

Database Analysis & Design

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Introduction to Web and Database Concepts

DATABASE ANALYSIS AND DESIGN

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DATA & INFORMATION SYSTEMS

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Introduction

Northern Lights LTD is an event planning organisation based in Swansea in South Wales. The firm specialises in events for more than ten people, for example, workshops, seminars, festivals \ concerts and conferences, excluding business meetings and parties.

Northern Lights have recently opened new offices in Neath and Carmarthen, expanding its team and client base. The company also has an extensive list of suppliers and products they regularly use for events, for example, to order event equipment, stationery, cleaning supplies etc. They also work closely with venues in the area which cater for the different needs of events and their clients.

Event patrons initially contact the branch manager to discuss the requirements. From here the manager instructs various departments to organise the event.

This report will illustrate the stages of the design and development of a new relational database system for Northern Lights. The system aims to better manage their growing client base and events, taking Northern Lights from paper-based administration to a computerised database system, allowing the users to record event and customer details and produce reports based on various criteria.

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What is a database?

A database is a structured collection of data stored on a computer system [1]. Databases can store a large amount of data allowing related information to be easily viewed, edited and maintained. Databases allow for improved data access and security and minimise the risk of data loss as the data can be quickly and easily backed up compared to a paper-based system.

Database Management System

A database is typically controlled by a DBMS - database management system. Today's most popular include Microsoft SQL Server, Oracle, Microsoft Access and MySQL. A DBMS is a piece of software used to control and interact with data within a database [2]. Developers use the software to create the structure using programming languages to generate the database. Users can then use the DBMS to interact with the data, including viewing and updating records.

From researching the available DBMS solutions, this project will utilise Microsoft Access. Access has many advantages over its competitors, including:

Quick and easy to set up: Inbuilt wizards for creating queries, forms and reports.

Microsoft Integration: works well with other Microsoft applications; for example, data can be easily imported from Microsoft Excel.

Cost: The cost of software licenses are relatively cheap compared to larger, more complex DBMS. This is essential for a smaller company like Northern Lights.

Software support: access has been around for over 30 years, with support still available from Microsoft and many online resources.

Requirements

A vital part of database design is gathering the requirements. Requirements gathering is the method of identifying the business's exact needs from start to finish [3]. This section outlines what Northern Lights needs from the database solution.

Database Users

Below outlines and describes the typical users of the database.

Database Administrator: Responsible for granting database access, monitoring usage and supporting any issues from end users.

Application Developer: Controls the development of the database and any future improvements \ extensions that may be needed.

Branch Manager: the ability to access and amend staff records, events booked and client information.

Patrons: they should be able to view any upcoming events or see any outstanding invoices.

Department Manager: will use the database to view products ordered by the department, order new products and view staff associated with the department.

Staff: will need the ability to add, delete and amend records. Also, the ability to query the database for upcoming events and view available venues and products that may need to be ordered.

Database Departments

Northern Lights has several departments that will need access to the database, including:

Admin: to add, amend and delete events, user and patron information. Admin will need to query the database, for example, to check the staff record details, e.g. phone numbers. Admin is also responsible for training new staff on using the database system.

Finance: to run invoices for events and products ordered from suppliers. Run reports on staff salary and edit when needed.

Sales: to add, amend and delete event information. Sales will need to query the database to check availability.

Event Planning: for assigning tasks to departments, ordering any products needed and booking venues.

Marketing: would need access to obtain the necessary information to promote events and venues for clients.

Management: will need the ability to add, amend and delete staff information and assign staff to branches \ departments.

IT Department: will need access to deal with any issues, for example deleting duplicating records and creating backup files. Access will also be needed for any development or fixes required.

Database Entry & Amendments

Microsoft Access can create a user data entry form for the end users. A form is a database object designed to allow an interface for the user interface to interact with the database application [4]. Below lists the form requirements for Northern Lights.

- Branch Form:** Add, delete, amend and view the branch details.
- Department Form:** Add, delete, amend and view the department details.
- Employee Form:** Add, delete, amend and view the employee details.
- Event Booking Form:** Add, delete, amend and view the event booking details.
- Tasks Assigned Form:** Add, delete, amend and view the task-assigned details.
- Patron Form:** Add, delete, amend and view the patron details.
- Venue Form:** Add, delete, amend and view the venue details.
- Product Form:** Add, delete, amend and view the product details.
- Supplier Form:** Add, delete, amend and view the supplier details.
- Order Form:** Add, delete, amend and view the order details.
- Navigation Form:** Menu to navigate to all forms and reports.

Required Reports and Queries

The company requires access to reports and queries to obtain valuable information from the database, for example:

- To report on branches.
- To report on departments.
- To report on staff details.
- To report on Events.
- To report on venues.
- To report on Patrons.
- To report on Products.
- To report on Suppliers.
- To report on Tasks assigned to departments.
- To report on Tasks assigned to events.
- To report on orders.
- To report on outstanding invoices.

Design

With all the requirements gathered, the next stage is the database design. A key aspect of database design is creating an entity-relationship model; this is a top-down methodology for database development, beginning with identifying the relationships between the data [5]. Below shows the entity relationship diagram design for Northern Lights created in Microsoft Visio using Peter Chen's methodology.

Entity Relationship Diagram

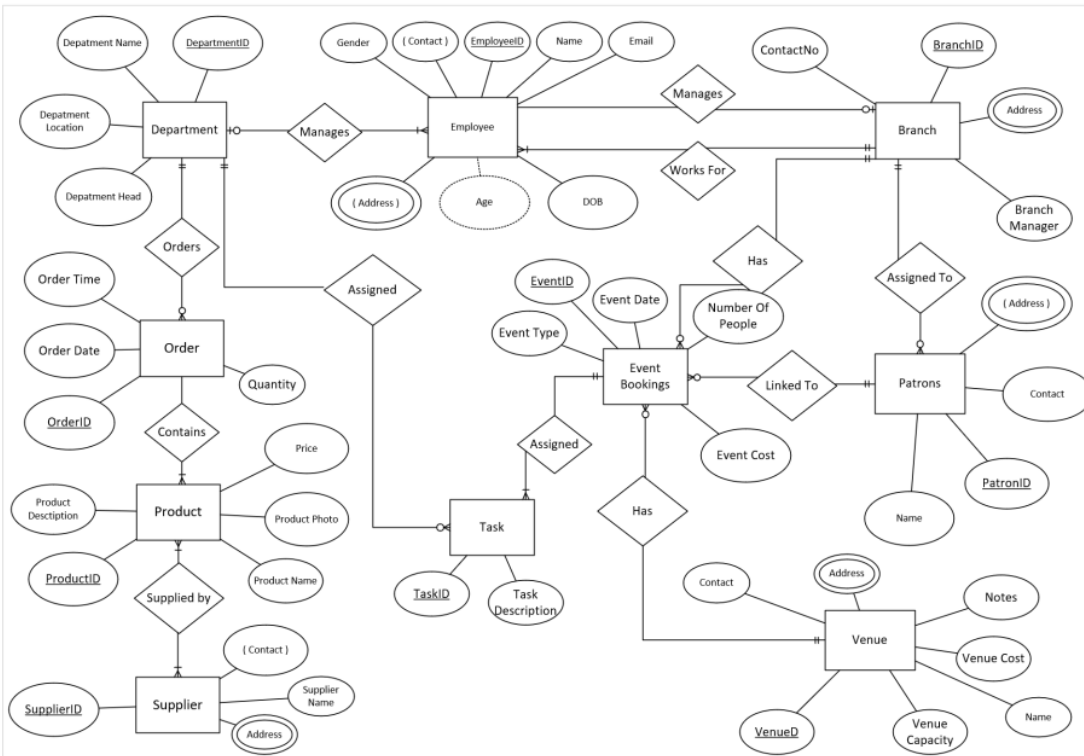


Figure 1 – Entity Relationship Diagram for Northern Lights created in Microsoft Visio

Implementation

Using the Entity Relationship Diagram implementation can begin. This section demonstrates and explains the stages of the database design. Each table uses the third normal form design approach to avoid the need for data duplication.

