

Database Design (The Book Store)



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1. Introduction

This report will outline the design and implementation stages of creating a Microsoft Access database for Dylan's Bookstore follow user requirements. Design techniques including data flow diagrams, entity relationship diagrams and data structure tables will be used to create a solid design for the database before beginning implementation to ensure that user requirements will be met.

An evaluation will conclude the report and will discuss the successes of the database design and implementation, along with recommendation for future improvements.

2. Specification and Requirements

The brief is to produce a stock and mail order system for Dylan's Book Store based in Swansea.

2.1. User Requirements

The system must allow users to:

- View, Create, Update and Delete **Books**
- View, Create, Update and Delete **Customers**
- View, Create, Update and Delete **Customer Orders**
- View, Create, Update and Delete **Suppliers**
- View, Create, Update and Delete **Supplier Orders**
- View, Increase and Decrease **Stock Quantity** for **Books**
- Differentiate between **Books** of the same *Type*, *Author* and *Title* if they are First Editions
- View all **Customers** registered for the *Newsletter*

The system must also implement some basic security for the purpose of complying with current General Data Protection Regulation [1].

2.2. Assumptions

The following assumptions are made regarding the proposed system:

- The *Newsletter* is sent out manually by **Staff** using a list of **Customers** that are registered for the Newsletter generated by the system
- Staff are not an entity in the system. In a future version, a log in, with staff details could be implemented to differentiate between different members of staff

3. Design

The following section will use a range of design techniques to outline the design for the proposed database solution.

