Oundle School Minibus Rental System

Matthew Riegels Computing Coursework 2025

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# Programming project (Component 03 or 04) marking criteria AO 2.2 Analysis (maximum 10 marks) marks The candidate Will have: • Identified some features that make the problem solvable by computational methods. • Identified suitable stakeholders for the project and described them and some of their requirements. • Identified some appropriate features to incorporate into their solution. • Identified some features of the proposed computational solution. • Identified some limitations of the proposed solution. • Identified some requirements for the solution. • Identified some success criteria for the proposed solution. 3—5 marks • Described the features that make the problem solvable by computational methods. • Identified suitable stakeholders for the project and described how they will make use of the proposed solution. • Researched the problem looking at existing solutions to similar problems identifying some appropriate features to incorporate into their solution. • Identified the essential features Of the proposed computational solution. • Identified and described some limitations of the proposed solution. • Identified most requirements for the solution. • Identified some measurable success criteria for the proposed solution. — 70 marks marks • Described the features that make the problem solvable by computational methods and why it is amenable to a computational approach. • Identified suitable stakeholders for the project and described them and how they will make use of the proposed solution and why it is appropriate to their needs. • Researched the problem in depth looking at existing solutions to similar problems identifying and describing suitable approaches based on this research. • Identified and described the essential features of the proposed computational solution. • Identified and explained any limitations of the proposed solution. • Specified the requirements for the solution including (as appropriate) any hardware and software requirements. • Identified measurable success criteria for the proposed solution. 9—10 marks • Described and justified the features that make the problem solvable by computational methods, explaining why it is amenable to a computational approach. • Identified suitable stakeholders for the project and described them explaining how they will make use of the proposed solution and why it is appropriate to their needs. • Researched the problem in depth looking at existing solutions to similar problems, identifying and justifying suitable approaches based on this research. • Identified the essential features of the proposed computational solution explaining these choices. • Identified and explained with justification any limitations of the proposed solution. • Specified and justified the requirements for the solution including (as appropriate) any hardware and software requirements. • Identified and justified measurable success criteria for the proposed solution. O marks = no response or no response worthy of credit. Analysis

## Project description

*Described and justified the features that* make *the problem solvable by computational methods, explaining why it is* amenable *to a computational approach.*

### Current system details

When a teacher at school wants to organise transportation for a group of students, they have to email the school’s transportation office and request a minibus with a certain capacity for a certain time. Staff requesting transport can either drive themselves or choose to use a hired driver. The school has a small number of hired drivers on casual contracts. Additionally, the school sometimes hires minibuses instead of using those from its own fleet. When a staff member makes a request, they must provide the same information every time: details like the destination and required capacity of the vehicle.

* Required information for a request:
  + Vehicle type,
  + Date/time required,
  + Destination/use,
  + Date/time returned,
  + Whether a hired driver is required.
* Booking process:
  + Provide all above information for each vehicle.
  + If you request a driver, the job is added to a shared spreadsheet and an email is sent to the group of drivers notifying them; the drivers choose to take jobs for times when they are available.
    - The drivers are not full-time employees, and as such are not obliged to take the jobs. As a result, this part can take a few days.
  + Once a driver has accepted a job, the requestor will be informed that their request has been accepted.
  + The current system aims to respond within 4 days of a request.
  + Requestors can talk to drivers directly, but any change of plan must still be reflected in the spreadsheet so that the drivers are appropriately paid, and the office knows when they are busy.
* Additional details:
  + The school currently has four drivers currently hired.
  + They have the same recruitment checks as permanent staff, but they have casual contracts (they can work as much or little as they want).
  + There are some drivers currently on holiday (general point being that driver time off should be accounted for).

