Evidence template:

AS91902 - Use complex techniques to develop a database

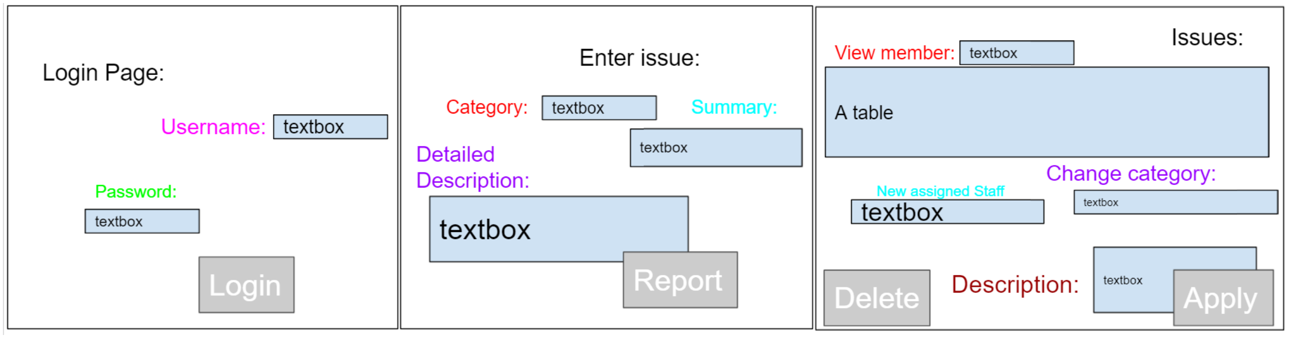
AS91907 - Use complex processes to develop a digital technologies outcome

1. Planning

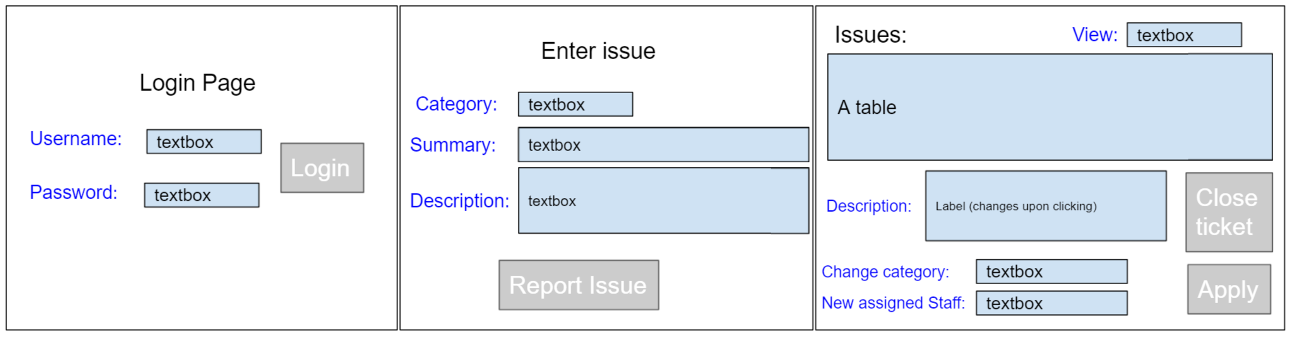
What am I making? What is its purpose? Who are my end users? How does this affect the design?

I am making a program in Visual Studio so that teachers and students can send in IT issues. Admin staff is then able to see these issues and assign them to different staff members. The end-users are the students, teachers and admin staff that need to be able to use this program. This means I need a design and instructions that are easy to follow, rather than having a messy layout that no one can understand.

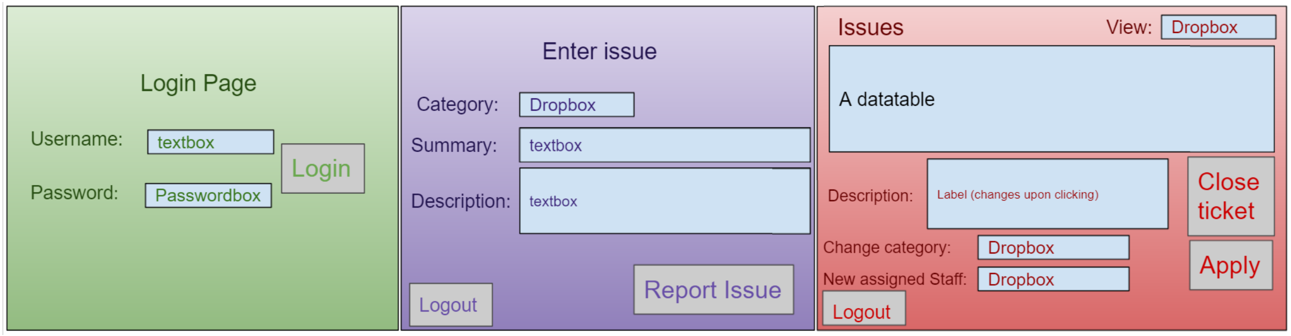
Program interface design



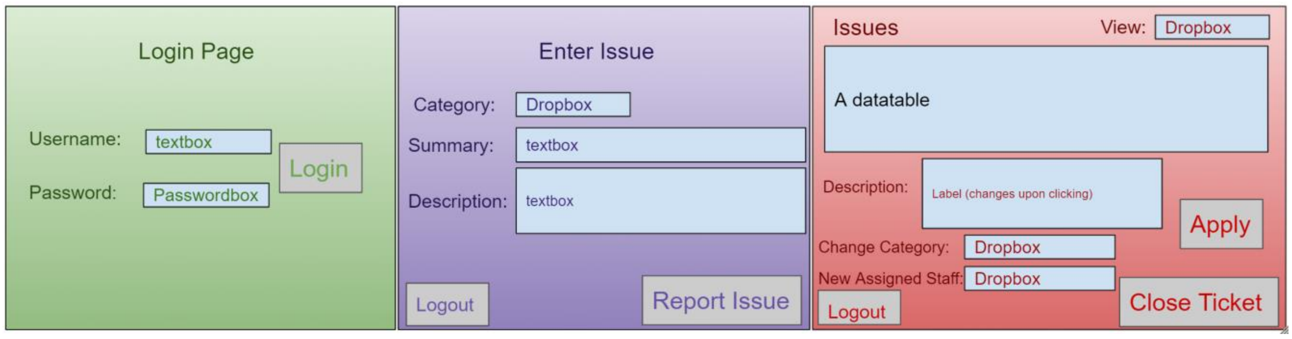
Upon reading about design principles, I realised this layout is very hard to read and very messy i.e., it's not aligned or balanced, it has a lot of different colours, and the headers and labels aren't very clear, they are all different sizes and same counts for textboxes, so I've tidied it up a bit:



After the first change I realized there's a lot of empty space and the colour of the labels don't match the textboxes, so I've changed it to make it more colourful. Furthermore, I realised logout button would be nice and that some textboxes could be a drop box and the textbox for the password in the login page could be a password box since therefore other people can't really know what you're typing. So here are the screens that I plan in using.



After this design I asked some friends for feedback. One of it is that they want the 'Login Page' label to align with the 'Enter Issue' label. Another one is that they would like that the 'Report Issue' button and the 'Logout' are bottom aligned. However, they did like the colour scheme. Another person would like if the 'Close Ticket' button would be somewhere less likely that you would accidentally click it. Another person said to capitalize all the labels/buttons, to be consistent:



Note that I considered aesthetics into this as the outcome needs to have an appealing quality, for it to be used. You don't want to use something that's messy and unclear what everything is. I addressed this by ensuring that the screens are in such a way that's clear and everything looks good. The colours match each screen functionality i.e., green is used for trust, while red is used for anger and hence problems.

Database structure

Fields

Field name	Data Type	Justification
Username	VARCHAR(15)	The username shouldn't be longer than 10 characters hence I've put a maximum of 15. VARCHAR opposed to CHAR since for CHAR the username must be 15 characters, but everyone wants different username not which are necessarily 15 character long.
Password	VARCHAR(45)	VARCHAR has opposed to CHAR because password is varied length and CHAR would make it that length. I put an upper limit of 45 because if the password is any longer, the user is likely to forget.
occupation	VARCHAR(45)	This is put in manual in the database and there are only 3 options, and this is default one and hence easier. VARCHAR is used

		because the 3 options are varied lengths and CHAR fixes the length. Hence, it’s VARCHAR(45).
Ticket/idticket	INT(unassigned)	This is an integer that can go up if the school is big, so I haven’t put on a limit for this. I’ve put int so that it’s number only which is what we want.
Category	VARCHAR(45)	All the categories aren’t longer than 45 characters so 45 is fine. VARCHAR is used because the categories don’t have the same amount of character so CHAR can’t be used.
Summary	CHAR(100)	This is a textbox that users can put in, so it needs to be somewhat longer than the usual 45. I used CHAR because I want the user to have a decent summary so I want it to be 100 characters long, as opposed to VARCHAR which would allow less.
Description	VARCHAR(255)	This is optional for the user to put in so I’ve decided to leave this one VARCHAR so the user can put in nothing. I’ve put in 255 because if the issue is difficult to explain they have somewhat more characters to explain.
Assigned	VARCHAR(15)	VARCHAR to allow different lengths for username. 15 because it’s the maximum length of username, and the only other option is unassigned which is also less than 15.

usermame	password	occupation	tickets	category	**summary**	description	assigned
gabe	admin	admin	0	null	null	null	null
strang	teacher	teacher	2	Wireless	the wireless internet isnt working.	None of the computer in the classroom are able to connect to the internet	unassigned
strang	teacher	teacher	2	Software	The computer has shut down and doesn't want to turn on	The laptop said it had 5% and a few minutes later it just shut downs out of nowhere	gabe
matt	student	student	1	PCSchool	I can't logon on to my PcSchool/spider account on Ranginet	I put in the correct password but it says wrong username/ password. I keep putting in my password without errors.	gabe

This table is very long and has nulls, so I decided to split it + not very clear primary key. This table has a few nulls and is extremely hard to understand. So, in this case more tables would be better so that it’s clearer and separated into two.

username	password	occupation				
gabe	admin	admin				
strang	teacher	teacher				
matt	student	student				
ticket id	*username*	occupation	category	summary	description	assigned
1	strang	teacher	Wireless	the wireless internet isnt working.	None of the computer in the classroom are able to connect to the internet	unassigned
2	strang	teacher	Software	The computer has shut down and doesn't want to turn on	The laptop said it had 5% and a few minutes later it just shut downs out of nowhere	gabe
3	matt	student	PCSchool	I can't logon on to my PcSchool/spider account on Ranginet	I put in the correct password but it says wrong username/ password. I keep putting in my password without errors.	gabe

Upon learning on 1 normal form and 3 normal form I decided to split the ticket table once more because they aren’t allowed to relate to each other, but summary and description clearly do, and username and occupation are also related so I’ve decided to add an iduser so that is clear which user entered the ticket.

iduser	username	password	occupation		**idticket**	*iduser*	category	*iddetail*	assigned		**iddetail**	summary	description
1	gabe	admin	admin		1	2	Wireless	1	unassigned		1	the wireless internet isn't working.	None of the computer in the classroom are able to connect to the internet
2	strang	teacher	teacher		2	2	Software	2	gabe		2	The computer has shut down and doesn't want to turn on	The laptop said it had 5% and a few minutes later it just shut downs out of nowhere
3	matt	student	student		3	3	PCSchool	3	gabe		3	I can't logon on to my PcSchool/spider account on Ranginet	I put in the correct password but it says wrong username/ password. I keep putting in my password without errors.

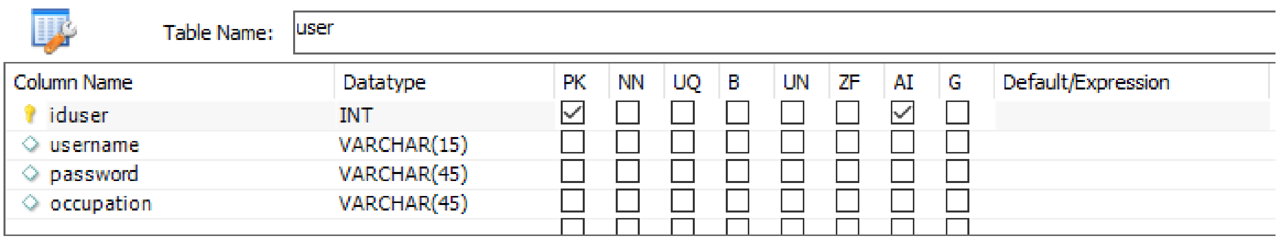


Table Name: user

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
iduser	INT	✓	☐	☐	☐	☐	☐	✓	☐	
username	VARCHAR(15)	☐	☐	☐	☐	☐	☐	☐	☐	
password	VARCHAR(45)	☐	☐	☐	☐	☐	☐	☐	☐	
occupation	VARCHAR(45)	☐	☐	☐	☐	☐	☐	☐	☐	

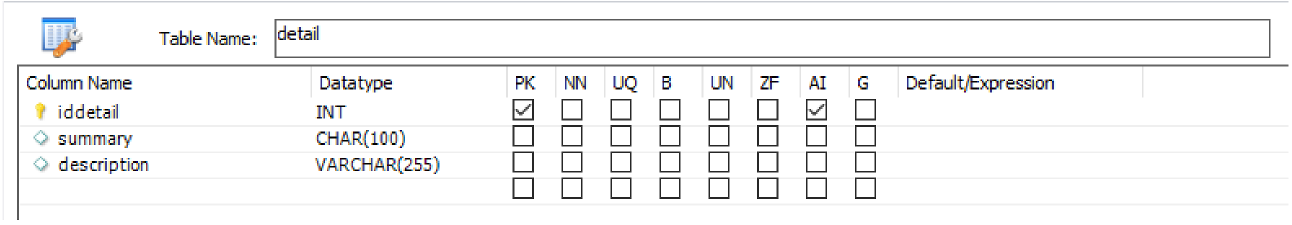


Table Name: detail

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
iddetail	INT	✓	☐	☐	☐	☐	☐	✓	☐	
summary	CHAR(100)	☐	☐	☐	☐	☐	☐	☐	☐	
description	VARCHAR(255)	☐	☐	☐	☐	☐	☐	☐	☐	

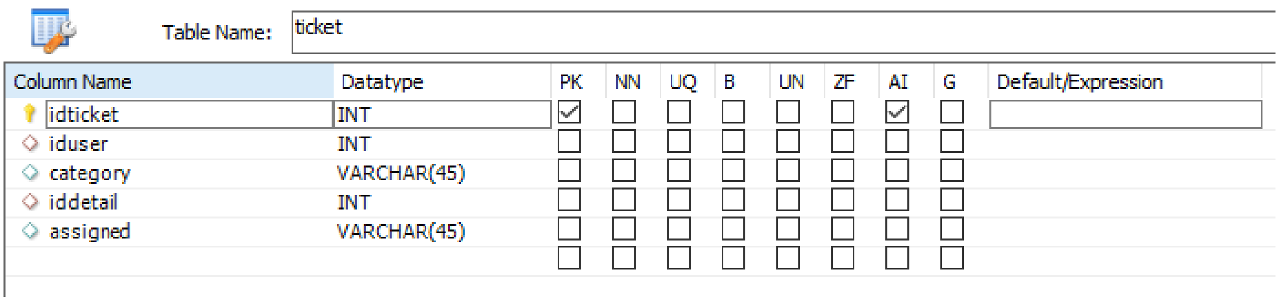


Table Name: ticket

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
idticket	INT	✓	☐	☐	☐	☐	☐	✓	☐	
iduser	INT	☐	☐	☐	☐	☐	☐	☐	☐	
category	VARCHAR(45)	☐	☐	☐	☐	☐	☐	☐	☐	
iddetail	INT	☐	☐	☐	☐	☐	☐	☐	☐	
assigned	VARCHAR(45)	☐	☐	☐	☐	☐	☐	☐	☐	

I have just put in the columns; the ticked boxes are the default one… Hence, I decided to double check everything and just check it:

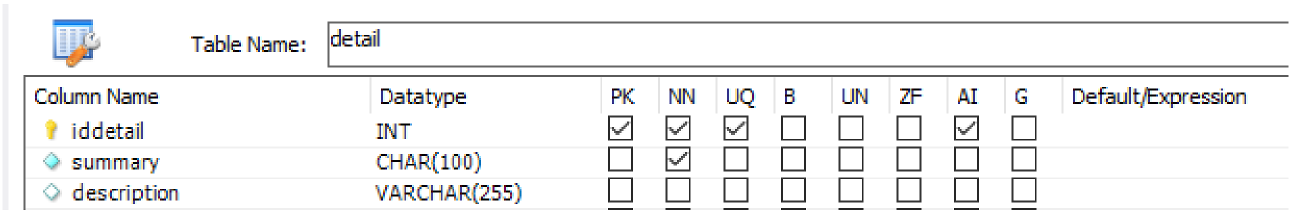


Table Name: detail

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
iddetail	INT	✓	✓	✓	☐	☐	☐	✓	☐	
summary	CHAR(100)	☐	✓	☐	☐	☐	☐	☐	☐	
description	VARCHAR(255)	☐	☐	☐	☐	☐	☐	☐	☐	

The description isn't compulsory so it can be null as opposed to the summary which is compulsory and hence can't be null. Same for iddetail this one isn't null since it's the primary key, and therefore it's unique as well. This one auto increments as new tickets gets added so that it gets autoassigned. Note summary and description aren't unique as different teachers/student can enter the same problem.