3.1. Context Diagram

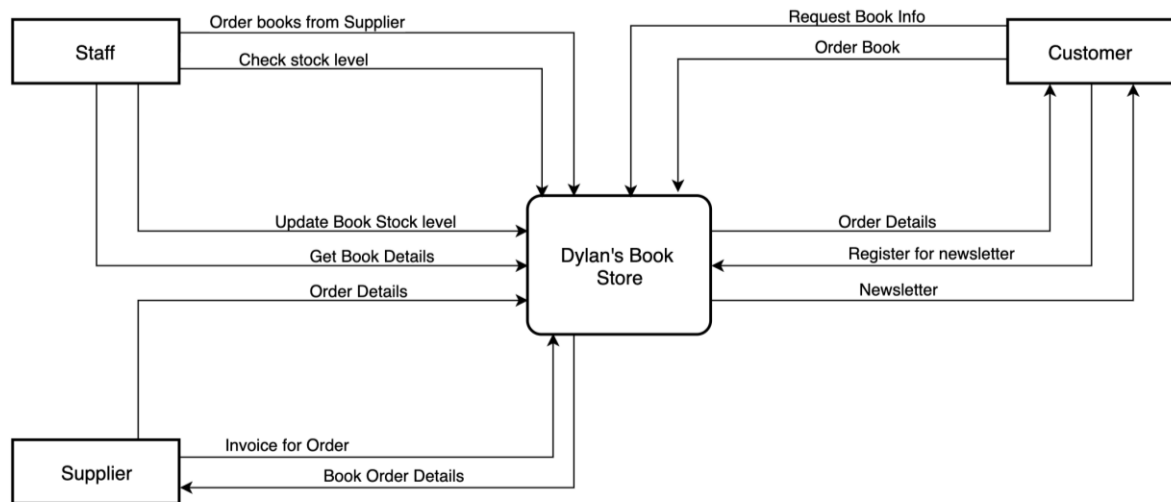


Figure 1. Context Diagram

1.1. Level 0 Data Flow Diagram

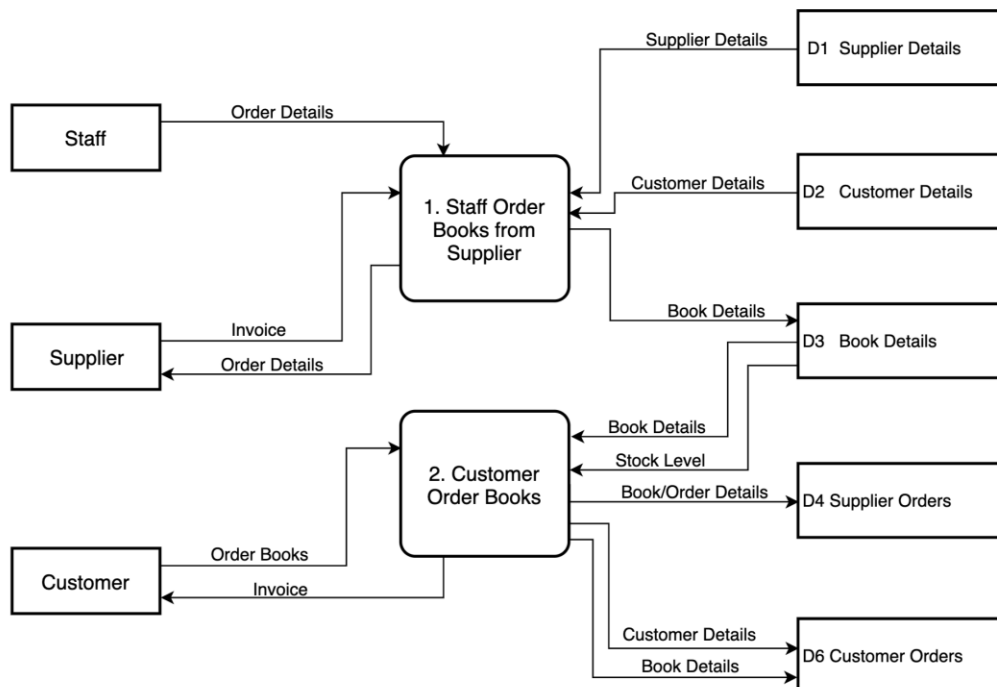


Figure 2. Level 0 Data Flow Diagram

3.2. Entity Relationship Diagram

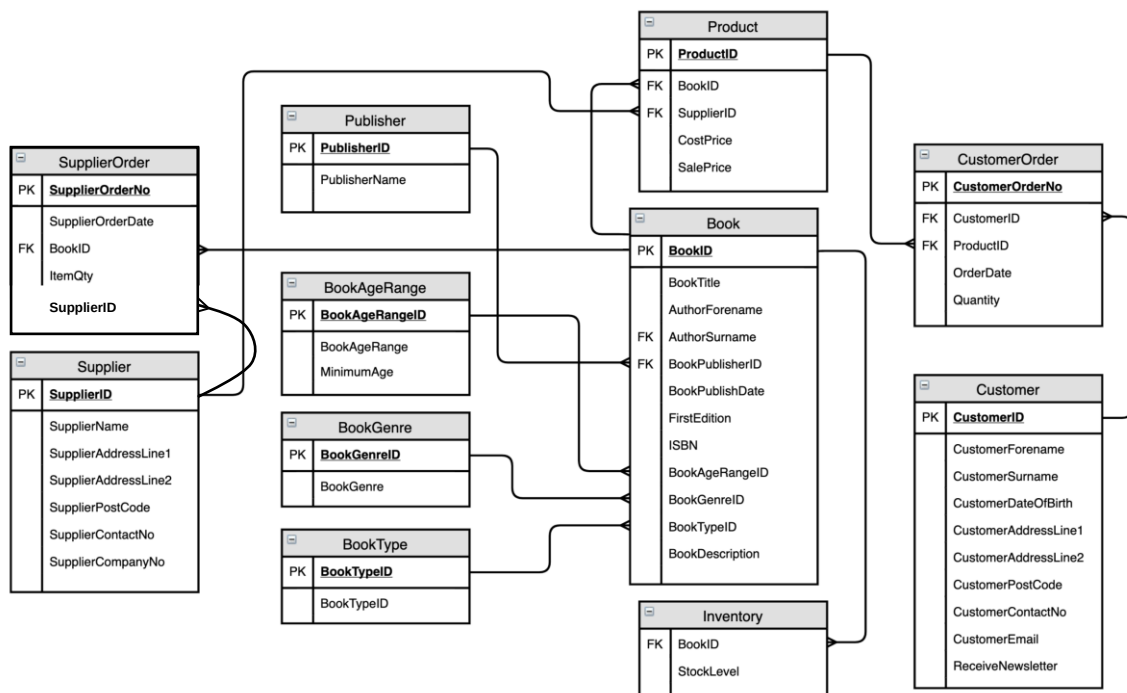


Figure 3. Entity Relationship Diagram

The entity relationship diagram is normalised to third normal form which will mitigate against data redundancy and data inconsistency. However, it has been decided that the author field (books table) will not become a separate table on the database, to improve user friendliness. Some data inconsistency may occur as a result, but as many authors only produced one book, much data would have to be stored to uniquely identify each author and it would mean the user would have to create a new author each time.

Tables and purpose:

A. Supplier

- The purpose of the supplier table is to store details on the different suppliers used by the book store including name, contact and company no.
- Each supplier will be uniquely identified using a supplier ID.

B. SupplierOrder

- The purpose of the supplier order table is to track orders made by the book store with the supplier, including the books ordered, quantities, cost price etc.
- Each supplier order will be uniquely identified using a supplier order ID.

C. Publisher

- The purpose of the publisher table is to store the names of different publishers.
- Each publisher will be uniquely identified using a publisher ID.

D. BookAgeRange

- The purpose of the book age range table is to store different age categories that will be applied to the books, such as 'Under 10', or 'Over 18'. These fields will be used to validate the person purchasing the book.
- Each age range will be uniquely identified using a book age range ID.
- Staff will not have a form to add/edit/delete book age ranges, as the data is not subject to change.

- E. BookGenre
 - i. The purpose of the book genre table is to identify the genre of the book, such as Comedy, Romance etc. Each genre will have a unique ID.
 - ii. Staff will not have a form to add/edit/delete book genres, as the data is not subject to change.
- F. BookType
 - i. The purpose of the book type table is to identify the type of the book, such as Article, Comic, Book, Poem etc.
 - ii. Staff will not have a form to add/edit/delete book types, as the data is not subject to change.
- G. Product
 - i. The purpose of the product table is to link individual books with their supplier using foreign keys. It will also store the cost and sale price of the books.
- H. Book
 - i. The purpose of the book table is to store details on books, including their title, author, publisher, and whether they are a rare first edition.
- I. Inventory
 - i. The purpose of the inventory table is to keep track of the number of a certain book (product) in stock.
- J. Customer
 - i. The purpose of the customer table is to store details on the book store's customers, including their newsletter preferences.
- K. CustomerOrder
 - i. The purpose of the customer order table is to track orders made by customers for a book.

Relationships:

- A. **Supplier** (PK SupplierID) > **Product** (FK SupplierID)
- B. **Book** (PK BookID) > **SupplierOrder** (FK BookID)
- C. **Supplier** (PK SupplierID) > **SupplierOrder** (FK SupplierID)
- D. **Book** (PK BookID) > **Inventory** (FK BookID)
- E. **BookAgeRange** (PK BookAgeRangeID) > **Book** (FK BookAgeRangeID)
- F. **BookGenre** (PK BookGenreID) > **Book** (FK BookGenreID)
- G. **BookType** (PK BookTypeID) > **Book** (FK BookTypeID)
- H. **Publisher** (PK PublisherID) > **Book** (FK PublisherID)
- I. **Book** (PK BookID) > **Product** (FK BookID)
- J. **Product** (PK ProductID) > **CustomerOrder** (FK ProductID)
- K. **Customer** (PK CustomerID) > **CustomerOrder** (FK CustomerID)

3.3. Data Structure Tables

Data structure tables will be used during database implementation to create each table and field using SQL [3]. The tables outline the field types, input masks [4] and validations. The database has been designed with the end output (reports) in mind, and so the fields stored in the database reflect this.

Meaningless keys will be used for all primary keys, due to the lack of truly unique and consistent data in the tables. As the ID's are not customer facing, this should not be an issue as meaningful keys would provide no other benefits.

Supplier Order Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
SupplierOrderNo	PK	Autonumber	Uniquely identify each supplier order	10	1111111111	Presence
SupplierID	FK	Number	Foreign key to supplier	10		Presence
SupplierOrderDateTime		Date/Time	Date/Time the order was made	10	(Date picker)	Valid Date
BookID	FK	Number	Foreign key for book	10		Presence
ItemQty		Number	Quantity ordered for each book	10		Presence, >0 and <100

Figure 4. Supplier Order Data Structure Table

Supplier Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
SupplierID	PK	Autonumber	Uniquely identify each supplier	10		Presence
SupplierName		Text	Name of supplier	30		Presence, length >=5 & <31
SupplierAddressLine1		Text	Address line 1 of supplier	30		Presence, length >=5 & <31
SupplierAddressLine2		Text	Address line 2 of supplier	30		Length <31
SupplierPostCode		Text	Post code of supplier		LA0#0LL	Presence, length >5 and <8
SupplierContactNo		Text	Contact number of <u>supplier</u>	13	00000000000	Presence, length =11
SupplierCompanyNo		Text	Company number of <u>supplier</u>	25		Length >3 and <26

Figure 5. Supplier Data Structure Table

Book Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
BookID	PK	Autonumber	Uniquely identify each book	12		Presence, length = 12
BookTitle		Text	Title of the book	30		Presence, length>3 & <31
BookAuthor		Text	Author of the book	50		Presence, length >3 & <51
PublisherID		Integer	Foreign key to book publisher	10		Presence
BookPublishDate		Date	Publishing date of the book	10		Valid Date
FirstEdition		Yes/No	Is the book a first edition?	13		Presence, "Yes" or "No"
ISBN		Text	ISBN of the book	20		Presence, length >8 and <20
SupplierID	FK	Integer	Foreign key to supplier	10		Presence
BookAgeRangeID	FK	Integer	Foreign key for Age range	10		Presence
BookGenreID	FK	Integer	Foreign key for Genre of the book	10		Presence
BookTypeID	FK	Integer	Foreign key for book type	10		Presence
BookDescription		Text	Description of book	100		Length <101

Figure 6. Book Data Structure Table

Book Age Range Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
BookAgeRangeID	PK	Autonumber	Uniquely identify each book age range	10		Presence
BookAgeRange		Text	The age range the book is suitable for	30		Presence, length >3 and <31
MinimumAge		Integer	The minimum age for the book	10		Presence, >1 and <21

Figure 7. Book Age Range Data Structure Table

Book Type Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
BookTypeID	PK	Autonumber	Uniquely identify each book type	10		Presence
BookType		Text	The type of the book	30		Presence, length >=3 & <31

Figure 8. Book Type Data Structure Table

Book Genre Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
BookGenreID	PK	Autonumber	Uniquely identify each book genre	10		Presence
BookGenre		Text	The genre of the book	30		Presence, length>3 & <31

Figure 9. Book Genre Data Structure Table

Customer Order Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
CustomerOrderNo	PK	Autonumber	Uniquely identify each customer order	10	1.11111E+11	Presence
customerOrderDateTime		Date/Time	Date/time the order was made	10		Presence, Valid Date
BookID	FK	Integer	Foreign key for book	10		Presence
CustomerID	FK	Integer	Foreign key for customer	10		Presence
BookQty		Integer	Quantity ordered for each book	5	1	Presence, >1 and <100