### Description of the problem

The problems with the current system that I am trying to solve are as follows:

* Requests come through by email to the office that manages transportation, and those emails can get lost in the inbox, or take a long time to be actioned on by the office.
  + The new system would need to make unread requests more obvious.
* The number of staff that can drive large minibuses is dwindling due to some recent legislation change in the UK which means that staff need special training to legally drive the minibuses on their licence.
  + The current system can’t deal with the heightened demand for drivers.
  + The new system would need to streamline requests, allowing reduced numbers of drivers to handle a greater number of requests.
* It is often unclear whether all drivers are aware that a job is available.
  + The new system will make jobs obviously and readily visible to drivers on the main page. This will ensure that all drivers can clearly see what jobs are available to them.
  + I should add a means by which drivers can indicate that they have read a job so that the coordinator can confirm that all drivers are aware of their options.

### Computational Solution

I aim to upgrade this system, and to build the new solution I will use a web-based database. Users will fill in an online digital form to provide request information.

* Since the same information must be given each time in the same format, a digital form is suitable for this use. Furthermore, since this information will be stored in an online database, the fields of the form can be easily added to a database table, further streamlining the process of requesting. Also, since all required information will be asked for in the form, the office won’t have to send reply emails asking for more information, which slows down the process of requesting.
* The requests all being added to the same database table means that all requests are in a single centralized location which can easily referenced, and the requests can be sorted based on whether they have been read or accepted or neither. This will allow the transport office to keep track of all requests and respond more quickly.
* A web-based database system can easily monitor whether a driver has viewed the details of a job with a simple tick box for each driver, and can send automated emails to drivers when jobs are available to them to remind them to check the system.

## Stakeholders

Identified suitable stakeholders for the project and described them explaining how they will make use of the proposed solution and why it is appropriate to their needs.

In general, any stakeholders will be in one of the following categories:

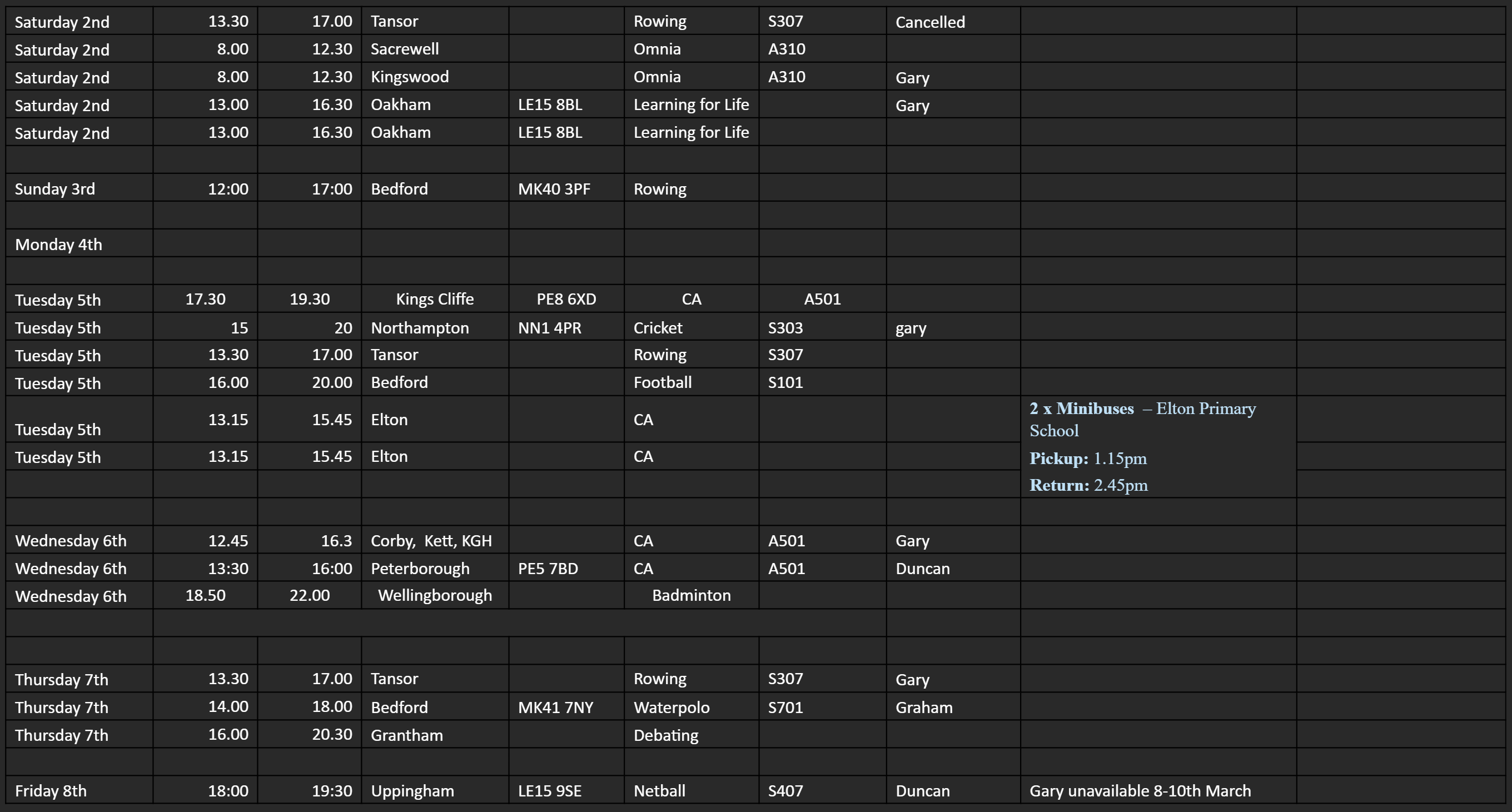
* Coordinator.
  + The only candidate for this category is Kristian Fewster ([kfewster@oundleschool.org.uk](mailto:kfewster@oundleschool.org.uk)), the school’s transport manager.
  + A coordinator uses the system to ensure that the driver knows about any details of the job, and that the requestor knows that their job has been taken. The coordinator is also responsible for making sure that the drivers are aware of the jobs available.
  + The system will be able to send automated emails to relevant people, as well as store request information online in a centralized location to make the details of a particular job clear.
* Driver.
  + Drivers need to see the details of the jobs they can choose to take. It should also be clear which jobs are available and which have already been taken.
  + Available jobs will be posted on the online system with all relevant information provided.
* Requestor.
  + Requestors need to provide the information relevant to their request.
  + There will be a fixed online form to enter this information.

