

Database Report

by Daniel Leone

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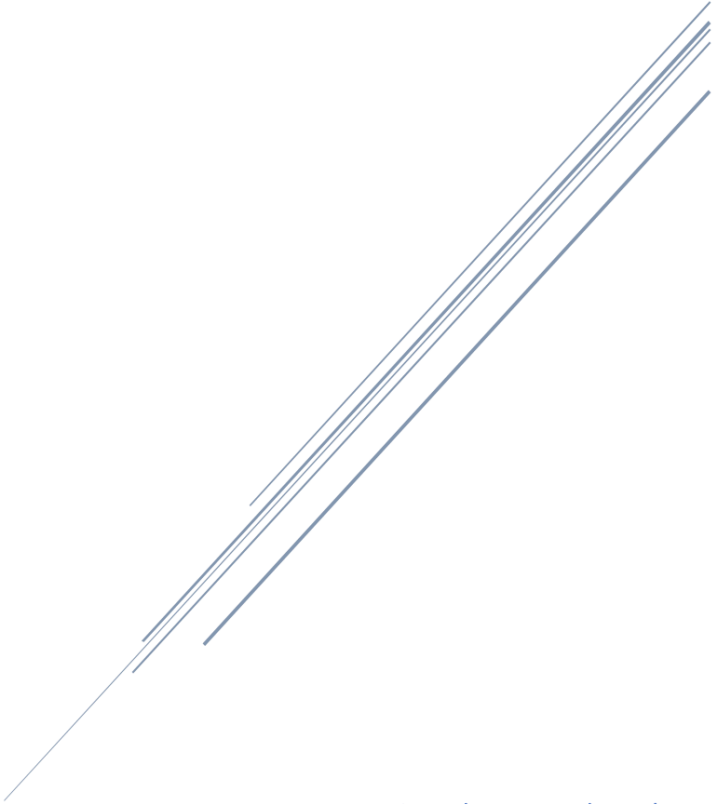
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DESIGN AND IMPLEMENTATION OF A RELATIONAL DATABASE SYSTEM

Introduction to Web and Database Concepts – ACCA4023
06/11/24



2317483@student.uwtsd.ac.uk
Daniel Leone (2317483)

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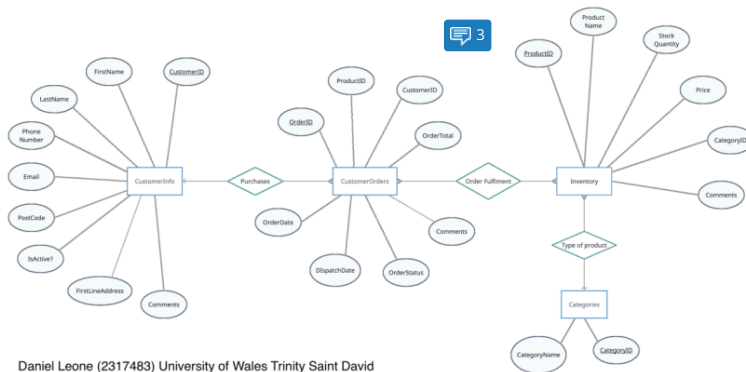
1. Introduction

The aim of this report is to demonstrate the design and implementation of a relational database system which could be used by a small business called 'CraftGem', which sell's handmade jewellery. The database will be created using Microsoft Access. The objectives are to create a robust, organised solution which is capable of the following; enable the end user to manage inventory, Customer Information, Orders, and to facilitate reporting. Examples of queries will be made, along with detailing how such information can be insightful to the business. Additionally, the database will need a menu which is intuitive for navigation.

2. Entity Relationship Diagram (ERD)

2.1 What is an ERD?

An ERD, Entity relationship Diagram, can be used for planning and visualising a model for a relational database [1]. An example of an ERD has been created for this assignment, figure 1, representing all of the elements implemented within the database shown in the following sections of this report.



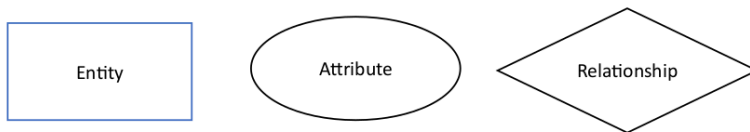
Daniel Leone (2317483) University of Wales Trinity Saint David

Figure 1, Entity Relationship Diagram

2.2 Understanding the ERD notations

2.2.1 Notations for Entities, Attributes, Relationships

This particular ERD demonstrates three of the core components which make up the relational database; Entities/tables, Attributes, Relationships. The notations for each component are detailed below [1].



It should be noted that for more intricate databases, there are variations of these core components, and their respective ERD notations are distinctly unique.

2.2.2 Key Attributes

- Some attributes within the ERD are presented with underlined text - this represents the Primary Key for its respective entity [1].
- Each primary key is unique to its own specific entity [1] [2].
- In the example ERD, it can be determined that the primary key for 'CustomerOrders' is 'OrderID'.

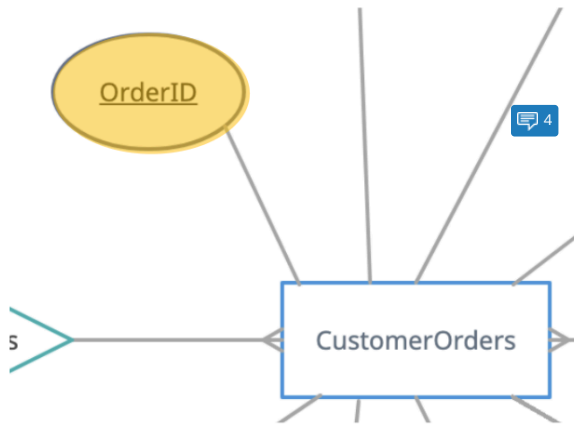
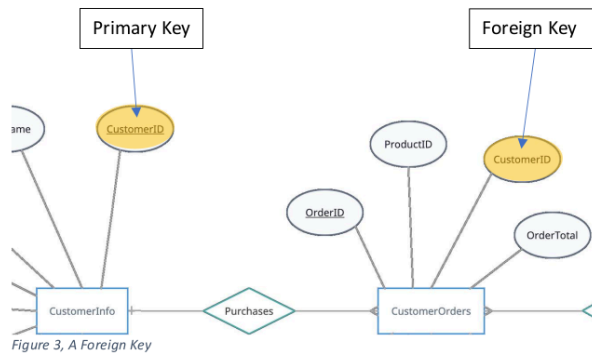


Figure 2, A Primary Key

- When a key attribute is shown with another entity, this is known as a 'foreign key' [1].
- The foreign key establishes a relationship between entities, ensures data integrity, and minimises data redundancy (When the same data is stored in multiple places at once) [2].
- In the example ERD, it can be determined that one of the Foreign Keys is 'CustomerID', Highlighted in figure 3, below.



