

[Advanced Database Management]

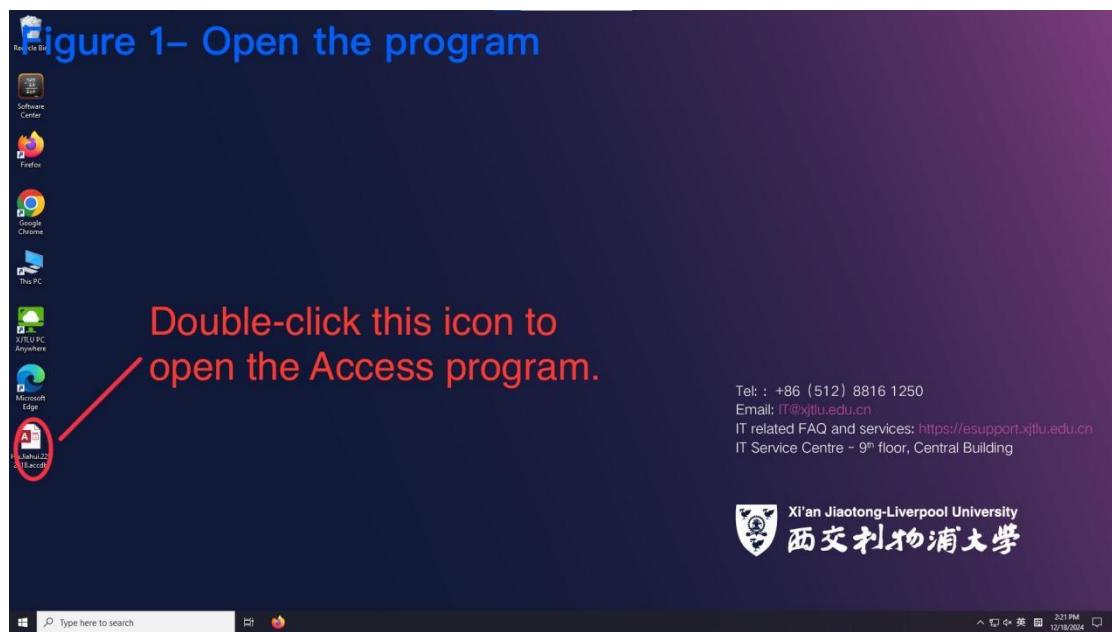
Analysis Report of the UniBooks database

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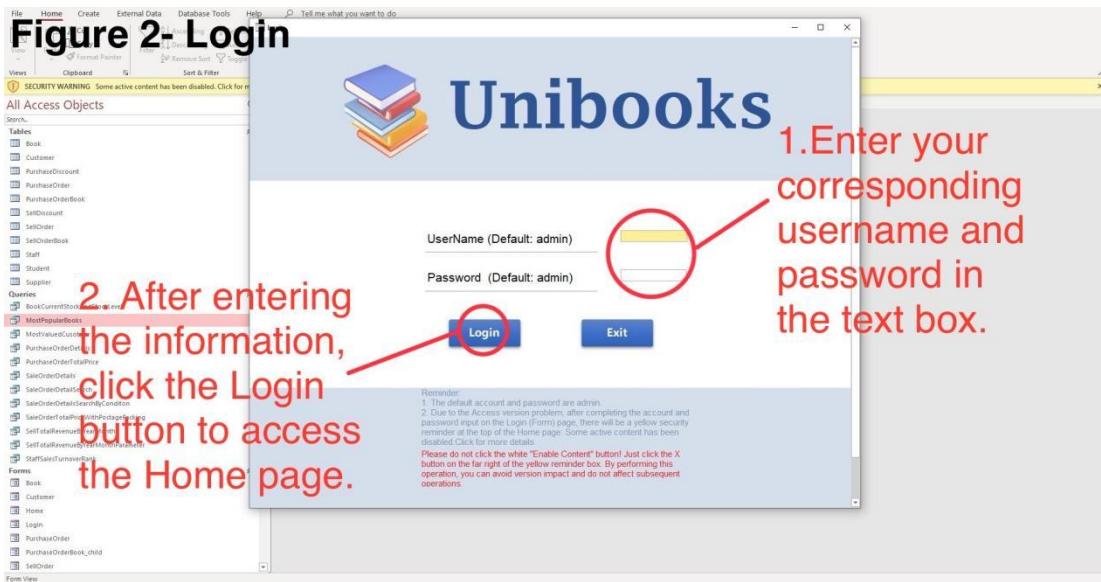
Operation Instructions

