

INTRODUCTION TO WEB AND DATABASE

ACCA4023

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Task 1

1.1 Scenario Analysis

After a thorough analysis of the job specification and requirements brought forward by Eco Ride. I have identified the following entities and attributes that relate to each one.

1. Fleet - Bike ID, Bike Type, Location, and Availability.
2. Customer - Customer ID, First Name, Last Name, Email, and Contact Number.
3. Maintenance - Maintenance ID, Entry Date, Exit Date, Status and Completed.
4. Rental Transaction - Rental ID, Customer ID, Bike ID, Rental Start Date, Rental End Date, Duration, Cost, and Completed.
5. Staff - Staff ID, First Name, and Last Name.

Attributes

Fleet: The primary key would be the Bike ID; this is to be able to correctly track each bike that is registered to the Fleet. This will also help identify bikes as they make their way onto maintenance and servicing.

Customer: The primary key for this entity is Customer ID, which will be crucial for correctly invoicing and charging the correct customer for the services. This will also be important in the case of an accidents or damage to bikes, it can be traced to the customer.

Maintenance: Maintenance ID will be the unique identifier. Across the lifespan of any given bike is usage dependent, with that it is expected that periodically the bikes will need servicing and repairs. With the Maintenance ID being the primary key, we can track each bike service history over time, and any problematic bike can be spotted to improve the overall fleet health and reliability.

Rental Transactions: Rental ID is the unique identifier, this will be used to track any and every rental transaction, upon completion an invoice can be presented to the customer for payments.

Staff: Staff ID will be the unique identifier for this entity. This will help trace every staff across different departments and be able to see who did what and any problems can be resolved.

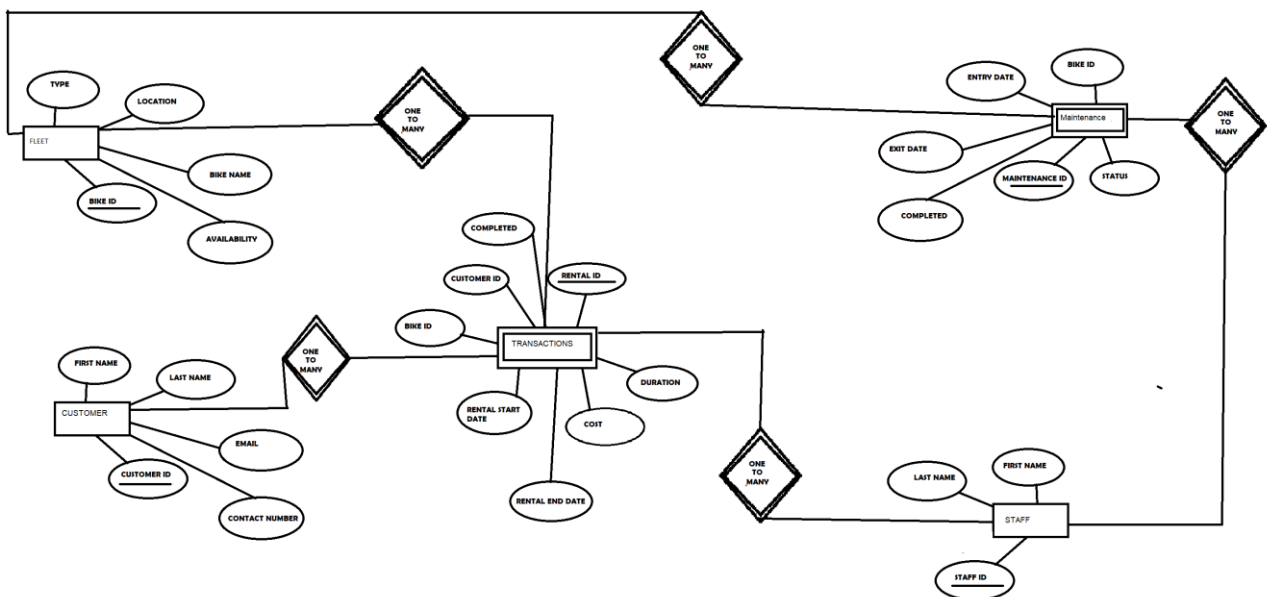
1.2 Entity-Relationship Diagram

Below you will find the exact representation of the database structure.

As it can be seen, this structure, consisting of one-to-many cardinality across the board.

Even though 1:M relationship is the most common and fundamental relationship in relational database designs, user efficiency and competence is carries the upmost importance.