2.2.3 Relationship Cardinality and Ordinality

Types of relationships are distinguishable by their Cardinality, and Ordinality. This dictates how many times a data set within one entity can associate with another entity. The cardinality and ordinality can be determined by the stylization of the line [3] [4], shown in figure 4.

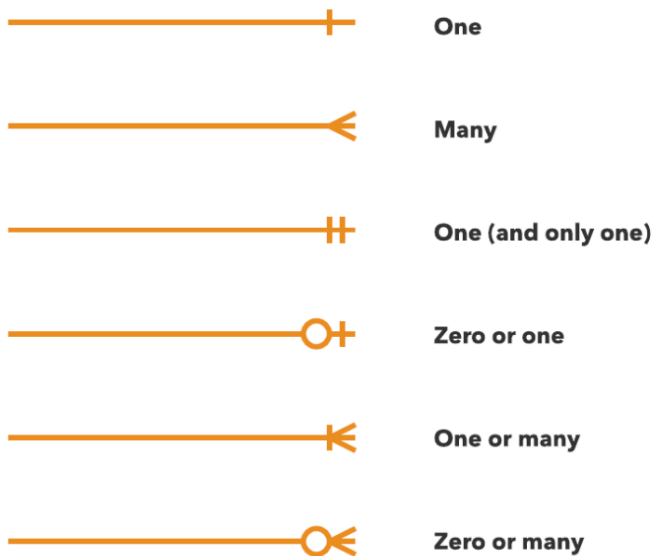


Figure 4, Cardinality and Ordinality - Line Stylization [3]

In this assignment, it can be determined that 'One-to-Many' and 'Many-to-Many' [5, p. 82] Relationships have been established, as can be seen in the annotated ERD screenshots below, figure 5.

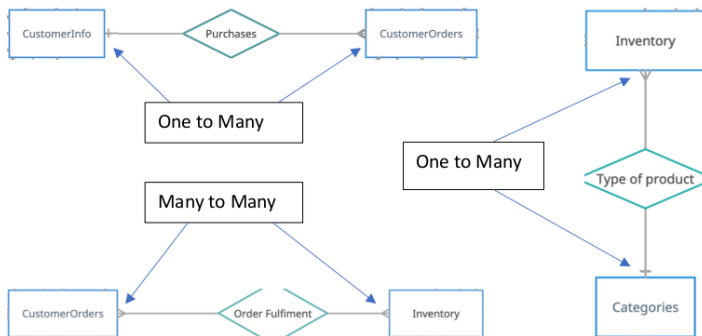


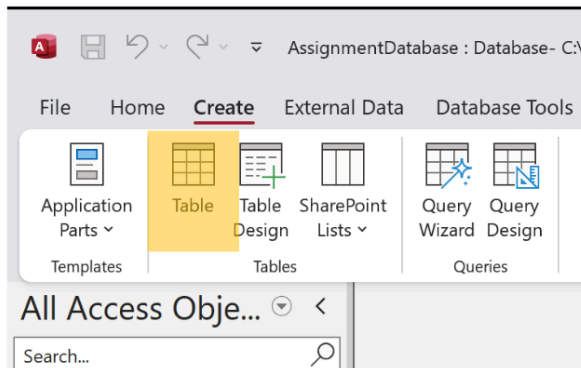
Figure 5, Relationship Cardinality and Ordinality

3. Creating a Database in Microsoft Access

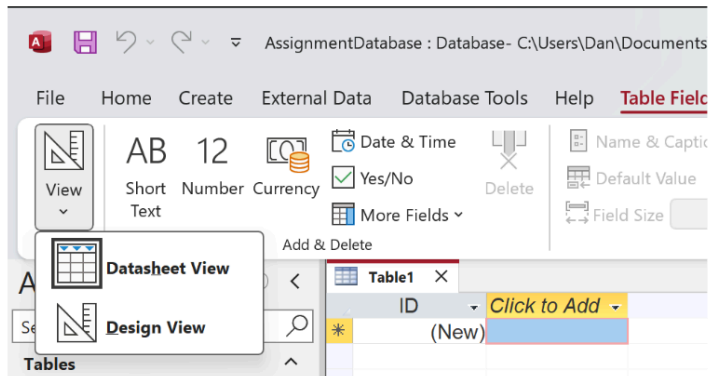
3.1 Creating Tables / Entities

The following steps detail how to create new tables within Microsoft access.

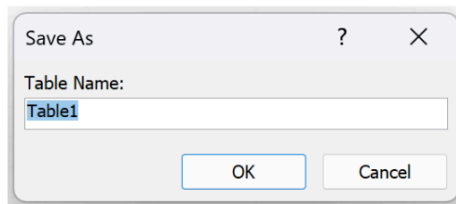
1. Under the 'Create' tab, click 'Table'



2. Change to the design view



3. Give the table/entity a relevant name, click Ok to save.



4. Create the attributes, and select a relevant data type, E.g:

Field Name	Data Type
PrimaryAttribute	AutoNumber
Attribute2	Short Text
Attribute3	Short Text

For this assignment, the following Attributes along with respective data types were created for the 'CustomerInfo' Table:

CustomerInfo X	
Field Name	Data Type
CustomerID	AutoNumber
First Name	Short Text
Last Name	Short Text
Phone Number	Short Text
Email	Short Text
Postcode	Short Text
First line Address	Short Text
isActive?	Yes/No
Comments	Short Text

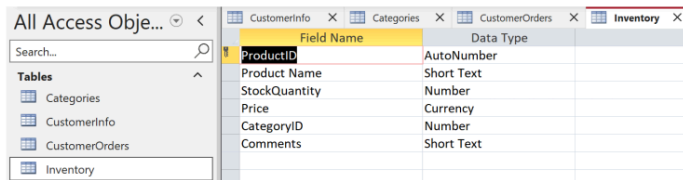
5. The Primary Key can be set by right clicking the box to the left of the attribute.