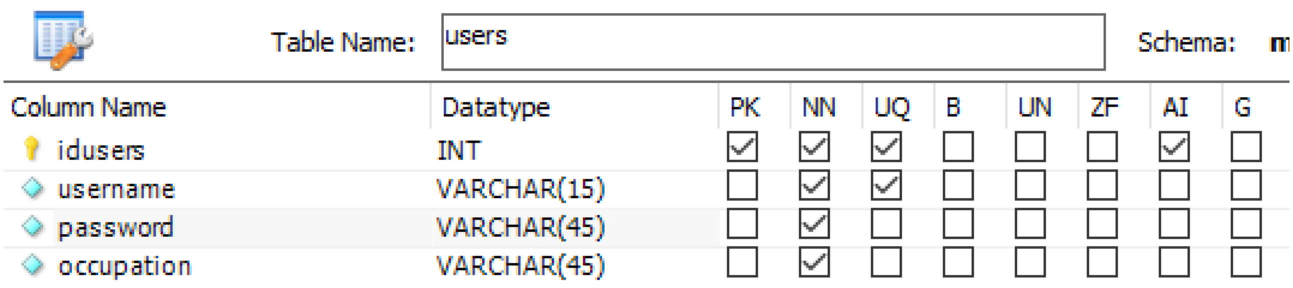


Table Name: users Schema: m

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G
idusers	INT	✓	✓	✓	☐	☐	☐	✓	☐
username	VARCHAR(15)	☐	✓	✓	☐	☐	☐	☐	☐
password	VARCHAR(45)	☐	✓	☐	☐	☐	☐	☐	☐
occupation	VARCHAR(45)	☐	✓	☐	☐	☐	☐	☐	☐

Iduser is the primary key and hence unique and not null. It's important for the program to know the username, password, and occupation so that we know whether the credentials are valid and know to which screen they should go to, hence they are all not null. Username is unique as we don't want any confusion, however, people can have the same password (though unlikely) and occupation.

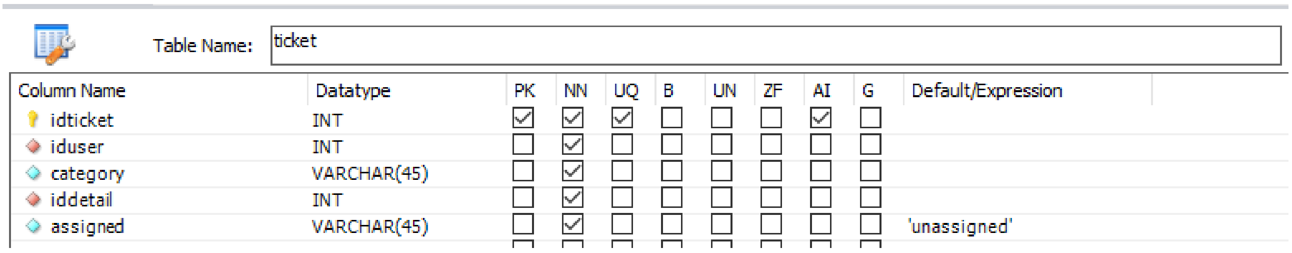
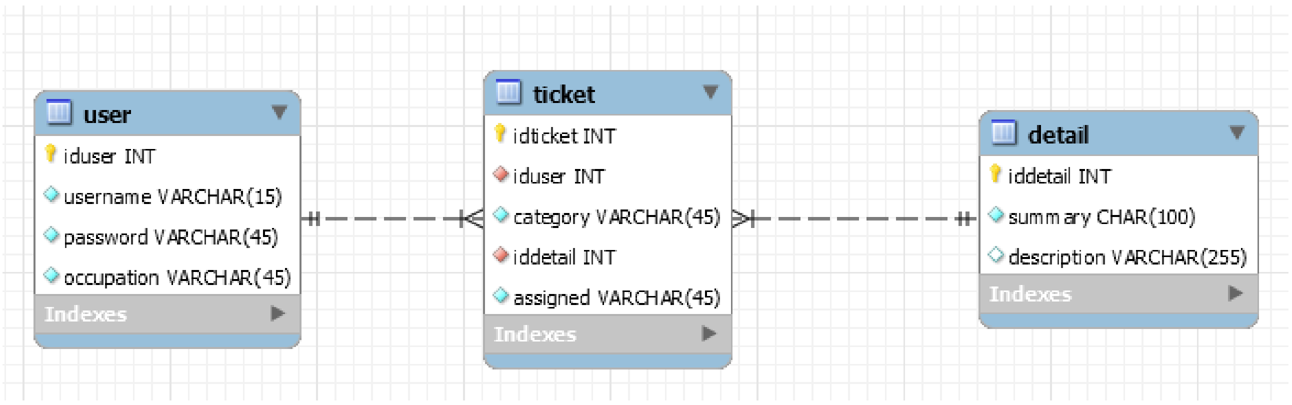


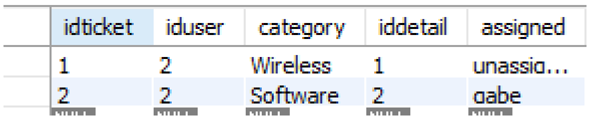
Table Name: ticket

Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
idticket	INT	✓	✓	✓				✓		
iduser	INT		✓							
category	VARCHAR(45)		✓							
iddetail	INT		✓							
assigned	VARCHAR(45)		✓							'unassigned'

Idticket is the primary key and hence can't be null and must be unique, it auto-increments as a new ticket gets added, it's needs a new number and auto increment is the default one. The category, iddetail and assigned all can't be null since they all need to be visible to the admin staff. In this case, iduser isn't necessarily unique as the same user can resubmit the ticket, however, iddetail is unique as it is fit to the description. The column assigned default is 'unassigned' so that upon each new ticket it's clear to the admin that it isn't assigned yet.



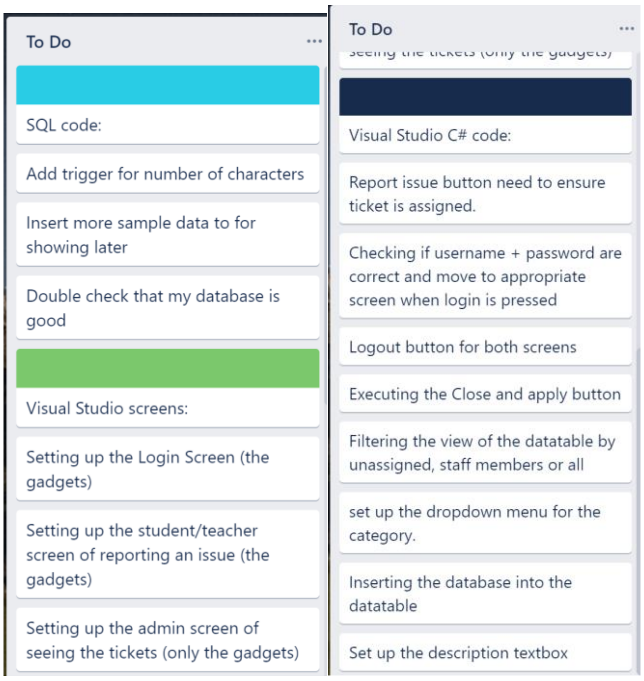
Inserting a new user through the database.	INSERT INTO \`student2021130434\`.\`user\` (\`iduser\`, \`username\`, \`password\`, \`occupation\`) VALUES ('1', 'gabe', 'admin', 'admin');
Inserting a ticket. I'll use the textboxes/drop down menus to insert the details but for now this is just an example.	First add to 'detail' as otherwise it won't work. Then add to the 'ticket' table: INSERT INTO \`student2021130434\`.\`detail\` (\`iddetail\`, \`summary\`, \`description\`) VALUES ('1', 'the wireless internet isn\'t working. ', 'None of the computer in the classroom are able to connect to the internet'); INSERT INTO \`student2021130434\`.\`detail\` (\`iddetail\`, \`summary\`, \`description\`) VALUES ('2', 'The computer has shut down and doesn\'t want to turn on ', 'The laptop said it had 5% and a few minutes later it just shutdowns out of nowhere');
	Upon realizing that CHAR100 would fill with spaces so that it is 100 characters long. Also 100 characters isn't a lot. So, I've decided to make summary to VARCHAR(200) and increase the description to VARCHAR(750) to allow for somewhat more description for complicated problems.

	INSERT INTO \`student2021130434\`.\`ticket\` (\`idticket\`, \`iduser\`, \`category\`, \`iddetail\`) VALUES ('1', '2', 'Wireless', '1'); INSERT INTO \`student2021130434\`.\`ticket\` (\`idticket\`, \`iduser\`, \`category\`, \`iddetail\`, \`assigned\`) VALUES ('2', '2', 'Software', '2', 'gabe');  | idticket | iduser | category | iddetail | assigned | | 1 | 2 | Wireless | 1 | unassig... | | 2 | 2 | Software | 2 | gabe | note how column 1 says unassigned – this is showing that the default expression works

Updating category/assigned columns:	UPDATE \`student2021130434\`.\`ticket\` SET \`category\`='Hardware', \`assigned\`='unassigned' WHERE \`idticket\`='2';
	
	UPDATE \`student2021130434\`.\`ticket\` SET \`assigned\`='gabe' WHERE \`idticket\`='1';

What project management and version control tools will I be using?
I'll be using a Kanban board on Trello so that I know what I still need to do. Also, I will be using subversion to see what I've done and to see where I can improve.

Decomposed list of the components of my project:


To Do

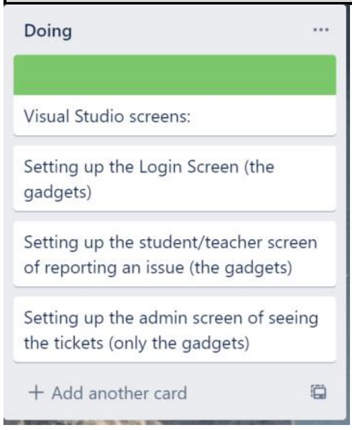
SQL code:
- Add trigger for number of characters
- Insert more sample data to for showing later
- Double check that my database is good

Visual Studio screens:
- Setting up the Login Screen (the gadgets)
- Setting up the student/teacher screen of reporting an issue (the gadgets)
- Setting up the admin screen of seeing the tickets (only the gadgets)

To Do

Visual Studio C# code:
- Report issue button need to ensure ticket is assigned.
- Checking if username + password are correct and move to appropriate screen when login is pressed
- Logout button for both screens
- Executing the Close and apply button
- Filtering the view of the datatable by unassigned, staff members or all
- set up the dropdown menu for the category.
- Inserting the database into the datatable
- Set up the description textbox

2. For each component:
These steps will be repeated for each component of your outcome. Copy and paste the table below as many times as you need.


Doing

Visual Studio screens:

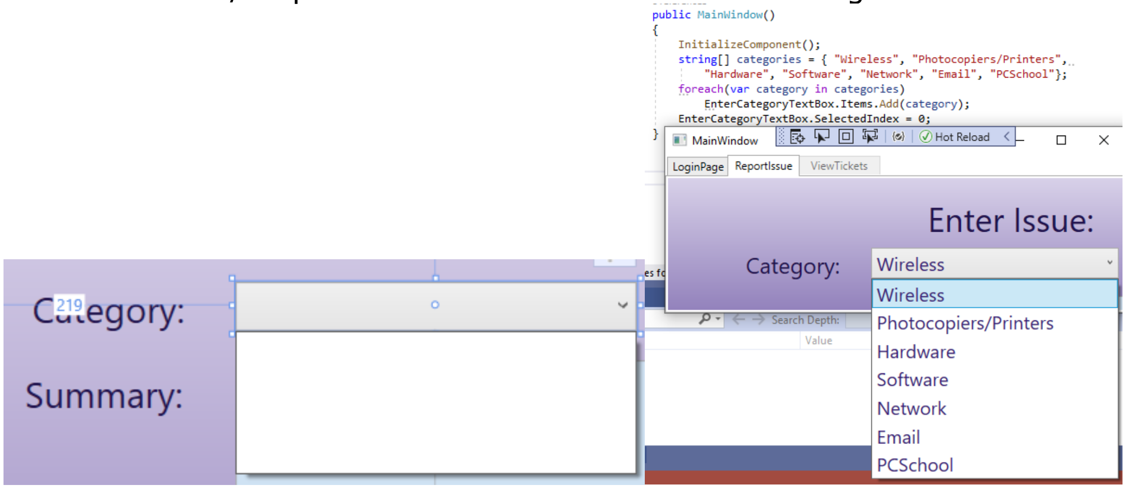
Setting up the Login Screen (the gadgets)

Setting up the student/teacher screen of reporting an issue (the gadgets)

Setting up the admin screen of seeing the tickets (only the gadgets)

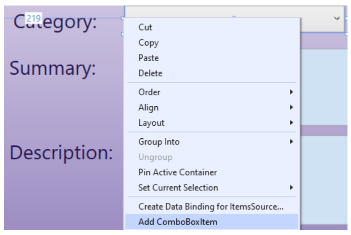
Component: Setting up the screens (Login, reporting issue, and managing.)
Show *trialling* of alternative techniques/components. Explain what you are trialling and justify which techniques you are going to use. How is this going to improve functionality? (Include screenshots)

1. The combo box/dropdown menu I wanted to add it through the C# code:



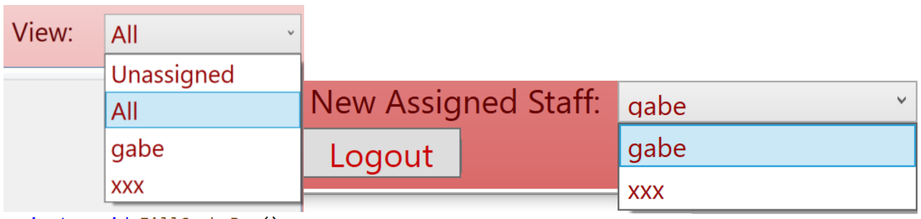
```
public MainWindow()
{
    InitializeComponent();
    string[] categories = { "Wireless", "Photocopiers/Printers",
        "Hardware", "Software", "Network", "Email", "PCSchool"};
    foreach(var category in categories)
        EnterCategoryTextBox.Items.Add(category);
    EnterCategoryTextBox.SelectedIndex = 0;
}
```

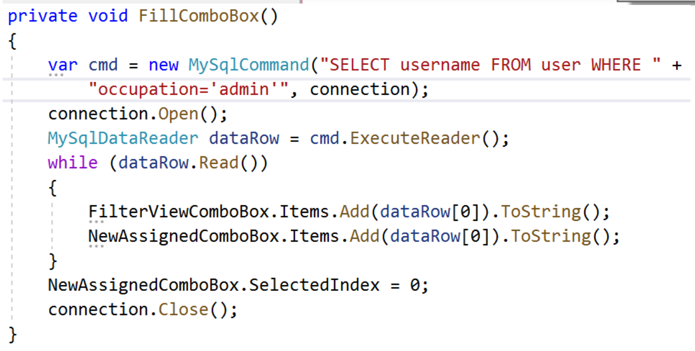
However, it can also be done manually through the XAML file:



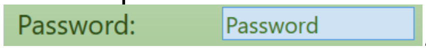
Therefore, I've decided for the combo boxes for category (on the Enter Issue page and Issues page), to try to do it manually rather than coding, so that my C# code is less dense and hence more easily readable.

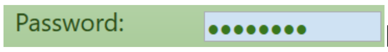
However, for the viewing drop box, it has the usernames of the admins, which isn't fixed, plus 2 other options (all and unassigned). Hence, I've decided to put in the 'all' and unassigned' manually and add in the usernames using c#, to ensure my C# code is as short but clear as possible. For the new assigned I will do it similar; I will put in the unassigned manually and add in the admin staff using C# since I need access to the database. However, I will do this in a private function so that my code is clear and easily readable.

