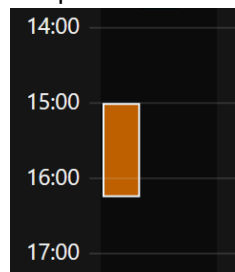
There are buttons on the right hand side which allow you to easily cancel an appointment or cancel all appointments within the same booking. The appointment will then be cancelled and hidden from the user.



6	Staff should be shown how long a given appointment is expected to take	Fully Met
---	--	-----------

Evidence:

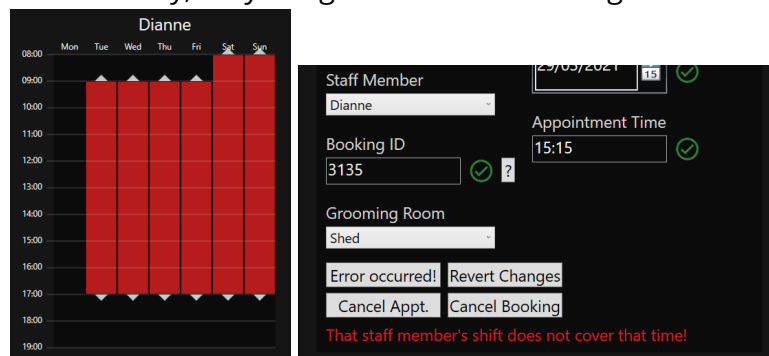
You can tell the length of the appointment by looking at the length of the rectangle used to represent it. For example, the appointment below has a length of 1 hour and 15 minutes. This will adapt based on conditions, for example the appointment type, if it is an initial appointment, etc.



7	Appointments cannot be booked when a staff member's shift does not cover that time/day	Fully Met
---	--	-----------

Evidence:

If Dianne's shift does not cover Monday, and the user tries to book an appointment with Dianne on a Monday, they are given an error message.



8	An appointment cannot be booked with a staff member who is on holiday	Fully Met
<p>Evidence:</p> <p>If Elaine is given a holiday between 03/04/21 and 04/04/21, her existing appointments on those days are marked clearly with a white border to show they clash, and no new appointments with Elaine can be scheduled for those days. The user can also click a button to find out how many appointments clash with staff schedules.</p> 		
9	It should be clear who any appointment is with	Fully Met
<p>Evidence:</p> <p>Appointments are coloured by staff member by default, with a key at the bottom. This can also be changed to colour appointments by type, if it includes nails and teeth, and if it has been cancelled.</p> 		
10	Appointments that do not fit into staff shifts or clash with staff holidays should be clearly marked out	Fully Met
<p>Evidence:</p> <p>If Elaine is on holiday on Saturday and Sunday one week, her appointments are clearly marked out as clashing with a thicker white border. If the user then selects one of those appointments, they are told it currently clashes.</p>		

11

It should be easy to find a specific appointment if the user knows some details related to the appointment

Fully Met

Evidence:

If the user clicks on the “Find an appointment” button, They are brought to a window where they can select a specific appointment to go to it.

Find Appointment

Appointment ID	Dog ID	Appointment Type	Dog ID	Booking ID	Grooming Room	CNails And Teeth	Cancelled	Paid	Appointment Date	Appointment Time
0	0	1	0	1	False	False	True	05/05/2016	09:00	
0	0	1	0	1	True	False	True	05/04/2017	09:00	
2	0	2	3	0	0	True	False	True	13/08/2017	08:45
3	1	1	1	0	2	False	False	True	05/09/2016	09:00
4	2	0	2	1	2	False	False	True	14/11/2016	09:00
5	1	1	2	1	1	True	False	True	26/11/2016	08:45
6	3	1	2	1	1	False	True	False	18/02/2017	08:30
7	4	1	1	2	0	True	False	True	26/09/2016	09:00
8	5	0	2	3	2	False	False	True	05/06/2016	08:30
9	6	2	2	3	0	True	False	True	14/08/2016	08:45
10	7	0	3	4	1	False	False	True	19/11/2016	09:00
11	7	0	0	4	1	False	False	True	10/03/2017	09:00
12	8	0	1	5	0	False	False	True	19/10/2016	09:00
13	8	2	3	5	2	True	True	False	04/03/2017	08:45
14	9	1	1	5	1	True	False	True	01/08/2016	09:00
15	10	2	0	5	0	True	False	True	17/09/2016	09:00
16	11	0	2	6	0	False	False	True	28/07/2016	08:30
17	12	0	3	6	2	True	False	True	03/12/2016	08:15
18	13	2	0	7	2	False	False	True	06/11/2016	09:00
19	13	0	2	7	0	True	False	True	29/11/2016	09:00
20	13	1	0	7	0	True	False	True	04/03/2017	08:30
21	14	1	0	8	0	True	False	True	21/08/2016	08:45
22	14	2	1	8	1	True	True	False	21/03/2017	09:00
23	15	2	0	8	1	False	False	True	02/12/2016	09:00

Count: 10289

Confirm Selection

They then have the ability to filter the list.