CustomerInfo X	
Field Name	Data Type
Primary Key	AutoNumber
Cut	Short Text
Copy	Short Text
Paste	Short Text
Insert Rows	Short Text
Delete Rows	Short Text
Properties	Yes/No
	Short Text

It can be seen that the 'CustomerID' attribute has been set as the primary key for this table (highlighted in the screenshot below).

Field Name
CustomerID

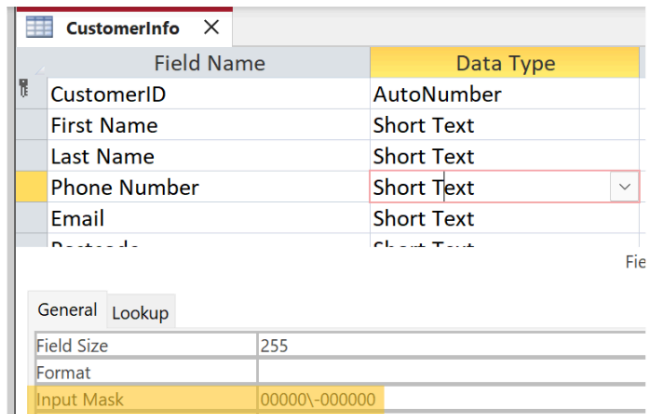
6. Steps 1-5 can be repeated for each table required. For this assignment, four tables have been created.



Field Name	Data Type
ProductID	AutoNumber
Product Name	Short Text
StockQuantity	Number
Price	Currency
CategoryID	Number
Comments	Short Text

7. Additionally, Input masks, and validation rules can be created to ensure only cohesive data can be entered into these database fields.

In this assignment an input mask has been implemented for the CustomerInfo – 'Phone Number' field.



Field Name	Data Type
CustomerID	AutoNumber
First Name	Short Text
Last Name	Short Text
Phone Number	Short Text
Email	Short Text
...	...

General	
Field Size	255
Format	
Input Mask	00000\-\000000

Also, a validation rule was implemented for the CustomerInfo – ‘Email’ field.

CustomerInfo	
Field Name	Data Type
CustomerID	AutoNumber
First Name	Short Text
Last Name	Short Text
Phone Number	Short Text
Email	Short Text
Postal Code	Short Text
First Line Address	Short Text
Second Line Address	Short Text
Third Line Address	Short Text
IsActive	Yes/No
General	
Lookup	
Field Size	255
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	Like "*@*.*)"
Validation Text	"Please enter Valid email address."

8. Change back to the DataSheet view, The tables fields can now be populated with Data.
The following data has been fabricated as an example, for testing purposes.

‘CustomerInfo’ Data:

CustomerID	First Name	Last Name	Phone Number	Email	Postal Code	First Line Address	IsActive?
1	Emily	Thompson	07812-345678	emily.thompson@gmail.com	A812 3CD	24 Maple Street	Yes
2	James	Wilson	07890-123456	james.wilson@email.com	CD34 5EF	78 Oak Avenue	Yes
3	Sarah	Patel	07112-987654	sarah.patel@email.com	EF56 7GH	56 Cedar Lane	Yes
4	Michael	Johnson	07123-456789	michael.j@email.com	GH78 9IJ	89 Pine Road	Yes
5	Olivia	Smith	07901-234567	olivia.smith@email.com	IJ90 1KL	12 Birch Close	Yes
6	Alan	Anderson	07631-234567	alan.scammer@email.com	GH78 9IJ	89 Pine Road	No
(New)							

'Categories' Data:

CategoryID	CategoryName	Click to Add		
1	Pendants			
2	Necklaces			
3	Bracelets			
4	Earrings			
5	Rings			
*	(New)			

'CustomerOrders' Data:

OrderID	ProductID	CustomerID	Order Total	Order Date	Dispatch Date	OrderStatus	Comments
1	4	5	£15.00	15/09/2024	17/09/2024	Delivered	
2	1	4	£30.00	16/09/2024	18/09/2024	Returned	Item was damaged
3	3	3	£30.00	17/09/2024	20/09/2024	Delivered	
4	2	2	£20.00	18/09/2024	22/09/2024	Shipped	
5	5	1	£10.00	19/09/2024	21/09/2024	Cancelled	problem with product
6	1	5	£30.00	22/09/2024	23/10/2024	Pending	
7	3	5	£30.00	22/09/2024	23/10/2024	Pending	
9	6	6	£15.00	26/10/2024	27/10/2024	Returned	
10	6	6	£15.00	28/10/2024	29/10/2024	Returned	
11	7	6	£15.00	30/10/2024	30/10/2024	Returned	
12	7	6	£15.00	30/10/2024	01/11/2024	Returned	
*	(New)	0	£0.00				

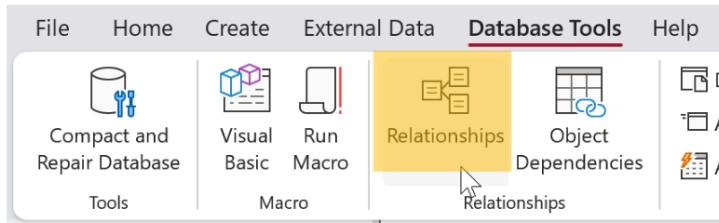
'Inventory' Data:

ProductID	Product Name	StockQuantity	Price	CategoryID	Comments
1	Silver Leaf Pendant	5	£30.00	1	
2	Amethyst Beaded Bracelet	40	£20.00	3	
3	Rose Gold Charm Necklace	4	£30.00	2	
4	Turquoise Stone Earrings	30	£15.00	4	
5	Handmade Clay Ring	10	£10.00	5	Being discontinued
6	Bead Necklace	10	£15.00	2	
7	Amethyst Earrings	10	£15.00	4	
*	(New)	0	£0.00	0	

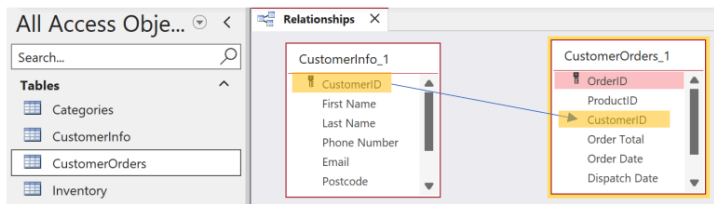
3.2 Establishing Relationships

The following steps detail how to establish relationships between tables.

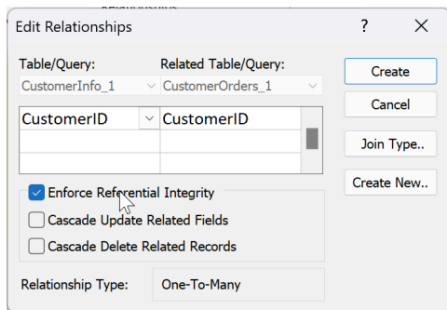
1. Click 'Relationships', under Database Tools.



2. Drag and drop all of the required tables into the relationships blank Relationships field (The large grey area).

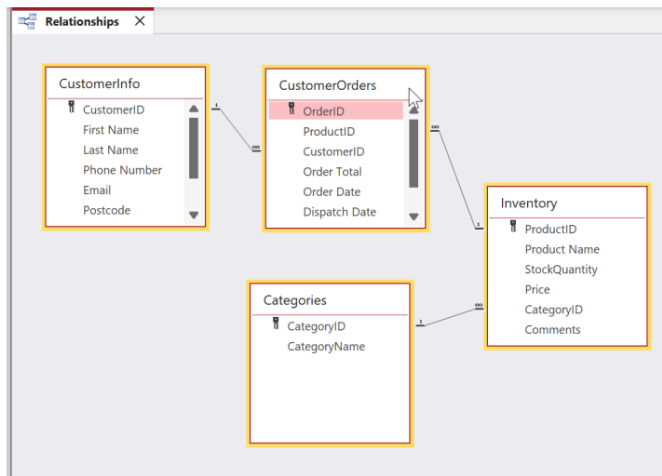


3. Drag and drop an attribute from one table to another. For example, in this assignment, the 'CustomerID' attribute, from the CustomerInfo table, can be dragged onto 'CustomerID' attribute in the 'CustomerOrders' table, to establish a foreign key relationship.



Click 'Enforce Referential Integrity', and then click Create.

4. Once all relationships have been established, it will look like this:



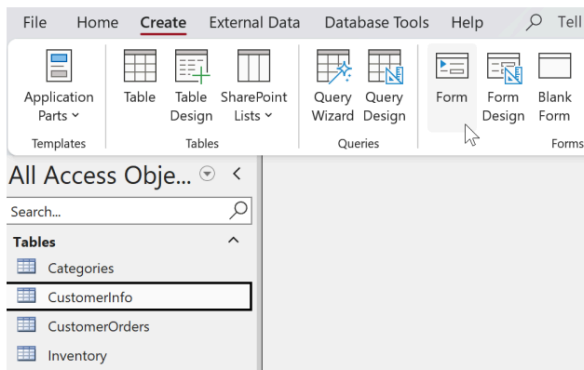
3.3 Designing Forms

3.3.1 Designing Forms for Data input & Navigation

3.3.1.1 Creating a Form

Forms enable the end user to interact with the database in an easier manner [5, p. 12]. The following steps show how a form can be designed.

1. Select a table to create a form for. Next, click 'Form' under the 'Create' Tab.



2. Change to design view.



3. The default form design can be seen below.

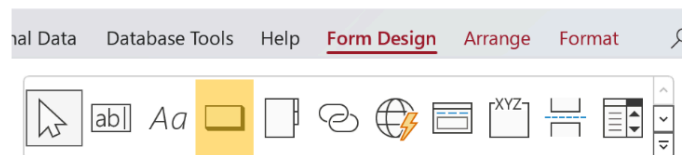
A screenshot of a form titled "CustomerInfo". The form has a header section with the title "CustomerInfo" and a detail section with fields for CustomerID, First Name, Last Name, Phone Number, Email, Postcode, First line Address, isActive?, and Comments. The form is displayed in a design view with a grid background.

3.3.1.2 Implementing Form Buttons

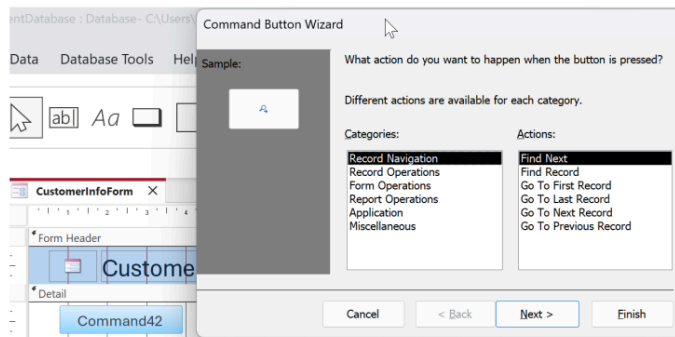
Buttons can provide a more intuitive interface for the end user to interact with the database. For example, allowing easy navigation between forms [6]. The following steps detail how to implement a button into a form.

1. Under the 'Form Design' tab, there are a variety of tools which can be used to design and customise the form.

To add a button, click 'Button', highlighted below.