Microsoft Access Tables & Fields

Branch Table: The branch table stores all details about the branch. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
BranchID	AutoNumber	Primary Key. Unique number. 1-2 Digits in length
Manager (Employee No)	Number	Foreign Key. linked to employee number. Max 4 Digits
Address Line 1	Short Text	Address Line 1, text max 50 characters
Address Line 2	Short Text	Address Line 2, text max 50 characters
Town	Short Text	Town, text max 50 characters
Post Code	Short Text	Post Code, text less than 8 characters
Contact Number	Number	Number less than 11 characters

Figure 2 – Branch table for Northern Lights created in Microsoft Access

Department Table: The department table captures department details at Northern Lights. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
DepartmentID	AutoNumber	Primary Key. Unique number. 1-2 Digits in length
Department Name	Short Text	Department name 50 Characters limit
Department Head ID	Short Text	Foreign Key. linked to employee table

Figure 3 – Department table for Northern Lights created in Microsoft Access

Employee Table: The employee table captures employee details, including salary and position. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
EmployeeID	AutoNumber	Primary Key. Unique number. 1-3 Digits in length
First Name	Short Text	First Name Text Max 30
Last Name	Short Text	Last Name Text Max 30
Date Of Birth	Date/Time	Date picker
Address Line 1	Short Text	Text max 50 characters
Address Line 2	Short Text	Text max 50 characters
Town	Short Text	Text max 50 characters
Post Code	Short Text	Post Code, text less than 8 characters
Phone Number	Number	Number less than 11 characters
Join Date	Date/Time	Date picker
Employee Title	Short Text	Job position title, drop down list
Email	Short Text	Text max 60 characters
Gender	Short Text	Drop down Male or Female
Salary	Currency	Salary per year.
DepartmentID	Number	Foreign Key. linked to department table
BranchID	Number	Foreign Key. linked to branch table

Figure 4 – Employee table for Northern Lights created in Microsoft Access

Event Booking Table: This table is where event details are recorded, including the total cost. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
EventID	AutoNumber	Primary Key. Unique number. 1-3 Digits in length
BranchID	Number	Foreign Key. linked to branch table
EventDate	Date/Time	Date picker. Date of Event must be after 01/01/2015
EventType	Short Text	Event type from pre defined types dropdown
Number Of People	Short Text	Number of people attending. Must be greater than 9
Patron ID	Number	Foreign Key. linked to the Patron table
Venue ID	Number	Foreign Key. linked to the Venue table
EventCost	Currency	Total cost of event
Event Paid For	Yes/No	Mark when customer has paid. Yes / No Input

Figure 5 – Event booking table for Northern Lights created in Microsoft Access

Task Table: Departments logs task needed to be completed for each event. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
TaskID	AutoNumber	Unique task number
Department ID	Number	Foreign key linked to department table
EventBooking ID	Number	Foreign key linked to event booking table
Task Notes	Long Text	Notes relating to task required. Long text max 1000 characters

Figure 6 – Task table for Northern Lights created in Microsoft Access

Patron Table: Records all the data related to patrons. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
PatronID	AutoNumber	Primary Key. Unique number. 1-3 Digits in length
Allocated Branch ID	Number	Foreign Key. linked to branch table
PatronName	Short Text	Name of Patron. Text Max 30
First Name	Short Text	First Name Text Max 30
Last Name	Short Text	Last Name Text Max 30
Address Line 1	Short Text	Text max 50 characters
Address Line 2	Short Text	Text max 50 characters
Town	Short Text	Text max 50 characters
Post Code	Short Text	Post Code, text less than 8 characters
Phone Number	Number	Number less than 11 characters
Email	Short Text	Text max 60 characters

Figure 7 – Patron table for Northern Lights created in Microsoft Access

Order Table: Records any orders created by the departments. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
OrderID	AutoNumber	Primary Key. Unique number. 1-5 Digits in length
ProductID	Number	Foreign Key. linked to product table.
Order Date	Date/Time	Date of order. Date picker.
Ordering Department	Number	Foreign Key. linked to department table.

Figure 8 – Order table for Northern Lights created in Microsoft Access

Product Table: Records all products available from the supplier. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
ProductID	AutoNumber	Unique Product IDPrimary Key. Unique number. 1-5 Digits in length
Product Name	Short Text	Product Name. Text max 50 characters
Product Description	Long Text	Product Description. Long text max 200 characters
Price	Currency	Price of Product
SupplierID	Number	Foreign Key. linked to supplier table.
Photo	Attachment	Photo attachment max file size 3mb

Figure 9 – Product table for Northern Lights created in Microsoft Access

Supplier Table: Records all available suppliers for Northern Lights. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
SupplierID	AutoNumber	Primary Key. Unique number. 1-4 Digits in length
Supplier Name	Short Text	Supplier Name. Text max 50 characters
Specialty	Short Text	Drop down from defined list
Address Line 1	Short Text	Address Line 1, text max 50 characters
Address Line 2	Short Text	Address Line 2, text max 50 characters
Town	Short Text	Town, text max 50 characters
Post Code	Short Text	Post Code, text less than 8 characters
Contact Number	Number	Number less than 11 characters

Figure 10 – Supplier table for Northern Lights created in Microsoft Access

Venue Table: Records all available venues. Below lists the fields \ foreign keys and any field rules.