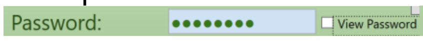


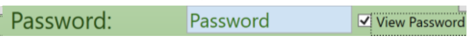


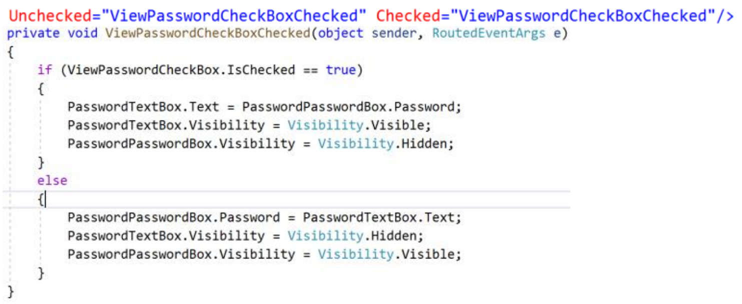
```
private void FillComboBox()
{
    var cmd = new MySqlCommand("SELECT username FROM user WHERE " +
        "occupation='admin'", connection);
    connection.Open();
    MySqlDataReader dataRow = cmd.ExecuteReader();
    while (dataRow.Read())
    {
        FilterViewComboBox.Items.Add(dataRow[0]).ToString();
        NewAssignedComboBox.Items.Add(dataRow[0]).ToString();
    }
    NewAssignedComboBox.SelectedIndex = 0;
    connection.Close();
}
```

2. For the password box I inserted a textbox so that I can what I'm typing: 

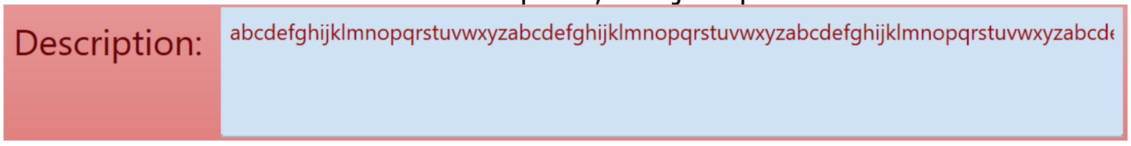
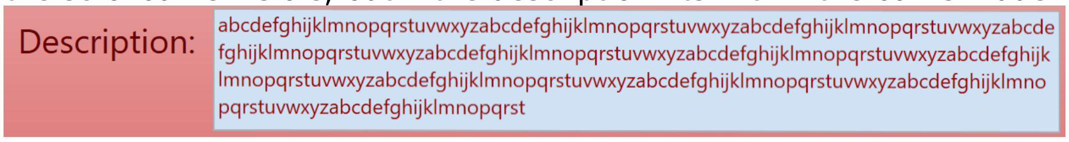
. However, now other people can see it to so I changed it to a password box, so that people can't see your password, however that also mean that I can't see what I'm typing. 

Hence, I've decided to add a show button (checkbox) that would reveal the password, using a textbox, when checked and hide the textbox, and show the password box it if unchecked. This is to ensure that the password as default can't be seen but it if needed the user can see it. 





```
Unchecked="ViewPasswordCheckBoxChecked" Checked="ViewPasswordCheckBoxChecked"/>
private void ViewPasswordCheckBoxChecked(object sender, RoutedEventArgs e)
{
    if (ViewPasswordCheckBox.IsChecked == true)
    {
        PasswordTextBox.Text = PasswordPasswordBox.Password;
        PasswordTextBox.Visibility = Visibility.Visible;
        PasswordPasswordBox.Visibility = Visibility.Hidden;
    }
    else
    {
        PasswordPasswordBox.Password = PasswordTextBox.Text;
        PasswordTextBox.Visibility = Visibility.Hidden;
        PasswordPasswordBox.Visibility = Visibility.Visible;
    }
}
```

3. For the display description label, that show the description of the selected ticket, it can be very long, and labels can't scroll. Hence, I've decided to change it to a Read Only textbox so that if the description is long, the admin staff can still read the entire description, not just part of it. 
Description:
abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcd
A label also doesn't have a wrap function that puts all the letter within the left and right boundary. Therefore, textboxes are better since they have word wrap and you can add a scrollbar. Scrollbar can be set to hidden, visible, auto or disabled. I've chosen for auto, which means that if there are unseen lines the scrollbar is visible, but if the description fits within the bar is hidden. 
Description:
abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcde
fghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijk
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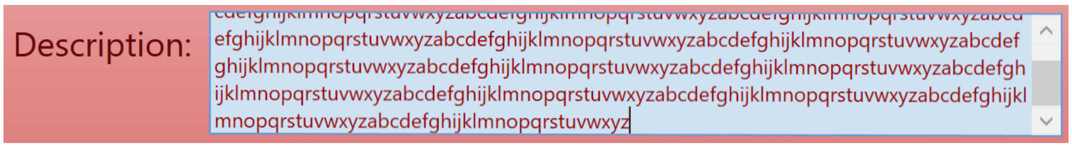
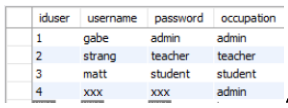

Description: cdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcd
efghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdef
ghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefgh
ijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijkl
mnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz

Show *testing* of your selected technique/component. What did you find out? What do you need to do as a result? How have you improved your design?

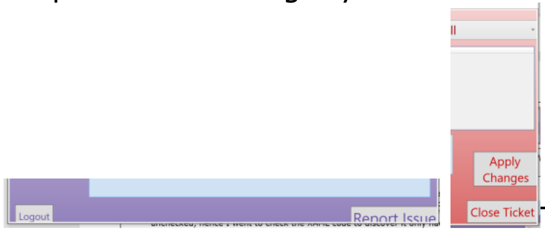
1. The checkbox for view password only works one way. It doesn't work if it gets unchecked. Hence, I went to check the XAML code to discover it only had a checked function but not unchecked. Hence, I've added the unchecked with the same function: `4" Checked="ViewPasswordCheckBoxChecked"/>` to `' Unchecked="ViewPasswordCheckBoxChecked" Checked="ViewPasswordCheckBoxChecked"/`. After having retested this function, it does work both ways now. The individual components of the textbox and password box also work.
2. Also, as you can see above, the combo boxes are filled with the right names, that I've put into the database.



iduser	username	password	occupation
1	gabe	admin	admin
2	strang	teacher	teacher
3	matt	student	student
4	xxx	xxx	admin

. As you can see at only has 2 admins, with the usernames gabe and xxx.
3. Lastly, the description textbox now has a scroll bar if the content is overflowing. This is how I want it to function i.e., this works.

- When I ran the program, the screen was not completely visible i.e., the output screen is slightly smaller than the designer screen:



Therefore, I've added 15 to both the height and width so that everything fits within the output screen:

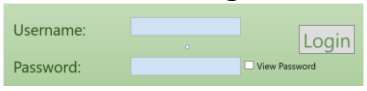
```
Width="815" Height="465">
```

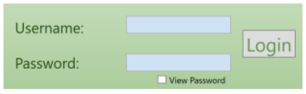
What implications are relevant to this component, and why?

- Functionality – This program needs to function well to be successful. Hence, I need to ensure that it does what the brief asks and that everything works the way I want it to work.
- Privacy – People put in their password, which is how they can access either the report or the view issues tab. Since password need to be secret, they need to be private.
- Usability – This program is going to be used by different people so it needs to be easily usable so that people of all experiences can use it.
- End-user considerations – Since the end-user will be students, teachers and admin staff and need to ensure that they want to use the program and that it isn't a hassle to use.
- Future proofing – This program might be used in the future, so I need to ensure that everything works and that it is clear what everything component does.

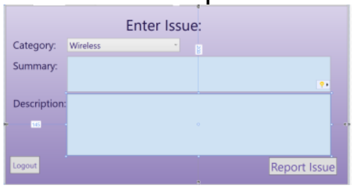
How did I address these implications?

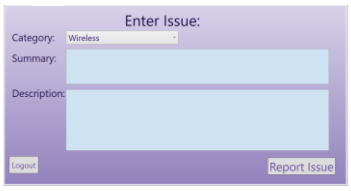
- Functionality – I ensured that the dropdown menu works, and that the description can be seen well, so that the user can see everything. Furthermore, when the unchecked button wasn't working, I looked at why and fixed the problem. This is to ensure that the program functions correctly without bugs. Hence, I test all the functions to ensure it works.
- Privacy – I ensured that the password could be hidden on screen so that it remains secret so that other people can't look over the shoulder and see the password and as a result use their login.
- Usability – Some of the buttons were hidden and hence weren't very usable since you had to click them very accurately. I addressed this my slightly increasing the width of the window from 450 to 465 and the height 800 – 815, to ensure that everything is visible and hence can be used.
- End-user considerations – I asked for some feedback from some students and a teacher and here's what they said: the view password checkbox should be underneath the password box rather than besides it. Then the next end-user told me to move the login button closer in.

  Before: 

  and After: 

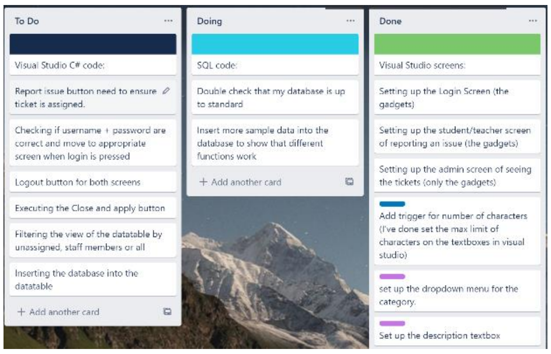
  On the report issue page, the user found it a bit cramped between the summary and description with the buttons. Hence, I've moved up the header to make more space for it and align the top of the description with the top of the textbox for description.

  Before: 

  and After: 

- Future proofing – I've named every component on the way clearly so that future programmers, that want to look at my program, know what everything is and why it's there so that they know what is happening at any point in the program.

My project management, version control tools, and any feedback on your program at this point in the project.:



To Do

Visual Studio C# code:

Report issue button need to ensure ticket is assigned.

Checking if username + password are correct and move to appropriate screen when login is pressed

Logout button for both screens

Executing the Close and apply button

Filtering the view of the datatable by unassigned, staff members or all

Inserting the database into the datatable

+ Add another card

Doing

SQL code:

Double check that my database is up to standard

Insert more sample data into the database to show that different functions work

+ Add another card

Done

Visual Studio screens:

Setting up the Login Screen (the gadgets)

Setting up the student/teacher screen of reporting an issue (the gadgets)

Setting up the admin screen of seeing the tickets (only the gadgets)

Add trigger for number of characters (I've done set the max limit of characters on the textboxes in visual studio)

set up the dropdown menu for the category.

Set up the description textbox

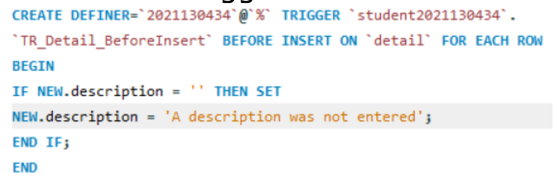
Note that I intended to do the combo boxes along with the other C# coding, however, I found another way to do halve of it, hence, I've decided to do it simultaneous so that I ensured that they are full completed. Furthermore, I didn't realize I could set a character limit on the textboxes so thought I would need a trigger but turns out I don't need a trigger to set the max lengths.

For subversion log please refer to the word document titled subversion_log_3.3_3.8

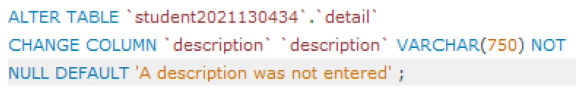
Component: SQL database

Show *trialling* of alternative techniques/components. Explain what you are trialling and justify which techniques you are going to use. How is this going to improve functionality? (Include screenshots)

1. Upon realizing that admin want to see the description and might think something is wrong with the program if the description box is empty. I could either add a trigger as shown below or have a default value:



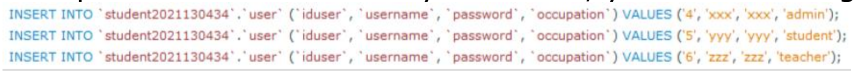
```
CREATE DEFINER=`2021130434`@`%` TRIGGER `student2021130434`.
`TR_Detail_BeforeInsert` BEFORE INSERT ON `detail` FOR EACH ROW
BEGIN
IF NEW.description = '' THEN SET
NEW.description = 'A description was not entered';
END IF;
END
```



```
ALTER TABLE `student2021130434`.`detail`
CHANGE COLUMN `description` `description` VARCHAR(750) NOT
NULL DEFAULT 'A description was not entered' ;
```

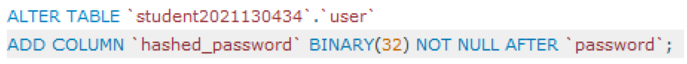
Both the trigger and the default expression works, if it's entered manually (through mysql). however, when using C# code for later on, the text will be empty (""), not NULL. Hence for later on, it would be easier to use a trigger, so I need to do less if-else statements in the C# code and it's easier to troubleshoot in the future if something is wrong (future proofing). Hence I've decided to go with the trigger.

2. I could go with 3 users, 1 admin/teacher/student or with 6, 2 admin/teacher/student. One will give a clearer outline however, for testing purposes it only shows if it works once not twice. Hence, I've to add extra users into the user database so that when I test, I can ensure that it works twice rather than just once. This is because if only one works it might be just the specific code whereas if you have 2, you need more general code:



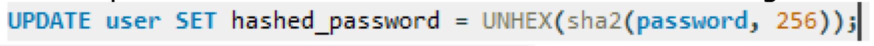
```
INSERT INTO `student2021130434`.`user` (`iduser`, `username`, `password`, `occupation`) VALUES ('4', 'xxx', 'xxx', 'admin');
INSERT INTO `student2021130434`.`user` (`iduser`, `username`, `password`, `occupation`) VALUES ('5', 'yyy', 'yyy', 'student');
INSERT INTO `student2021130434`.`user` (`iduser`, `username`, `password`, `occupation`) VALUES ('6', 'zzz', 'zzz', 'teacher');
```

3. I could either use a normal password, like I have now or a hashed password that no one can see. Currently the password for the user can be seen by everyone. What I mean is, it isn't hidden and you can easily find it. Hence, I've decided to go add a hashed_password column for privacy reasons with BINARY(32):

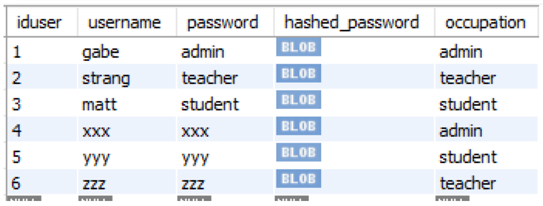


```
ALTER TABLE `student2021130434`.`user`
ADD COLUMN `hashed_password` BINARY(32) NOT NULL AFTER `password`;
```

Next, I needed to ensure that every password that already exists has a hashed password so I've decided to run the following code:

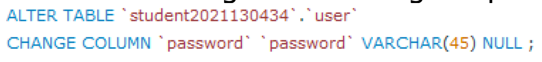


```
UPDATE user SET hashed_password = UNHEX(sha2(password, 256));
```

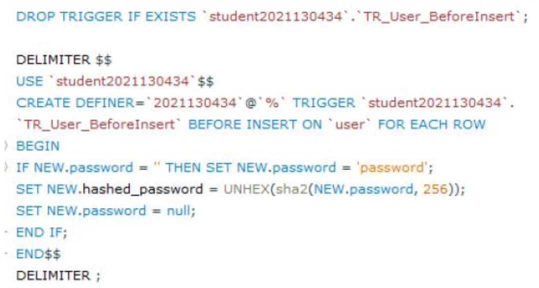


iduser	username	password	hashed_password	occupation
1	gabe	admin	BLOB	admin
2	strang	teacher	BLOB	teacher
3	matt	student	BLOB	student
4	xxx	xxx	BLOB	admin
5	yyy	yyy	BLOB	student
6	zzz	zzz	BLOB	teacher

So now I have to add a trigger that when a new password is added that it is hashed immediately as the hashed_password shouldn't be null and then set the password to null. Hence I have to change the setting for password as it is set to null after the trigger:



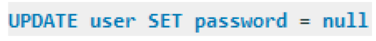
```
ALTER TABLE `student2021130434`.`user`
CHANGE COLUMN `password` `password` VARCHAR(45) NULL ;
```



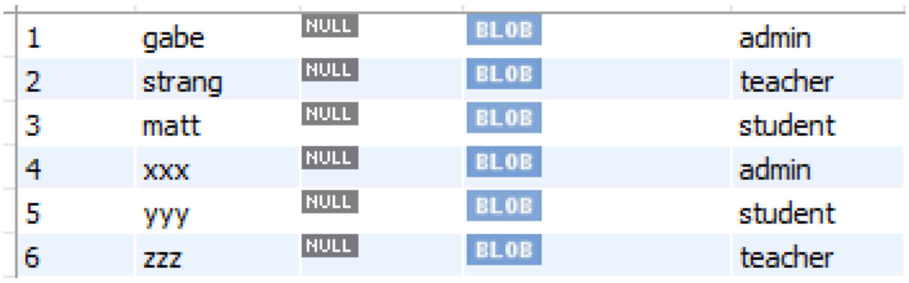
```
DROP TRIGGER IF EXISTS `student2021130434`.`TR_User_BeforeInsert`;

DELIMITER $$
USE `student2021130434`$$
CREATE DEFINER=`2021130434`@`%` TRIGGER `student2021130434`.
`TR_User_BeforeInsert` BEFORE INSERT ON `user` FOR EACH ROW
BEGIN
IF NEW.password = '' THEN SET NEW.password = 'password';
SET NEW.hashed_password = UNHEX(sha2(NEW.password, 256));
SET NEW.password = null;
END IF;
END$$
DELIMITER ;
```

Finally, the already esixtant password are still visible, just the added are hidden. So I've decided to run the following code:



```
UPDATE user SET password = null
```



1	gabe	NULL	BLOB	admin
2	strang	NULL	BLOB	teacher
3	matt	NULL	BLOB	student
4	xxx	NULL	BLOB	admin
5	yyy	NULL	BLOB	student
6	zzz	NULL	BLOB	teacher

4. Summary and description could be kept at 100 and 255 characters respectively. However, this isn't very long as 100 characters is about 20 words. Hence, I've decided to increase summary and description to 200 and 750 respectively. Also change summary to VARCHAR instead of CHAR as CHAR just fills up with spaces if it isn't 200 characters long:

```
ALTER TABLE `student2021130434`.`detail`
CHANGE COLUMN `summary` `summary` VARCHAR(200) NOT NULL ,
CHANGE COLUMN `description` `description` VARCHAR(750) NULL ;
```

Show *testing* of your selected technique/component. What did you find out? What do you need to do as a result? How have you improved your design?