Manage Appointment Filters (3)

Filter By Value: Cancelled Equal To False X

Filter By Reference: Dog X

Filter By Value: Dog Type Contains Labrador X

+ Add a new filter

Filter By Reference: Contact X

Filter By Value: Contact County Contains Down X

+ Add a new filter

+ Add a new filter

Apply Filters

3642	250	2	0	1280	1	False	False	True	03/08/2019	10:00
3643	250	0	2	1280	2	False	False	True	10/12/2019	09:00
3644	250	1	2	1280	2	True	False	True	04/04/2020	08:30
3657	380	1	1	1284	0	False	True	True	08/08/2019	09:00
3672	1042	1	3	1290	0	False	False	True	18/08/2019	09:15
3733	528	2	0	1310	1	False	True	True	28/03/2020	08:30
3734	528	1	1	1310	2	True	False	True	11/05/2020	09:00
3983	433	0	0	1392	0	False	False	True	08/10/2019	09:00
5294	380	1	1	1849	1	False	False	True	13/02/2020	09:00

Count: 37

Confirm Selection

Client Management

Req No.	Description	Met?
1	Allow staff to add new contacts/dogs	Fully Met

Evidence:
“Add New Item” tab allows the user to input details for the new contact/dog

Editing Contacts

Add New Contacts

Contact ID

2237

Contact County

✓

Client ID

0

✓

?

Contact Postcode

✓

Contact Name

✗

Contact Phone No

✗

Contact Email

✗

Contact Address

✓

Contact Town

✓

Add new item

Cancel Addition

Contact Name: This value cannot be left empty!

Contact Email: This value cannot be left empty!

Contact Phone No: This value cannot be left empty!

Editing Contacts

Add New Contacts

Contact ID

2237

Contact County

Co. Down

✓

Client ID

0

✓

?

Contact Postcode

BT11 1AA

✓

Contact Name

James

✓

Contact Phone No

0281111111

✓

Contact Email

mail@example.com

✓

Contact Address

✓

Contact Town

✓

Contact Town

Banbridge

✓

Add new item

Cancel Addition

When the “Add new item” button is clicked, the contact is added to the list of contacts.

Manage Contact Filters (0)

Contact ID	Client ID	Contact Name	Contact Email	Contact Address	Contact Town	Contact County	Contact Postcode	Contact Phone No
2213	1087	Shea Donnelly	shedon@email.abc	37 Pinewood Hill	Banbridge	Co. Tyrone	BT86 3YL	07700 900156
2214	1087	Cameron Donnelly	camerond9@coolmail.abc	37 Pinewood Hill	Banbridge	Co. Tyrone	BT86 3YL	028 9649 6635
2215	1087	Zara Donnelly	zardl@email.abc	37 Pinewood Hill	Banbridge	Co. Tyrone	BT86 3YL	028 9649 6816
2216	1088	Aoife Young	aoifey@neutron.abc	27 Rathmore	Allihies	Co. Down	BT27 1QF	07700 900032
2217	1088	Molly Young	mollyy65@mycloud.abc	27 Rathmore	Allihies	Co. Down	BT27 1QF	07700 900696
2218	1089	Amy McCloskey	amccloskey@email.abc	24 Glen Court	Bessbrook	Co. Down	BT30 7XB	07700 900659
2219	1089	Jessica McCloskey	jessmcc53@neutron.abc	24 Glen Court	Bessbrook	Co. Down	BT30 7XB	028 9649 6198
2220	1090	Joshua Burns	joshbur@email.abc	7 Gifford Road	Antrim	Co. Tyrone	BT77 7PX	028 9649 6109
2221	1091	Samuel Rooney	samroo8@ymail.abc	11 Central Park	Coalisland	Co. Armagh	BT77 8AD	07700 900716
2222	1091	Oscar Rooney	oscroo8@ymail.abc	11 Central Park	Coalisland	Co. Armagh	BT77 8AD	07700 900020
2223	1092	Oliver McCann	omccann@ymail.abc	4 Tudor Oaks	Newtownhamilton	Co. Down	BT14 4SR	07700 900081
2224	1092	William McCann	williamm@mail.abc	4 Tudor Oaks	Newtownhamilton	Co. Down	BT14 4SR	028 9649 6390
2225	1093	Lauren Adams	lauada@neutron.abc	17 Newtown Road	Kilkeel	Co. Down	BT80 6NA	07700 900248
2226	1094	Anna McVeigh	annam@mycloud.abc	25 Chapel Road	Newcastle	Co. Down	BT7 7ZN	028 9649 6753
2227	1094	Nicole McVeigh	nmcveigh90@email.abc	25 Chapel Road	Newcastle	Co. Down	BT7 7ZN	07700 900763
2228	1095	Corey Stevenson	corste68@ymail.abc	2 Tandragee Road	Portadown	Co. Down	BT18 9YD	07700 900631
2229	1096	Callum Shaw	callums5@coolmail.abc	28 Tandragee Road	Newcastle	Co. Down	BT92 7PS	028 9649 6529
2230	1096	Leah Shaw	leasha@mycloud.abc	28 Tandragee Road	Newcastle	Co. Down	BT92 7PS	028 9649 6814
2231	1097	Lucas O'Neill	lo'neill36@mail.abc	39 Treacle Mine Road	Banbridge	Co. Down	BT74 8HR	07700 900439
2232	1097	Gemma O'Neill	gemo'n9@neutron.abc	39 Treacle Mine Road	Banbridge	Co. Down	BT74 8HR	028 9649 6429
2233	1097	Cara O'Neill	co'neill62@mail.abc	39 Treacle Mine Road	Banbridge	Co. Down	BT74 8HR	07700 900312
2234	1098	Sophie Ross	sopros@ymail.abc	21 Linnenhall Street	Newcastle	Co. Antrim	BT22 2LX	07700 900273
2235	1099	Michael Campbell	michaeltc@ymail.abc	20 Nap Hill	Mayobridge	Co. Armagh	BT5 4UD	028 9649 6431
2236	1099	Sean Campbell	seanc90@mail.abc	20 Nap Hill	Mayobridge	Co. Armagh	BT5 4UD	07700 900678
2237	0	James	mail@example.com		Banbridge	Co. Down	BT11 1AA	0281111111

The same applies for dogs.