2. Draw a button onto the form, a window will appear which can be configure the desired action for the button.



3. Once the buttons are placed and configured, it will look like this:

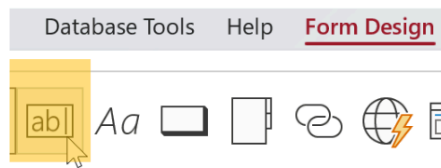


For this form, buttons for navigation, adding recording, saving records, and deleting records have been implemented.

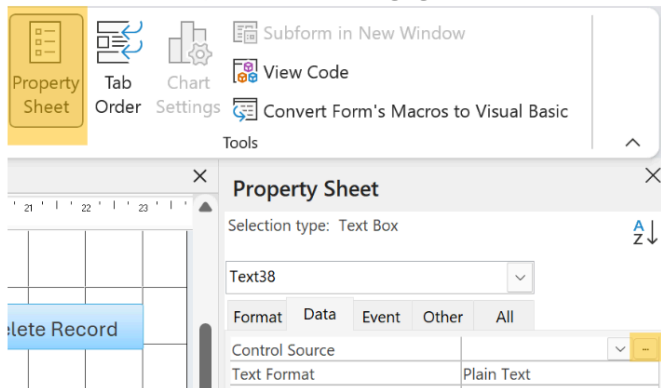
3.3.1.3 Implementing expressions for calculations

Additional information can be presented on a form such as calculations, utilising the tables data. This can be implemented through formulas, using the Expression builder tool [5, pp. 268-275]. The Following steps will detail how to add a calculation between a date period.

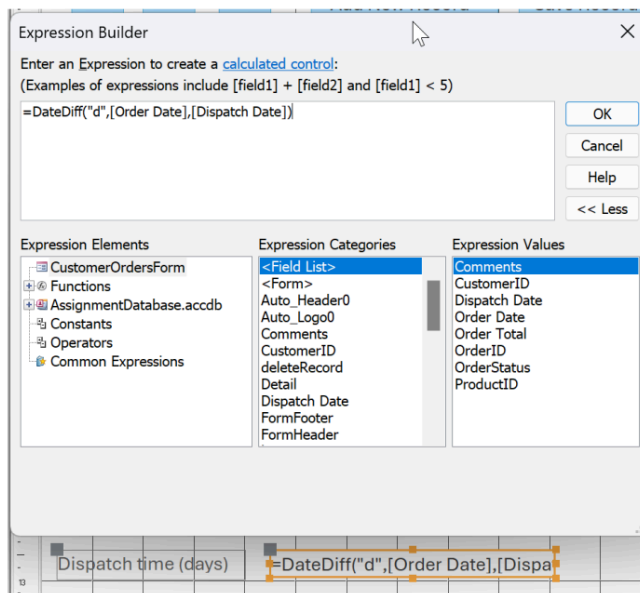
1. Under 'Form Design', Add a text box to the form.



2. Once the text box is drawn, click the 'Unbound' box and open the 'Property Sheet', next click the three dots, in 'Control Source'. Highlighted below.



3. From here, the expression can be built for the desired calculation.



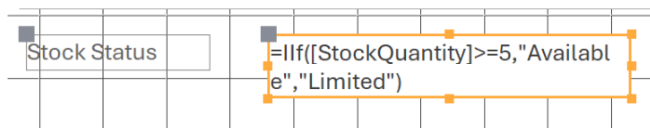
4. In this example, the difference in days between the Order date and Dispatch date has been calculated and displayed on the form. Seen below.

Order Date	22/09/2024
Dispatch Date	23/10/2024
OrderStatus	Pending
Comments	
Dispatch time (days)	31

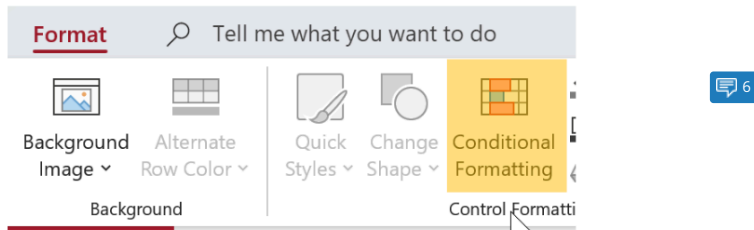
3.3.1.4 Conditional Formatting

Conditional Formatting can be applied to values, drawing attention to the data being presented. The following steps will detail how to apply conditional formatting to a 'Stock Status' field.

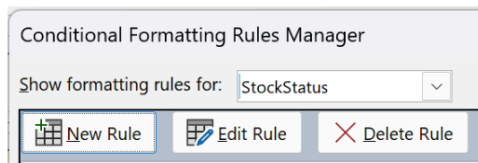
1. Select the text box.



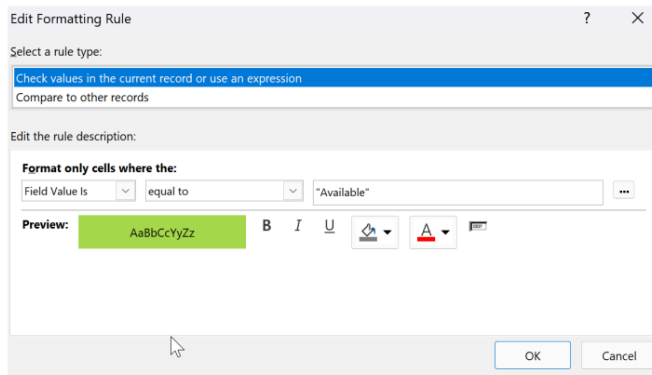
2. Under the 'Format' Tab, Click 'Conditional Formatting'.