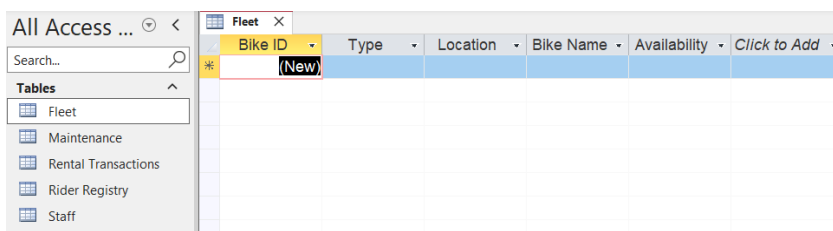
The data integrity solely relies on the correct user input.



1.3

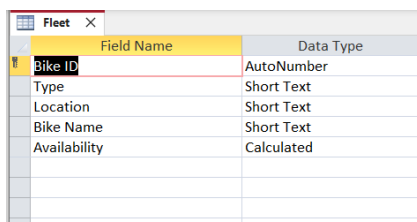
Data Structure Development and Implementation

When it came to developing and implementing the database, using the [ER Diagram](#) and with a clear understanding of what is required for the database to be a success, I have created relevant tables.



Bike ID	Type	Location	Bike Name	Availability	Click to Add
(New)					

Fleet Table i



Field Name	Data Type
Bike ID	AutoNumber
Type	Short Text
Location	Short Text
Bike Name	Short Text
Availability	Calculated

Fleet Table ii

As reflected in Fleet Table ii, availability of a specific bike will be determined by its location. Availability field's purpose is to provide ease to user by making it clear on fleet availability. This is also a key field that can be used for running queries and reports.

Fleet Table iii

When creating a form for this table, I wanted to create something that would be easily maintained, and any errors could be rectified quickly.

As seen in Fleet Table iii, I have implemented some key functions such as buttons that will allow users to navigate across records and add new records with a simple few clicks.

I have also added a view of maintenance data, which should make the broader view of the data flow better and data exchange can be viewed in real-time.

I have also added drop down list option for various attributes in order to avoid wrongful input by providing clear listed available options. Like I mentioned before, the user efficiency and competence carry the upmost importance, therefore by implementing such function, I believe it brings the database one step further into assuring a well-functioning database with integrity. This is represented below in Rental Table i.

Rental Table i

	Field Name	Data Type
	Rental ID	AutoNumber
	Customer ID	Number
	Bike ID	Number
	Rental Start	Date/Time
	Rental End	Date/Time
	Duration	Number
	Cost	Calculated
	Complete	Yes/No
	Staff ID	Short Text

Rental Table ii

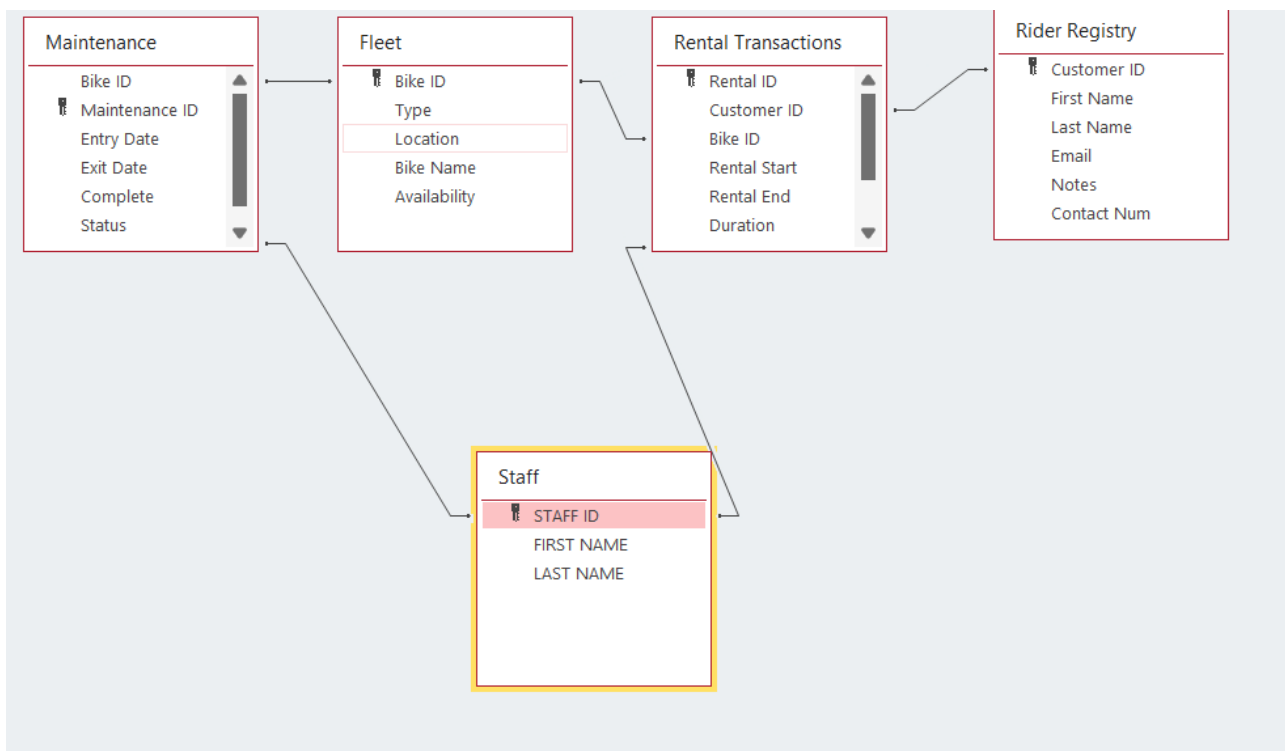
Just the same as Fleet data, for the Transaction table, I have created a calculated data type. In this data type the duration value is auto calculated and reflected in the Cost field. As a default, I have set the rule that the Cost = Duration multiplied by 10, and currency set to Great British Pounds.