Editing Dogs

Add New Dogs

Dog ID

2221

Dog Notes

✓

Client ID

1094

✓

?

Dog Name

✗

Dog DOB

Select a date

15

✗

Dog Gender

✓

Dog Type

✓

Add new item

Cancel Addition

Dog Name: This value cannot be left empty!

Dog DOB: This value cannot be left empty! Please enter a valid date!

Editing Dogs

Add New Dogs

Dog ID

2221

Dog Notes

✓

Client ID

1094

✓

?

Dog Name

Rocky

✓

Dog DOB

24/07/2015

15

✓

Dog Gender

M

✓

Dog Type

Labrador

✓

Add new item

Cancel Addition

Manage Dog Filters (0)						
Dog ID	Client ID	Dog Name	Dog DOB	Dog Gender	Dog Type	Dog Notes
2199	1087	George	04/03/2021	M	Papillon	
2200	1088	Diva	06/03/2021	F	Dachshund	
2201	1088	Faith	06/03/2019	F	Newfoundland	
2202	1088	Jada	06/03/2017	F	Manchester Terrier	
2203	1089	Chewy	08/03/2018	M	German Wirehaired Pointer	
2204	1090	Tasha	10/03/2018	F	Greyhound	
2205	1091	Marley	12/03/2021	M	Irish Wolfhound	
2206	1092	Belle	14/03/2020	F	Foxhound	
2207	1093	Chief	16/03/2021	M	Chow Chow	
2208	1094	Brutus	18/03/2021	M	Bearded Collie	
2209	1094	Coco	18/03/2021	F	Chesapeake Bay Retriever	
2210	1095	Goldie	20/03/2018	F	Border Terrier	
2211	1096	Sophia	22/03/2021	F	Beagle	
2212	1096	Tasha	22/03/2016	F	Brussels Griffon	
2213	1097	Ringo	24/03/2019	M	English Setter	
2214	1097	Rose	24/03/2019	F	Japanese Spaniel	
2215	1097	Titus	24/03/2021	M	Affenpinscher	
2216	1098	Honey	26/03/2021	F	Samoyed	
2217	1098	Gunner	26/03/2019	M	Manchester Terrier	
2218	1098	Gage	26/03/2020	M	Bullmastiff	
2219	1099	Tilly	28/03/2018	F	Bernese Mountain Dog	
2220	1099	Chester	28/03/2020	M	German Shorthaired Pointer	
2221	1094	Rocky	24/07/2015	M	Labrador	

Users are told if any information they have entered is invalid, and are prevented from saving if so.

2	Allow staff to edit contact/dog information	Fully Met
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Evidence:

The Editing tab allows users to update the existing details of clients/dogs
The user can click on a specific table to select it, which will show the dogs belonging to the selected contact or vice versa. The user can then use the data editing sidebar to edit the details of the client/dog, and use the “Save Changes” button to save their changes. Users are told if any information they have entered is invalid, and are prevented from saving if so.

[Image Redacted For Github]

3	Allow staff to search through contacts/dogs	Fully Met
---	---	-----------

Evidence:

Clicking “Manage Filters” brings up a menu that allows the user to filter through contacts/dogs.

Filter contacts to people named Ethan living in Antrim

Manage Contact Filters (2)

Filter By Value: Contact County Contains Antrim X

Filter By Value: Contact Name Contains Ethan X

+ Add a new filter Apply Filters

Manage Contact Filters (2)

Contact ID	Client ID	Contact Name	Contact Email	Contact Address	Contact Town	Contact County	Contact Postcode	Contact Phone No
43	19	Ethan Devlin	edevlin50@mycloud.abc	38 Newell Road	Banbridge	Co. Antrim	BT46 3HS	07700 900521
597	293	Ethan Adams	ethada7@mail.abc	8 Hampton Rise	Newry	Co. Antrim	BT41 2BP	028 9649 6214
1107	532	Ethan Campbell	ethc2@ymail.abc	9 Greencastle Road	Bessbrook	Co. Antrim	BT39 3JD	07700 900300

Filter dogs to male pugs born in 2017

Manage Dog Filters (3)

Filter By Value: Dog Gender Contains M X

Filter By Value: Dog DOB Between 01/01/2017 and 31/12/2017 X

Filter By Value: Dog Type Contains Pug X

+ Add a new filter Apply Filters

Manage Dog Filters (3)

Dog ID	Client ID	Dog Name	Dog DOB	Dog Gender	Dog Type	Dog Notes
431	211	Angus	17/03/2017	M	Pug	
1411	698	Denver	29/09/2017	M	Pug	
1723	854	Joey	28/01/2017	M	Pug	

4

Allow the user to easily see which dogs belong to each contact and vice versa

Fully Met

Evidence:

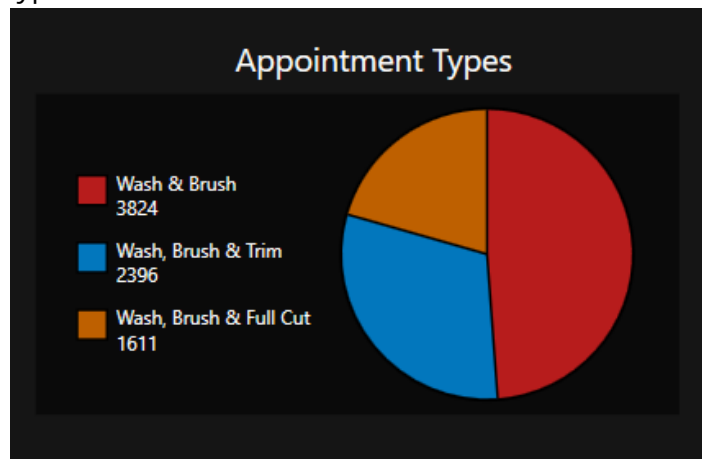
When a client/contact/dog is selected, the related clients/dogs are also displayed