1.
```
INSERT INTO `student2021130434`.`detail` (`iddetail`, `summary`) VALUES ('3', 'nothing');
```

3	nothing	A description was not entered

As you can see when enter just an id and summary to the details table, a description is automatically added. This means that the default expression works. However, when added in c#, it is empty:

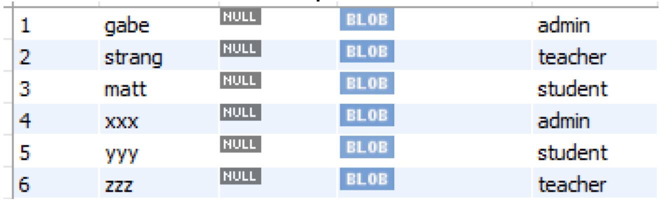
```
INSERT INTO `student2021130434`.`details`
(`summary`, `description`) VALUES ('nothing', '');
```

nothing	

However with the trigger, it's added, with the same code, this happens:

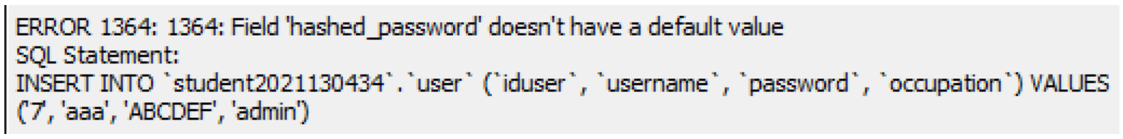
nothing	A description was not entered

2. The table has been updated to contain the extra users:



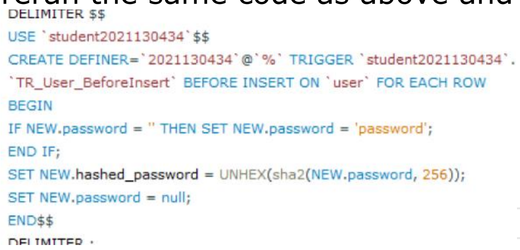
1	gabe	NULL	BLOB	admin
2	strang	NULL	BLOB	teacher
3	matt	NULL	BLOB	student
4	xxx	NULL	BLOB	admin
5	yyy	NULL	BLOB	student
6	zzz	NULL	BLOB	teacher

3.
```
INSERT INTO `student2021130434`.`user` (`iduser`, `username`, `password`, `occupation`) VALUES ('7', 'aaa', 'ABCDEF', 'admin');
```

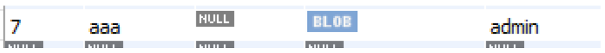


```
ERROR 1364: 1364: Field 'hashed_password' doesn't have a default value
SQL Statement:
INSERT INTO `student2021130434`.`user` (`iduser`, `username`, `password`, `occupation`) VALUES
('7', 'aaa', 'ABCDEF', 'admin')
```

I rechecked my trigger to see if there were any bugs in it. Turns out, that I needed to add the END IF; up so that the 2 SET lines would always run. Now I reran the same code as above and it worked:

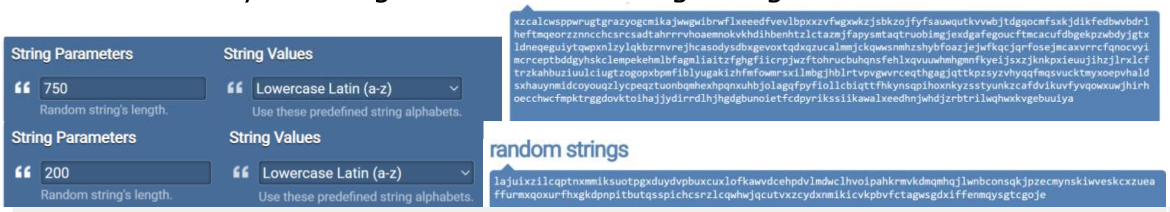


```
DELIMITER $$
USE `student2021130434`$$
CREATE DEFINER=`2021130434`@`%` TRIGGER `student2021130434`.
`TR_User_BeforeInsert` BEFORE INSERT ON `user` FOR EACH ROW
BEGIN
IF NEW.password = '' THEN SET NEW.password = 'password';
END IF;
SET NEW.hashed_password = UNHEX(sha2(NEW.password, 256));
SET NEW.password = null;
END$$
DELIMITER ;
```



7	aaa	NULL	BLOB	admin

4. Summary can now have 200 characters and description 750 characters. I've confirmed this by entering a 200 and 750 long string:

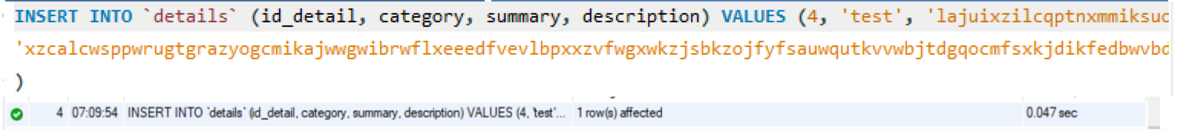

String Parameters | String Values
750 | Lowercase Latin (a-z)
Random string's length. | Use these predefined string alphabets.

String Parameters | String Values
200 | Lowercase Latin (a-z)
Random string's length. | Use these predefined string alphabets.

```
xzcalcwsppwrugtgrazyogcmikajwwgwibrwflxeeedfvevlbpxxzvfwgxwkzjsbkzojfyfsauwqutkvvwbjtdgqocmfsxkjdikfedbwvbdrl
heftmqeorzznncchcsrcsadtahrrrvhoaemnokvkhdihbenhtzlctazmjfapysmtaqtruobimgjexdgafegoucftmcacufdbgekpzwbdyjgtx
ldneqeguiytqwpxnlzylqkbzrnvrejhcasodysdbxgevoxtqdxqzucalmmjckqwwsnmhzshybfoazjejwfkqcjqrfosejmcaxvrrcfqnocvyi
mcrceptbddgyhskclempekehmlbfagmliaitzfghgfiicrpjwzftohrucbuhqnsfehlxqvuuwhmhgmnfkyeijsxzjknkpxieuujihzjlrxlcf
trzkahbuziuulciugtzogopxbpmfiblyugakizhfmfowmrsxilmbgjhblrtvpvgwvrceqthgagjqttkpzsyzvhyqqfmqsvucktmyxoepvhald
sxhauynmidcoyouqzlycpeqztuonbqmhexhpqnxuhbjolagqfpyfiollcbiqttfhkynsqpihoxnkyzsstyunkzcafdvikuvfyvqowxuwjhirh
oecchwcfmpktrggdovktoihajjydirrdlhjhgdgbunoietfcdpyrikssiikawalxeedhnjwhdjzrbtrilwqhwxkvgebuuiya
```

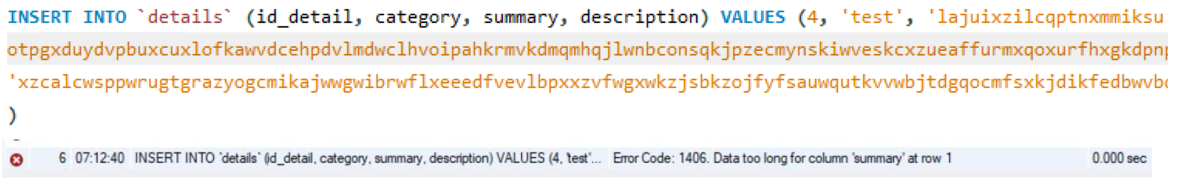
random strings

```
lajuixzilcqptnxmmiksuotpgxduydvpbuxcuxlofkawvdcehpdvlmdwclhvoipahkrmvkdmqmhqjlwnbconsqkjpzecmynskiwveskcxzuea
ffurmxqoxurfhxgkdpnpitbutqsspichcsrzlcqwhwjqcutvxzcydxnmikicvkpbvfctagwsgdxiffenmqysgtcgoje
```



```
INSERT INTO `details` (id_detail, category, summary, description) VALUES (4, 'test', 'lajuixzilcqptnxmmiksuc
'xzcalcwsppwrugtgrazyogcmikajwwgwibrwflxeeedfvevlbpxxzvfwgxwkzjsbkzojfyfsauwqutkvvwbjtdgqocmfsxkjdikfedbwvbd
)
```

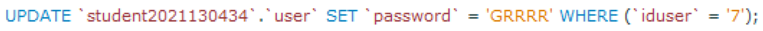
```
4   07:09:54   INSERT INTO `details` (id_detail, category, summary, description) VALUES (4, 'test'...   1 row(s) affected   0.047 sec
```



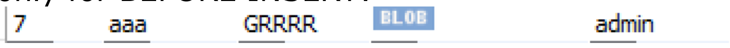
```
INSERT INTO `details` (id_detail, category, summary, description) VALUES (4, 'test', 'lajuixzilcqptnxmmiksu
otpgxduydvpbuxcuxlofkawvdcehpdvlmdwclhvoipahkrmvkdmqmhqjlwnbconsqkjpzecmynskiwveskcxzueaffurmxqoxurfhxgkdpn
'xzcalcwsppwrugtgrazyogcmikajwwgwibrwflxeeedfvevlbpxxzvfwgxwkzjsbkzojfyfsauwqutkvvwbjtdgqocmfsxkjdikfedbwvb
)
```

```
6   07:12:40   INSERT INTO `details` (id_detail, category, summary, description) VALUES (4, 'test'...   Error Code: 1406. Data too long for column 'summary' at row 1   0.000 sec
```

- User Testing: One of the end-users looked through my MySQL database and asked what would happen if you would update a password, since the trigger is only for BEFORE INSERT:

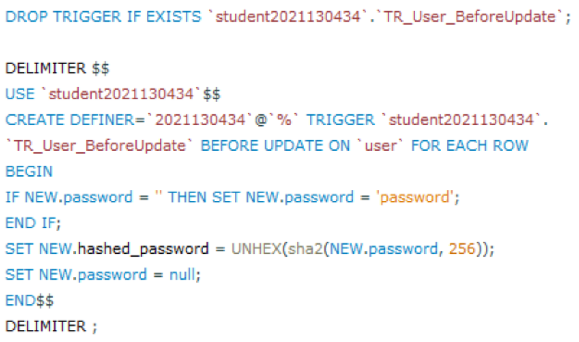


```
UPDATE `student2021130434`.`user` SET `password` = 'GRRRR' WHERE (`iduser` = '7');
```



```
7     aaa     GRRRR     BLOB     admin
```

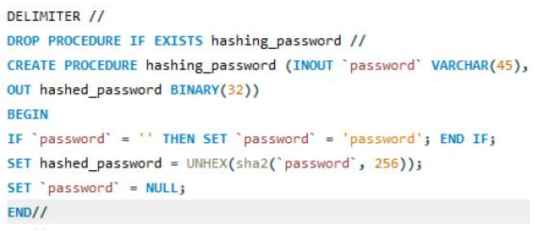
As you can see the password is visible and the hashed_password is probably not updated. So, I checked out how to have a trigger for both BEFORE INSERT and BEFORE UPDATE. So, initially I added a trigger for BEFORE UPDATE with the same code as BEFORE INSERT to ensure it is correct:



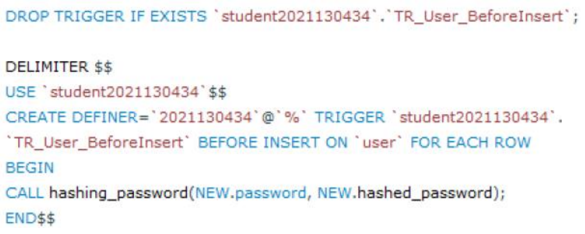
```
DROP TRIGGER IF EXISTS `student2021130434`.`TR_User_BeforeUpdate`;

DELIMITER $$
USE `student2021130434`$$
CREATE DEFINER=`2021130434`@`%` TRIGGER `student2021130434`.
`TR_User_BeforeUpdate` BEFORE UPDATE ON `user` FOR EACH ROW
BEGIN
IF NEW.password = '' THEN SET NEW.password = 'password';
END IF;
SET NEW.hashed_password = UNHEX(sha2(NEW.password, 256));
SET NEW.password = null;
END$$
DELIMITER ;
```

However, I looked for alternative methods as copied code isn't ideal for a program. I tried procedures which can be called to run specific code. I created a procedure with the same code between BEGIN and END as BEFORE INSERT. Hence, I've decided to use procedures as this would prevent copied code and makes it work. Then I had to change both the triggers so that they would call the procedure and I had to ensure the code worked:

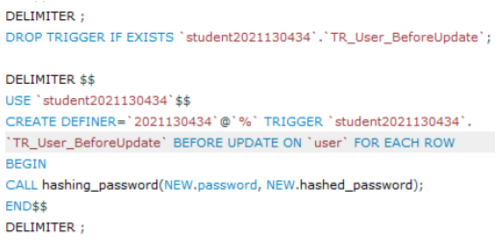


```
DELIMITER //
DROP PROCEDURE IF EXISTS hashing_password //
CREATE PROCEDURE hashing_password (INOUT `password` VARCHAR(45),
OUT hashed_password BINARY(32))
BEGIN
IF `password` = '' THEN SET `password` = 'password'; END IF;
SET hashed_password = UNHEX(sha2(`password`, 256));
SET `password` = NULL;
END//
```



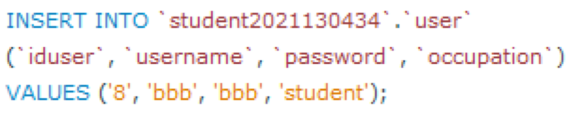
```
DROP TRIGGER IF EXISTS `student2021130434`.`TR_User_BeforeInsert`;

DELIMITER $$
USE `student2021130434`$$
CREATE DEFINER=`2021130434`@`%` TRIGGER `student2021130434`.
`TR_User_BeforeInsert` BEFORE INSERT ON `user` FOR EACH ROW
BEGIN
CALL hashing_password(NEW.password, NEW.hashed_password);
END$$
```

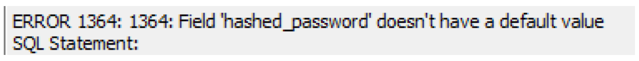


```
DELIMITER ;
DROP TRIGGER IF EXISTS `student2021130434`.`TR_User_BeforeUpdate`;

DELIMITER $$
USE `student2021130434`$$
CREATE DEFINER=`2021130434`@`%` TRIGGER `student2021130434`.
`TR_User_BeforeUpdate` BEFORE UPDATE ON `user` FOR EACH ROW
BEGIN
CALL hashing_password(NEW.password, NEW.hashed_password);
END$$
DELIMITER ;
```

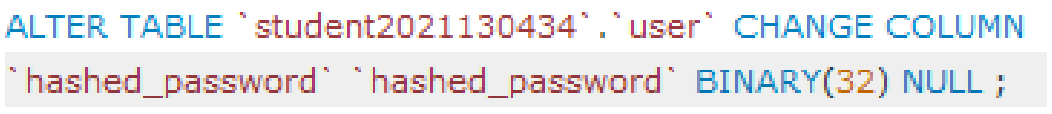


```
INSERT INTO `student2021130434`.`user`
(`iduser`, `username`, `password`, `occupation`)
VALUES ('8', 'bbb', 'bbb', 'student');
```

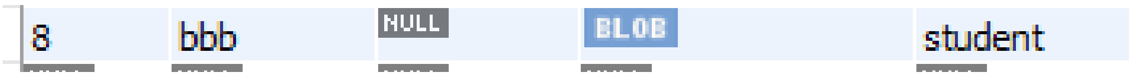


```
ERROR 1364: 1364: Field 'hashed_password' doesn't have a default value
SQL Statement:
```

The program doesn't recognise that at the end hashed_password will be set. Hence, I've decided that hashed_password can be NULL in the table, as it will always be generated through the PROCEDURE/TRIGGER and hence it doesn't really matter if the NULL box for hashed_password is ticked or not:



```
ALTER TABLE `student2021130434`.`user` CHANGE COLUMN
`hashed_password` `hashed_password` BINARY(32) NULL ;
```



8	bbb	NULL	BLOB	student

I reran the same code as above and this time it worked. The procedure worked as password isn't 'bbb' and the hashed_password isn't NULL.