### Stakeholder 1: Kristian Fewster

Kristian Fewster is the school’s transport manager. His role in school is to oversee and manage all of the school’s transportation. The system will be useful to him because it will collect all information pertaining to transport arrangements in one centralized location for him to reference. He will also be able to change some of the arrangements if necessary. The system is especially suited to his needs due to the ease of access provided by a centralized web-based database. Not only is it easy for him to access and reference, it is also easy for staff members and drivers to make and respond to requests, which is convenient to his role since it is essential that everyone is up to date on information and referencing the same plan.

Kristian helpfully answered some of my questions:

* Could you shed some light on the recent changes in British licencing laws and how they have affected transportation at school?
  + “As far as British Driving legislation, I would suggest you go on the DVLA Website as this explains everything to do with transport licencing laws and is up to date.”
* How much do the aesthetics of the website matter to you?
  + “Aesthetically, it needs to be simple to use and have clear steps as all levels of IT competencies would have access including the more mature drivers.”
* What problem with the current system would you most like to avoid in the new system?
  + “The problem we currently have is a that we use a shared spreadsheet that I populate with details of a trip, then the casual drivers look through and put their names against them, but I need to know if all drivers have seen them. Below is part of our current sheet and details I need.”



Considering this feedback and the screenshot, I will

* Ensure the design of the website is straightforward and simple, so that technologically inexperienced users will not have difficulty using the system.
* Create a feature that lets Kristian know whether drivers have seen that a job is available and read the details of said job.
* Give the request form a field for a postcode for destinations outside of school.
* Similarly, add a field for the general purpose of the trip (such as “CA”, “Cricket”, “Learning for Life”) in the screenshot above.

## Research

Researched the problem in depth looking at existing solutions to similar problems, identifying and justifying suitable approaches based on this research.