Statistics

Req No.	Description	Met?
1	See which service option is most popular	Fully Met

Evidence:

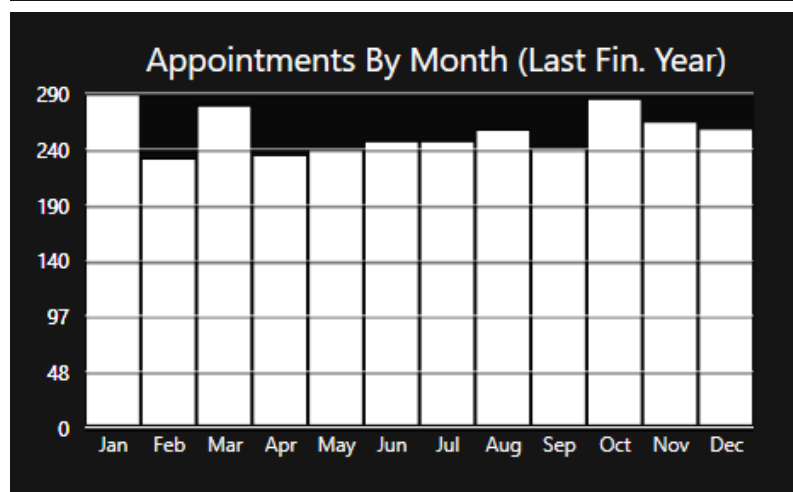
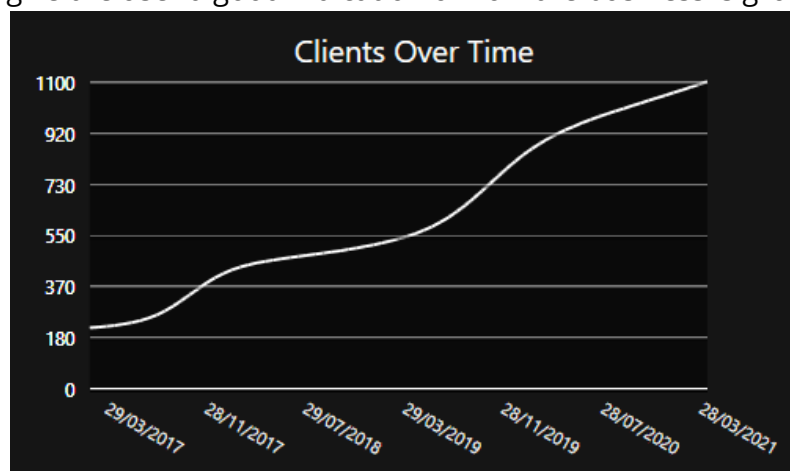
The "Appointment Types" pie chart shows the user how many appointments there are of each types and shows them the ratios for each

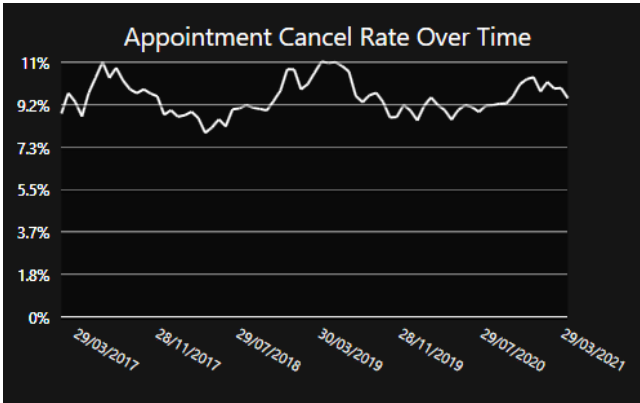
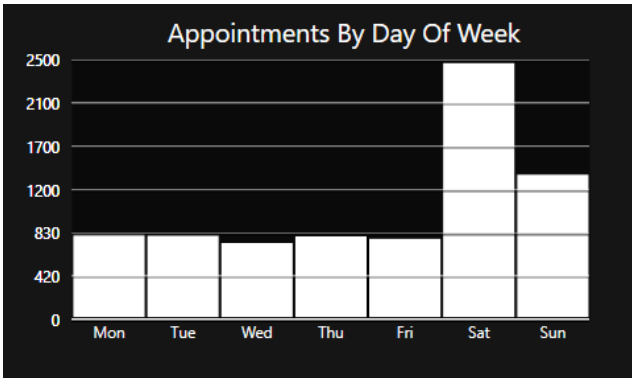
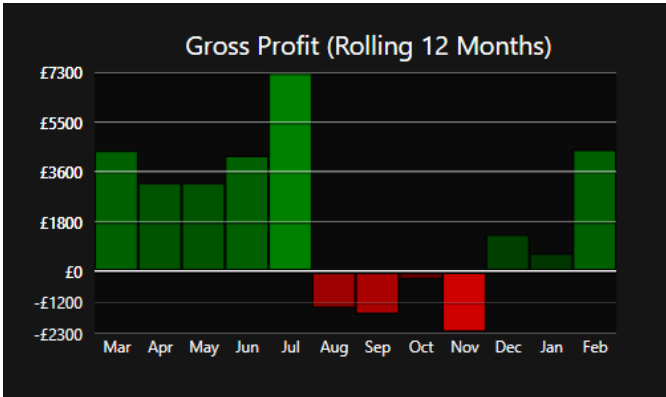
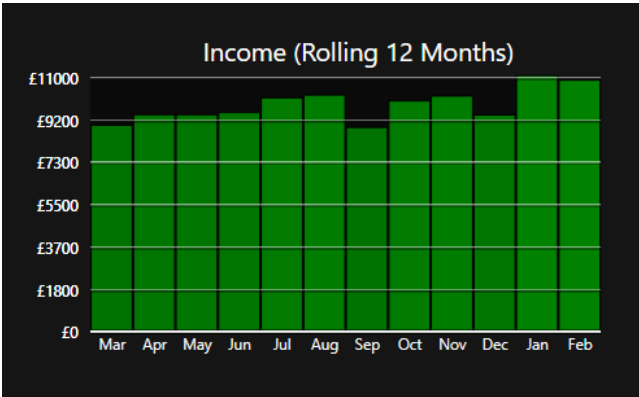