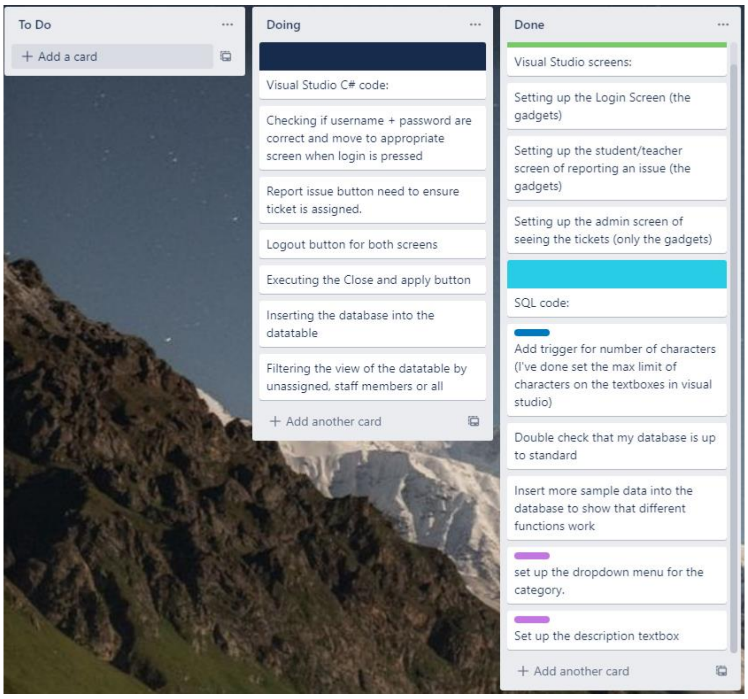
What implications are relevant to this component, and why?

- End-user considerations: This is relevant because the people who are using the program want it to work and ensure that every part of the database is clear. Hence, I need to consider what the end-user would like it to look like
- Functionality: I need to ensure that every part of the program works, i.e., is functional. Hence, I need to consider the different functionalities of the program to ensure it doesn't crash.
- Privacy: We need to ensure that all data is stored and is secure. The password shouldn't be easy to find or figure out, as we want that to be private, so that not everyone can login.
- Futureproofing: The program is likely to be used for a few years, hence I need make sure that everything works and makes sense so that future programmers understand every component of the database.
- Accessibility: I need to ensure that the database is easily accessible so that it can be easily updated, to ensure that IT staff can add and remove members.

How did I address these implications?

- End-user considerations: I allowed end-users staff members and other students at the school to test the database and give feedback so that I can ensure it makes everyone happy. Secondly, I considered what I would like it to look like in the end so that end-users are happy to use it.
- Functionality: I tested all components of the database alongside with end-users testing so that there are no bugs in the program, so that everything works as functions as it is supposed to.
- Privacy: I ensured that the password isn't easily found, by hashing the password so that you can't see it and hence it's kept private to you, as no one can see it.
- Futureproofing: I considered what would be easiest to understand, in terms of altering and understanding everything, to ensure future staff can easily edit it and know what each component is for, rather than just guessing and making unnecessary changes.
- Accessibility: I added triggers and functions to ensure that everything runs smoothly when it's updated or new data is entered, to ensure staff need to do minimal checks.

My project management, version control tools, and any feedback on your program at this point in the project.:


To Do
+ Add a card

Doing
- Visual Studio C# code:
- Checking if username + password are correct and move to appropriate screen when login is pressed
- Report issue button need to ensure ticket is assigned.
- Logout button for both screens
- Executing the Close and apply button
- Inserting the database into the datatable
- Filtering the view of the datatable by unassigned, staff members or all

+ Add another card

Done
- Visual Studio screens:
- Setting up the Login Screen (the gadgets)
- Setting up the student/teacher screen of reporting an issue (the gadgets)
- Setting up the admin screen of seeing the tickets (only the gadgets)
- SQL code:
- Add trigger for number of characters (I've done set the max limit of characters on the textboxes in visual studio)
- Double check that my database is up to standard
- Insert more sample data into the database to show that different functions work
- set up the dropdown menu for the category.
- Set up the description textbox

+ Add another card

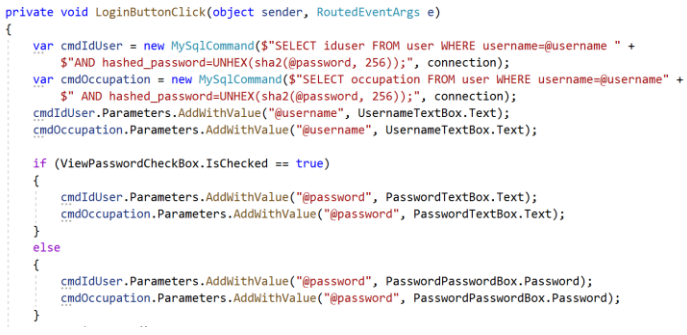
For subversion log please refer to the word document titled subversion_log_3.3_3.8. I am on track since I have still 4 weeks to complete the C# code and for testing, which should be plenty of time.

At this stage I ensured that I followed all the conventions that I need to follow. For example, I had to add _ between id and singular table name. Secondly, I had to change the names of the foreign keys in the ticket table, I had to add fk to the name. So, it changed from iduser to fk_user and iddetail changed to fk_detail. Thirdly, I did all my component names as Pascal Case, while it should've been camelCase. Hence, I changed all the buttons, label, combo boxes etc, to camel case.

Component: C# code

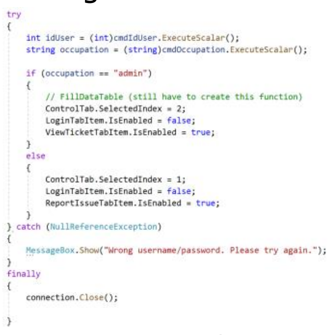
Show *trialling* of alternative techniques/components. Explain what you are trialling and justify which techniques you are going to use. How is this going to improve functionality? (Include screenshots)

- When people login, I need the user id and their occupation. I could either use Execute Scalar two timer or use Execute Reader to get both:



```
private void LoginButtonClick(object sender, RoutedEventArgs e)
{
    var cmdIdUser = new MySqlCommand($"SELECT iduser FROM user WHERE username=@username " +
        $"AND hashed_password=UNHEX(sha2(@password, 256));", connection);
    var cmdOccupation = new MySqlCommand($"SELECT occupation FROM user WHERE username=@username" +
        $" AND hashed_password=UNHEX(sha2(@password, 256));", connection);
    cmdIdUser.Parameters.AddWithValue("@username", UsernameTextBox.Text);
    cmdOccupation.Parameters.AddWithValue("@username", UsernameTextBox.Text);

    if (ViewPasswordCheckBox.IsChecked == true)
    {
        cmdIdUser.Parameters.AddWithValue("@password", PasswordTextBox.Text);
        cmdOccupation.Parameters.AddWithValue("@password", PasswordTextBox.Text);
    }
    else
    {
        cmdIdUser.Parameters.AddWithValue("@password", PasswordPasswordBox.Password);
        cmdOccupation.Parameters.AddWithValue("@password", PasswordPasswordBox.Password);
    }
```



```
try
{
    int idUser = (int)cmdIdUser.ExecuteScalar();
    string occupation = (string)cmdOccupation.ExecuteScalar();

    if (occupation == "admin")
    {
        // FillDataTable (still have to create this function)
        ControlTab.SelectedIndex = 2;
        LoginTabItem.IsEnabled = false;
        ViewTicketTabItem.IsEnabled = true;
    }
    else
    {
        ControlTab.SelectedIndex = 1;
        LoginTabItem.IsEnabled = false;
        ReportIssueTabItem.IsEnabled = true;
    }
} catch (NullReferenceException)
{
    MessageBox.Show("Wrong username/password. Please try again.");
}
finally
{
    connection.Close();

}
```

Execute Scalar is very easy to use, however it's quite a bit of code, with some part being repeated, and it has 2 commands instead of 1:

```
private void LoginButtonClick(object sender, RoutedEventArgs e)
{
    var cmd = new MySqlCommand($"SELECT iduser, occupation FROM user WHERE username=@username" +
        $" AND hashed_password=UNHEX(sha2(@password, 256));", connection);
    cmd.Parameters.AddWithValue("@username", UsernameTextBox.Text);

    if (ViewPasswordCheckBox.IsChecked == true)
    {
        cmd.Parameters.AddWithValue("@password", PasswordTextBox.Text);
    }
    else
    {
        cmd.Parameters.AddWithValue("@password", PasswordPasswordBox.Password);
    }
    connection.Open();
    MySqlDataReader dataRow = cmd.ExecuteReader();
    if (dataRow.HasRows)
    {
        while (dataRow.Read())
        {
            int iduser = (int)dataRow[0];
            string occupation = dataRow[1].ToString();
            if (occupation == "admin")
            {
                // FillDataTable (still have to create this function)
                ControlTab.SelectedIndex = 2;
                ViewTicketTabItem.IsEnabled = true;
            }
            else
            {
                ControlTab.SelectedIndex = 1;
                ReportIssueTabItem.IsEnabled = true;
            }
            LoginTabItem.IsEnabled = false;
        }
    }
    else
    {
        MessageBox.Show("Wrong username/password. Please try again.");
    }
    connection.Close();
```

Execute reader is a bit harder to use but once you've got the hang of it it's easier to understand the code. Furthermore, execute reader allows a more flexible approach in case you want more data from the database.

- I could have an if else statement to know whether, the textbox or password box is currently used and add the right parameter, to the MySQL code:

```
if (viewPasswordCheckBox.IsChecked == true)
{
    cmd.Parameters.AddWithValue("@password", passwordTextBox.Text);
}
else
{
    cmd.Parameters.AddWithValue("@password", passwordPasswordBox.Password);
}
```

This is rather a long way of doing it, it works fine, but it can look a bit confusing. Alternatively, I could use a statement that checks the box, so that the password box is always correct, so that I don't need the if-else statement:

```
viewPasswordCheckBox.IsChecked = false;
cmd.Parameters.AddWithValue("@password", passwordPasswordBox.Password);
```

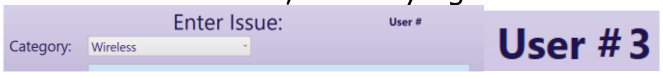
The second option, is easier to use and understand, as it's clear that I uncheck the box and as a result use the password box to get the password (especially when I add comments). Hence, I'm going with the unchecking the box as this way I have less code and it's easier to understand, for future proofing, what's happening, because there are less statements and you don't have to think about how it works.

- I need to store id_user if it's a student or teacher because the ticket needs to know their username and occupation. I could either make iduser a public variable as shown below and set it to the value I want:

```
MySqlConnection connection;
int iduser;
```

```
iduser = (int)dataRow[0];
```

However, I could also use an extra 2 labels, one saying 'User # and one displaying their user id.



```
else
{
    ControlTab.SelectedIndex = 1;
    ReportIssueTabItem.IsEnabled = true;
    UserIdLabel.Content = $"User #{iduser}";
}
```

This approach allows the user will know whether they are logged into the right account and I'll have less global variables. Hence, adding labels is better since it has better coding styl and the user can check if they have logged in correctly.

- I have two logout buttons, 1 on the View Tickets Tab and one on the Report Ticket tab. I could use 2 separate method that reset everything:

```
private void ReportLogoutButtonClick(object
{
    usernameTextBox.Text = "";
    passwordPasswordBox.Password = "";
    passwordTextBox.Text = "";

    summaryTextBox.Text = "";
    enterDescriptionTextBox.Text = "";

    controlTab.SelectedIndex = 0;
    loginTabItem.IsEnabled = true;
    reportIssueTabItem.IsEnabled = false;
}
```

```
private void ViewLogoutButtonClick(object sender, RoutedEv
{
    usernameTextBox.Text = "";
    passwordPasswordBox.Password = "";
    passwordTextBox.Text = "";
    changeCategoryComboBox.SelectedIndex = 0;
    filterViewComboBox.SelectedItem = allViewComboBoxItem;

    controlTab.SelectedIndex = 0;
    loginTabItem.IsEnabled = true;
    viewTicketTabItem.IsEnabled = false;
}
```

However, I could use 1 method for bout logut button, so that there is only 1 method for logging out:

```
2 references
private void LogoutButtonClick(object sender, RoutedEventArgs e)
{
    // Resets everything is that the new user is introduced to a empty program.
    usernameTextBox.Text = "";
    passwordPasswordBox.Password = "";
    passwordTextBox.Text = "";

    summaryTextBox.Text = "";
    enterDescriptionTextBox.Text = "";
    changeCategoryComboBox.SelectedIndex = 0;
    filterViewComboBox.SelectedItem = allViewComboBoxItem;

    controlTab.SelectedIndex = 0;
    loginTabItem.IsEnabled = true;
    viewTicketTabItem.IsEnabled = false;
    reportIssueTabItem.IsEnabled = false;
}
```

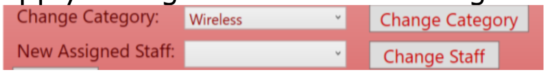
This allows me to have less repeated code and it's clear that it does the same thing. Hence, using 1 method is beneficial because less code and the outline is clearer and if you need to change the logout method slightly it's easier to do it once rather than twice. So, I'm using the singular method.