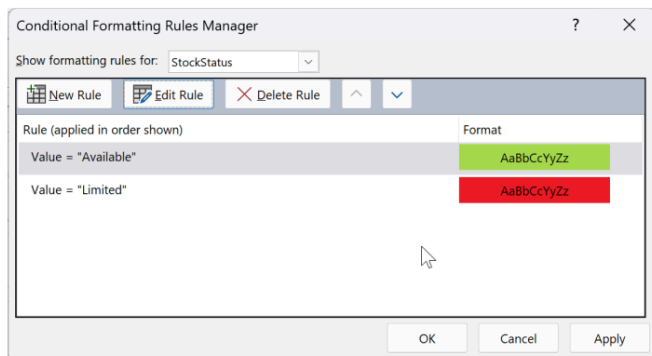
3. Click 'New Rule'



4. In this example, a rule has been set which will colour the field green, when the expressions' value is equal to "Available"



5. A second rule has been created which will colour the field red, when the value is equal to "Limited"



6. Returning to the form view, the conditional formatting can be seen applied to the field, below.

CustomerOrdersForm

CustomerInfoForm

InventoryForm

Inventory

ProductID

1

Product Name

Silver Leaf Pendant

StockQuantity

5

Price

£30.00

CategoryID

1

Comments

OrderID	CustomerID	Order Total	Order Date	Dis
2	4	£30.00	16/09/2024	
6	5	£30.00	22/09/2024	
* (New)	0	£0.00		

Record: 1 of 2

No Filter

Search

Stock Status

Available

A Form can be created as a home menu, which includes buttons linking to the previously created forms. This will further improve useability for the end user. The following steps will detail how a form can be created to be used as a home menu.

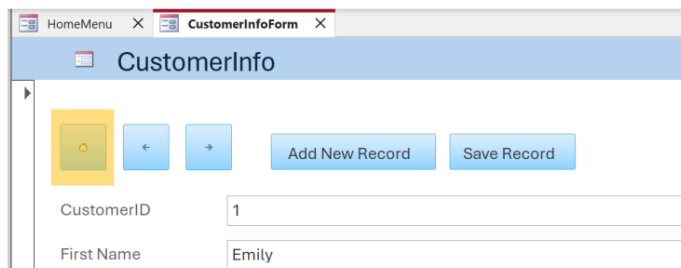
- Create** External Data Database Tools Help
- | | | | | | | |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
| Table | Table Design | SharePoint Lists ▾ | Query Wizard | Query Design | Form | Form Design |
| Tables | | | Queries | | | |

-

3. For this Assignment, a simple home menu has been designed which allows the user to navigate to forms which would be in frequent use by the business.



4. Additionally, A home menu button can now be added to all other forms, allowing the user to easily return to the home menu. An Example of this can be seen highlighted below.

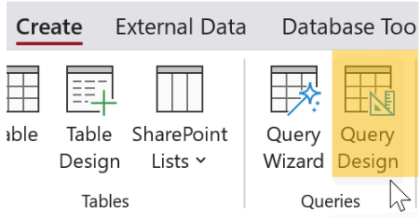


4. Queries and Reports

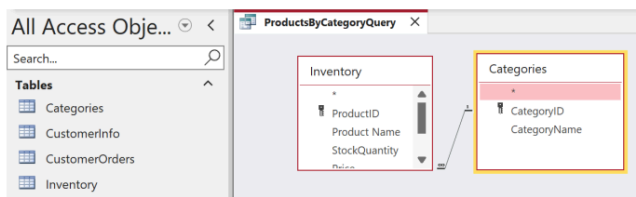
4.1 Creating Queries

Queries are a versatile tool which allow the database user to pull data from multiple tables, filter out data, and combine it to create insights which answer questions or calculations [5, p. 219] [7]. The following steps will detail how to create a query.

1. Under the Create tab, Click 'Query Design'.



2. Drag and drop the relevant tables into the query design field (Large grey area). In this example, the inventory, and categories tables will be used.



3. Select the required fields for the query, in this example, The query will be created to show products by categoryID. Note: Criteria can also be set to further filter the data.

Field:	ProductID	Product Name	CategoryID
Table:	Inventory	Inventory	Categories
Sort:			
Show:	☒	☒	☒
Criteria:			4
or:			

4. Switch to the datasheet view or click 'Run', to see the results

ProductsByCategoryQuery X		
ProductID	Product Name	CategoryID
4	Turquoise Stone Earrings	4
7	Amethyst Earrings	4
*	(New)	(New)

The demonstrated query can provide quick, and useful product information to the business. For example, if a customer contacted the business requesting to show all the different lines of one specific category of products, E.g. earrings.

A total of five example queries were produced for this assignment. Each query has been designed to provide meaningful insight to the business.

Queries ^	
	HighValueOrdersQuery
	LowStockQuery
	OrderDispatchQuery
	ProductsByCategoryQuery
	ReturnsAndCancellationsQuery

The following explanations will detail their significance, and potential use cases of the remaining four queries.

1. 'HighValueOrdersQuery', This query shows insight into the customers who spend the most money, such trends can identify loyal customers, enabling the business to reward the customer with discounts, or personalised offers. It also shows the categories of items that they are purchasing, allowing offers to be tailored to meet the customers purchasing habits.

HighValueOrdersQuery X			
CustomerID	Order Total	CategoryID	
5	£30.00	2	
5	£30.00	1	
3	£30.00	2	
4	£30.00	1	
2	£20.00	3	
*		(New)	

2. 'LowStockQuery', This query has criteria which means only products lines that have 5 or less in stock will be shown in the data sheet. This can be a helpful query for stock management, the criteria figure can be manipulated to show a wider range of stock levels.

Field:	ProductID	Product Name	StockQuantity
Table:	Inventory	Inventory	Inventory
Sort:			
Show:	☒	☒	☒
Criteria:			<=5
or:			

LowStockQuery X			
ProductID	Product Name	StockQuant	
1	Silver Leaf Pendant	5	
3	Rose Gold Charm Necklace	4	
*	(New)	0	

3. 'OrderDispatchQuery', This Query is essentially a simplified version of the CustomerOrders table, however only displays the OrderID, Order Date and Dispatch Date. Streamlining this data in such a way could help with quickly identifying when a particular order was dispatched.