Figure 10. Customer Order Data Structure Table

Customer Table						
Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
CustomerID	PK	Autonumber	Uniquely identify each customer	10		Presence
CustomerForename		Text	Forename of customer	30		Presence, length >=3 and <31
CustomerSurname		Text	Surname of customer	30		Presence, length >=3 and <31
CustomerDateOfBirth		Date/Time	Customer's date of birth	10	(date picker)	Presence, valid date
CustomerAddressLine1		Text	Address line 1 of customer	30		Presence, length >=5 and <31
CustomerAddressLine2		Text	Address line 2 of customer	30		Length <31
CustomerPostCode		Text	Post code of customer		LA0#0LL	Presence, length >5 and <8
ReceiveNewsletter		Yes/No	Does the customer want to be a part of the mailing list?	5	1	Presence, Yes OR No
CustomerContactNo		Text	Contact number of customer	13	00000000000	Presence, length =11
CustomerEmail		Text	Email address of customer	60	"(Like *?@?*.?*)"	Presence, length >4 and <61

Figure 11. Customer Data Structure Table

Publisher Table

Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
PublisherID	PK	Autonumber	Uniquely identify each book publisher	10		Presence
PublisherName		Text	The name of the publisher	50		Length >=3 and <51

Figure 12. Publisher Data Structure Table

Product Table

Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
ProductID	PK	Autonumber	Uniquely identify each product	10		Presence
SupplierID	FK	Integer	Foreign key for supplier	10		Presence
BookID	FK	Integer	Foreign key for book	12		Presence
SalePrice		Currently	The sale price of the book	10		Presence, >0.5 & <100000
CostPrice		Currently	The cost price of the book	10		Presence, >0.5 & <100000

Figure 13. Product Data Structure Table

Inventory Table

Field Name	PK/FK	Data Type	Description	Size	Input Mask	Validation
ProductID	PK	Integer	Foreign key to product table	10		Presence
StockLevel		Integer	The number in stock	10		Presence, >= 0 & <300

Figure 14. Inventory Data Structure Table

4. Implementation

Test data will be implemented using suitable data from Mockaroo [2].

The database will be created using Microsoft Access. All screenshots will be from inside the application.

4.1. Relationships

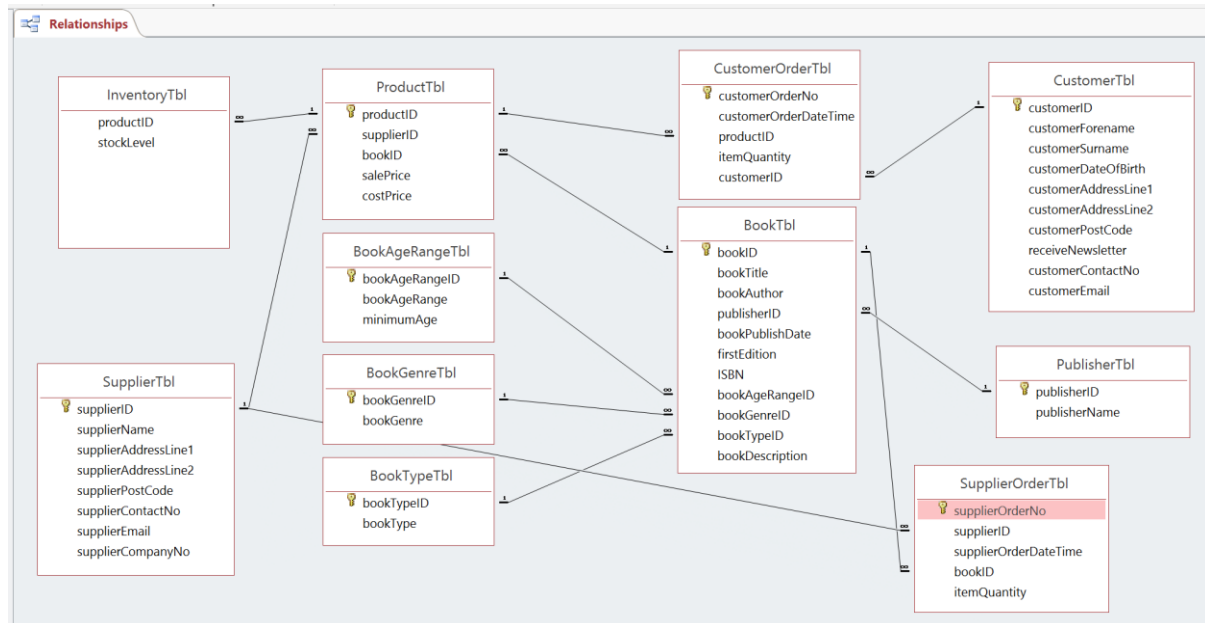


Figure 15. Access Relationships View

The relationships exactly follow the ERD in the design section.

4.2. Tables

BookAgeRangeTbl			
	Field Name	Data Type	Description
	bookAgeRangeID	AutoNumber	
	bookAgeRange	Short Text	
	minimumAge	Number	
Field Properties			
General			
	Field Size	30	
	Format		
	Input Mask		
	Caption	Book Age Range	
	Default Value		
	Validation Rule	Len([bookAgeRange])>3 And Len([bookAgeRange])<31	
	Validation Text	Please enter the book's age range.	
	Required	Yes	
	Allow Zero Length	No	
	Indexed	No	
	Unicode Compression	No	
	IME Mode	No Control	
	IME Sentence Mode	None	
	Text Align	General	

Figure 16. Book Age Range Access Table

Field Name	Data Type	Description
bookGenreID	AutoNumber	
bookGenre	Short Text	

Field Properties

General	
Field Size	30
Format	
Input Mask	
Caption	Book Genre ID
Default Value	
Validation Rule	Len([bookGenre])>3 And Len([bookGenre])<31
Validation Text	Please enter the book's genre.
Required	Yes
Allow Zero Length	Yes
Indexed	No
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General

Figure 17. Book Genre Access Table

Field Name	Data Type	Description
bookID	AutoNumber	
bookTitle	Short Text	
bookAuthor	Short Text	
publisherID	Number	
bookPublishDate	Date/Time	
firstEdition	Yes/No	
ISBN	Short Text	
bookAgeRangeID	Number	
bookGenreID	Number	
bookTypeID	Number	
bookDescription	Short Text	

Field Properties

General	
Field Size	30
Format	
Input Mask	
Caption	Book Title
Default Value	
Validation Rule	Len([bookTitle])>3 And Len([bookTitle])<31
Validation Text	Please enter the book's title.
Required	Yes
Allow Zero Length	No
Indexed	No
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General

Figure 18. Book Access Table

BookTypeTbl		
Field Name	Data Type	Description
bookTypeID	AutoNumber	
bookType	Short Text	

Field Properties

General	
Field Size	30
Format	
Input Mask	
Caption	Book Type
Default Value	
Validation Rule	Len([bookType]) >= 3 And Len([bookType]) < 31
Validation Text	Please enter the book type.
Required	Yes
Allow Zero Length	No
Indexed	No
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General

Figure 19. Book Type Access Table

CustomerOrderTbl		
Field Name	Data Type	Description
customerOrderNo	AutoNumber	
customerOrderDateTime	Date/Time	
productID	Number	
itemQuantity	Number	
customerID	Number	

Field Properties

General	
Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	Item Quantity
Default Value	
Validation Rule	[itemQuantity] > 1 And [itemQuantity] < 100
Validation Text	Please enter the item quantity.
Required	Yes
Indexed	No
Text Align	General