- For the View Ticket apply changes, the user needs to be able to change both the category and who's assigned. I could either go with 1 change button or 2 with 1 for each. Apply changes with 1 button, I need to set the combo boxes automatically to the selected row:

```
changeCategoryComboBox.Text = (string)((DataRowView)ticketDataGrid.SelectedItems[0])["category"];
changeStaffComboBox.Text = (string)((DataRowView)ticketDataGrid.SelectedItems[0])["assigned"];
```

```
private void ApplyChangesButtonClick(object sender, RoutedEventArgs e)
{
    if (ticketDataGrid.SelectedItems.Count > 0)
    {
        int ticketId = (int)((DataRowView)ticketDataGrid.SelectedItems[0])["id_ticket"];
        MySqlCommand cmd = new MySqlCommand($"UPDATE `details`, `tickets` SET details.category = {changeCategoryComboBox}," +
            $" tickets.assigned = {changeStaffComboBox} WHERE tickets.id_ticket = 4 AND tickets.fk_detail = details.id_detail;", connection);
        connection.Open();
        cmd.ExecuteNonQuery();
        connection.Close();
        FillDataGrid();
```

Nevertheless, I could also use two apply changes button that changes one column at a time with 2 functions:

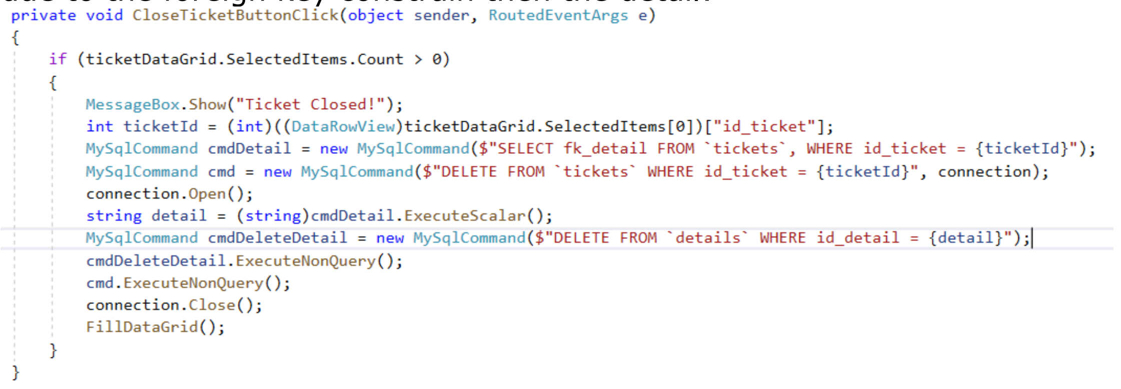


```
private void ChangeCategoryButtonClick(object sender, RoutedEventArgs e)
{
    if (ticketDataGrid.SelectedItems.Count > 0)
    {
        int ticketId = (int)((DataRowView)ticketDataGrid.SelectedItems[0])["id_ticket"];
        MySqlCommand cmd = new MySqlCommand($"UPDATE `details`, `tickets` SET details.category = " +
            $"'{changeCategoryComboBox.Text}' WHERE tickets.id_ticket = {ticketId} AND tickets.fk_detail = details.id_detail", connection);
        connection.Open();
        cmd.ExecuteNonQuery();
        connection.Close();
        FillDataGrid();
    }
}
```

```
private void ChangeStaffButtonClick(object sender, RoutedEventArgs e)
{
    if (ticketDataGrid.SelectedItems.Count > 0)
    {
        int ticketId = (int)((DataRowView)ticketDataGrid.SelectedItems[0])["id_ticket"];
        var cmd = new MySqlCommand($"UPDATE tickets SET assigned = " +
            $"'{changeStaffComboBox.Text}' WHERE id_ticket = {ticketId}", connection);
        connection.Open();
        cmd.ExecuteNonQuery();
        connection.Close();
        FillDataGrid();
    }
```

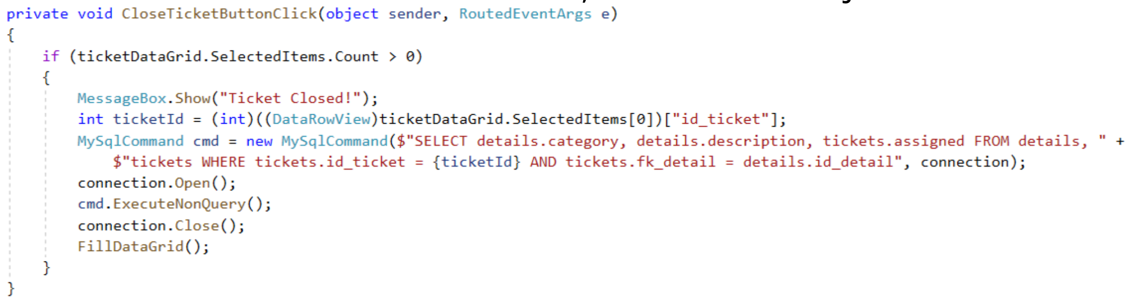
Using 1 change button is preferable because it doesn't need as much code and it only needs 1 method, which prevents some repeated code. Also, this will allow the user to change both at the same time if wanted, and it gives a better overall overview of what is in the database.

- When a ticket is deleted, I want the associated detail row also deleted. I could either use two delete statements or 1 using inner join. With two delete statements I will need to command and run it, with the ticket running first due to the foreign key constrain then the detail:



```
private void CloseTicketButtonClick(object sender, RoutedEventArgs e)
{
    if (ticketDataGrid.SelectedItems.Count > 0)
    {
        MessageBox.Show("Ticket Closed!");
        int ticketId = (int)((DataRowView)ticketDataGrid.SelectedItems[0])["id_ticket"];
        MySqlCommand cmdDetail = new MySqlCommand($"SELECT fk_detail FROM `tickets`, WHERE id_ticket = {ticketId}");
        MySqlCommand cmd = new MySqlCommand($"DELETE FROM `tickets` WHERE id_ticket = {ticketId}", connection);
        connection.Open();
        string detail = (string)cmdDetail.ExecuteScalar();
        MySqlCommand cmdDeleteDetail = new MySqlCommand($"DELETE FROM `details` WHERE id_detail = {detail}");
        cmdDeleteDetail.ExecuteNonQuery();
        cmd.ExecuteNonQuery();
        connection.Close();
        FillDataGrid();
    }
}
```

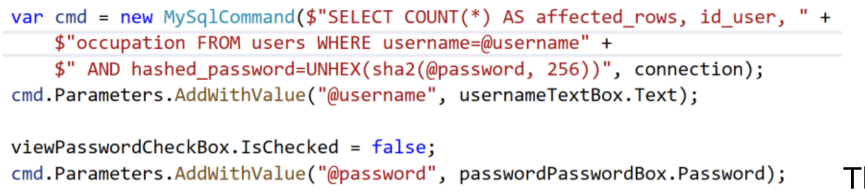
This isn't great as it requires some code to store the foreign key needed. So, I needed to have 3 commands. However, I could also use just one command:



```
private void CloseTicketButtonClick(object sender, RoutedEventArgs e)
{
    if (ticketDataGrid.SelectedItems.Count > 0)
    {
        MessageBox.Show("Ticket Closed!");
        int ticketId = (int)((DataRowView)ticketDataGrid.SelectedItems[0])["id_ticket"];
        MySqlCommand cmd = new MySqlCommand($"SELECT details.category, details.description, tickets.assigned FROM details, " +
            $"tickets WHERE tickets.id_ticket = {ticketId} AND tickets.fk_detail = details.id_detail", connection);
        connection.Open();
        cmd.ExecuteNonQuery();
        connection.Close();
        FillDataGrid();
    }
}
```

This is easy to use as it deletes the right rows with 1 statement, and I don't have to store any values. Hence, going with INNER JOIN DELETE statement is easier because I only need 1 command and it's easier to understand what's going on. Furthermore, for future proofing this is the better option if you want to change something, you only must change 1 statement as opposed to 3.

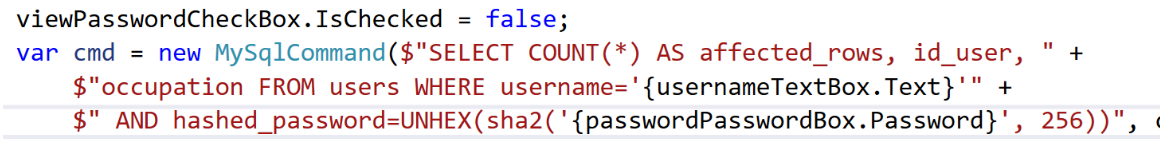
- For my commands, I could either use {} (curly brackets) or parameters that I add in later. For the once with parameter I could use @name, and then use Add With Value to add the needed value:



```
var cmd = new MySqlCommand($"SELECT COUNT(*) AS affected_rows, id_user, " +
    $"occupation FROM users WHERE username=@username" +
    $" AND hashed_password=UNHEX(sha2(@password, 256))", connection);
cmd.Parameters.AddWithValue("@username", usernameTextBox.Text);

viewPasswordCheckBox.IsChecked = false;
cmd.Parameters.AddWithValue("@password", passwordPasswordBox.Password);
```

This is a method, that's useful if you don't know what the parameter is, however, if you know what the paramers will be, it's a bit finicky, as you have to use a standin name and then define it, even though you already know what it is. With the {}, the problem is that if you don't know what the value will be, it's isn't great, however, in this case I can just move the line of checking the checkbox up, so that I can set the parameter already:

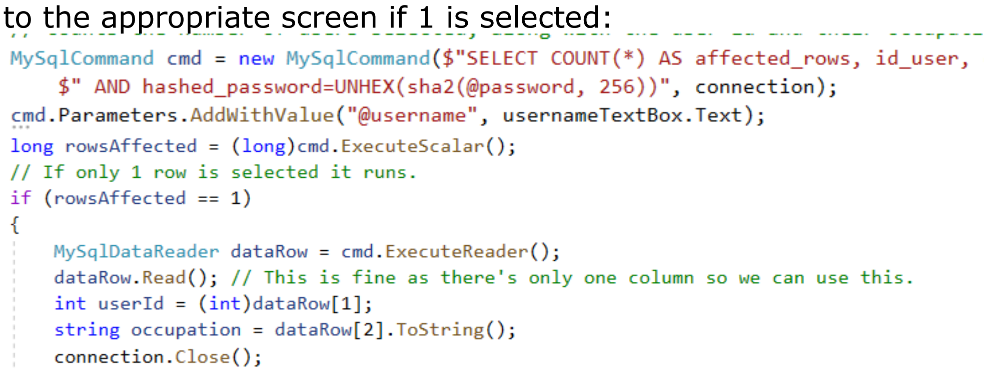


```
viewPasswordCheckBox.IsChecked = false;
var cmd = new MySqlCommand($"SELECT COUNT(*) AS affected_rows, id_user, " +
    $"occupation FROM users WHERE username='{usernameTextBox.Text}'" +
    $" AND hashed_password=UNHEX(sha2('{passwordPasswordBox.Password}', 256))",
```

Hence it's better to use the {} as it is less code and when someone else reads, they know what you're using rather than having to go back in forth to see what each thing does.

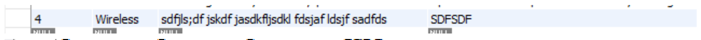
Show *testing* of your selected technique/component. What did you find out? What do you need to do as a result? How have you improved your design?

- Execute Scalar works just fine. It selects the correct occupation, and then redirects to the correct tab. Same goes for execute reader. However, with execute reader, I need to ensure that only 1 user is selected, as otherwise I might get the wrong user. As a result, I added in an extra column and only go to the appropriate screen if 1 is selected:



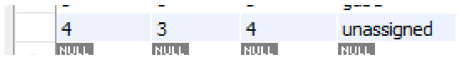
```
MySqlCommand cmd = new MySqlCommand($"SELECT COUNT(*) AS affected_rows, id_user,
    $" AND hashed_password=UNHEX(sha2(@password, 256))", connection);
cmd.Parameters.AddWithValue("@username", usernameTextBox.Text);
long rowsAffected = (long)cmd.ExecuteScalar();
// If only 1 row is selected it runs.
if (rowsAffected == 1)
{
    MySqlDataReader dataRow = cmd.ExecuteReader();
    dataRow.Read(); // This is fine as there's only one column so we can use this.
    int userId = (int)dataRow[1];
    string occupation = dataRow[2].ToString();
    connection.Close();
```

- Both the if-else statement and checking the password check box work. They both allow the user to login, and then redirect to the right screen, without any problems. I tested the second method by checking the box and entering a user and see if it works, and it did.
- Using a public iduser variable works, it gives the correct user when I report the ticket and double check in the database. I logged in as Matt (#3) reports a nonsense ticket and checked the database:



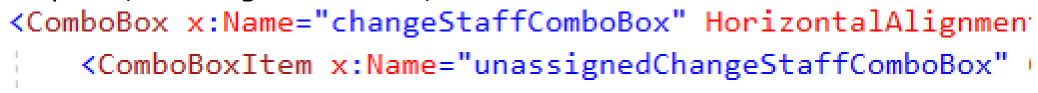
4	Wireless	sdfjls;df jskdf jasdkfljsdkl fdsjaf ldsjf sadfds	SDFSDF

(details)



4	3	4	unassigned
NULL	NULL	NULL	NULL

(tickets) Also, as seen above (in the trialling box) storing the number in a label also works and this will also give me the right user when the ticket is reported.
- Both the logout button methods work i.e., reset the wanted screen, I checked first by just letting the code run, then I temporarily removed the enabled=false line to double check whether everything was truly removed. Furthermore, the singular method for both buttons also work, as they also reset everything. I double checked my temporarily removing the line that disabled the screens. So, both methods work, only using 1 method is ideal as otherwise the code is repetitive and this way if you something needs changing, you only must look at 1 function.
- The 2 apply changes methods work. When you click the button, it's clearly visible on the DataGrid that the column changes, and hence the methods work. Same goes for using 1 method, it's shown what changes. However, with the change Staff combo box, the value isn't always seen since the value isn't an option, unassigned. Hence, I've decided to add an extra item to the box:



```
<ComboBox x:Name="changeStaffComboBox" HorizontalAlignmen
    <ComboBoxItem x:Name="unassignedChangeStaffComboBox"
```

- The 2 delete statements work. The first one with the delete ticket, obviously works as it is immediately removed from the database. I checked the 2nd delete statement of details by going to the database and checking if it was deleted. This was the case. With INNER JOIN, the ticket is obviously deleted as it isn't seen in the database anymore. The details are also deleted, as I have checked in the database itself. Both are great options, however, 1

statement is better to handle then 3.
- Both Parameters.AddWithValue and {} in the command works, as it doesn't crash and still does everything right. However {} is a better option as this makes the code more readily, in my opinion, and it's clearer what everything does/is.

What implications are relevant to this component, and why?

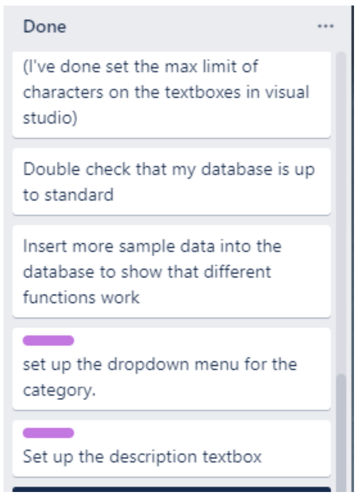
- Functionality: The program needs to work without crashing, so it needs to function to be usable.
- Future proofing: This program might be used in the future, so I need to ensure that the code is understandable and that everything is clear.
- Usability: the program needs to be usable as if it's hard to use no one wants to report a ticket, which is great for admin, less work, but frustrating for

How did I address these implications?

- Functionality: I tested this part of the program with all the new things added. I ensured that it worked as it supposed, and if it didn't work, I would troubleshoot and find the problem and fix it, so that it functions perfectly.
- Future proofing: The program needs to be able to be adjusted easily so that it if changes are needed, it's easy to do so. Hence, when I was trialling, I thought about what way would be easier to understand/change the program. This would make, it easier for future programmers. Furthermore, I added comments to ensure that other programmers know what each part of the program does, so they can modify it easier.
- Usability: I ensured that everything is working, in the program and that's easily usable and everyone knows what everything does by ensuring the text is clear and that the methods work, so that the buttons are usable.

My project management, version control tools, and any feedback on your program at this point in the project.:

Feedback: I had another student use the program; however, they couldn't come up with it. Further user-testing will also be done in the next section.
For version control refer to the document called subversion_log_3.3_3.8.


Done

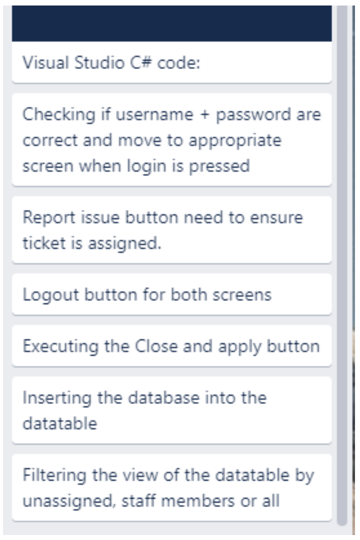
(I've done set the max limit of characters on the textboxes in visual studio)

Double check that my database is up to standard

Insert more sample data into the database to show that different functions work

set up the dropdown menu for the category.

Set up the description textbox


Visual Studio C# code:

Checking if username + password are correct and move to appropriate screen when login is pressed

Report issue button need to ensure ticket is assigned.

Logout button for both screens

Executing the Close and apply button

Inserting the database into the datatable

Filtering the view of the datatable by unassigned, staff members or all

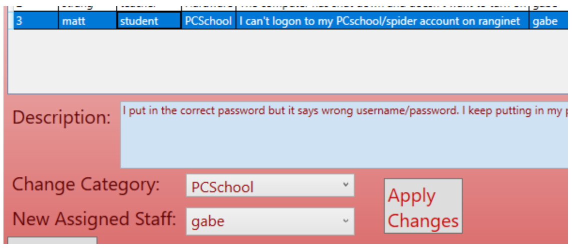
DOUBLE CHECK IF MY TICKET TABLE IS CORRECT

3. Finishing up

Final testing:

What **user testing** did I do on my completed outcome?