2	See how quickly business is growing	Fully Met
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Evidence:

The "Clients Over Time" and "Appointments By Month" graphs and the miscellaneous statistics give the user a good indication of how the business is growing

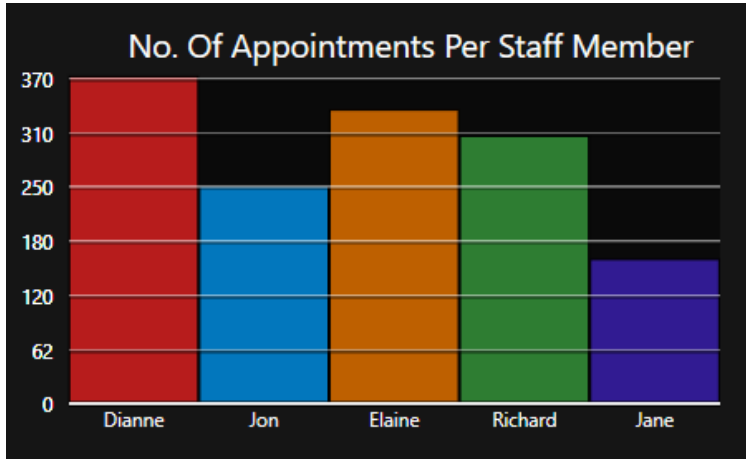


3	See how often are appointments cancelled	Fully Met
<p>Evidence:</p> <p>The "Appointment Cancel Rate" graph shows the user a rolling average of what percentage of appointments were cancelled over time. A rolling average is used to help smooth the graph out, meaning a single cancellation will not have a drastic effect on the graph.</p>  <p>The graph shows a line representing the appointment cancel rate over time from March 2017 to March 2021. The y-axis ranges from 0% to 11% in increments of 1.8%. The line fluctuates between approximately 8% and 10%.</p>		
4	Check if specific time of day/day of week is more popular, requiring extra capacity on that day Income over time	Partially Met
<p>Evidence:</p> <p>The "Appointments By Day Of Week" graph shows which day of the week is the most popular. However, there is no graph that shows which time of day is most popular.</p>  <p>The bar chart shows the number of appointments per day of the week. The y-axis ranges from 0 to 2500 in increments of 420. The x-axis lists the days: Mon, Tue, Wed, Thu, Fri, Sat, Sun. Saturday has the highest number of appointments, exceeding 2500.</p>		
5	Income over time	Fully Met
<p>Evidence:</p> <p>The "Gross Profit (Rolling 12 Months)" and "Income (Rolling 12 Months)" graphs give staff a good indication of how well the business is doing financially. The gross profit graph also highlights negative values in red, to draw attention to those months. It also changes the brightness of each bar based on its height.</p> <div style="display: flex; justify-content: space-around;">   </div> <p>The Gross Profit chart shows values from March to February, with a peak in July and negative values in August, September, and October. The Income chart shows values from March to February, with a peak in January and February.</p>		

6	Check that no staff member is overworked and booked into significantly more appointments than any other staff member.	Fully Met
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Evidence:

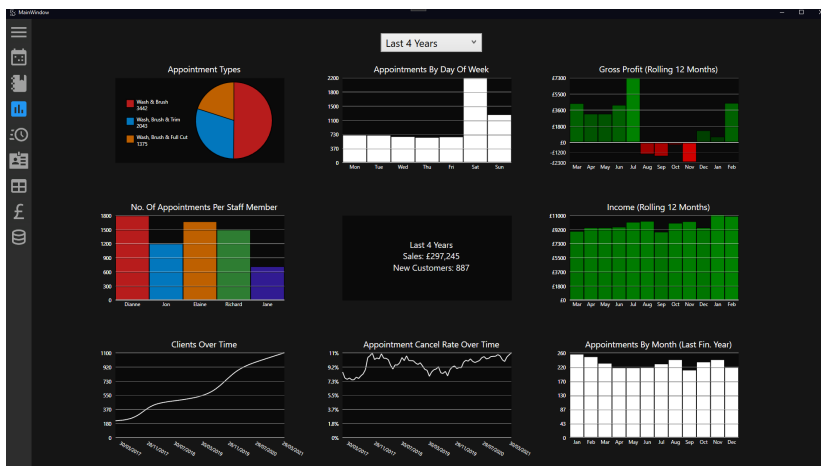
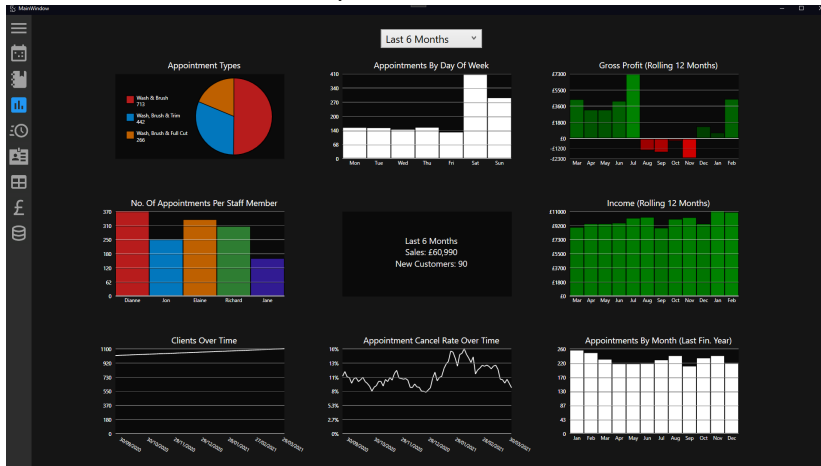
The "No. of Appointments Per Staff Member" graph shows the user how many appointments each staff member has.