Field Name	Data Type	Description (Optional)
VenueID	AutoNumber	Primary Key. Unique number. 1-4 Digits in length
Address Line 1	Short Text	Address Line 1, text max 50 characters
Address Line 2	Short Text	Address Line 2, text max 50 characters
Town	Short Text	Town, text max 50 characters
Post Code	Short Text	Post Code, text less than 8 characters
Phone Number	Number	Number less than 11 characters
Venue Cost	Currency	Price of product currency
Max Capacity	Number	Number 1-10000 max
Notes	Long Text	text max 500 characters

Figure 11 – Venue table for Northern Lights created in Microsoft Access

Microsoft Access Relationships

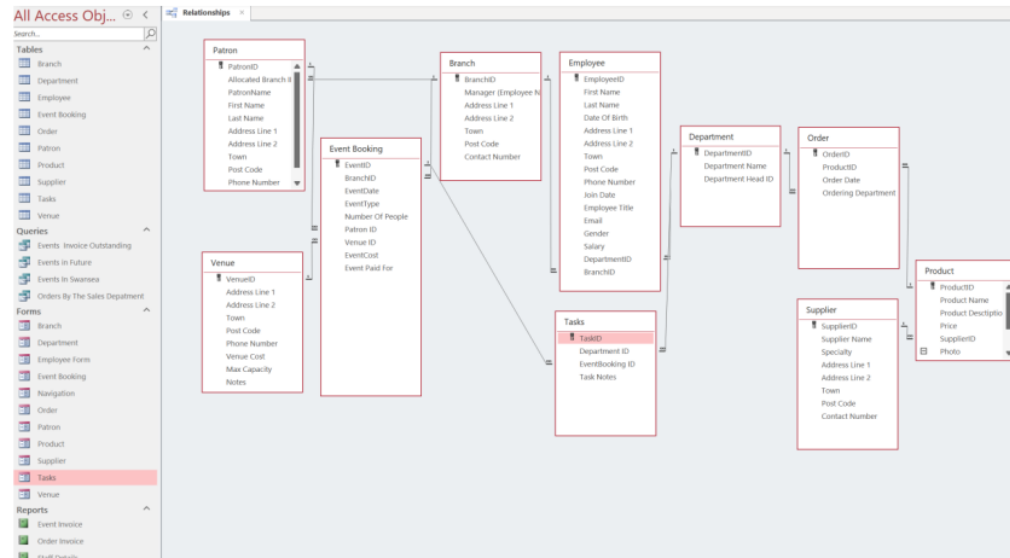


Figure 12 –Relationship Diagram for Northern Lights created in Microsoft Access

The figure above shows the relationships created between the tables in Microsoft Access. Relationships are meaningful connections between tables that have linked information and data [6]. These connections give the user the ability to set up queries and reports with all the related information between tables.

Microsoft Access Navigation

When the user opens the database they are presented with a menu. The top bar allows navigation through reports and forms, and the sidebar shows the menu subcategories.

The navigation menu design includes the following components:

- Top Bar:** Contains 'Forms' and 'Reports' tabs, the 'NORTHERN LIGHTS' logo, and the title 'Branch Details Form' with a date and time stamp.
- Sidebar:** Lists menu items: Employee, Branch, Department, Patron, Venue, Event Booking, Order, Product, Supplier, and Tasks.
- Main Form Area:**
 - Navigation:** Buttons for 'First Record', 'Previous Record', 'Next Record', and 'Last Record'.
 - Add / Amend / Delete:** Buttons for 'Add Record', 'Save Changes', and 'Delete Record'.
 - Print Record:** A button to print the current record.
 - Staff At Branch:** A table listing staff members with columns: EmployeeID, First Name, Last Name, Date Of Birth, Address Line 1, Address Line 2, Town, Post Code, Phone Number, Join Date, and Employee Title.

Figure 13 – Navigation menu design created in Microsoft Access

Microsoft Access Forms

The database has several forms to help aid with viewing, amending, adding and deleting records. Each form is detailed below.

Branch Form: The branch form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Also included is an embedded form showing the staff allocated to the branch. Combo boxes have been added to link to the staff table to select a manager for the branch.



Branch Details Form

12 April 2023
08:46:48

BranchID: 1

Manager (Employee ID): 10

Address Line 1: 1 High Street

Address Line 2: Neath Road

Town: Neath

Post Code: SA67JL

Contact Numt: 1639844892

Navigation

First Record Previous Record Next Record Last Record

Add / Ammed / Delete

Add Record Save Changes Delete Record

Print Record

Staff At Branch

Employee	First Name	Last Name	Date Of Bir	Address Lir	Address Lir	Town	Post Code	Phone Nur	Join Date	Employee
10	Jonathan	Wilcox	28/05/1985	9 Meascynai	Ystradgynlai	Swansea	SA9 1PD	07395549128	04/04/2023	Manager
15	Jo	Jones	19/02/1990	88 High stree	Resolven	Neath	SA91KJ	01728181818	10/02/2017	Maintenance
18	Daniel	Paull	05/06/1991	1 Yeo Road	Resolven	Neath	SA81JD	01828181818	16/02/2023	Admin
20	Fred	Daves	01/01/1950	33 Queen Str	Swansea Ro	Swansea	SA671JD	01828181818	12/11/2015	Audio & Visuc
22	Debby	Jones	01/09/1988	9 Llanfaes	Ystradgynlai	Swansea	SA91DK	01818182818	04/04/2023	Maintenance
25	Rhod	Jones	15/09/1957	55 High Road	Townhill	Swansea	SA891JH	01718181818	12/07/2018	Cleaner
28	Hayley	Jo	09/09/1991	66 Station ro		Pontadawe	SA761AJ	01728293021	11/05/2022	Audio & Visuc

Figure 14 – Branch form design created in Microsoft Access



Branch Details Form

12 April 2023
08:46:48

BranchID: 1

Manager (Employee ID): 10

Address Line 1: 10 Jonathan Wilcox Manager

Address Line 2: 11 Lindsey Wilcox Manager

Town: 12 Josh Jones Admin

Post Code: 13 Alfie Howard Manager

Navigation

First Record Previous Record Next Record Last Record

Add / Ammed / Delete

Add Record Save Changes Delete Record

Figure 15 – Branch form – demo of combo box table linking

Employee Form: The employee form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Combo boxes have been added to create dropdowns from selected criteria for employee title and gender. Department and branch fields have been linked to the relevant tables to create drop-downs of departments and branches available.

NORTHERN LIGHTS
Event Organising

Employee Form
12 April 2023
08:59:07

EmployeeID: 10
First Name: Jonathan
Last Name: Wilcox
Date Of Birth: 28/05/1985
Age: 38
Address Line 1: 9 Meascynog
Address Line 2: Ystradgynlais
Town: Swansea
Post Code: SA9 1PD
Phone Number: 07395549128
Join Date: 04/04/2023
Employee Title: Manager
Email: Jonathan@email.com
Gender: Male
Salary: £10,000.00
Department: Finance
Branch: Neath

Navigation
First Record Previous Record Next Record Last Record

Add / Ammed / Delete
Add Record Save Changes Delete Record

Print Record

Figure 16 – Employee form design created in Microsoft Access.

The employee form also includes a calculated field to work out the employee's age based on the date of birth. This is calculated using SQL code within the form control.

Date Of Birth	Date Of Birth
Age	=DateDiff("yyyy",[Date Of Birth],Date())

Figure 17 – Employee form – example of calculation used to calculate age.

Event Booking Form: The event booking form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Patron, branch and venue fields have been linked to the relevant tables to create drop-downs of selections available.

EventID: 1

Branch: Carmarthen

Event Date: 01/01/2023

Event Type: Workshop

Number Of People: 10

Patron: Confetti LTD

Venue: Ty Cross Holiday House

Event Cost: £400.00

Event Paid For: ☐

Navigation: First Record, Previous Record, Next Record, Last Record

Add / Ammed / Delete: Add Record, Save Changes, Delete Record

Print Record

Figure 18 – Event booking form design created in Microsoft Access.

Below shows an example of a combo box linking to the venue table to return different venues.