## Essential features

Identified the essential features of the proposed computational solution explaining these choices.

Essential features of the website will include the following:

* A page where users can log in to the website.
  + This will be the first page shown to the user, and no other page will be accessible until the user has logged in.
  + The pages that are accessible after this will depend on the role of the user logged in.
* A page where Kristian can view and modify all transport arrangements.
  + This will be laid out like a calendar/timetable, each day being a column with vertical space representing the time of day.
  + He should be able to view both pending requests and active jobs.
  + He should be able to see whether a driver has read a job or not.
    - This is so that he can confirm whether a driver has read a job and is unavailable or whether they have not checked available jobs.
  + This is all so that Kristian can oversee and manage all transportation arrangements as an ultimate authority.
* A page where the school’s drivers can view all available jobs that haven’t been accepted by anyone else, and accept them if they choose to.
  + This is so that the drivers can volunteer for their own jobs, since they are on casual contracts.
* A page where staff members can submit requests.
  + This page will have a digital form with all required information, so that .
* A way for staff members to remove their requests once they’re made in case plans change.
  + If only some details have been changed, the staff member can make another request with the modified details.

## Limitations

Identified and explained with justification any limitations of the proposed solution.

With regards to paying the drivers, I will be unable to process payments directly on the website. This is because there are some legal issues I’d like to avoid, along with user data security issues. Additionally, I would have to buy an SSL certificate which can cost up to a thousand pounds annually. Given my lack of experience with web-based development, I think that navigating the complex issues that accompany handling money transfers would be too difficult for me to be a feasible part of the system.

Instead, I will likely make use of an online based payment solution, since I will be able to integrate it into the website without having to do the payment processing myself. This will circumvent many of the issues mentioned above, since I can pass the role of managing user data onto the company.

I will not create a downloadable sister app for the website. While this may be a convenience to customers, it is beyond my capabilities and it would be especially difficult to make the app available on all devices since it would have to function on multiple different operating systems, thereby requiring two separate coded solutions to function on these different devices. This limitation can be mitigated by making the website easily accessible on a phone by ensuring that my CSS code uses mobile-friendly Bootstrap styles.

Furthermore, this limitation is not likely to be a major hindrance to the project on the whole, since the database will be stored on a central server which cannot be accessed without an Internet connection. Given that an internet connection is required for the system to work, one will always be able to access the website in any situation where the system could work on an app.

## Hardware & software requirements

Specified and justified the requirements for the solution including (as appropriate) any hardware and software requirements.

The software requirements to implement the final project will include making use of Visual Studio Code for the sake of easy traversal of the many files involved in the final product. I will code the solution using PHP and MySQL to access database tables and output the results of these queries. I will also be using HTML to create the structure of the website, using Bootstrap and CSS in order to ensure the final website has a pleasant and appropriate look and feel by styling the HTML. I am choosing to use these languages as these are the languages that we have been taught in school and so I am most proficient with, in addition to the fact that they lend themselves very well to web-based development, allowing me to easily code the final solution with them.

As for the Hardware requirements of the final project, I will use Xampp for a local hosting app, which I need in order to create and host the databases and tables used in the final system. Xampp is the local hosting app that I am most familiar with, and it is also free and pre-installed on the school computers, which I will be using to complete this project. Xampp also allows for an easy view of the tables, so that I can easily see the data within them. Eventually once I am ready to host the final project, I will need to use a free online web server to host the website so it is available for customers to access from anywhere at all times.