Figure 20. Customer Order Access Table

CustomerTbl

Field Name	Data Type	Descr
customerID	AutoNumber	
customerForename	Short Text	
customerSurname	Short Text	
customerDateOfBirth	Date/Time	
customerAddressLine1	Short Text	
customerAddressLine2	Short Text	
customerPostCode	Short Text	
receiveNewsletter	Yes/No	
customerContactNo	Short Text	
customerEmail	Short Text	

Field Properties

General Lookup

Field Size	30
Format	
Input Mask	
Caption	Forename
Default Value	
Validation Rule	Len([customerForename])>=3 And Len([customerForename])<31
Validation Text	Please enter the customer's forename.
Required	Yes
Allow Zero Length	No
Indexed	No
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General

Figure 21. Customer Access Table

InventoryTbl

Field Name	Data Type	Descr
productID	Number	
stockLevel	Number	

Field Properties

General Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	Stock Quantity
Default Value	
Validation Rule	[stockLevel]>=0 And [stockLevel]<300
Validation Text	Please enter the stock level.
Required	Yes
Indexed	No
Text Align	General

Figure 22. Inventory Access Table

ProductTbl

Field Name	Data Type	Descr
productID	AutoNumber	
supplierID	Number	
bookID	Number	
salePrice	Currency	
costPrice	Currency	

Field Properties

General Lookup

Format	Currency
Decimal Places	Auto
Input Mask	
Caption	Sale Price
Default Value	
Validation Rule	[salePrice]>0.5 And [salePrice]<100000
Validation Text	Please enter the sale price of the book.
Required	Yes
Indexed	No
Text Align	General

Figure 23. Product Access Table

PublisherTbl

Field Name	Data Type	Descr
publisherID	AutoNumber	
publisherName	Short Text	

Field Properties

General Lookup

Field Size	50
Format	
Input Mask	
Caption	Publisher Name
Default Value	
Validation Rule	Len([publisherName])>=3 And Len([publisherName])<51
Validation Text	Please enter the publisher's name.
Required	Yes
Allow Zero Length	No
Indexed	No
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General

Figure 24. Publisher Access Table

SupplierOrderTbl			
	Field Name	Data Type	Descr
	supplierOrderNo	AutoNumber	
	supplierOrderDateTime	Date/Time	
	bookID	Number	
	itemQuantity	Number	
Field Properties			
General Lookup			
	Field Size	Long Integer	
	Format		
	Decimal Places	Auto	
	Input Mask		
	Caption	Item Quantity	
	Default Value		
	Validation Rule	[itemQuantity]>0 And [itemQuantity]<100	
	Validation Text	Please enter the item quantity.	
	Required	Yes	
	Indexed	No	
	Text Align	General	

Figure 25. Supplier Order Access Table

SupplierTbl			
	Field Name	Data Type	Descr
	supplierID	AutoNumber	
	supplierName	Short Text	
	supplierAddressLine1	Short Text	
	supplierAddressLine2	Short Text	
	supplierPostCode	Short Text	
	supplierContactNo	Short Text	
	supplierEmail	Short Text	
	supplierCompanyNo	Short Text	
Field Properties			
General Lookup			
	Field Size	30	
	Format		
	Input Mask		
	Caption	Address Line 1	
	Default Value		
	Validation Rule	Len([supplierAddressLine1])>=5 And Len([supplierAddressLine1])<31	
	Validation Text	Please enter the supplier's address line 1.	
	Required	Yes	
	Allow Zero Length	No	
	Indexed	No	
	Unicode Compression	No	
	IME Mode	No Control	
	IME Sentence Mode	None	
	Text Align	General	

Figure 26. Supplier Access Table

4.3. Queries

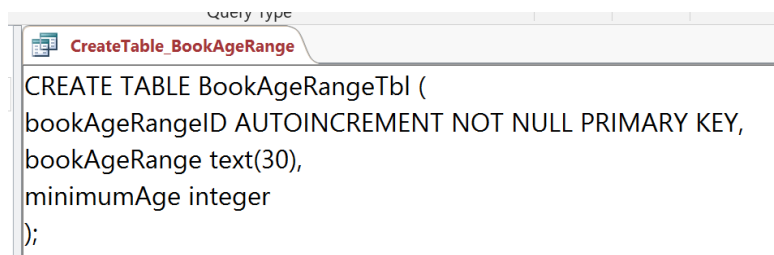


Figure 27. Create Book Age Range Table Query

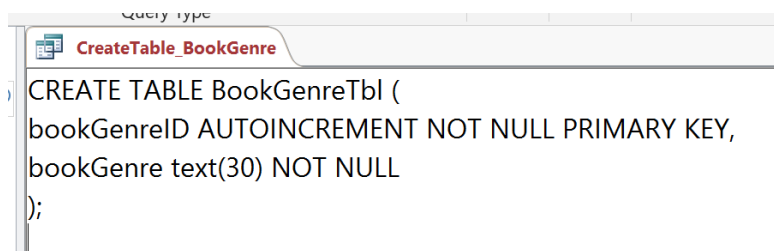


Figure 28. Create Book Genre Table Query

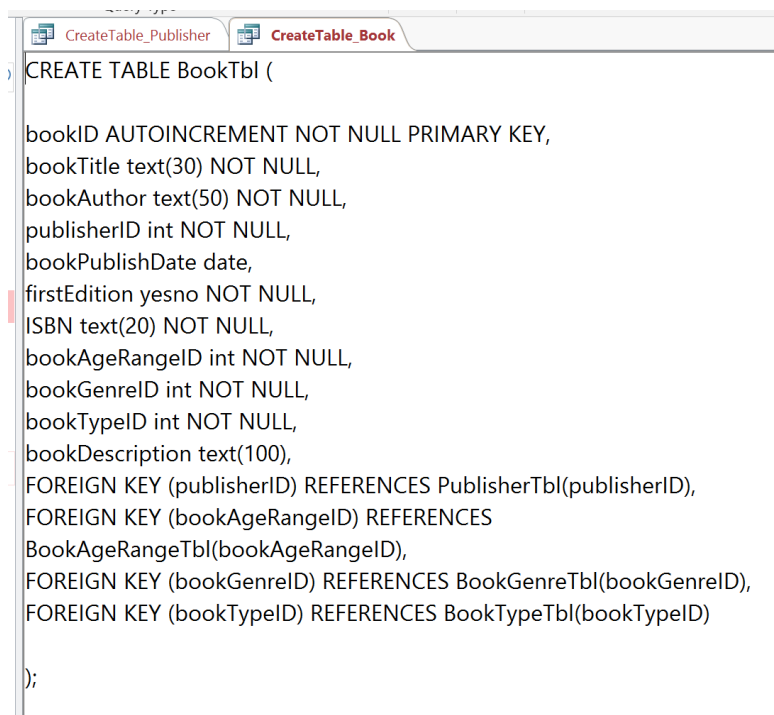


Figure 29. Create Book Table Query

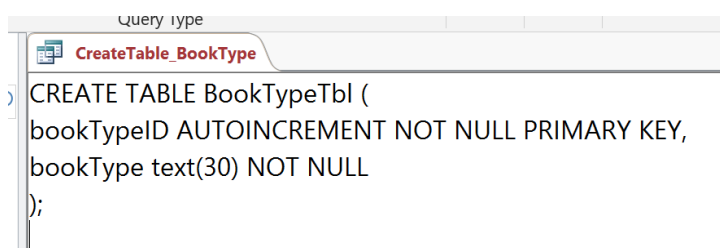
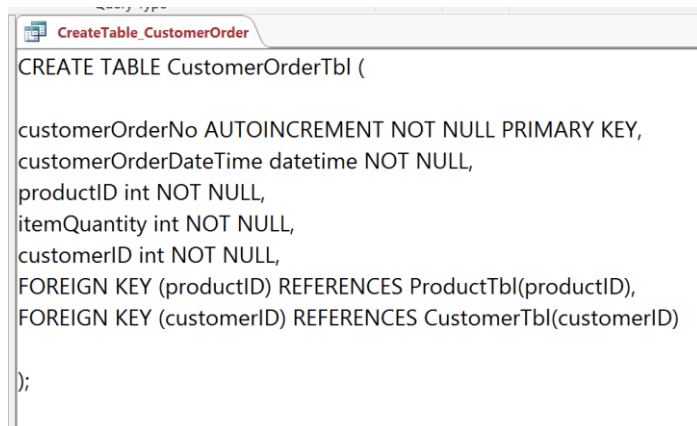