EventID: 1

Branch: Carmarthen

Event Date: 01/01/2023

Event Type: Workshop

Number Of People: 10

Patron: Confetti LTD

Venue: Ty Cross Holiday House

Event Cost: £400.00

Event Paid For: ☐

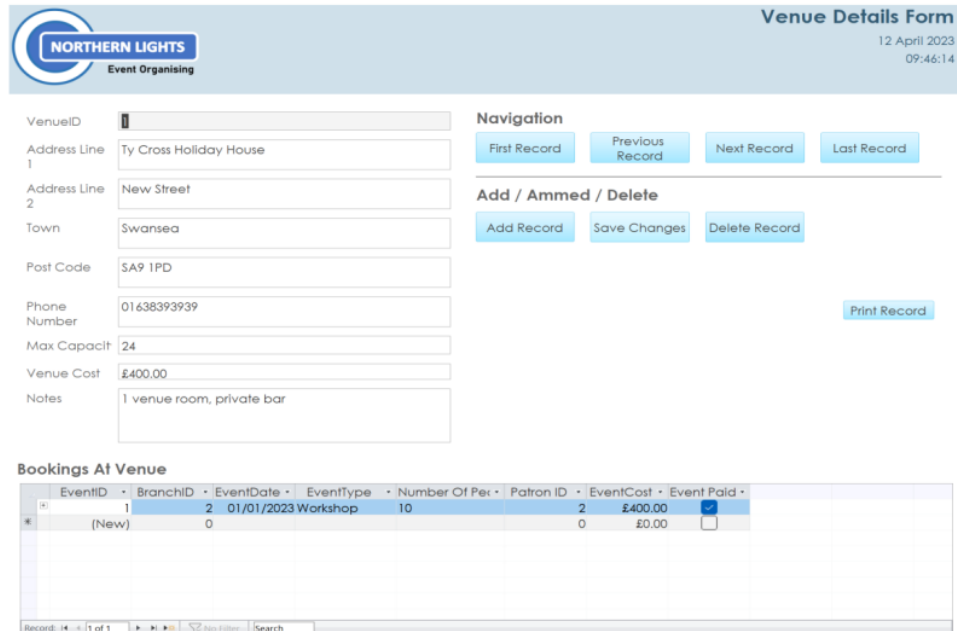
Navigation: First Record, Previous Record, Next Record, Last Record

Add / Ammed / Delete: Add Record, Save Changes, Delete Record

Print Record

Figure 19 – Event booking form – example of combo box dropdown.

Venue Form: The venue form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Also included is an embedded form showing bookings booked at the venue.



NORTHERN LIGHTS
Event Organising

Venue Details Form
12 April 2023
09:46:14

VenueID: 1

Address Line 1: Ty Cross Holiday House

Address Line 2: New Street

Town: Swansea

Post Code: SA9 1PD

Phone Number: 01638393939

Max Capacity: 24

Venue Cost: £400.00

Notes: 1 venue room, private bar

Navigation
First Record Previous Record Next Record Last Record

Add / Ammed / Delete
Add Record Save Changes Delete Record

Print Record

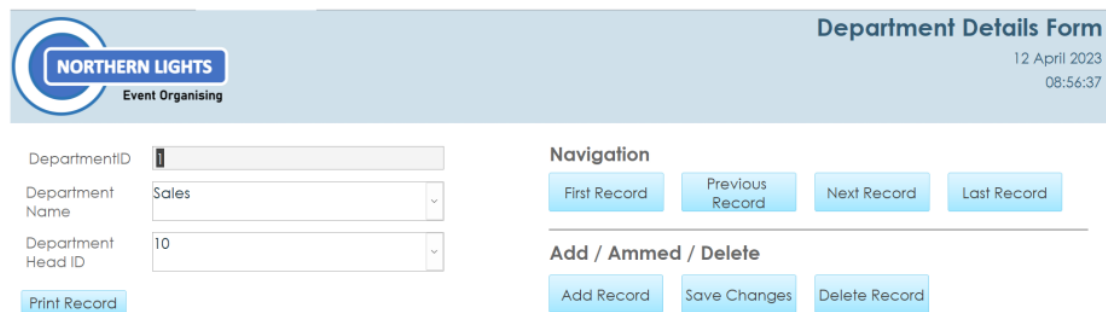
Bookings At Venue

EventID	BranchID	EventDate	EventType	Number Of Per	Patron ID	EventCost	Event Paid
1	2	01/01/2023	Workshop	10	2	£400.00	☒
(New)	0				0	£0.00	☐

Record: 1 of 1

Figure 20 – Venue form created in Microsoft Access.

Department Form: The department form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Combo boxes have been added to create dropdowns from selected criteria for department title. Department head has been linked to the employee table to create drop-downs of staff to assign.



NORTHERN LIGHTS
Event Organising

Department Details Form
12 April 2023
08:56:37

DepartmentID: 1

Department Name: Sales

Department Head ID: 10

Navigation
First Record Previous Record Next Record Last Record

Add / Ammed / Delete
Add Record Save Changes Delete Record

Print Record

Figure 21 – Department form created in Microsoft Access.

Task Form: The task form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Department and event fields have been linked to the relevant tables to create drop-downs of departments and events booked.

NORTHERN LIGHTS
Event Organising

Task Assigned Form
12 April 2023
10:26:39

TaskID: 2
Department: 1
Event Booking: 2

Task Notes:

1	01/01/2023	Workshop
2	04/04/2023	Music Festival
3	28/04/2023	Concert
4	22/07/2022	Other
5	03/04/2023	Conference
6	20/04/2022	Workshop
7	20/04/2023	Conference
8	21/07/2022	Workshop
9	14/12/2022	Workshop
10	15/12/2022	Concert
11	09/11/2022	Workshop
12	03/01/2023	Music Festival
13	21/04/2023	Conference
14	21/12/2022	Workshop

Navigation: First Record, Previous Record, Next Record, Last Record

Add / Ammed / Delete: Add Record, Save Changes, Delete Record

Print Record

Figure 22 – Example of the linked combo box to event booking.

Product Form: The product form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. The supplier's field has been linked to the supplier table to create drop-downs of companies. Options have been added to allow the user to upload a photo of the product.

NORTHERN LIGHTS
Event Organising

Product Form
12 April 2023
10:27:22

ProductID:
Product Name: Large Speaker
Product Description: Speaker 4000amps
Price: £892.00
Supplier: A&A Audio
Photo: 