1. As user 1 was testing, the C# program, they noticed that the DataGrid doesn’t get updated if you login, logout, and login:

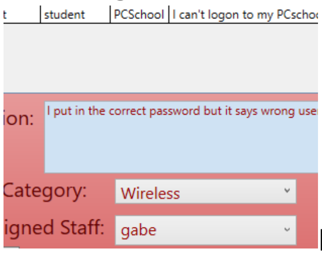


3	matt	student	PCSchool	I can't logon to my PCschool/spider account on ranginet	gabe

Description: I put in the correct password but it says wrong username/password. I keep putting in my p

Change Category: PCSchool

New Assigned Staff: gabe



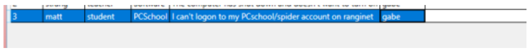
t | student | PCSchool | I can't logon to my PCschoo

ion: I put in the correct password but it says wrong use

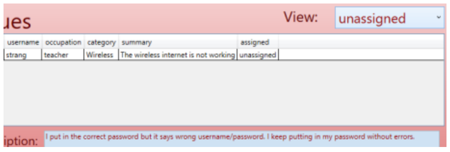
Category: Wireless

igned Staff: gabe

Hence I edited the code that would reset the combo boxes and description box after logging out. This made me wonder if this also happens if I change the view and/or close a ticket:



3	matt	student	PCSchool	I can't logon to my PCschool/spider account on ranginet	gabe



ues

View: unassigned

username	occupation	category	summary	assigned
strang	teacher	Wireless	The wireless internet is not working	unassigned

iption: I put in the correct password but it says wrong username/password. I keep putting in my password without errors.

So I just had to ensure that I reset the description, category and assigned staff in the filldatagrid method:

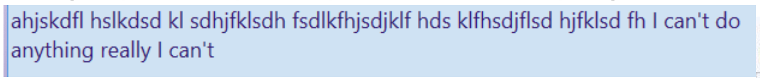
```
private void FillComboBox()
{
    // This fills the comboboxes in th
    var cmd = new MySqlCommand("SELECT
    _connection.Open();
    MySqlDataReader dataRow = cmd.Exec
    while (dataRow.Read())
    {
        filterViewComboBox.Items.Add(c
        changeStaffComboBox.Items.Add(
    }
    changeStaffComboBox.Text = "";
    changeCategoryComboBox.Text = "";
    viewDescriptionTextBox.Clear();
    _connection.Close();
```

. Also, they noticed that if I delete a ticket, the numbers are out of order, and my program crashes due to having a duplicate primary key with my id_detail/id_ticket so I removed the counting the rows. Now the columns just auto increment, has that box is checked in the database.

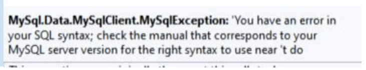
2. I allowed user 2 to add in new users. The problem that they noticed was that there are no restrictions on occupation i.e., you can fill in anything and the C# program would go to the report issue tab since it says, ‘if occupation = admin, else’. Hence, I needed to add in a restriction, or give feedback in the C# program:

```
else
{
    MessageBox.Show("Your occupation isn't specified in the database. Please ask IT staff to update this.");
}
```

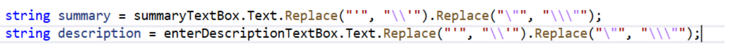
3. My 3rd user added in apostrophes into the summary. However, since were using MySQL, apostrophes make the program crash:



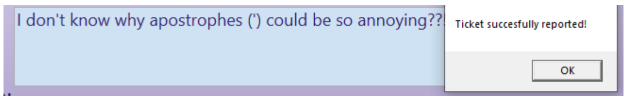
ahjskdfl hslkdsd kl sdhjfklsdh fsdlkfhjsdjklf hds klfhsdjflsd hjfklsd fh I can't do anything really I can't



MySql.Data.MySqlClient.MySqlException: 'You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 't do

This led to checking if it likes emojis, since students, and teachers, might use them: emojis. The emojis also made the program crash. To fix the apostrophe I used replace to insert a back slash before the apostrophe or quote so it would ignore it: 

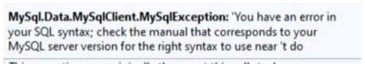
```
string summary = summaryTextBox.Text.Replace("'", "\\'").Replace("\"", "\\\"");
string description = enterDescriptionTextBox.Text.Replace("'", "\\'").Replace("\"", "\\\"");
```

Now I rechecked for my summary and description and now it does accept ‵ and ": 

I don't know why apostrophes (') could be so annoying??!

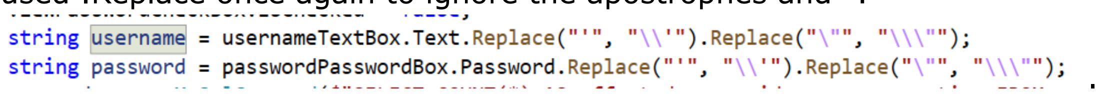
Ticket succesfully reported!

However, this led me to think about the login page as the user might want to insert those as well.

So, I double checked this, and it crashed: 

MySql.Data.MySqlClient.MySqlException: 'You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 't do

. Hence, I used .Replace once again to ignore the apostrophes and ":



```
string username = usernameTextBox.Text.Replace("'", "\\'").Replace("\"", "\\\"");
string password = passwordPasswordBox.Password.Replace("'", "\\'").Replace("\"", "\\\"");
```

For the emoji part, I could either delete them from the string itself, however, they are there to help the admin understand the problem. The other alternative is going into the MySQL database and setting the default character set to utf8mb4 instead of utf8, since utf8mb4 supports emojis. Hence, I've decided to change the characters, which allows emojis in varchar, I will set this for the users table as well as the details table so that usernames, passwords, summaries, and description can all emojis:

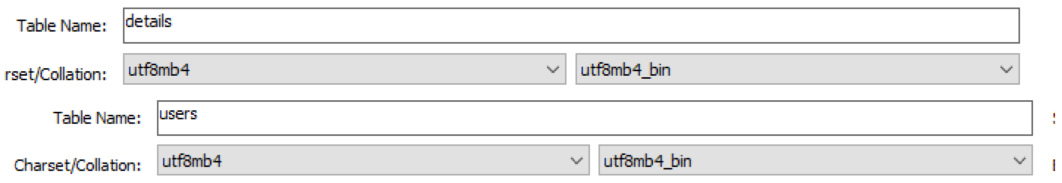


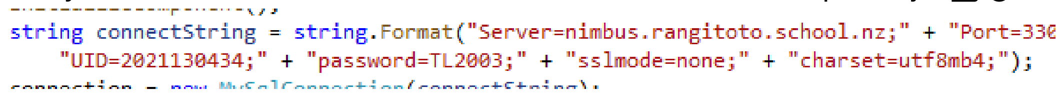
Table Name: details

rset/Collation: utf8mb4 utf8mb4_bin

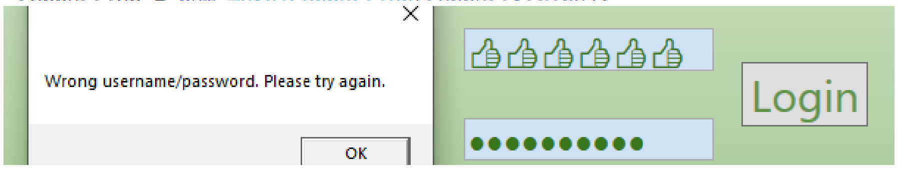
Table Name: users

Charset/Collation: utf8mb4 utf8mb4_bin

Finally, I had to set the charset in C# as well. Now it would accept emojis 👍👌:

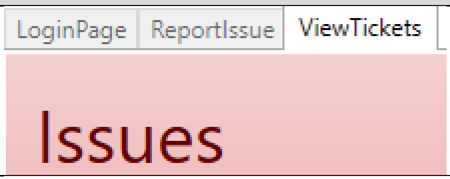
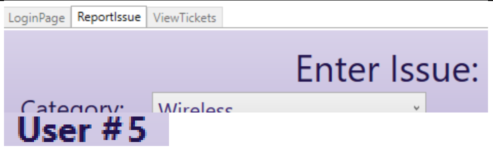


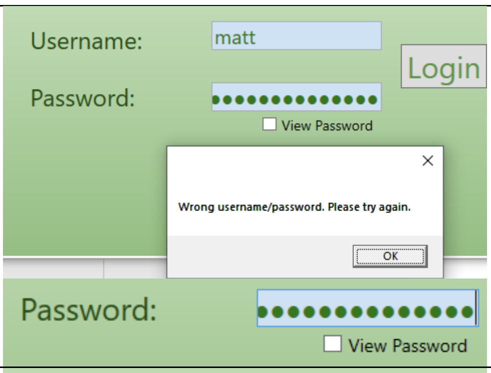
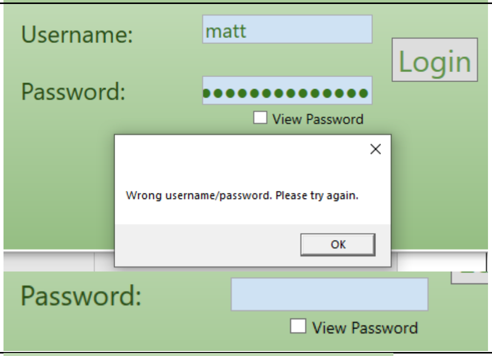
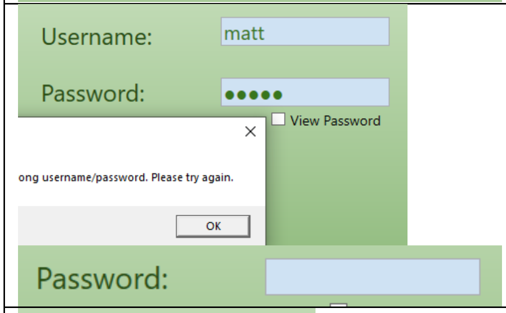
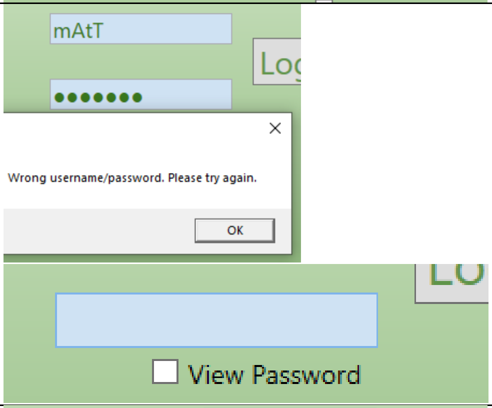
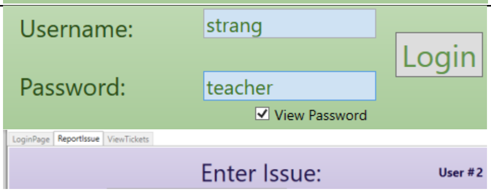
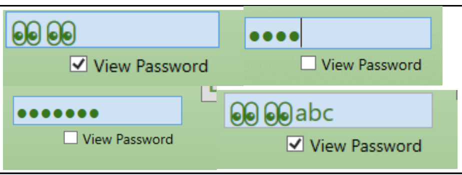
```
string connectString = string.Format("Server=nimbus.rangitoto.school.nz;" + "Port=33
    "UID=2021130434;" + "password=TL2003;" + "sslmode=none;" + "charset=utf8mb4;");
```

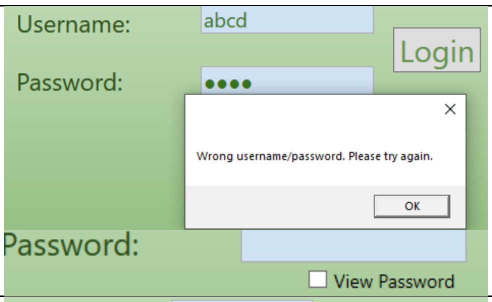
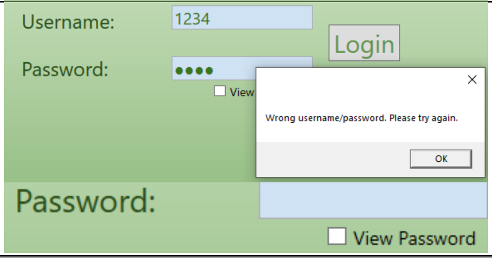
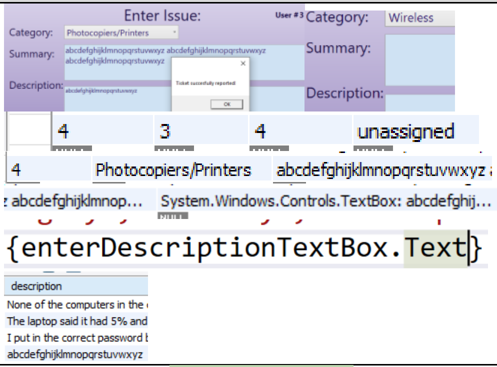
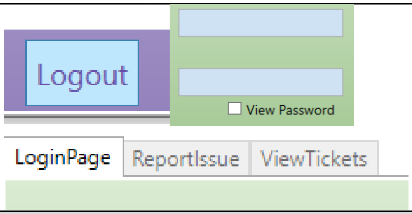
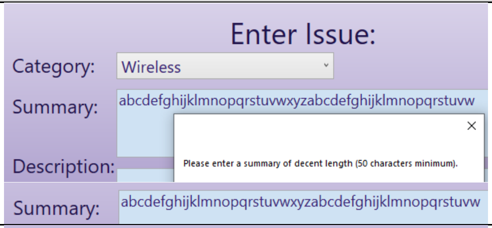
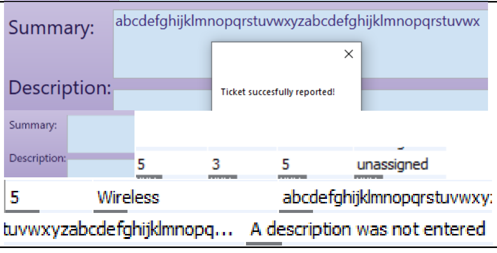


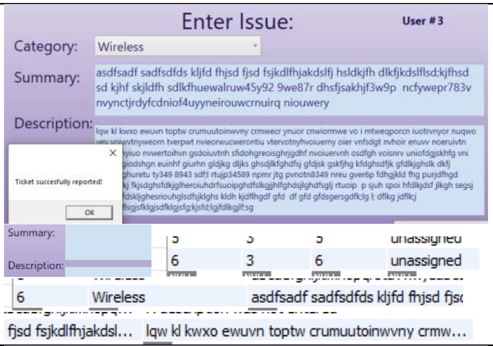
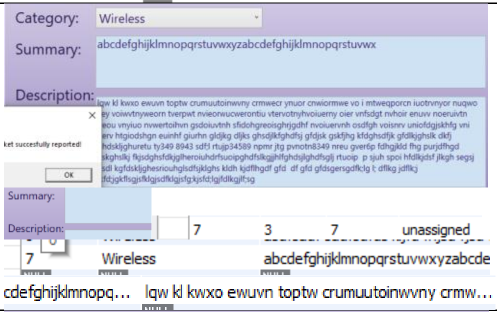
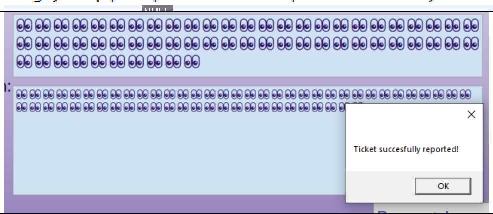
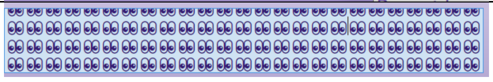
Wrong username/password. Please try again.

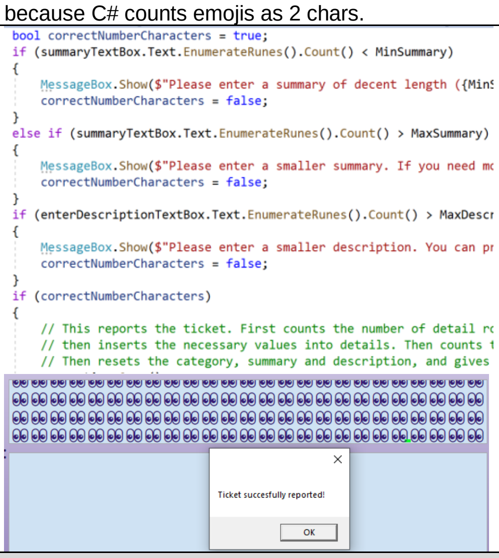
What **functional testing** did I do on my completed outcome?