Figure 30. Create Book Type Table Query



```

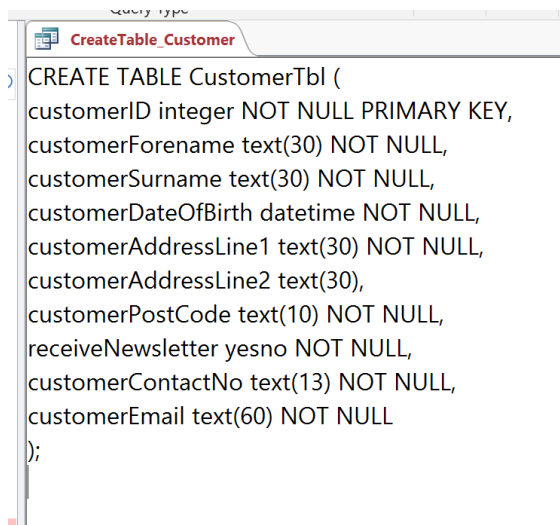
CREATE TABLE CustomerOrderTbl (

customerOrderNo AUTOINCREMENT NOT NULL PRIMARY KEY,
customerOrderDateTime datetime NOT NULL,
productID int NOT NULL,
itemQuantity int NOT NULL,
customerID int NOT NULL,
FOREIGN KEY (productID) REFERENCES ProductTbl(productID),
FOREIGN KEY (customerID) REFERENCES CustomerTbl(customerID)

);

```

Figure 31. Create Customer Order Table Query

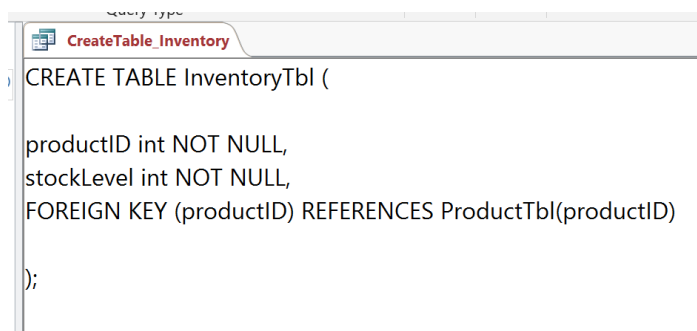


```

CREATE TABLE CustomerTbl (
customerID integer NOT NULL PRIMARY KEY,
customerForename text(30) NOT NULL,
customerSurname text(30) NOT NULL,
customerDateOfBirth datetime NOT NULL,
customerAddressLine1 text(30) NOT NULL,
customerAddressLine2 text(30),
customerPostCode text(10) NOT NULL,
receiveNewsletter yesno NOT NULL,
customerContactNo text(13) NOT NULL,
customerEmail text(60) NOT NULL
);

```

Figure 32. Create Customer Table Query



```

CREATE TABLE InventoryTbl (

productID int NOT NULL,
stockLevel int NOT NULL,
FOREIGN KEY (productID) REFERENCES ProductTbl(productID)

);

```

Figure 33. Create Inventory Table Query

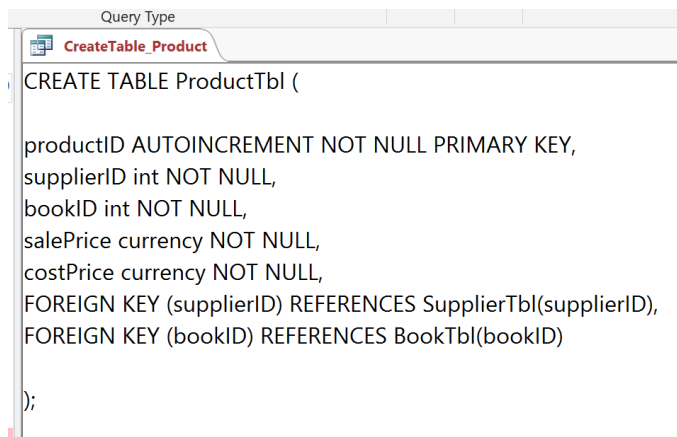


Figure 34. Create Product Table Query

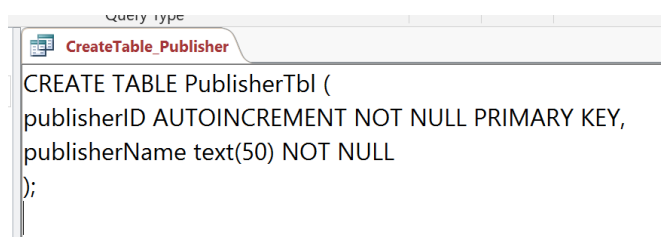


Figure 35. Create Publisher Table Query

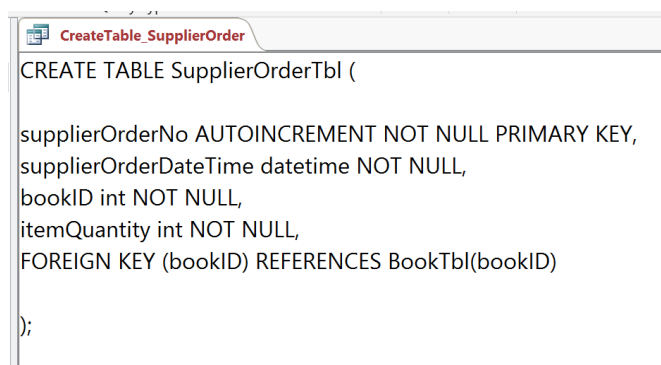


Figure 36. Create Supplier Order Table Query

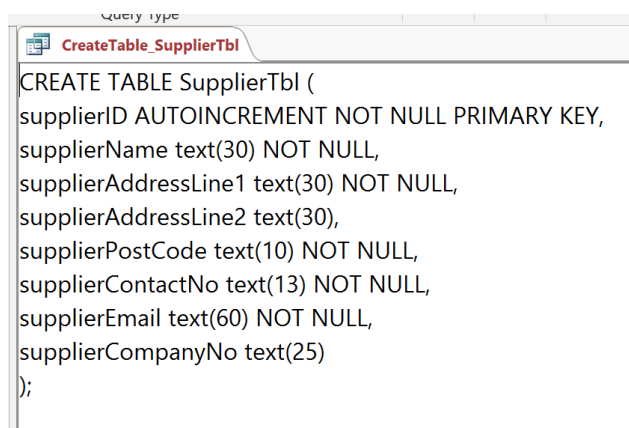
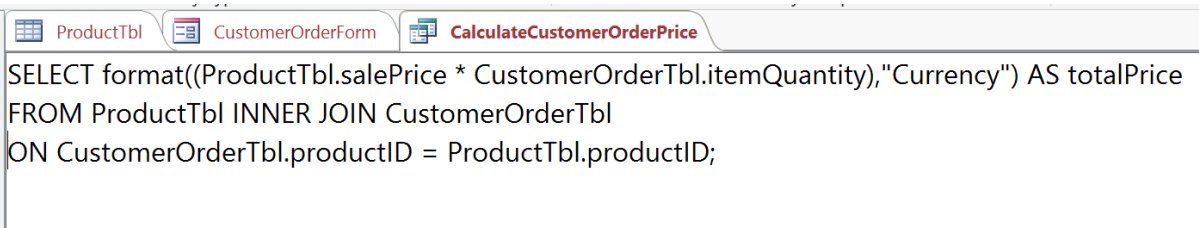