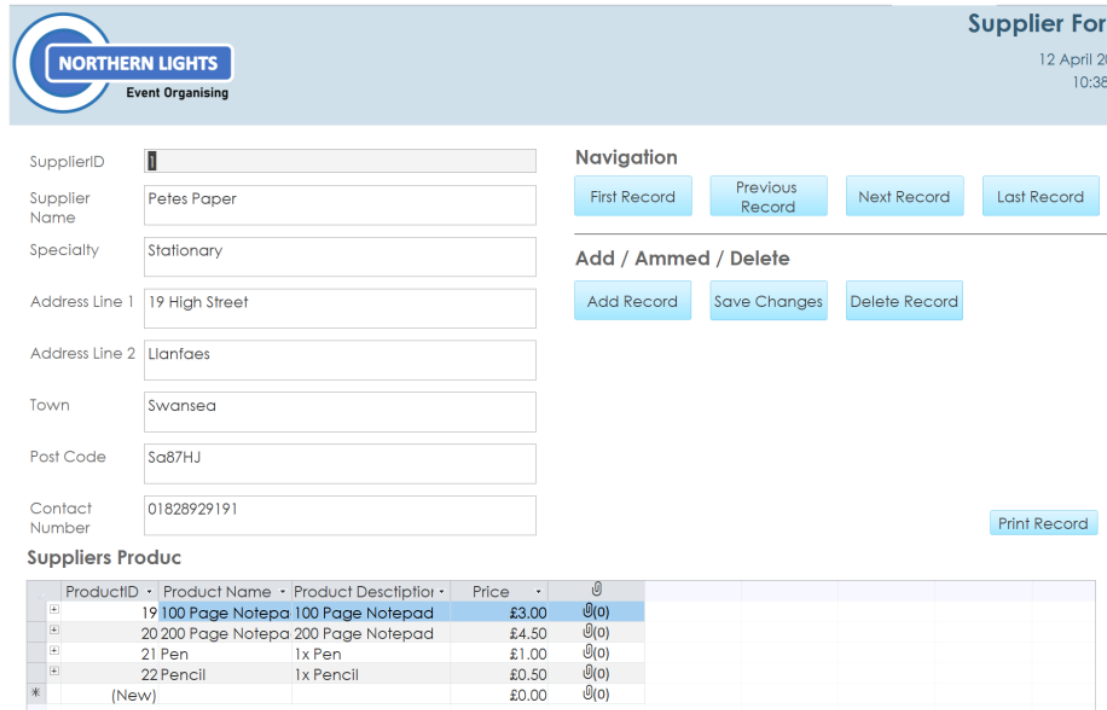
Navigation: First Record, Previous Record, Next Record, Last Record

Add / Ammed / Delete: Add Record, Save Changes, Delete Record

Print Record

Figure 23 – Product form created in Microsoft Access.

Supplier Form: The supplier form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Also included is an embedded form showing all supplier's products.



NORTHERN LIGHTS
Event Organising

Supplier Form
12 April 2023
10:38

SupplierID:

Supplier Name:

Specialty:

Address Line 1:

Address Line 2:

Town:

Post Code:

Contact Number:

Navigation

First Record Previous Record Next Record Last Record

Add / Ammed / Delete

Add Record Save Changes Delete Record

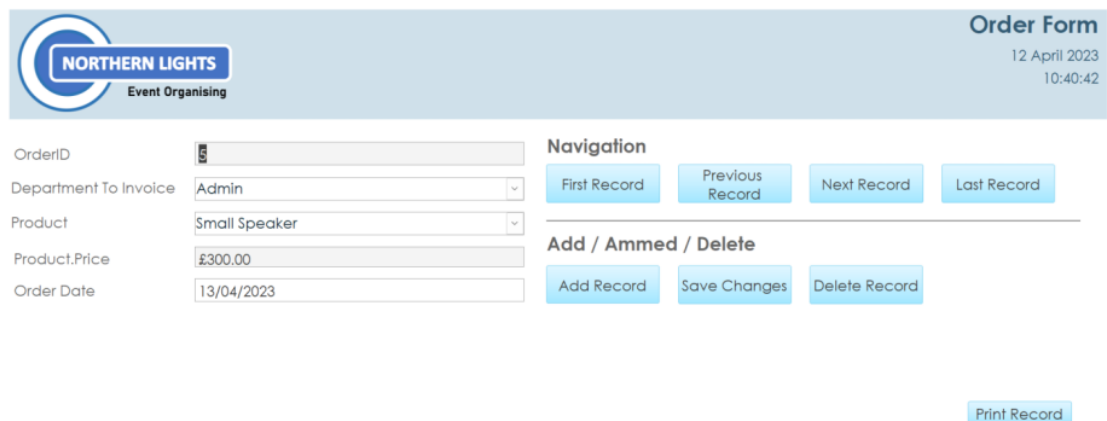
Print Record

Suppliers Product

ProductID	Product Name	Product Description	Price	
19	100 Page Notepad	100 Page Notepad	£3.00	0(0)
20	200 Page Notepad	200 Page Notepad	£4.50	0(0)
21	Pen	1x Pen	£1.00	0(0)
22	Pencil	1x Pencil	£0.50	0(0)
(New)			£0.00	0(0)

Figure 24 – Supplier form created with embedded product form in Microsoft Access.

Order Form: The order form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons. Departments and product fields have been linked to the relevant tables to create drop-downs of departments and products available. Product price is automatically populated depending on the product selection.



NORTHERN LIGHTS
Event Organising

Order Form
12 April 2023
10:40:42

OrderID:

Department To Invoice:

Product:

Product Price:

Order Date:

Navigation

First Record Previous Record Next Record Last Record

Add / Ammed / Delete

Add Record Save Changes Delete Record

Print Record

Figure 25 – Order form with calculated price example, created in Microsoft Access.

Patron Form: The patron form allows users to navigate through the records and print if needed. The form also allows adding, amendment and deletion of records using the macro buttons.



NORTHERN LIGHTS
Event Organising

Patron Details Form
12 April 2023
10:48:50

PatronID

3

Allocated Branch

Swansea

First Name

Fred

Last Name

Jones

Address Line 1

77 Brecon Road

Address Line 2

Ystradgynlais

Town

Swansea

Post Code

SA9 1DJ

Phone Number

01238128312

Email

Fred@email.com

Navigation

First Record

Previous Record

Next Record

Last Record

Add / Ammed / Delete

Add Record

Save Changes

Delete Record

Print Record

Figure 26 – Patron form created in Microsoft Access.

Microsoft Access Reports

Reports allow the users to view and summarise data from the Northern Lights database. This section will explore some of the example reports created for the company.

Events Invoice by Patron Report: The event invoice report gives the total balance for each event the patron has booked. This report links the event booking, Venue and branch tables, bringing together invoices for the patrons.

 Event Invoice By Patron Report 12 April 2023 10:58:24							
PatronName	EventID	BranchID	EventDate	EventType	Number Of People	Venue	Total Cost
Rejoice							
	14	1	21/12/2022	Workshop	75	Kings Hotel	£543.00
	13	1	21/04/2023	Conference	876	Marriott Hotel	£4,839.00
							£5,382.00
Confetti LTD							
	6	2	20/04/2022	Workshop	10	Marriott Hotel	£300.00
	1	2	01/01/2023	Workshop	10	Ty Cross Holiday House	£400.00
							£700.00
Red Carpet Studios							
	11	3	09/11/2022	Workshop	73	Swansea football club	£568.00
	8	1	21/07/2022	Workshop	87	The Gough	£843.00
							£1,411.00
Drum							
	9	3	14/12/2022	Workshop	98	Penny Sports and Social Club	£984.00
							£984.00

Figure 27 – Event invoice by patron report created in Microsoft Access.

Also included is a calculated field to work out the total cost for each patron.

*Detail	EventID	BranchID	EventDate	EventType	Number Of People	Address Line 1	EventCost
*PatronName Footer							=Sum([EventCost])

Figure 28 – example of a calculated field in the report – total cost per patron.