General	Lookup
Expression	[Duration]*10
Result Type	Currency
Format	Currency
Decimal Places	Auto
Caption	
Text Align	General

Rental Table iii

1.4 Relationship

Across the different databases there are no transitive dependencies, the only data shared are primary key attributes which are the main link that forms the relationships reflected below.



1.5

Sample Data Population

	Bike ID	Type	Location	Bike Name	Availability
+	23	Mountain Bike	Train Station	MB01	Yes
+	24	Cargo Bike	University Car	CGB01	Yes
+	25	Folding Bike	Maintenance	FB01	No
+	27	Road Bike	University Car	RB01	Yes
+	28	Monkey	Park	MK01	Yes
*	(New)				

Fleet Sample Data i

As seen in the *Fleet Sample Data i*, I have registered various bike types into stock and set their location across various rental points provided by Eco Ride. In this scenario currently there are 4 available bike options. As described previously, this design benefits from the expression I have put in place to seamlessly provide important information such as stock availability, without having to spend a lot of time checking what is available. In this scenario, we can see how the Fleet Database interacts with the Maintenance logs.

	Maintenance ID	Bike ID	Entry Date	Exit Date	Complete	Status	Staff ID
	14	25	01/12/2025	03/12/2025	☒	In Transit	2
	15	23	02/12/2025	04/12/2025	☒	Transported	3
	16	28	04/12/2025	05/12/2025	☒	Transported	5
	18	24	10/12/2025	11/12/2025	☒	Transported	4
	19	23	15/12/2025	16/12/2025	☒	Transported	1
*	(New)				☐		

Maintenance Sample Data i

Once a bike is delivered, the maintenance team would be able to provide status update, and with appropriate access to the Fleet database, they would be able to change location, which in turn would indicate its availability.

Fleet	Maintenance	Rental Transactions	Rider Registry	Staff
STAFF ID	FIRST NAME	LAST NAME	Click to Add	
1	James	Brown		
2	Michael	Jackson		
3	Clark	Kent		
4	James	Bond		
5	Bruce	Lee		
(New)				

Staff Sample Data i

Fleet		Maintenance		Rental Transactions		Rider Registry		Staff	
	Customer ID	First Name	Last Name	Email	Contact Num	Notes			
	+	1 John	Smith	js@zmail.com	7123123123				
	+	2 James	Smith	james_s@zmail.com	7123123321				
	+	3 Jessica	Smith	Jess_S@zmail.com	7123123111				
	+	4 Beatle	Juice	btj@madhouse.com	754456545634	Frequently rec			
	+	5 Tommy	Wheelfigure	tw@wheeling.com	7445456434				
*		(New)			0				

Rider Registry Sample Data i

In regard to Rider Registry database, I went with the essentials. If more information is required, it would be an easy application. However, in this current age of technology, with just the above information, a communication for payment could be formed without a problem. Nevertheless, I believe field such as Notes, would be beneficial for communicating rental trends of a specific customer within the organisation for more tailored service or pre-booking incentive to loyal clients.