Figure 37. Create Supplier Table Query

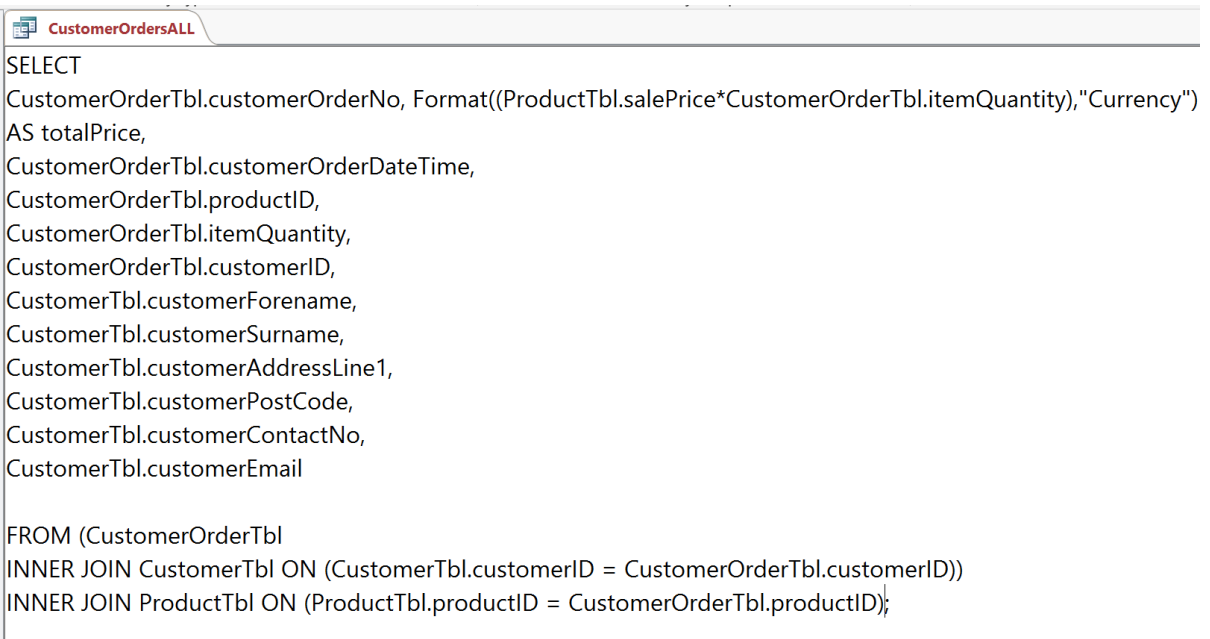


```
SELECT format((ProductTbl.salePrice * CustomerOrderTbl.itemQuantity),"Currency") AS totalPrice
FROM ProductTbl INNER JOIN CustomerOrderTbl
ON CustomerOrderTbl.productID = ProductTbl.productID;
```

Figure 38. Calculate Customer Order Price Query

```
SELECT
CustomerTbl.customerForename,
CustomerTbl.customerSurname,
CustomerTbl.customerAddressLine1,
CustomerTbl.customerPostCode,
CustomerTbl.customerEmail,
CustomerTbl.customerContactNo,
CustomerTbl.receiveNewsletter
FROM CustomerTbl
WHERE CustomerTbl.receiveNewsletter=Yes;
```

Figure 39. Customer Newsletter Details Report



```
SELECT
CustomerOrderTbl.customerOrderNo, Format((ProductTbl.salePrice*CustomerOrderTbl.itemQuantity),"Currency")
AS totalPrice,
CustomerOrderTbl.customerOrderDateTime,
CustomerOrderTbl.productID,
CustomerOrderTbl.itemQuantity,
CustomerOrderTbl.customerID,
CustomerTbl.customerForename,
CustomerTbl.customerSurname,
CustomerTbl.customerAddressLine1,
CustomerTbl.customerPostCode,
CustomerTbl.customerContactNo,
CustomerTbl.customerEmail

FROM (CustomerOrderTbl
INNER JOIN CustomerTbl ON (CustomerTbl.customerID = CustomerOrderTbl.customerID))
INNER JOIN ProductTbl ON (ProductTbl.productID = CustomerOrderTbl.productID);
```

Figure 40. Customer Order Query (Get all orders)

BookDetailsForm ProductTbl ProductDetailsForm Query1 GetBookDe

```

SELECT
ProductTbl.bookID,
BookTbl.bookTitle,
BookTbl.bookAuthor,
BookTbl.firstEdition,
PublisherTbl.publisherName
FROM PublisherTbl

INNER JOIN
(BookTbl INNER JOIN ProductTbl
ON BookTbl.bookID = ProductTbl.bookID)
ON PublisherTbl.publisherID = BookTbl.publisherID;

```

Figure 41. Get Book Details Query

SupplierTbl supplierID, SupplierTbl.supplierName, SupplierTbl.supplierAddressLine1, SupplierTbl.supplierPostCode FROM SupplierTbl INNER JOIN ProductTbl ON SupplierTbl.supplierID = ProductTbl.supplierID;

Figure 42. Get Supplier Details Query

4.4. Forms

When the database is opened, the home page is displayed.

HomePage

Quit App

Welcome to

Dylan's Book Store

Forms

Customer Details

Publisher Details

Supplier Details

Supplier Orders

Book Details

Customer Orders

Reports

Check Stock (ALL)

Customer Orders (By Date)

Check Book Stock

Customer Orders (ALL)