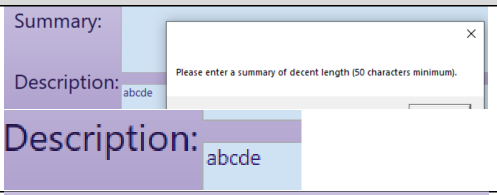
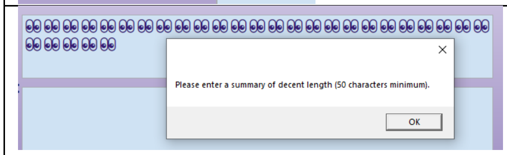
Purpose of the test	**Data entry for the test**	**Expected Result**	**Actual Result**	**Outcome of Test**
Testing Login page				
Expected Inputs				
An admin user	gabe, admin	Go to the view ticket tab and disable the other 2 tabs		Pass
A student/ teacher user	yyy, yyy	Go the report ticket tab, disable other 2 tabs, display user #5	 LoginPage ReportIssue ViewTickets Enter Issue: Category: Wireless User #5	Pass
Boundary inputs				

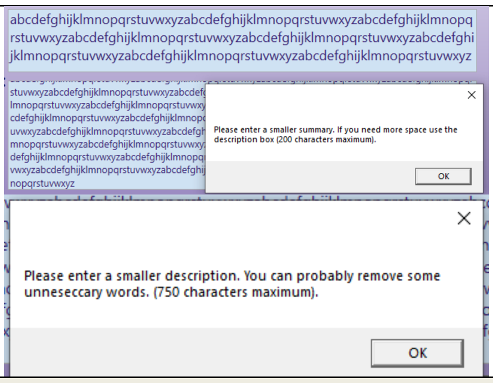
Putting in the hashed password	'student' hashed is: 264c8c381bf16c982a4e59b0dd4c6f7808c51a05f64c35db42cc78a2a72875bb	Show a message box that says wrong username/password and reset the password box	 Username: matt Login Password: •••••••••••••• View Password Wrong username/password. Please try again. OK Password: •••••••••••••• View Password	Fail
			 Username: matt Login Password: •••••••••••••• View Password Wrong username/password. Please try again. OK Password: View Password	Pass (Forgot to empty the box)
Username with a different password	matt, admin		 Username: matt Password: ••••• View Password ong username/password. Please try again. OK Password:	Pass
Different cases for username	mAtT, student		 mAtT Log ••••••• Wrong username/password. Please try again. OK Lo View Password	Pass
Having the checkbox unchecked	strang, teacher	Move onto the report ticket tab, disable the tabs, and say user #3 for matt and #2 for strang	 Username: strang Login Password: teacher ✓ View Password LoginPage ReportIssue ViewTickets Enter Issue: User #2	Pass
Emojis in the textbox - switch to password box	👀👀, in the password box add abc	Just have the same input regardless.	 👀👀 ✓ View Password •••• View Password ••••••• View Password 👀👀abc ✓ View Password	Pass Note that password box has 4 characters. That is because 1 emoji = 2 chars
Unexpected Inputs				

Random letters for both entries	abcd, zyxw	Show a message box that says wrong username/password and reset the password box Go the report issue tab	 Username: abcd Password: •••• Login — Wrong username/password. Please try again. OK — Password: View Password	Pass
Just numbers	1234, 5678		 Username: 1234 Password: •••• Login View — Wrong username/password. Please try again. OK — Password: View Password	Pass
Testing Report Issue page (and triggers)				
Expected Inputs				
A decent summary (~80 char) with a description /report ticket	Alphabet with space*3, alphabet*1	Give a message saying ticket reported + added to the database + emptied boxes	 Enter Issue: User #3 Category: Photocopiers/Printers Summary: abcdefghijklmnopqrstuvwxyz abcdefghijklmnopqrstuvwxyz abcdefghijklmnopqrstuvwxyz Description: abcdefghijklmnopqrstuvwxyz — Ticket succesfully reported! OK — Category: Wireless Summary: Description: — 4 3 4 unassigned — 4 Photocopiers/Printers abcdefghijklmnopqrstuvwxyz abcdefghijklmnop... System.Windows.Controls.TextBox: abcdefghij... — {enterDescriptionTextBox.Text} — description: None of the computers in the / The laptop said it had 5% and / I put in the correct password / abcdefghijklmnopqrstuvwxyz	Fail {enterDescriptionTextBox} (Missed .Text) Pass
Logout button i.e., press the button	Clicking it should disable the tab and return to an enabled login screen with empty boxes.		 Logout View Password LoginPage ReportIssue ViewTickets	Pass
Boundary inputs				
49 chars in summary	alphabet*2 minus xyz, nothing (‘’)	Message asking for it to be longer than 50 char and keep text	 Enter Issue: Category: Wireless Summary: abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvw Description: — Please enter a summary of decent length (50 characters minimum). — Summary: abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvw	Pass
50 chars in summary	Alphabet*2 minus yz, nothing (‘’)	Message say ticket reported and add to database + empty boxes	 Summary: abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwx Description: — Ticket succesfully reported! — Summary: Description: 5 3 5 unassigned — 5 Wireless abcdefghijklmnopqrstuvwxy: tuvwxyzabcdefghijklmnopq... A description was not entered	Pass (Note that the default value for assigned column as well as the trigger for description works)

Fill summary + description	200 char, 750 char.		 Enter Issue: User # 3 Category: Wireless Summary: asdfsadf sadfsdfds kljfd fhjsd fjsd fsjkdlfhjakdslfj hsldkjfh dlkfjkdslflsd;kjfhsd sd kjhf skjldfh sdlkfhuewalruw45y92 9we87r dhsfjsakhjf3w9p ncfywepr783v nvynctjrdyfcdniof4uyyneirouwcrnuirq niouwery Description: lqw kl kwxo ewuvn toptw crumuutoinwvny crmwecr ynuor cnwiormwe vo i mtweqporcn iuotrvnyor nuqwo … Ticket succesfully reported! OK 6 3 6 unassigned 6 Wireless asdfsadf sadfsdfds kljfd fhjsd fjs fjsd fsjkdlfhjakdsl… lqw kl kwxo ewuvn toptw crumuutoinwvny crmw…	Pass
Duplicate summary/description	Alphabet*2 minus yz, 750 char (same as above)		 Category: Wireless Summary: abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwx Description: lqw kl kwxo ewuvn toptw crumuutoinwvny crmwecr ynuor cnwiormwe vo i mtweqporcn iuotrvnyor nuqwo … Ticket succesfully reported! OK 7 3 7 unassigned 7 Wireless abcdefghijklmnopqrstuvwxyzabcde cdefghijklmnopq… lqw kl kwxo ewuvn toptw crumuutoinwvny crmw…	Pass
Adding emojis into summary/ description	👀*60, 👀*60	Should work, i.e., report the ticket and empty out the boxes.	 Ticket succesfully reported! OK	Pass
Adding between 100 and 200 in summary	👀*150		 It only allows for me to enter 100 👀. This is because C# counts emojis as 2 chars.	Fail

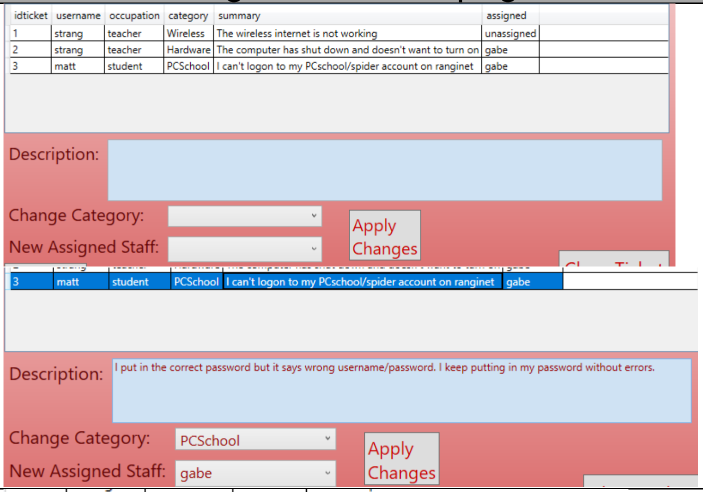
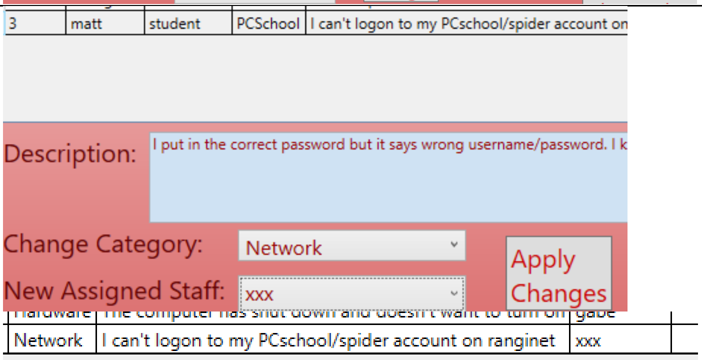
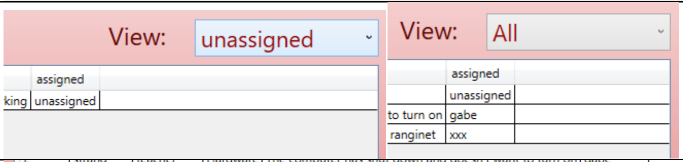
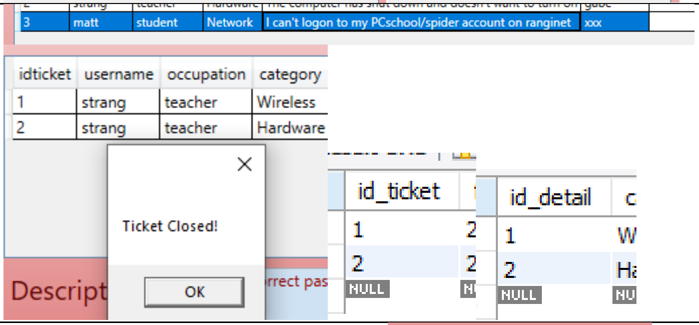
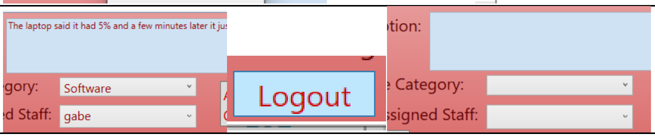
			
			```
			bool correctNumberCharacters = true;
			if (summaryTextBox.Text.EnumerateRunes().Count() < MinSummary)
			{
			    MessageBox.Show($"Please enter a summary of decent length ({MinS
			    correctNumberCharacters = false;
			}
			else if (summaryTextBox.Text.EnumerateRunes().Count() > MaxSummary)
			{
			    MessageBox.Show($"Please enter a smaller summary. If you need mc
			    correctNumberCharacters = false;
			}
			if (enterDescriptionTextBox.Text.EnumerateRunes().Count() > MaxDescr
			{
			    MessageBox.Show($"Please enter a smaller description. You can pr
			    correctNumberCharacters = false;
			}
			if (correctNumberCharacters)
			{
			    // This reports the ticket. First counts the number of detail rc
			    // then inserts the necessary values into details. Then counts t
			    // Then resets the category, summary and description, and gives
			```
			Ticket succesfully reported!
			OK
				Pass
				It allowed me to enter the 6 lines of emojis (25 per line). Note that I used enumarateRunes.Count instead of Length as length counts the emojis as two characters. Note that I added an auto scrollbar to the summary as well as a result.

Unexpected Inputs				
No summary	‘’, abcde	Message asking for it to be longer than 50 char and keep text	 Summary: Description: abcde Please enter a summary of decent length (50 characters minimum). Description: abcde	Pass
Number of emojis is above 25 but below 50 for summary	👀*30		 Please enter a summary of decent length (50 characters minimum). OK	Pass

200+ chars in summary and 750+ char for description	Alphabet*8, Alphabet*30	Give an error message saying that there is too many characters *2	 abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyz Please enter a smaller summary. If you need more space use the description box (200 characters maximum). Please enter a smaller description. You can probably remove some unnesecary words. (750 characters maximum).	Pass

Note I deleted all the new 'tickets' I made during testing to clean up the database.

Testing View Ticket page

When I click on a row, description and combo boxes get updated. I will just be highlighting a row.	 idticket | username | occupation | category | summary | assigned 1 | strang | teacher | Wireless | The wireless internet is not working | unassigned 2 | strang | teacher | Hardware | The computer has shut down and doesn't want to turn on | gabe 3 | matt | student | PCSchool | I can't logon to my PCschool/spider account on ranginet | gabe Description: Change Category: New Assigned Staff: 3 | matt | student | PCSchool | I can't logon to my PCschool/spider account on ranginet | gabe Description: I put in the correct password but it says wrong username/password. I keep putting in my password without errors. Change Category: PCSchool New Assigned Staff: gabe	Pass
Apply changes button that will change the row. xxx, network	 3 | matt | student | PCSchool | I can't logon to my PCschool/spider account on Description: I put in the correct password but it says wrong username/password. I k Change Category: Network New Assigned Staff: xxx Network | I can't logon to my PCschool/spider account on ranginet | xxx	Pass
Filtering view, I'll be filtering by unassigned and going back to all:	 View: unassigned assigned unassigned View: All assigned unassigned gabe xxx	Pass
Testing close ticket: Will be removing the 3rd row. Should delete the ticket, and detail from the database and say ticket closed.	 3 | matt | student | Network | I can't logon to my PCschool/spider account on ranginet | xxx idticket | username | occupation | category 1 | strang | teacher | Wireless 2 | strang | teacher | Hardware Ticket Closed! id_ticket 1 2 NULL id_detail 1 2 NULL	Pass
If I logout and login again everything is reset.	 The laptop said it had 5% and a few minutes later it ju gory: Software d Staff: gabe Logout Category: signed Staff:	Pass

How did planning assist in the development of a high-quality outcome?
Planning allowed me to consider what I want the program to look like at the end. It allowed me to organize my thoughts so that it would turn into an organized project. Furthermore, Trello (Kanban Board), allowed me to layout the task I had to do for each component, and was a visual for me to see how much I had left to do, so I was able to complete the project with enough time for thorough testing to allow for a high-quality outcome. It also allowed me stay ahead of the project, so that I could take a break during the winter holidays so that I could have a fresh mind, going into the 2nd half of the project. This allowed me to think of several new ways I could approach a specific part, which would as a result improve the program. Moreover, I got sick for a week, and didn't have to work on it because I had my Kanban board and knew I still had enough time to do the C# coding. This ensured that I didn't have to code while being sick, which allowed me to focus on it and not make any errors, rather than being sick and writing bad code, that could lead to problems later. Lastly, planning allowed me to set up the Kanban board and as result I was able to structure my program and make it a high-quality outcome by ensuring everything worked together. Subversion allowed me to track back to what I'd already done so that when I took a break I knew where I left off, so I had fresh and old ideas working together to ensure that the best choices were made to complete a high-quality project. In conclusion, planning allowed me to take break and come back with fresh ideas, improving the program, it allowed me to create a structured program that has a logical flow, and hence a high-quality outcome, and it ensured I was on track so I didn't have to rush things, that would leave the outcome uncompleted.

How did testing and trialling assist in the development of a high-quality outcome?
Firstly, testing and trialling allowed me to try out different techniques for the same part, like default expression vs triggers in the database, to ensure I got the most efficient and logical technique for every part of the program, resulting in a high-quality outcome. Secondly, I have done testing of every part to ensure that there are no bugs whatsoever in the program, so that it works without a flaw, because if I didn't do any testing, the program for example would crash with apostrophes or the number of characters including emojis would be wrong, resulting in a high-quality outcome. Moreover, through code convention, allowed me to ensure my code has comments, follows all the basic programming rules like no magic numbers, like MinSummary, MaxSummary and MaxDescription, ensuring every part makes sense and is easy to change if needed, which creates a high-quality outcome. Finally, through continuous seeking of end-use feedback, by letting them test, I was able to create a program that is both pleasing for the end-user to use and ensures that everything works without bugs, like not assigning numbers to id_detail/id_ticket, instead let the database do it. It also allowed me to make some minor changes that would improve the program, by functionality, usability, and aesthetics, like at the start with seeking feedback for the original layout of the 3 screens, for the end-user. It allowed for a pleasing outcome without any errors, making a high-quality outcome.