7	The user should be able to select which time period is shown for the graphs.	Fully Met
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Evidence:

The combo box at the top of the window allows the user to select a time period to view.



Last 4 Years

All Time

Last 4 Years

Last 2 Years

Last Year

Last 6 Months

Last 3 Months

Last 4 Weeks

Last Week

Shift Manager

Req No.	Description	Met?
1	View/edit/add new staff shifts	Fully Met

Evidence:

“Shift Manager” window shows all staff shifts on the left hand side.

These can be edited by dragging them around to change when they are/which staff member they apply to, and the arrows at the top and bottom of each shift can be used to adjust how long a shift is.

New shifts can be added by clicking and dragging from the Add/Remove Shift rectangle.



2	View/edit/add new staff holidays	Fully Met
---	----------------------------------	-----------

Evidence:

The right hand side of the “Shift Manager” window allows the user to see past, current and future staff holidays. These can then be edited and saved. New holidays can be added by using the “Confirm” button at the bottom.

The screenshot shows the Staff Holidays interface. It is divided into three sections: Past, Current, and Future. Each section lists staff members and their corresponding holiday periods with date pickers. A Confirm button is located at the bottom right.

Staff Holidays

Past:

- Elaine: 05/01/2021 to 13/01/2021
- Elaine: 08/03/2021 to 13/03/2021

Current:

- Dianne: 30/03/2021 to 06/04/2021
- Jon: 30/03/2021 to 06/04/2021
- Elaine: 30/03/2021 to 06/04/2021

Future:

- Jane: 03/05/2021 to 16/05/2021

For Jane: 03/05/2021 to 16/05/2021 **Confirm**

Future:

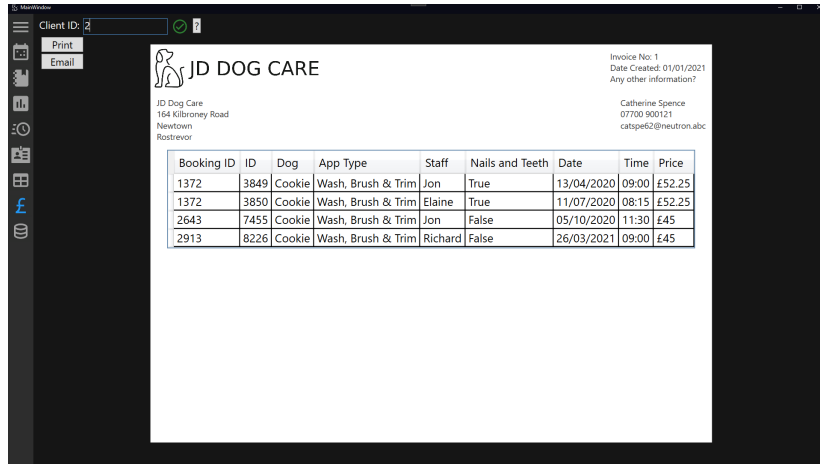
- Elaine: 03/05/2021 to 16/05/2021 **Save Changes**

Billing/Invoices

Req No.	Description	Met?
1	Support printing out invoices or directly emailing them to customers	Fully Met

Evidence:

The "Send Invoices" window allows the user to display the current invoice for any client, which can then be printed or emailed.



Email:


JD DOG CARE

JD Dog Care
164 Kilbroney Rd
Newtown, Rostrevor

Annie Spence
028 9649 6288
aspence@email.abc


Invoice #: 1
Created: 30/03/2021
Due: ???

Payment Method	Cheque No
Cash	1000

Booking ID	ID	Dog	App Type	Staff	Nails and Teeth	Date	Time	Price
1372	3849	Cookie	Wash, Brush & Trim	Jon	True	13/04/2020	09:00	£52.25
1372	3850	Cookie	Wash, Brush & Trim	Elaine	True	11/07/2020	08:15	£52.25
2643	7455	Cookie	Wash, Brush & Trim	Jon	False	05/10/2020	11:30	£45
2913	8226	Cookie	Wash, Brush & Trim	Richard	False	26/03/2021	09:00	£45

Total: £149.5

Printed:


JD DOG CARE

JD Dog Care
164 Kilbroney Road
Newtown
Rostrevor

Catherine Spence
07700 900121
catspe62@neutron.abc

Invoice No: 1
Date Created: 01/01/2021
Any other information?


Booking ID	ID	Dog	App Type	Staff	Nails and Teeth	Date	Time	Price
1372	3849	Cookie	Wash, Brush & Trim	Jon	True	13/04/2020	09:00	£52.25
1372	3850	Cookie	Wash, Brush & Trim	Elaine	True	11/07/2020	08:15	£52.25
2643	7455	Cookie	Wash, Brush & Trim	Jon	False	05/10/2020	11:30	£45
2913	8226	Cookie	Wash, Brush & Trim	Richard	False	26/03/2021	09:00	£45

2	Send reminders automatically to customers with unpaid invoices	Not Met
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3	Ensure clients with unpaid invoices cannot book further appointments	Not Met
4	Check the client is charged the correct fee for their appointment choice	Partially Met

Evidence:

Clients are charged the correct fee in an email invoice, but not in the printed version.