Fleet		Maintenance		Rental Transactions		Rider Registry		Staff	
Rental ID	Customer ID	Bike ID	Rental Start	Rental End	Duration	Cost	Complete	Staff ID	
1	4	28	03/11/2025	06/11/2025	3	£30.00	☒	1	
2	5	24	04/11/2025	11/11/2025	7	£70.00	☒	2	
3	1	24	07/11/2025	09/11/2025	2	£20.00	☒	3	
4	3	28	14/11/2025	17/11/2025	3	£30.00	☒	5	
5	4	27	10/11/2025	20/11/2025	10	£100.00	☒	4	
⌘	(New)				0		☐		

Rental Transactions Sample Data i

1.6

Queries

Complete Transactions							
Rental Transactions							
Rental ID	Customer ID	Bike ID	Rental Start	Rental End	Duration	Cost	Complete
1	4	28	03/11/2025	06/11/2025	3	£30.00	☒
2	5	24	04/11/2025	11/11/2025	7	£70.00	☒
3	1	24	07/11/2025	09/11/2025	2	£20.00	☒
4	3	28	14/11/2025	17/11/2025	3	£30.00	☒
5	4	27	10/11/2025	20/11/2025	10	£100.00	☒
6	2	23	16/12/2025				☐
⌘ (New)					0		☐

Rental Transactions Sample Data ii

In the case that a rental becomes, I have created a query which I think would be very useful.

Rental Transactions				
Complete Transactions				
Rental ID	Duration	Cost	Complete	Customer ID
2	7	£70.00	☒	5
3	2	£20.00	☒	1
4	3	£30.00	☒	3
5	10	£100.00	☒	4
1	3	£30.00	☒	4
⌘ (New)	0		☐	

Rental Transactions Sample Data iii

In any given time, upon completion of a rental, department such as the finance department can issue invoices and keep the revenue flow, moving along in a smooth fashion without time delays.

Fleet Availability X		
Bike ID	Type	Location
23	Mountain Bike	Train Station
24	Cargo Bike	University Campus
27	Road Bike	University Campus
28	Monkey	Park
✱	(New)	

Fleet Sample Data ii

Fleet Availability query, provides the rental team a better understanding of what is current and available for future rentals, minimising any double booking and inconveniencing of a customer.

Fleet X Maintenance X Rental Transactions X Rider Registry X					
Bike ID	Type	Location	Bike Name	Availability	
23	Mountain Bike	Train Station	MB01	Yes	
24	Cargo Bike	University Car	CGB01	Yes	
25	Folding Bike	Maintenance	FB01	No	
27	Road Bike	University Car	RB01	Yes	
28	Monkey	Park	MK01	Yes	
✱	(New)				

Fleet Sample Data iii

I chose the above examples to demonstrate how, with the use of above queries and the parameters of which I have created, is most useful for organisation to review and locate each bike. Finance team can with ease find all complete transactions for prompt invoicing and in event of accident or theft, financial recovery could be made whether through insurance claim or charging customers if terms and conditions are not fulfilled, and penalties could be served accurately.

1.7 Validation and Testing

EVALUATION AGAINST FUNCTIONAL REQUIREMENTS

Register Riders

Requirement: Customer ID, first name, last name, email, and contact number.

Achieved: Rider Registry table fulfils this.

Maintain Bike Records

Requirement: Maintenance ID, Bike ID, entry date, exit date, complete, status, location, and availability.

Achieved: Fleet and Maintenance tables comprehensively record bike status, attributes, and service history.

Record Rental Transactions

Requirement: Dates, duration, cost, details.

Achieved: Rental Transactions table links Fleet and Rider Registry, logs pickup/return locations, timestamps, cost, and duration.

Track Staff Involvement

Requirement: Staff ID, first name, and last name.

Achieved: Maintenance table records staff ID for each service event linking Staff table which maintains staff details.

TESTING PROCESS & OUTCOMES

Testing Approach

Entered sample data for each entity.

Simulated typical operations:

Registered a new rider.

Added new bikes and updated their statuses.

Recorded a rental transaction.

Logged a maintenance event and associated it with a staff member.

Queried current bike availability and completed rentals.

Outcomes

All requirements were met with the test data.

System prevents double-booking by updating bike status on rental.

Maintenance and staff involvement are traceable.

Accurate, up-to-date summaries and usage analysis are now possible.

Conclusion

The new database system fulfils all operational and reporting needs of the Eco Ride scheme. It enables efficient registration, asset tracking, rental management, and service accountability. Testing with sample data confirms the system meets each functional requirement and supports reliable, real-time operations for the management team.