## Success criteria

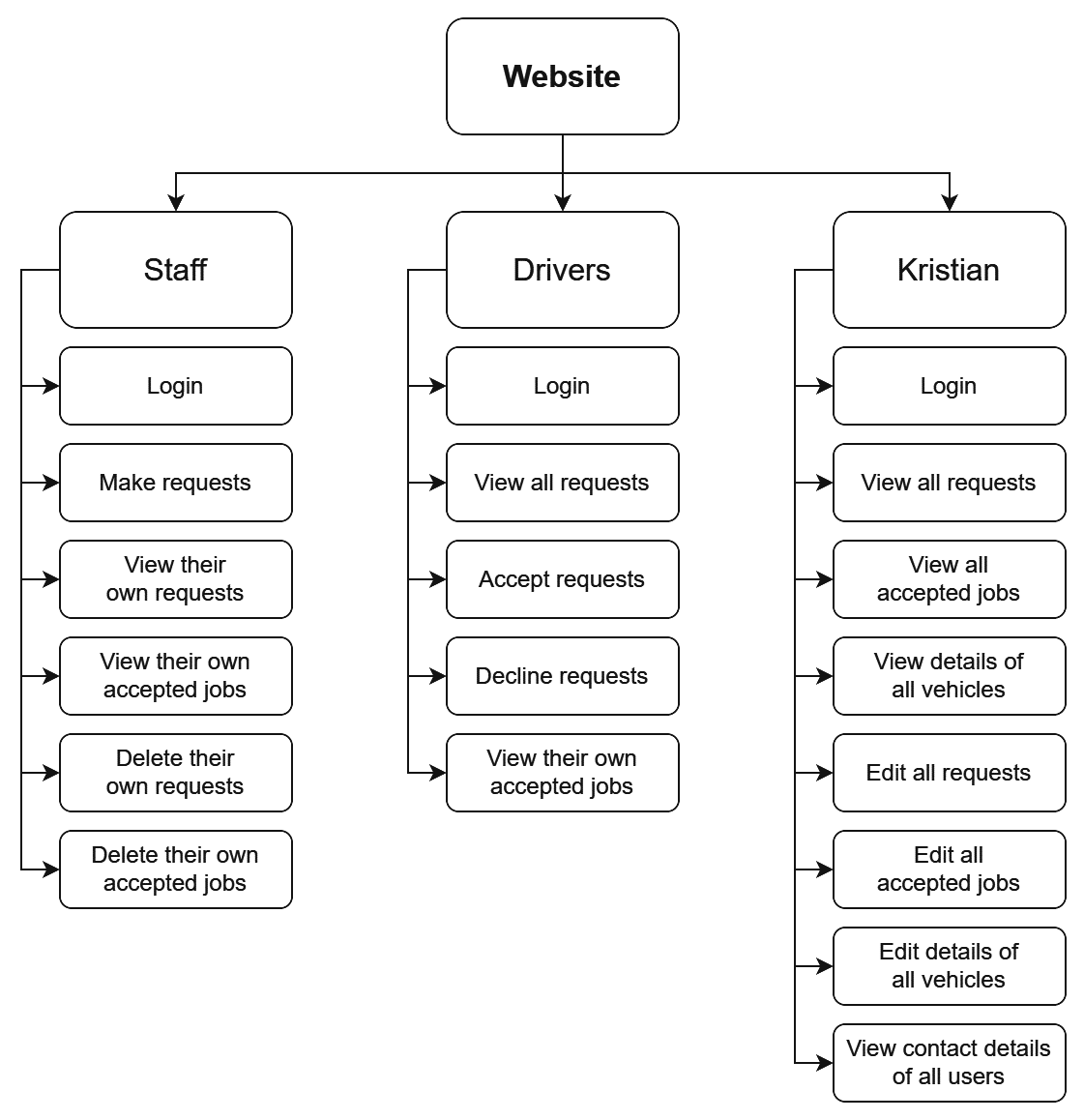
Identified and justified measurable success criteria for the proposed solution.

* My main success criterion is that the website must be easy and intuitive to use and understand.
  + This will mean that users will be able to make use of the website without requiring any help or training, thus significantly streamlining the process of implementing the new system.
  + This will be measured by asking users how easy they find the website to use, and then they will provide a personal rating on a scale from 1-10 on a usability questionnaire. I aim to achieve an average score of 7 or above.
* Another success criterion is that making a request must take less than 10 minutes.
  + This is to make the new system more attractive for staff members, who will not want to waste time adapting to a new method of requesting.
* Users must be able to log in to their account in less than a minute.
  + This is to ensure that users are not frustrated by the process of wasting vast quantities of time logging in to their account.
* Users must not be able to access any pages their role doesn’t allow them to (for example, a staff member shouldn’t be able to view and manage all transport arrangements, but Kristian should).
  + This is to ensure that the only people who can modify a job are Kristian and whoever requested it.
* Drivers must be able to view all their active jobs in one place easily.
  + This is so that they can manage their working hours effectively, and is also a convenience that will make the new system more attractive to them.