JD DOG CARE

JD Dog Care
164 Kilbroney Rd
Newtown, Rostrevor

Invoice # : 1
Created: 30/03/2021
Due: ???

Annie Spence
028 9649 6288
aspen@email.abc

Payment Method
Cash

Cheque No
1000

Booking ID	ID	Dog	App Type	Staff	Nails and Teeth	Date	Time	Price
1372	3849	Cookie	Wash, Brush & Trim	Jon	True	13/04/2020	09:00	£52.25
1372	3850	Cookie	Wash, Brush & Trim	Elaine	True	11/07/2020	08:15	£52.25
2643	7455	Cookie	Wash, Brush & Trim	Jon	False	05/10/2020	11:30	£45
2913	8226	Cookie	Wash, Brush & Trim	Richard	False	26/03/2021	09:00	£45
Total: £149.5								



JD DOG CARE

JD Dog Care
 164 Kilbroney Road
 Newtown
 Rostrevor

Invoice No: 1
 Date Created: 01/01/2021
 Any other information?

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Booking ID	ID	Dog	App Type	Staff	Nails and Teeth	Date	Time	Price
1372	3849	Cookie	Wash, Brush & Trim	Jon	True	13/04/2020	09:00	£52.25
1372	3850	Cookie	Wash, Brush & Trim	Elaine	True	11/07/2020	08:15	£52.25
2643	7455	Cookie	Wash, Brush & Trim	Jon	False	05/10/2020	11:30	£45
2913	8226	Cookie	Wash, Brush & Trim	Richard	False	26/03/2021	09:00	£45

Evaluation of Solution

Strengths

I think that one of the main strengths of my application is its calendar view, which allows users to easily view upcoming appointments, along with its details, like which staff member it is for, or which appointment type it is, very easily. I also feel that it provides an intuitive and easy to use method of rescheduling appointments. It makes use of rectangles to represent appointments, and allows the user to drag them around to reschedule them.



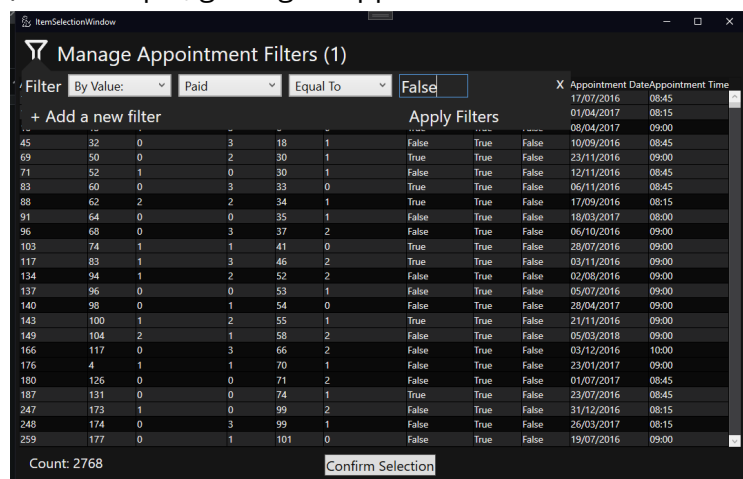
I feel that one of my other strengths is my “data editing sidebar”, which is what I use in both the calendar view and client management windows, which programmatically generates the UI to allow the user to edit an item. This flexible approach allowed me to make improvements to just one item and have these changes apply to multiple windows inside the application, allowing me to much more rapidly prototype different designs.

Three screenshots of the 'data editing sidebar' for different entities. The first sidebar is for an Appointment, showing fields for Appointment ID, Dog ID, Appointment Type, Staff Member, Booking ID, Grooming Room, and Appointment Date/Time. The second sidebar is for an Appointment Type, showing fields for Appointment Type ID, Base Time Taken, Base Price, and Description. The third sidebar is for a Shift, showing fields for Shift ID, Staff Member, Shift Day, Shift Start Time, and Shift End Time. Each sidebar includes validation status indicators (green checkmarks or red question marks) and buttons for 'Save Changes', 'Revert Changes', 'Add New', and 'Delete Item'.

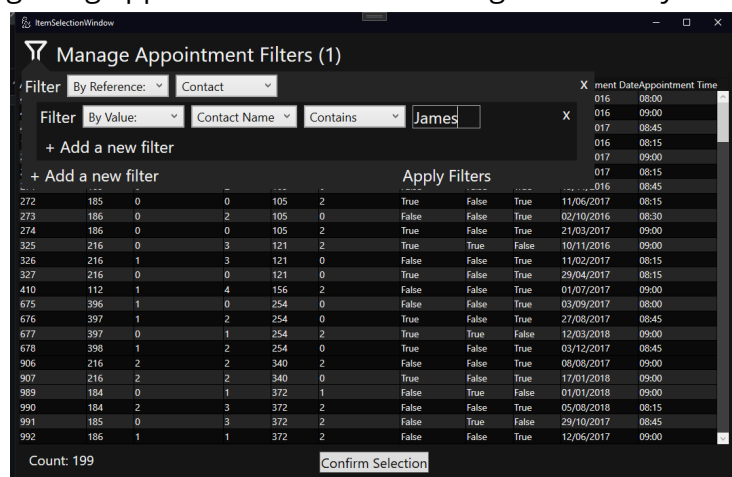
Taking this more general approach of programmatic UI generation also means that it will work fine with any table it has never seen before, without any additional work from me. However, I still applied some table specific optimisations to improve the user experience, like using combo boxes for specific fields like appointment type, staff member and grooming room, as I knew there would be a limited number of each of these.