OrderDispatchQuery X			
OrderID	Order Date	Dispatch Date	
12	30/10/2024	01/11/2024	
11	30/10/2024	30/10/2024	
10	28/10/2024	29/10/2024	
9	26/10/2024	27/10/2024	
7	22/09/2024	23/10/2024	
6	22/09/2024	23/10/2024	
5	19/09/2024	21/09/2024	
4	18/09/2024	22/09/2024	
3	17/09/2024	20/09/2024	
2	16/09/2024	18/09/2024	
1	15/09/2024	17/09/2024	
*(New)			

4. 'ReturnsAndCancellationsQuery', This Query will show all the returns and cancellations, along with their respective OrderID and CustomerID. This can be useful to recognise trends, such as fraudulent activity.

ReturnsAndCancellationsQuery X		
OrderID	CustomerID	OrderStatus
5		1 Cancelled
2		4 Returned
12		6 Returned
11		6 Returned
10		6 Returned
9		6 Returned
*(New)	(New)	

Field:	OrderID	CustomerID	OrderStatus
Table:	CustomerOrders	CustomerInfo	CustomerOrders
Sort:		Ascending	
Show:	☒	☒	☒
Criteria:			"Returned" Or "Cancelled"

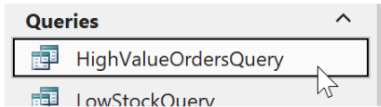
4.2 Using Reports

Reports can be generated as an alternative way to view and summarise the data held within a database [8]. Reports can be easily customised, making them visually appealing for printing and/or sharing [5, pp. 14-16].

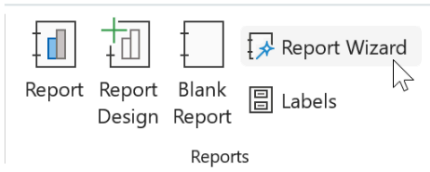
4.2.1 Generating Reports

The following steps will detail how a report can be generated.

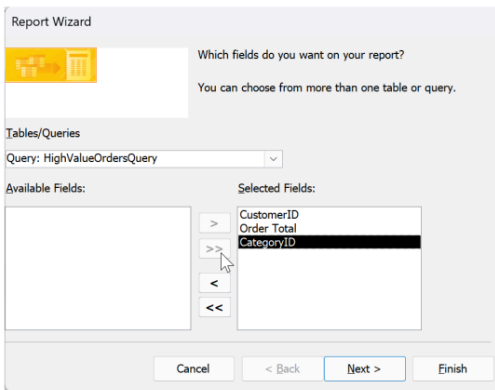
1. Select a query from the queries list



2. Under the Create tab, click the 'Report Wizard'.



3. Select the fields required to appear in the report by using the arrow buttons.



4. Follow the wizard, Choosing the preferred data layout for the report.

Report Wizard

How do you want to view your data?

by Categories
by CustomerOrders

Show me more information

CategoryID
CustomerID, Order Total

Cancel < Back Next > Finish

5. Click Finish to create the report.

Report Wizard

What title do you want for your report?
HighValueOrdersReport

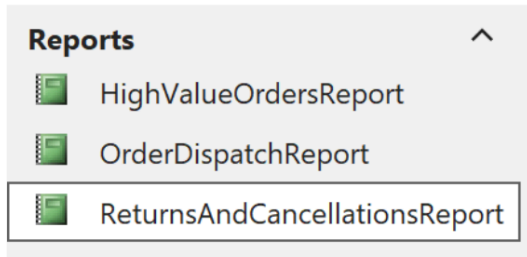
That's all the information the wizard needs to create your report.
Do you want to preview the report or modify the report's design?
☒ Preview the report.
☐ Modify the report's design.

Cancel < Back Next > Finish

4.2.2 Customising a report

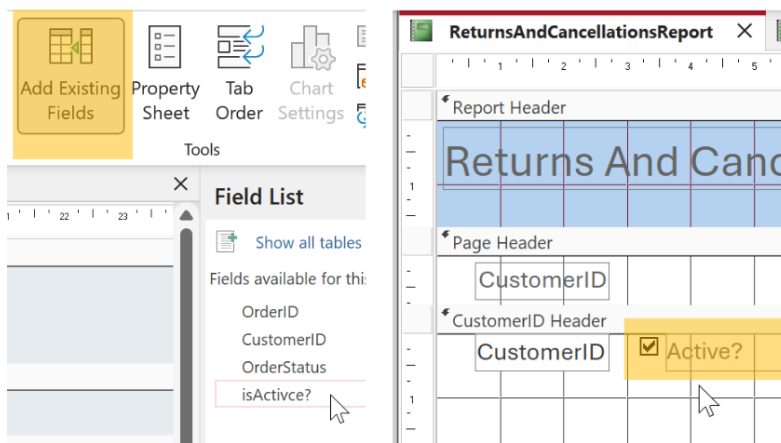
Reports can be customised and designed in a similar manner to forms.

In this Assignment, three reports have been generated, seen below.

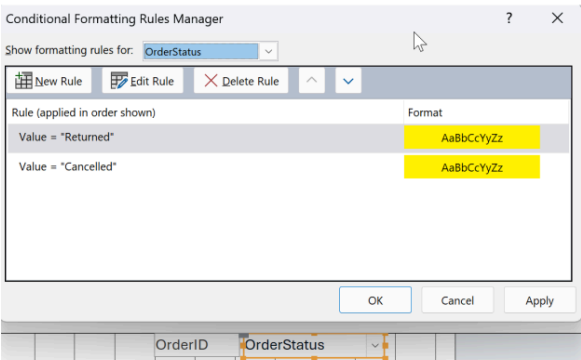


The 'OrderDispatchReport' has been customised to include an additional existing field, and also conditional formatting.