# AO 3.1 Design (maximum 15 marks) 1—4 marks The candidate will have: Described elements of the solution using algorithms. Described some usability features to be included in the solution. • Identified the key variables / data structures / classes (as appropriate to the proposed solution). • Identified some test data to be used during the iterative or post development phase Of the process. 5 8 marks • Broken the problem down systematically into a series of smaller problems suitable for computational solutions describing the process. • Defined the structure of the solution to be developed. • Described the solution fully using appropriate and accurate algorithms. • Described the usability features to be included in the solution. • Identified the key variables / data structures / classes (as appropriate to the proposed solution) and any necessary validation. • Identified the test data to be used during the iterative development of the solution. • Identified any further data to be used in the post development phase. 9—12 marks • Broken the problem down systematically into a series of smaller problems suitable for computational solutions explaining the process. Defined in detail the structure of the solution to be developed. • Described the solution fully using appropriate and accurate algorithms explaining how these algorithms form a complete solution to the problem. Described, explaining choices made, the usability features to be included in the solution. • Identified and justified the key variables / data structures / classes (as appropriate to the proposed solution) explaining any necessary validation. • Identified and justified the test data to be used during the iterative development of the solution. • Identified and justified any further data to be used in the post development phase. 13—15 marks • Broken the problem down systematically into a series of smaller problems suitable for computational solutions, explaining and justifying the process. Defined in detail the structure of the solution to be developed. Described the solution fully using appropriate and accurate algorithms justifying how these algorithms form a complete solution to the problem. Described, justifying choices made, the usability features to be included in the solution. • Identified and justified the key variables / data structures / classes (as appropriate to the proposed solution) justifying and explaining any necessary validation. • Identified and justified the test data to be used during the iterative development of the solution. • Identified and justified any further data to be used in the post development phase. O marks = no response or no response worthy of credit. Design

## Solution Decomposition

Broken the problem down systematically into a series of smaller problems suitable for computational solutions, explaining and justifying the process.

I will use decomposition to break down the problem with a top down design chart as shown on the right to display this. I am doing this in order to make the final coding of the solution easier for myself by simplifying the design and both showing and justifying the final structure of the site.

The first page every user sees is the login page where they enter their details and can then (if the details are correct) view other pages.

The website will have a navigation bar visible at all times that links to every page a user has access to.

Members of staff will have access to:

* A page that contains the digital form for submitting requests.
  + This is so that they can easily submit requests without omitting any information, which streamlines the entire process and helps Kristian and the driver too.
* A page that contains all the requests they have made.
  + This is so that they are reminded not to forget about the details of the jobs they’ve requested.
  + This is also so that they are able to cancel their requests if they change their mind about the details of any of them.
* A page that contains all the accepted jobs they have requested.
  + This page will likely be merged with the previous page for the sake of simplicity, and since it serves all the same purposes – those being to remind staff members about their jobs and also to allow them to cancel them.
* They will be able to delete their requests and their active jobs on the pages listed above, so separate pages are not required to provide that capability.

Drivers will have access to:

* A page that allows them to view the details of all requests that require a hired driver, and either accept or decline these requests.
  + Drivers will not be able to view requests they cannot accept. This includes staff members who are driving themselves (but still need a vehicle) and staff members who are already being driven by another driver.
  + Drivers will be able to view all details of a request including the time and date when it starts and finishes, the destination and purpose of the trip, the number of people being transported, and the staff member who requested it. They will also be able to view the details of the vehicle that has been assigned to that job, if any.
  + This is to ensure that they can make the most informed decision possible when they choose whether to volunteer for the job.
* A page that allows them to view all jobs they currently have active.
  + This page will display all the above-mentioned details of all the jobs they have accepted and not completed.
  + This is so that drivers can easily manage their working hours and avoid accidentally overcommitting.
  + This page may also have a feature where drivers can view their jobs on a timetable-like setup where the jobs are shown visually, where days are columns and time of day is represented in vertical space.