The “Validated Textboxes” that I made also clearly inform the user if their entered data is valid or not, along with displaying an error message as to why it is invalid. If the property is a foreign key, it also automatically adds a button to launch a filterable data grid to allow the user to easily pick the related item.

Another strength of this project has been the “filterable data grid”, which allows the user to efficiently filter through a list of items in a table, either by value - some direct properties of an item (For example, getting all appointments that have not been paid for),



or by reference - items that are referenced by other items with specific properties (For example, getting appointments where the dog is owned by someone called James).



It also allows the user to combine multiple filters together, with possible combinations being getting contacts who have booked an appointment in the last year with female dogs who are more than 5 years old, and who live in [Redacted For Github].
[Images Redacted For Github]

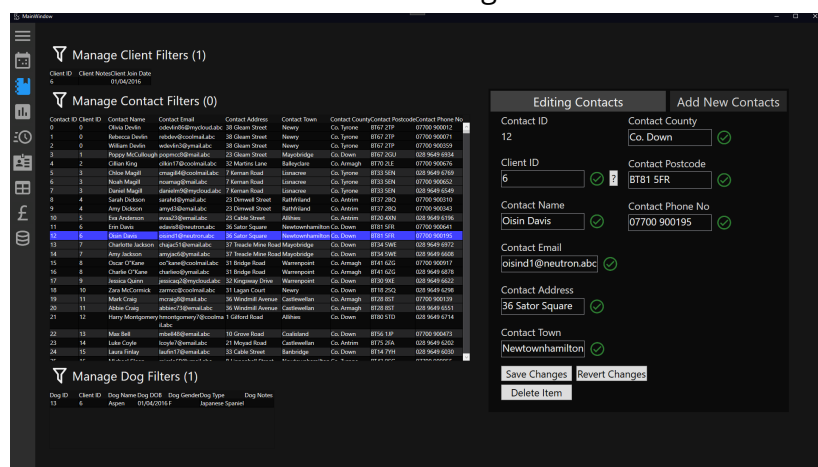
This provides a fast and effective way for users to either find a specific item out of thousands, or even as a way to view statistics, as the number of results is also displayed. This filter system is also written in such a way that it allows modification to the layout of the database without also then requiring updating code for the filterable data grid.

Weaknesses

One of the current weaknesses of my application is its delay on start up. My filterable data grid requires a map to be built up of all tables, so it knows how table A links to table B and how to build a path between them. I did not want to hard code the links between tables into my application, so I came up with a method for dynamically generating this map based on information retrieved from the database. However, this method is currently very inefficient and takes around 5 seconds to run, and as this map is not currently being saved anywhere, this method has to be run every time the application starts.

This issue could be fixed by either writing the binary data of the map to a file and loading it instead when the application starts, as this would be significantly faster. However, this would come with the disadvantage of this file having to be updated every time the properties of any table in the database changed. Another solution would be to initially read the map from a file, but build the map of the database up in the background after the application has started, instead of on the main thread. Then, if the newly generated map is different from the one read from the file, save the new one to the file and use it instead. Although this would be the best solution, I currently do not have the time to implement it.

I also feel that one of the weaknesses of my programme is the UI for managing clients/dogs. Although it meets all the requirements and works fine, it feels lacking in comparison to the appointment management system or shift manager. However, I am not sure what it would take to fix this, as it would probably require significant thought and completely redoing the UI for client management from scratch. Although it is helped by the filterable data grid which allows the user to easily find which contact/dog they are looking for, I feel that overall it is just slightly too clunky to use to edit or add new contacts/dogs.



I also did not fully meet the requirements for the statistics view, and I feel that in general that the statistics window could use a few more enhancements. It currently only allows a user to select a specific range of dates from a combo box. Ideally, the user should be able to input their own range of dates to view statistics for. I also think that more statistics should be added, for example a way to view the average time between a customer's appointments, which clients still have unpaid invoices, and a way to view if customers are returning after their first appointment.



Enhancements

I was not able to meet some of the requirements for the invoice section of my application, for example preventing clients with unpaid invoices from booking further appointments, charging customers the correct amount for each appointment and sending customers emails while they had unpaid invoices. Although I had plans for implementing invoices with decreasing times between emails, using a formula like "Time to next invoice = 1 + e ^ (-0.182 * Emails sent so far + 2)" or similar. I implemented this as a working standalone solution, however I never had the time to

integrate this into my main application. Testing this too rapidly also resulted in messages being blocked as spam.
[Email Address Redacted For Github]

Another enhancement which would be very useful to customers would be an automated way of sending them an email/text message whenever an appointment has been confirmed. This would also allow them to much more easily check when their appointments are. It would also probably be a good idea to send a “confirm email” message whenever a new contact is added to ensure their email address is real and belongs to them, as most services do.

I also feel that allowing customers to directly book their own appointments, rather than having to contact a staff member to do so, would significantly help the business, as this may make it significantly easier for them to choose a time that properly suits their needs, instead of having to ask “Is time X free”, and a staff member responding, “No, but Y and Z are”. This would also save staff members time, as although this new system would already help them significantly over their previous paper based system, clients still have to ask staff members to book appointments for them.

In my feedback form, I also asked users to suggest any enhancements. The only enhancement suggested, to give the user a confirmation message when they book an appointment, has now been implemented.



Users also reported that their overall experience with the system was very positive.