Adding an existing field:



Using conditional formatting:



The finished report can be seen in the screenshot below:

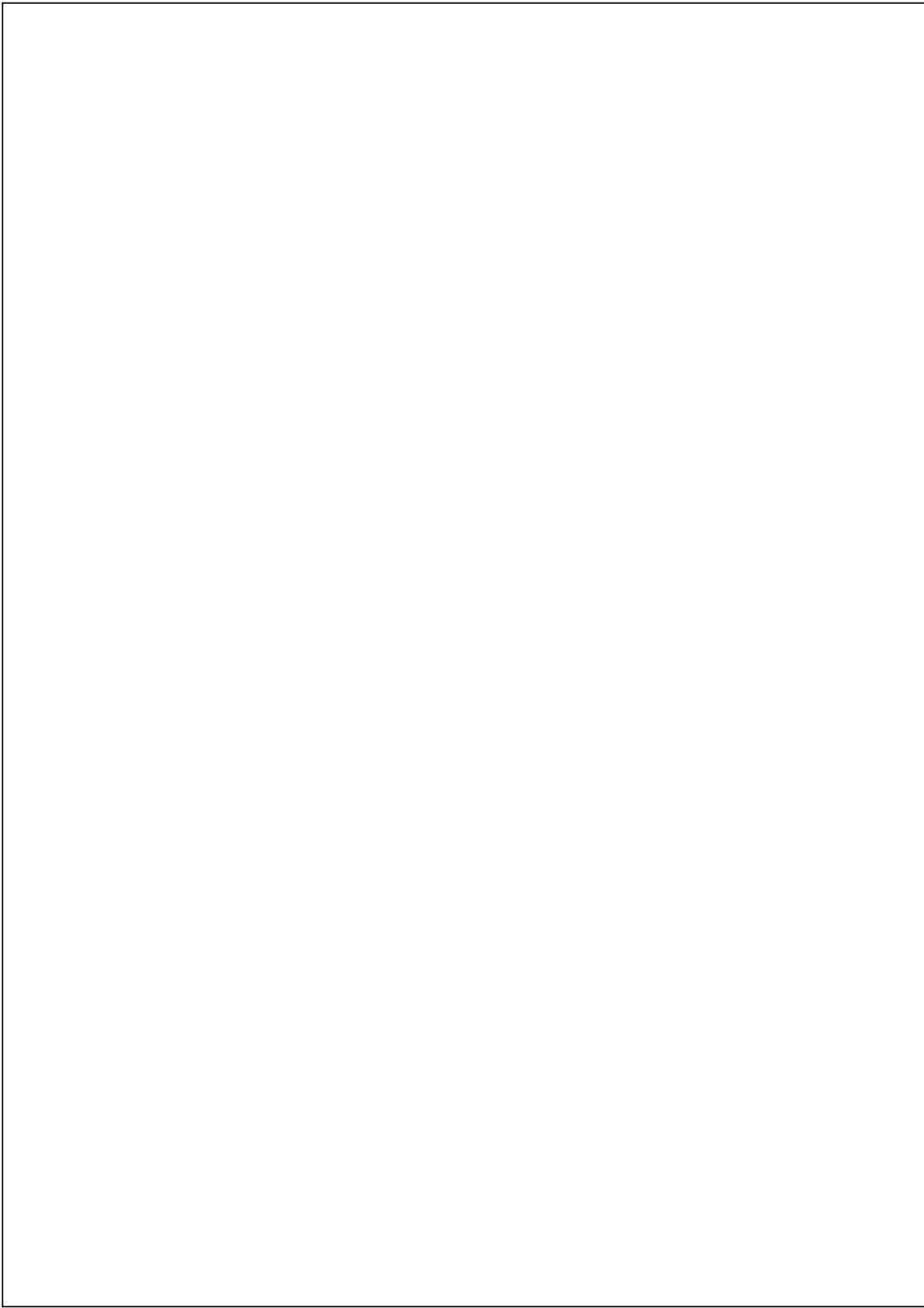
Returns And Cancellations

CustomerID	OrderID	OrderStatus
1 ☒ Active?	5	Cancelled
4 ☐ Active?	2	Returned
6 ☐ Active?	9	Returned
	10	Returned
	11	Returned
	12	Returned

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5. References

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- [8] Microsoft, "Introduction to reports in Access," [Online]. Available: <https://support.microsoft.com/en-gb/office/introduction-to-reports-in-access-e0869f59-7536-4d19-8e05-7158dcd3681c>. [Accessed 6 November 2024].



Database Report

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

94/100

PAGE 1

PAGE 2



Comment 1

good start with clear toc

PAGE 3



Comment 2

well done. could have included some details about the current system or problems with the current one



Comment 3

most of entities and its corresponding attributes are identified

PAGE 4



Comment 4

highlighting the primary key is a thoughtful approach

PAGE 5

PAGE 6

PAGE 7

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Comment 5

data validation rules is crucial to prevent errors. well done

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Comment 6

The use of conditional formatting for stock levels and sales tracking is a practical and effective feature.

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Comment 7

well justified

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PAGE 26

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PAGE 29



Comment 8

A conclusion is currently missing from the report, which leaves the reader without a final summary or reflection on the overall project. Including a brief conclusion would provide closure and emphasize the key takeaways from the database development process.

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PAGE 31

GRADING FORM: DC_IWD

DANIEL LEONE

94

ENG. WITH LITERATURE SKILLS

Materials to support the development of the database system

-  Showcased external research and practical experience through the explanation of functions and query implementation.

18

KNOWLEDGE&UNDERSTANDING SKILLS

ERD Description of tables with field names, datatypes, and constraints

-  The design choices in the ERD and database demonstrate clear problem-solving skills aligned with Craft Gem's requirements.

28

PRACTICAL APPLICATION SKILLS

populate database, Implementation with primary key, foreign key, Validation rules Forms Queries Reports

-  The database was successfully implemented with a functioning ERD, forms, queries, and reports, showing practical competency. reports could include some calculations

38

TRANSFERRABLE SKILLS

• Readability of the report. • Written quality, including spelling and grammar and the use of appropriate formal language. • Structure and presentation including screenshots of the report. • Critical evaluation of the selected database methods, tools and techniques and their deployment.

-  The report is well-structured, with minimal spelling and grammar issues, making it readable and professional.
Key functionalities, such as the ability to query and generate reports, are well-communicated and logical.

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