Kristian will have access to:

* A page that shows the details of all active jobs and requests.
  + This includes staff members that are driving themselves and those that need a hired driver.
  + This also includes jobs that both have and have not been accepted by any driver.
  + On this page Kristian will be able to see all the details of all jobs including the time and date when they start and finish, the destination and purpose of the trip, the number of people being transported, the staff member who requested it, the driver who accepted the job (if any), the drivers that declined the job (if any), and any drivers that have done neither (ie haven’t read it).
  + On this page he will also be able to modify the details of or delete any request or active job.
  + He will also be able to see which vehicles have been assigned to which jobs, and view their details.
  + This page may be split into several subpages – one for accepted jobs and one for requests, for instance. Alternatively, I may include a feature whereby Kristian can filter to show jobs based on their details.
* A page that shows the details of all vehicles in the school’s fleet.
  + On this page Kristian would be able to view the details of every vehicle at the school’s disposal including their registration number, capacity, and the date (if any) after which they will not be available for use.
  + He will also be able to view and modify which jobs any vehicle is currently assigned to.
  + This is so that Kristian can ensure that the vehicles are used efficiently and that there are vehicles free at all times to accept new jobs.
* A page that displays all users on the system and some of their details.
  + On this page Kristian will be able to view some of the account details of both staff members and drivers. These will include their full name, email address, telephone number, role (driver or staff), and (in the case of drivers) the number of hours they’ve worked and haven’t been paid for.
  + This is so that Kristian can contact people to ask them to provide additional information about jobs and requests if required, or to inform them of any changes made to any jobs or requests they’re involved in.

## Tables

For the validation, I plan to make sure that certain fields are required, as this will ensure that some data is always entered into relevant fields, which avoids the issues that occur when I try to retrieve the data stored in the tables. When a maximum character limit is set, this is to ensure that no ridiculous lengths of values are input which would take up unnecessary table space, or perhaps even crash the table if a suitably immense amount of data was provided. In places where a range of values is required by the table, this is to make sure that no absurd values are input.

### TblVehicles

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Field name** | **Data type** | **Validation** | **Typical data** | **Justification** |
| VehicleID | INT(6), auto increment, Primary key | Auto-generated. | 14 | Unique identifier for each vehicle on the system. This will be used as a foreign key in the jobs table. |
| RegNumber | VARCHAR(7) | Required. Must exactly be two uppercase letters, followed by two numbers, then three uppercase letters. | BD15SMR | Registration number of each vehicle for tax and legal purposes. |
| Capacity | INT(2) | Required. Must be an integer. | 10 | Indicates how many students can ride on the vehicle (driver and front seat not included). |
| NotAvailableFrom | DATE | Must be a date in the future when entered.  YYYY-MM-DD | 2025-04-22 | Indicates date after which the vehicle will be unavailable (if it has been hired or needs maintenance etc.). |