Staff Details Report: The staff details report gives the staff lists of each branch, including the total salary costs. This report links the branch, employee and department tables, bringing staff details.



Staff Details Report
12 April 2023
11:12:49

Branch	ID	First Name	Last Name	DOB	Address Line 1	Town	Post Cox	Phone Numb	Join Date	Title	Email	Salary	Department
Carmarthen													
	23	Jack	Phillips	18/09/1987	55 Hill Road	Swansea	SA9 1PD	01818181882	12/07/2022	Audio & Visual Tech	Jack@Northemlights.com	£34,028.00	Admin
	13	Alfie	Howard	22/12/1966	10 High Road	Neath	SA821HJ	01639844819	17/11/2022	Manager	Alfie@Northemlights.com	£42,000.00	Cleaning
	24	Andrew	Morris	16/07/1987	66 Long view road	Swansea	SA671DJ	01728177291	18/03/2021	Cleaner	Andrew@aol.com	£16,000.00	Marketing
	12	Josh	Jones	23/01/2000	10 High Street	Neath	SA19 1RJ	08283833838	01/01/2000	Admin	Josh@Northemlights.com	£22,000.00	Sales
	29	Elliott	Davues	28/05/1979	3 Maescynog	Swansea	SA9 1HJ	01638292919	22/11/2022	Maintenance	Elliott@northemlights.com	£17,000.00	Sales
												£131,028.00	
Neath													
	28	Hayley	Jo	09/09/1991	66 Station road	Pontadawe	SA761AJ	01728293021	11/05/2022	Audio & Visual Tech	Hayley@aol.com	£25,000.00	Finance
	10	Jonathan	Wilcox	28/05/1985	9 Meascynog	Swansea	SA9 1PD	07395549128	04/04/2023	Manager	Jonathan@email.com	£10,000.00	Finance
	18	Daniel	Pauli	05/06/1991	1 Yeo Road	Neath	SA81JD	01828181818	16/02/2023	Admin	Dan@northemlights.com	£66,000.00	Maintenance
	25	Rhod	Jones	15/09/1957	55 High Road	Swansea	SA891JH	01718181818	12/07/2018	Cleaner	Rhod@aol.com	£16,000.00	Maintenance
	15	Jo	Jones	19/02/1990	88 High street	Neath	SA91KJ	01728181818	10/02/2017	Maintenance		£20,000.00	Sales

Figure 29 – Staff report by branch created in Microsoft Access.

Also included is a calculated field to work out the total cost each branch spends on staff salaries each year.

Phone Numb	Join Date	Employee	Email	Salary	De
				=Sum([Salary])	
"Page" & [Page] & " of " & [Pages]					
				=Sum([Salary])	

Figure 30 – example of a calculated field in the staff report – staff cost per branch.

Department Orders Invoice Report: The department orders report gives the total balance for each department's orders. This report links the order, department and product tables bringing together invoices for each department.

 Depatment Invoice Report				
12 April 2023 11:26:24				
Department Name	OrderID	ProductID	Order Date	Price
Admin	5	2	13/04/2023	£300.00
				£300.00
Maintance	6	2	15/04/2023	£300.00
				£1.00
	2	16	06/04/2023	£301.00
Marketing	8	3	04/04/2023	£400.00
				£400.00
Purchasing	9	4	14/04/2023	£500.00
				£500.00
Sales	10	2	03/04/2023	£300.00
				£88.00
	3	6	04/04/2023	£388.00
				£1,889.00

Figure 31 – department spending report created in Microsoft Access.

Microsoft Queries

Microsoft Access queries allow the user to answer questions in the database, they use SQL code to instruct the software. SQL is a programming language specifically designed to be used with databases, it allows users to create databases, amend records and query the data [7]. Below are some query examples set up for Northern Lights.

Events Invoice Outstanding Queries: This query results returns all Patrons with events bookings balances outstanding. The query filters the paid for field to show only "No". This query links the event booking and patron tables.

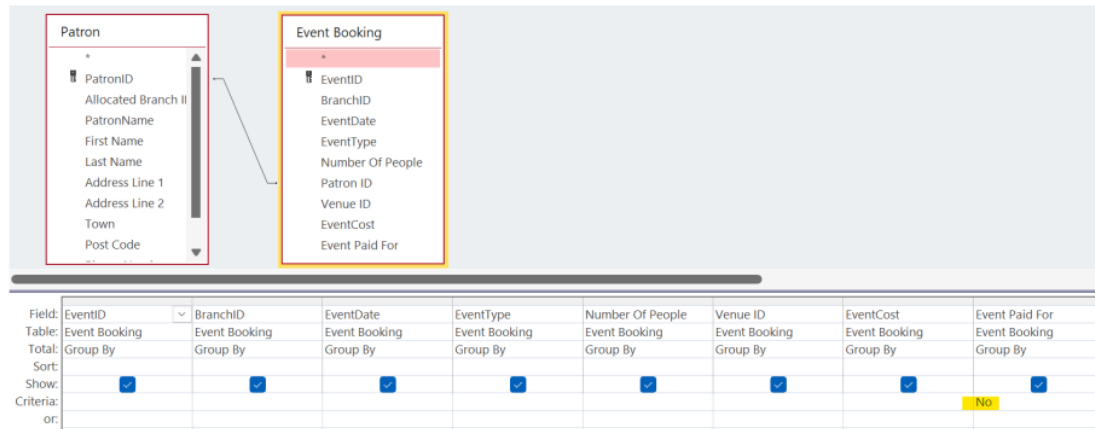


Figure 32 – example of events invoice query created in Microsoft Access

The figure below shows the results of the query after it is run:

EventID	BranchID	EventDate	EventType	Number Of People	Venue ID	PatronName	EventCost	Event Paid For
6	2	20/04/2022	Workshop	10	7	Confetti LTD	£300.00	☐
4	1	22/07/2022	Other	77	7	Dance Paradise	£748.00	☐
10	3	15/12/2022	Concert	997	6	Dance Paradise	£6,999.00	☐
9	3	14/12/2022	Workshop	98	9	Drum	£984.00	☐
2	3	04/04/2023	Music Festival	677	8	Festival LTD	£5,693.00	☐
7	1	20/04/2023	Conference	787	5	Unruffled Events	£4,583.00	☐
12	2	03/01/2023	Music Festival	87	8	Unruffled Events	£483.00	☐

Figure 33 – Events Invoice outstanding query results

Upcoming Events Queries: This query results returns all upcoming events. The query filters event dates to show dates greater than today. This query links the event booking and branch tables.

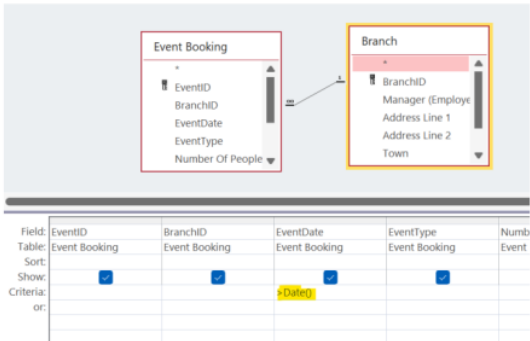


Figure 34 – example of the upcoming events query created in Microsoft Access

The figure below shows the results of the query after it is run:

EventID	BranchID	EventDate	EventType	Number Of People	Patron ID	Venue ID	Town
7	1	20/04/2023	Conference	787		5	5 Neath
13	1	21/04/2023	Conference	876		1	7 Neath
3	2	28/04/2023	Concert	767		6	9 Carmarthen
(New)							

Figure 35 – Upcoming events query results

Events In Swansea Queries: This query results returns all events in the Swansea area. The query filters town to show “Swansea” only. This query links the event booking and branch tables.