Customer Newsletter List

Dylan's Book Store | Swansea | 01793 234567

Figure 43. Home Page Form

HomePage

CustomerDetailsForm

Customer Details Form

Back to Home Page

Forename

Bob

Surname

Longbottom

Date of Birth

08/04/1989

Address Line 1

99 West Drive

Address Line 2

Post Code

CF366LK

Newsletter Preference

Yes

Contact Number

07933465768

Customer Email Address

bob.longbottom@email.com

Add

Save

Delete

Undo

⏮

⏪

⏩

⏭

Dylan's Book Store | Swansea | 01793 234567

Figure 44. Customer Details Form

HomePage

SupplierDetailsForm

Supplier Details Form

Back to Home Page

Supplier Name

AA Books

Address Line 1

10 Alexdra Estate

Address Line 2

Post Code

CF566KL

Contact Number

01567556789

Email Address

supply@aabooks.com

Company Number

05677668866

Add

Save

Delete

Undo

⏮

⏪

⏩

⏭

Dylan's Book Store | Swansea | 01793 234567

Figure 45. Supplier Details Form

HomePage

BookDetailsForm

Book Details Form

Back to Home Page

Book Title

The Big Bird

Book Author

John Williams

Publisher Name

Penguin Books

Add New Publisher

Book Publish Date

05/03/2005

First Edition

No

ISBN

455678666

Book Age Range

Toddler

Book Genre

Children

Book Type

Book

Book Description

Book about a big bird

Add

Save

Delete

Undo

⏮

⏪

⏩

⏭

Dylan's Book Store | Swansea | 01793 234567

Figure 46. Book Details Form

HomePage

PublisherForm

Publisher Details Form

Back to Home Page

Publisher Name

Penguin Books

Add

Save

Delete

Undo

⏮

⏪

⏩

⏭

Dylan's Book Store | Swansea | 01793 234567

Figure 47. Publisher Details Form

Relationships

SupplierDetailsForm

Supplier Order Form

Supplier Order Form

Back to Home Page

Supplier Order Number

1

Supplier

1

Order Date/Time

02/05/2019 18:39:05

Book

The Big Bird

Item Quantity

2

Add

Save

Delete

Undo

Dylan's Book Store | Swansea | 01793 234567

Figure 48. Supplier Order Form

HomePage

CustomerOrderForm

Customer Order Form

Back to Home Page

Customer Order Number

4

Order Date/Time

05/05/2019 22:18:23

Product

Bear's Journey

Item Quantity

1

Customer

Jamie

Total

£5.99

Add

Save

Delete

Undo

Dylan's Book Store | Swansea | 01793 234567

Figure 49. Customer Order Form

4.5. Reports

HomePage

ProductStockReport

Product Stock Report

Back to Home Page

Print

Book Title	Book Author	Publisher Name	First Edition?	Sale Price	Stock Quantity
Bear's Journey	Peter Arlington	Bird Books	Yes	£5.99	9
The Big Bird	John Williams	Penguin Books	No	£7.60	7

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Figure 50. Product Stock Report

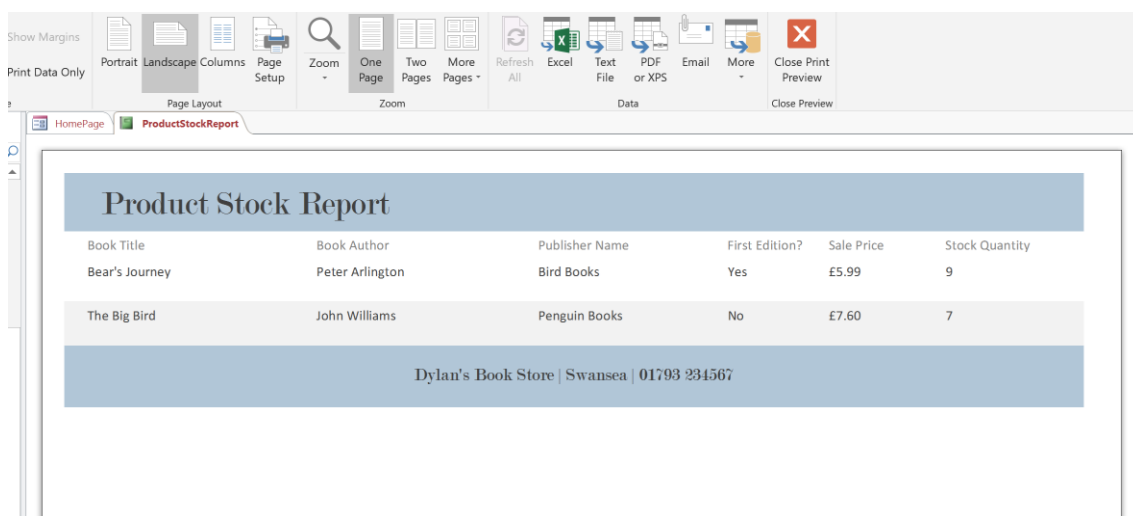


Figure 51. Print Functionality from Print Button on Report

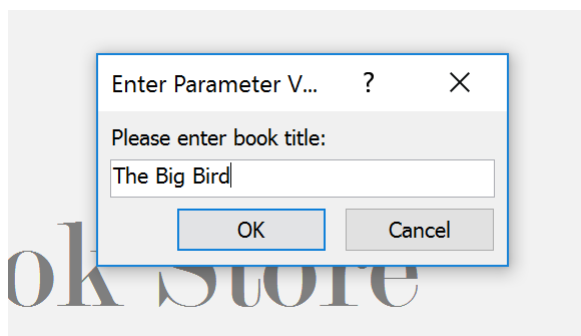


Figure 52. Check Stock By Title Parameter Entry

HomePage

CheckStockByTitleForm

Check Stock By Title

Back to Home Page

Print

Book Title	Book Author	Publisher Name	First Edition	Sale Price	ock Quantity
The Big Bird	John Williams	Penguin Books	No	£7.60	7

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Figure 53. Check Stock By Title Report

HomePage

CustomerOrdersALL

Customer Order Report

Back to Home Page

Print

Order Date/Time	Order Number	Book Title	First Edition	Item Quantity	Ex VAT	VAT	Total Price	Forename	Surname	Contact Number	Customer Email Address
05/05/2019 22:18:23	4	Bear's Journey	Yes	1	£4.79	£0.60	£5.99	Jamie	Phillips	05677474667	jamie.phillips@email.com
06/05/2019 13:15:14	5	Bear's Journey	Yes	1	£4.79	£0.60	£5.99	Peter	Pritchard	06755234536	peter.p@email.com

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Figure 54. Customer Order Report (all)

Enter Parameter V... ? X

Start Date:

OK Cancel

Figure 55. Customer Order By Date Parameter Entry

HomePage

CustomerOrdersALL

Customer Order Report

Back to Home Page

Print

Order Date/Time	Order Number	Book Title	First Edition	Item Quantity	Ex VAT	VAT	Total Price	Forename	Surname	Contact Number	Customer Email Address
05/05/2019 22:18:23	4	Bear's Journey	Yes	1	£4.79	£0.60	£5.99	Jamie	Phillips	05677474667	jamie.phillips@email.com
06/05/2019 13:15:14	5	Bear's Journey	Yes	1	£4.79	£0.60	£5.99	Peter	Pritchard	06755234536	peter.p@email.com

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Figure 56. Customer Order By Date Report

4.6. Macros

The screenshot shows the Macro Editor interface. At the top, there are tabs for 'HomePage' and 'CustomerOrderForm', and a button labeled 'CustomerOrderForm : Command19 : On Click'. The main area is divided into two sections: 'OpenForm' and 'CloseWindow'. The 'OpenForm' section has fields for 'Form Name' (HomePage), 'View' (Form), 'Filter Name', 'Where Condition', 'Data Mode', and 'Window Mode' (Normal). The 'CloseWindow' section has fields for 'Object Type' (Form), 'Object Name' (CustomerOrderForm), and 'Save' (Prompt). Below these sections is a '+ Add New Action' button with a dropdown arrow.

Figure 57. Back to Home Button (also closes the window)

The screenshot shows the Macro Editor interface. At the top, there are tabs for 'HomePage' and 'HomePage : quit_db_app_btn : On Click'. The main area is divided into two sections: 'QuitAccess' and 'Options'. The 'QuitAccess' section has a field for 'Options' (Prompt). Below these sections is a '+ Add New Action' button with a dropdown arrow.