### TblUsers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Field name** | **Data type** | **Validation** | **Typical data** | **Justification** |
| UserID | INT(6), auto increment, Primary key | Auto-generated. | 19 | Unique identifier for each user. This will be used as a foreign key in the jobs table. |
| Password | VARCHAR(60) | Required. Plaintext passwords must be entered with at least 6 characters. Since they are hashed, they will always be exactly 60 characters long when stored. | $2y$10$.vGA1O9wmRjrwAVXD98HNOgsNpDczlqm3Jq7KnEd1rVAGv3Fykk1a | Password is required to log in to the system, which is required to view or do anything on the system. Will be hashed for security reasons. |
| Email | VARCHAR(50) | Required. Max 50 characters. Must have exactly one ‘@’, and at least one ‘.’ afterwards. | smith.j@oundleschool.org.uk | Allows contacting users to remind them of upcoming jobs, confirm submission of requests, etc. |
| TelephoneNumber | VARCHAR(11) | Required. Must be 11 characters, all numbers. | 07305712268 |  |
| Forename | VARCHAR(30) | Required. Max 30 characters. | John | First name of user |
| Surname | VARCHAR(30) | Required. Max 30 characters. | Smith | Surname of user |
| IsDriver | TINYINT(1) | Required. Boolean. | False | Whether the user is a hired driver or not. False indicates ordinary member of staff. True indicates hired driver. |
| IsAdmin | TINYINT(1) | Required. Boolean. | False | Whether the user is an admin or not. Only Kristian will have this toggled to True. |
| HoursWorked | INT(3) | Auto-generated. | False | Will be used to calculate driver wages since they are on casual contracts. |

### TblRequests

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Field name** | **Data type** | **Validation** | **Typical data** | **Justification** |
| RequestID | INT(6), auto increment, Primary key | Auto-generated. | 12 | Unique identifier for each request. |
| DateTimeOut | DATETIME | Required. Must be in the future at time of entry.  YYYY-MM-DD HH:MM:SS | 2024-05-17 10:30:00 | Time and date when the job starts. |
| TimeIn | TIMESTAMP | Required. Must be after DateTimeOut.  HH:MM:SS | 12:40:00 | Time and date when the job ends. Jobs never span multiple days. |
| Destination | VARCHAR(20) | Required. | Uppingham | Name of destination so drivers know where they’re going. |
| Postcode | VARCHAR(8) | Required. Min length 5, max 8. Must be a valid postcode. | LE15 9SE | Postcode that can be input into a navigation device if needed. |
| Purpose | VARCHAR(20) | Required. | Netball | The department making the request, or the reason why the trip is necessary. |
| ReqCapacity | INT(2) | Required. The number of people needing to be taken. | 7 | This is so that an appropriate vehicle can be assigned to the request. |
| DriverID | INT(6) | This will be managed by the system, not input. | 9 | This is the UserID of the user driving the job. It may be one of the hired drivers or the requestor themselves. |
| VehicleID | INT(6) | This will be managed by the system, not input. | 14 | This is the VehicleID of the vehicle assigned to the job. Left blank if no vehicle has been assigned. |
| RequestorID | INT(6) | Auto-generated. | 19 | This is the UserID of the requestor. |

### Entity relationship diagram

**Requests**

**Users**

**Vehicles**

UserID  
password  
email  
telephone number  
forename  
surname  
IsDriver  
IsAdmin  
hours worked

RequestID  
date/time out  
date/time in  
destination/purpose  
required capacity  
DriverID (foreign UserID)  
VehicleID (foreign)  
RequestorID (foreign UserID)

VehicleID  
registration number  
capacity  
NotAvailableFrom

## Structure

Defined in detail the structure of the solution to be developed.

The Structure of the final product will be a website coded with HTML and styled with CSS and bootstrap that uses PHP and MySQL to access the tables in the database.

Kristian has advised that the website have a simple and intuitive layout that is easy to understand for those users that may less familiar with online technology. Following this guidance, I have decided to include a navbar that is always visible at the left-hand side of the page that contains clearly labelled links to all pages that a user has access to.

### Generic page design

As mentioned previously, I will design each page with a navbar on the left side always, so all pages will look something like this, with specifics filled in of course.

John Smith Log out

Page contents will be in here. Most pages will consist of listed objects. This will be displayed like below.

Another page

Pages will be listed down the side like this.

Page two

**Current page**

**Current page**



**List item 1**

*Relevant information provided here.*

**List item 2**

*Relevant information provided here.*

**List item 3**

*Relevant information provided here.*

Since this is intended for internal school use, it should be appropriately branded. Since the majority of school products we use have the school logo in the top left corner of the page, I decided to follow suit to ensure the branding is consistent. The links displayed on the navbar will depend on the role of the currently logged in user.

* Staff member
  + Make a request