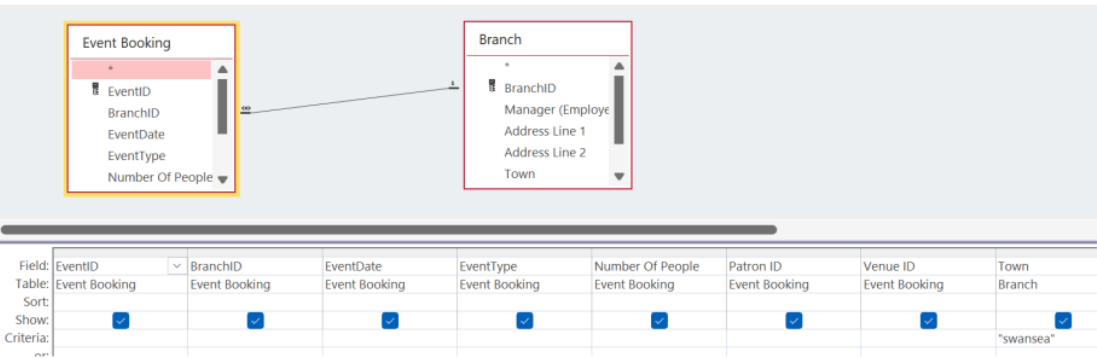


Figure 36 – example of the Swansea events query created in Microsoft Access

The figure below shows the results of the query after it is run:

EventID	BranchID	EventDate	Event Type	Number Of People	Patron ID	Venue ID	Town
2	3	04/04/2023	Music Festival	677	6	8	Swansea
9	3	14/12/2022	Workshop	98	4	9	Swansea
10	3	15/12/2022	Concert	997	9	6	Swansea
11	3	09/11/2022	Workshop	73	3	5	Swansea

Figure 37 – Swansea only events query results

Orders by the sales department Queries: This query results returns all orders completed by the sales department at Northern Lights. The query filters the department to show only “Sales”. This query links department, product and order tables.

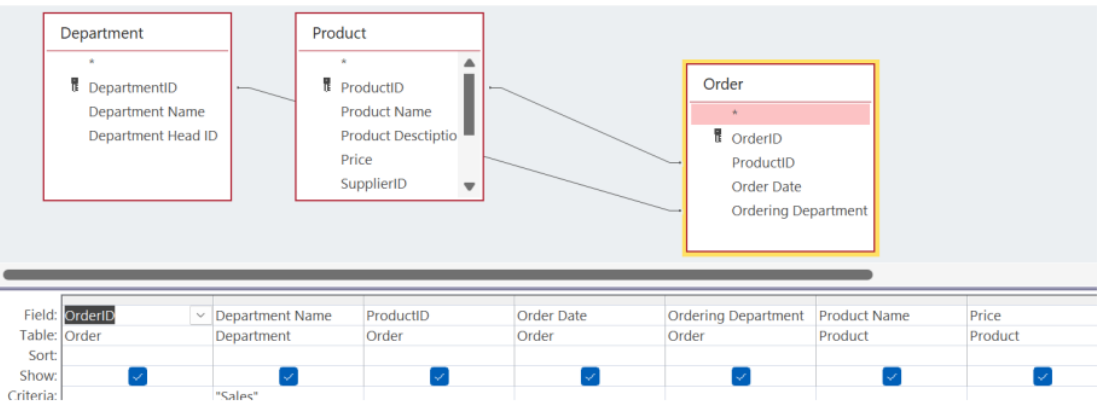


Figure 38 – example of the orders by the sales department query created in Microsoft Access

The figure below shows the results of the query after it is run:

OrderID	Department Name	ProductID	Order Date	Ordering Department	Product Name	Price
3	Sales	6	04/04/2023	1	Disco Light Small	£88.00
10	Sales	2	03/04/2023	1	Small Speaker	£300.00

Figure 39– Upcoming events query results

Database validation

Database input validation is essential to ensure the data collected is clean and accurate. This section shows some of the data validation techniques used throughout the Northern Lights database.

Combo Boxes: these dropdowns are implemented throughout the forms to ensure the user can select certain items (where appropriate)



Figure 40 – Combo box restricting male / female input only.

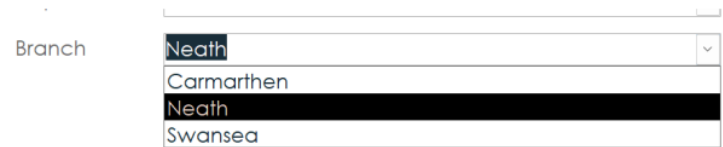


Figure 41 – Combo box restricting branches only available from the branch table.

Input Length Validation: where appropriate the text length of an input field is restricted. In the following example, the user is not able to enter more than 11 numbers for a phone number:

General Lookup	
Field Size	11
Format	
Input Mask	
Caption	

Figure 41 – Table design view showing text length restriction size.

Input Validation: where appropriate validation is put in place to ensure users select from any drop-down list or enter numbers only if numbers are expected.:

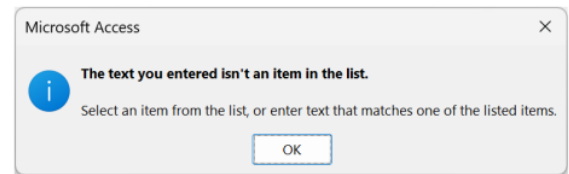


Figure 42 – Error displayed when trying to free key text in a list box.

User Guide

A user guide has been created and is included in Appendix A. For Northern Lights to make full use of the systems a user guide will help aid with training and avoid the need to seek additional help from database developers/admin.

Conclusion

Northern Lights is an expanding company now operating from three branches. Previously they have used a paper-based system to manage events which would have become increasingly difficult as the organisation grows. This report has demonstrated the design and implementation of a brand-new computerised database environment to help the business manage events.

The database created will bring many advantages to the business. Data can quickly be queried, eliminating the need to manually search through paper records; this will benefit both the business and the customer, saving a vast amount of time and leading to increased productivity and happier clients. The data is now more secure as access can be restricted based on employee role. Data can be backed up easily and cheaply ensuring that important data does not get lost. The database allows for improved data integrity with built-in validation controls to ensure data is recorded accurately.

The final database design is a prototype; if this was commissioned for full development, it would be advised to add a user login system to monitor user activity and restrict areas based on user role. More pre-built reports could be considered to meet the needs of the business.

If the business was to expand even further, a cloud-based solution may be more advantageous, allowing for remote access and larger storage options not restricted by local hardware.

References

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- [2] Anonymous (), "What is a database", OCI [Online], Available <https://www.oracle.com/database/what-is-database/>, [Accessed 01/04/2023].
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- [7] A. G. Taylor, SQL for dummies, 7th ed. Hoboken, NJ: Wiley Publishing, 2010.