Figure 58. Quit App Macro

5. User Guide

5.1. Open the Database

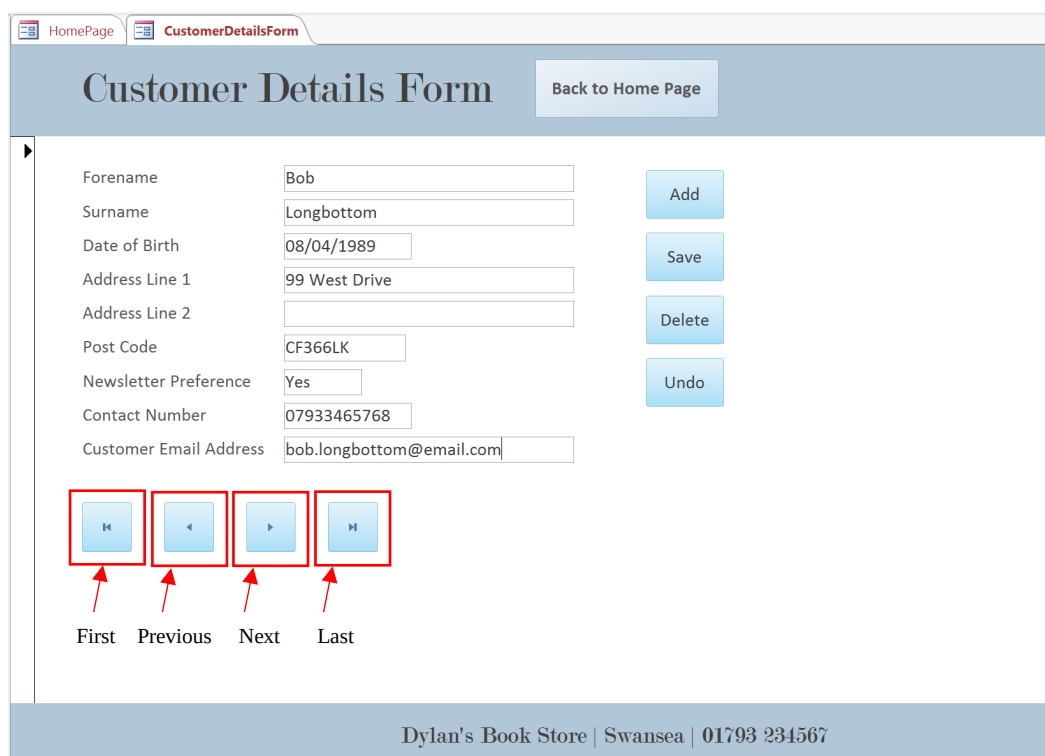
The database is encrypted, and password protected to comply with the General Data Protection Regulation.

The password for the database is case-sensitive, and is '**DylansBookstore**'.

5.2. Add/ Edit/ Delete Records on Forms

Open the relevant form by clicking the button on the home page.

The below example is for Customer details.



The screenshot shows a web application interface for a 'Customer Details Form'. At the top, there are two tabs: 'HomePage' and 'CustomerDetailsForm', with the latter being active. Below the tabs is a header bar with the title 'Customer Details Form' and a 'Back to Home Page' button. The main form area contains several input fields for customer information: Forename (Bob), Surname (Longbottom), Date of Birth (08/04/1989), Address Line 1 (99 West Drive), Address Line 2 (empty), Post Code (CF366LK), Newsletter Preference (Yes), Contact Number (07933465768), and Customer Email Address (bob.longbottom@email.com). To the right of these fields are four buttons: 'Add', 'Save', 'Delete', and 'Undo'. Below the form fields, there are four navigation buttons: 'First', 'Previous', 'Next', and 'Last', each with a corresponding icon. Red arrows point from the labels 'First', 'Previous', 'Next', and 'Last' to their respective buttons. At the bottom of the page, there is a footer bar with the text 'Dylan's Book Store | Swansea | 01793 234567'.

To navigate through the records, click the next and previous buttons. To go to the first record, click the first button. To go to the last record, click the last button (labelled above).

To add a new record, click the 'Add' button.

To save a record, click the 'Save' button.

To delete a record, click the 'Delete' button.

To undo changes to a record, click the 'Undo' button.

5.3. View Stock

If you want to view a report for all stock, click the 'Check Stock (All)' button on the home page.

If you want to view a report for a particular book, click the 'Check Book Stock' button on the home page. A window will appear prompting for input of a book title. Enter the title of the book you wish to check the stock for and press ok. The report will now be generated.

To print a report, press the 'Print' button.

5.4. View Customer Orders

To view all customer orders, click the 'Customer Orders (All)' button from the home page.

To view customer orders since a certain date, click the 'Customer Orders (By Date)' button from the home page. A window will appear prompting for input of a date, enter the date you want to see orders from and click 'Ok'.

To print either report, click the 'Print' button.

5.5. View Customer Newsletter Report

To view the list of customers who wish to receive the newsletter, click the 'Customer Newsletter List' button from the home page.

To print the report, click the 'Print' button.

6. Evaluation

6.1. Design

The requirements of the solution were analysed and listed before a context, data flow and entity relationship diagram were created. This ensured that the user requirements were to be met and that the design would be suitable in that it could store and retrieve the correct data and produce the necessary reports and outputs.

The relationships were normalised to third normal form ensuring that there is no data redundancy and no data inconsistency, except on the author field in the book table for the reasons stated during the design.

Design decisions regarding the scope of the project were outlined, such as not including a staff table and log in credentials and were therefore left out of the design and implementation of the database.

It was decided that meaningless primary keys were to be used throughout the database, due to factors such as the lack of unique and enduring data. This allowed the use of the in-built auto-incrementing Autonumber data type in Access, so that users did not have to validate each new primary key as Access ensures that each key is unique.

The use of data structure tables allowed for easy creation of the tables in SQL which not only sped up the process but also ensured that data types, field lengths and validation rules were consistent throughout the database.

Overall, a solid design was created that provided the necessary basis for a good database implementation.

6.2. Implementation

The database is encrypted, and password protected to help with complying to the GDPR. It opens onto a basic but clear home page, which is a menu that allows the user to navigate the system.

Labelled buttons on the home page allow the user to open reports and forms that meet the user's requirements.

Each form allows for CRUD (Create, Read, Update, Delete) operations and allow the user to navigate through each record using first, previous, next and last buttons. Each form follows a consistent design to aid in user-friendliness. The forms are easy to use and make use of drop-down boxes containing extra data where IDs are required, so that users do not have to remember meaningless keys.

Five reports have been created which allow the user to view stock for books/a book, view customer orders (all/by date) and view customer details for customers who wish to receive a newsletter.

Firstly, to improve the implementation, further queries and reports should be created to allow the user more flexibility, such as searching for books by category, genre, or by first editions.

Another area of improvement would be to allow the user to view/edit/delete details for a certain record by searching for that record, instead of having to navigate through the current buttons. Although the buttons work well for the current amount of data, in time with large amounts of data, navigation could become time-consuming and may frustrate the user, therefore a faster solution would be appreciated.

Forms for the three book-related tables, BookAgeRange, BookType and BookGenre could be created to allow staff to update values in these tables, however it was decided that they would not have a form in this project as the data is not subject to change very often.

Automatic calculation of stock levels could be implemented to update the stock levels when books are added to the product table/supplier orders and when customer orders are placed. This would aid in the case of 'double-booking', where a customer may purchase a book that is not in stock, but the inventory has not been updated, which could frustrate a customer.

Also, further fields could be added to the table, such as book shelf number, relating to where in the book store the books are kept etc.

Overall, a good Access database has been created that meets the user's requirements as it allows the user to add/edit/and delete data from the necessary tables, view stock, book, customer and order details and also to view and print reports.

7. References

- [1] "EUGDPR – Information Portal." [Online]. Available: <https://eugdpr.org/>. [Accessed: 20-Apr-2019].
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