Abbreviations

Abbreviation	Definition
ERD	Entity Relationship Diagram
ERM	Entity Relationship Model
DBMS	Database Management System
3NF	Third Normal Form
MS	Microsoft
SQL	Structured Query Language

Appendix A – User Guide (Northern Lights Database)

Navigation

To navigate through the menu, select from the main menu (top bar) and the sub menu will dynamically change depending on selection (left side). The top right of the page will show section title, date and time. Each input form has a set of navigation buttons to move through the records.

The screenshot shows the 'Employee Form' in the Northern Lights database. The interface includes a top bar with 'Forms' and 'Reports' tabs, a left sidebar with a main menu (Employee, Branch, Department, Patron, Venue, Event Booking, Order, Product, Supplier, Tasks) and a sub menu. The main form area displays fields for EmployeeID, First Name, Last Name, Date Of Birth, Age, Address Line 1, Address Line 2, Town, Post Code, Phone Number, Join Date, Employee Title, Email, Gender, Salary, Department, and Branch. Navigation buttons (First Record, Previous Record, Next Record, Last Record) and 'Add / Ammed / Delete' buttons (Add Record, Save Changes, Delete Record) are visible. A 'Print Record' button is at the bottom right. Callouts identify the 'Navigation Main Menu', 'Navigation Sub Menu', 'Section Title, Date & Time', and 'Data navigation buttons'.

Data Entry (Add / Delete / Amend / Print)

Each input form has a set of buttons to use when updating records. A print button is also included if you wish to print a record.

The screenshot shows the 'Patron Details Form' in the Northern Lights database. The interface includes a top bar with 'Forms' and 'Reports' tabs, a left sidebar with a main menu (Employee, Branch, Department, Patron, Venue, Event Booking, Order, Product, Supplier, Tasks) and a sub menu. The main form area displays fields for PatronID, Allocated Branch, First Name, Last Name, Address Line 1, Address Line 2, Town, Post Code, Phone Number, and Email. Navigation buttons (First Record, Previous Record, Next Record, Last Record) and 'Add / Ammed / Delete' buttons (Add Record, Save Changes, Delete Record) are visible. A 'Print Record' button is at the bottom right. Callouts identify the 'Click to add new record. For will be cleared.', 'Click to save any changed made.', 'Click to delete a record.', and 'Press to print record.' buttons.

Running Reports

Reports can be selected from the top menu bar. Available reports will be shown on the sub-menu on the left.

Select reports from top menu bar.

Available reports listed here.

Report will be displayed here.

The screenshot shows the 'Reports' menu in the top navigation bar. A sub-menu on the left lists available reports: 'Event Invoice', 'Event Booking', and 'Event Calendar'. The 'Event Invoice By Patron Report' is selected, displaying a table of event invoices.

PatronName	EventID	BranchID	EventDate	EventType	Number Of People	Venue	Total Cost
Rejoice	14	1	21/12/2022	Workshop	75	Kings Hotel	£543.00
	13	1	21/04/2023	Conference	876	Marriott Hotel	£4,839.00
							£5,382.00
Confetti LTD	6	2	20/04/2022	Workshop	10	Marriott Hotel	£300.00
	1	2	01/01/2023	Workshop	10	Ty Cross Holiday House	£400.00
							£700.00
Red Carpet Studios	11	3	09/11/2022	Workshop	73	Swansea football club	£568.00
	8	1	21/07/2022	Workshop	87	The Gough	£843.00
							£1,411.00
Drum	9	3	14/12/2022	Workshop	98	Penny Sports and Social Club	£984.00
							£984.00

Running Queries

Customs queries can be accessed within Microsoft Access's main interface. Please use the menu bar on the left.

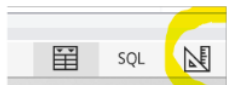
Select prebuild query here.

Query results show here.

The screenshot shows the Microsoft Access interface. The 'Queries' menu is selected in the left-hand pane, and the 'Events Invoice Outstanding' query is highlighted. The query results are displayed in a table.

EventID	BranchID	EventDate	EventType	Number Of People	Venue ID	PatronName	EventCost	Event Paid F
6	2	20/04/2022	Workshop	10	7	Confetti LTD	£300.00	
4	1	22/07/2022	Other	77	7	Dance Paradise	£748.00	
10	3	15/12/2022	Concert	997	6	Dance Paradise	£5,999.00	
9	3	14/12/2022	Workshop	98	9	Drum	£984.00	
2	3	04/04/2022	Music Festival	677	8	Festival LTD	£5,693.00	
7	1	20/04/2023	Conference	787	5	Unruffled Events	£4,583.00	
12	2	03/01/2023	Music Festival	87	8	Unruffled Events	£483.00	

You can also edit the query by selecting the design view button in the bottom right (marked in yellow)



The screenshot displays the Microsoft Access interface with the 'Events Invoice Outstanding' table selected. The left-hand pane shows the 'Navigation' pane with the 'Events Invoice Outstanding' table highlighted. The main window shows the 'Design View' of the table, with fields listed in the 'Field Name' column and their data types in the 'Data Type' column. The fields are: PatronID (Number), Allocated Branch ID (Number), PatronName (Text), First Name (Text), Last Name (Text), EventID (Number), BranchID (Number), EventDate (Date/Time), EventType (Text), and Number Of People (Number). The 'Table Design' tab is active, and the 'Table' tab is selected. The 'Table' tab shows the table structure with columns: Field Name, Event Booking Group By, BranchID, Event Booking Group By, EventDate, Event Booking Group By, EventType, Event Booking Group By, Number Of People, Event Booking Group By, Venue ID, Event Booking Group By, EventCost, Event Booking Group By, Event Paid For, Event Booking Group By, PatronID, Patron Group By, PatronName, Patron Group By, and Accounting. A blue arrow points to the 'Event Paid For' column.

Set criteria.

Database Analysis & Design

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

96/100

Generic Assessment Criteria	96
1. Engagement with Literature Skills	NA
NA- Not Applicable	
2. Knowledge and Understanding Skills	
Excellent work. All the user requirements were clearly identified and analysed. The users and their roles for the northern light database system were identified. Likewise, the departments required to manage the organization is also well identified.	24
3. Cognitive and Intellectual Skills	

• Judgements about the data and concepts are provided. • Verification of the design with the user requirements has been adhered. • Querying the system about the event information and staff details are provided.	20
4. Practical Application Skills	
• ER Diagram accurately represents the requirements of the database • appropriate notations and symbols to represent entities, attributes, and relationships are being followed. • Standard notations, such as Crow's Foot notation used makes your diagram easy to understand. • Annotations of the menu, forms and Reports clearly explains the database system. • MS-Access functionality to perform some calculations in the forms and corresponding reports are also been shown.	44
5.	

Transferable Skills for Life and Professional Practice	
· All task are clearly presented and documented. However, please adhere to the word limit that is been mentioned in the assessment specification. For an example definition of database and database management system could have been excluded for this assignment. · Front page with name and topic is been provided. · All the necessary Screen Capture of the database system has been added to the document. · A clear user guide for navigation between the system is provided.	8

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