1. Open the Access program (as shown in Figure 1).

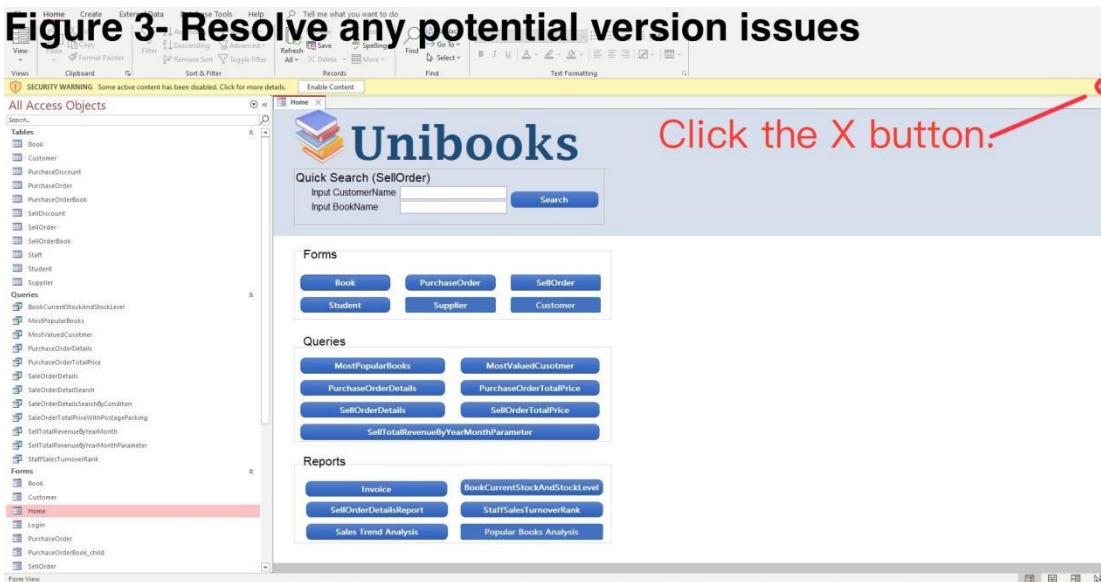


2. Information Login

After successfully opening the program, enter the correct username and password (as shown in Figure 2) to proceed with other operations.



Special circumstances (may not occur) : Due to the different version of Access, it may cause some problems, only need to press the following operations, you can run normally (specific operations are shown in Figure 3)

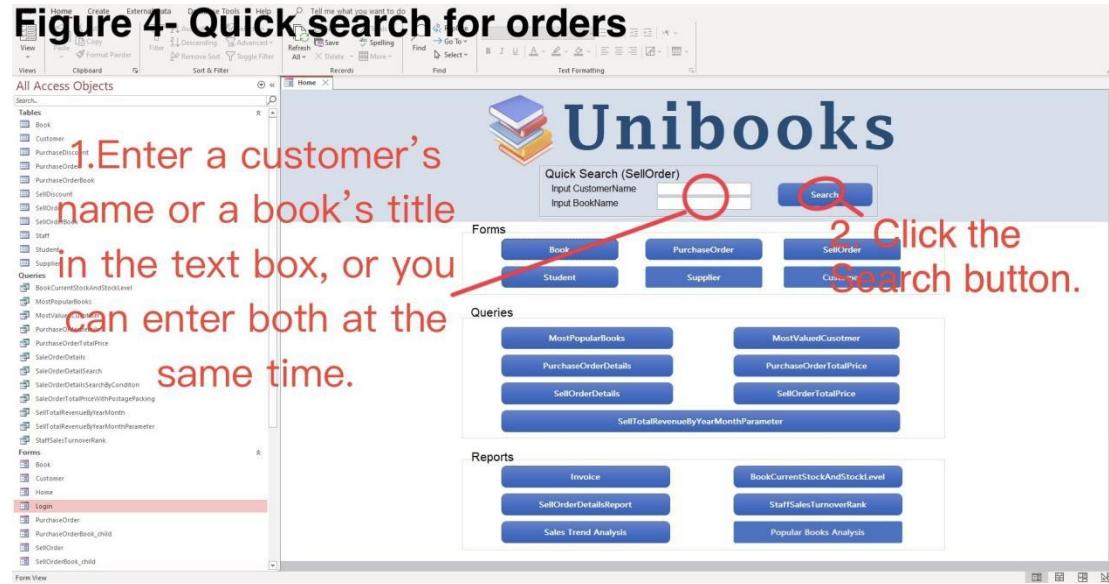


3.Operation Selection

On the Home page, the following operations can be performed:

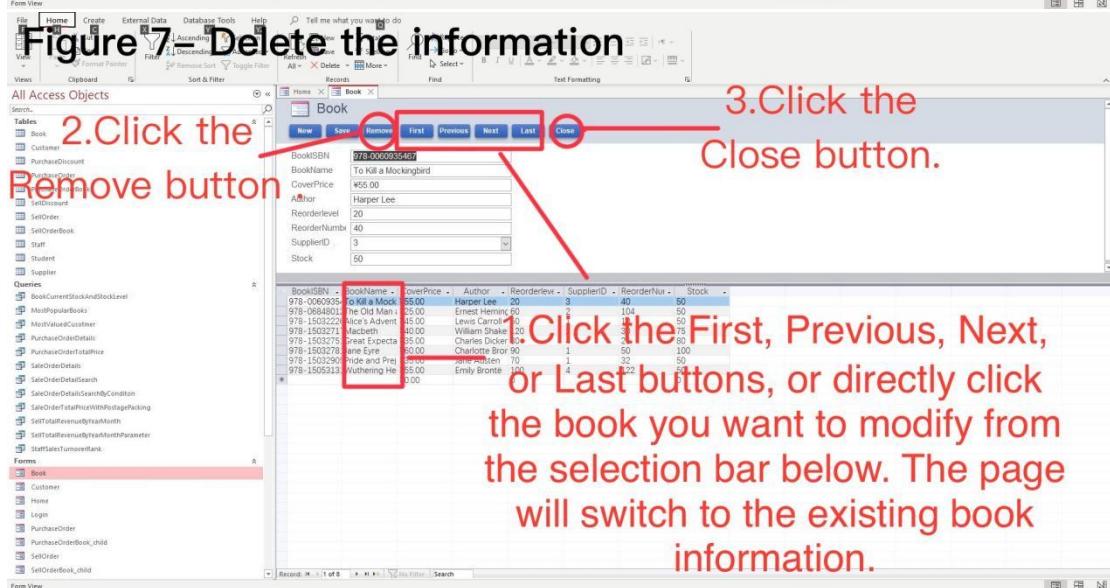
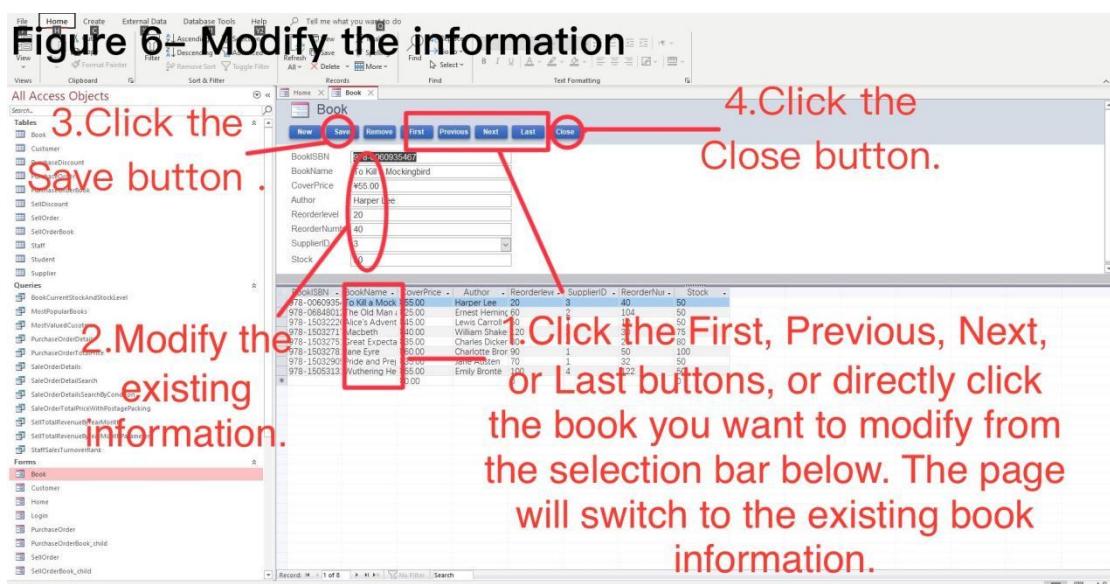
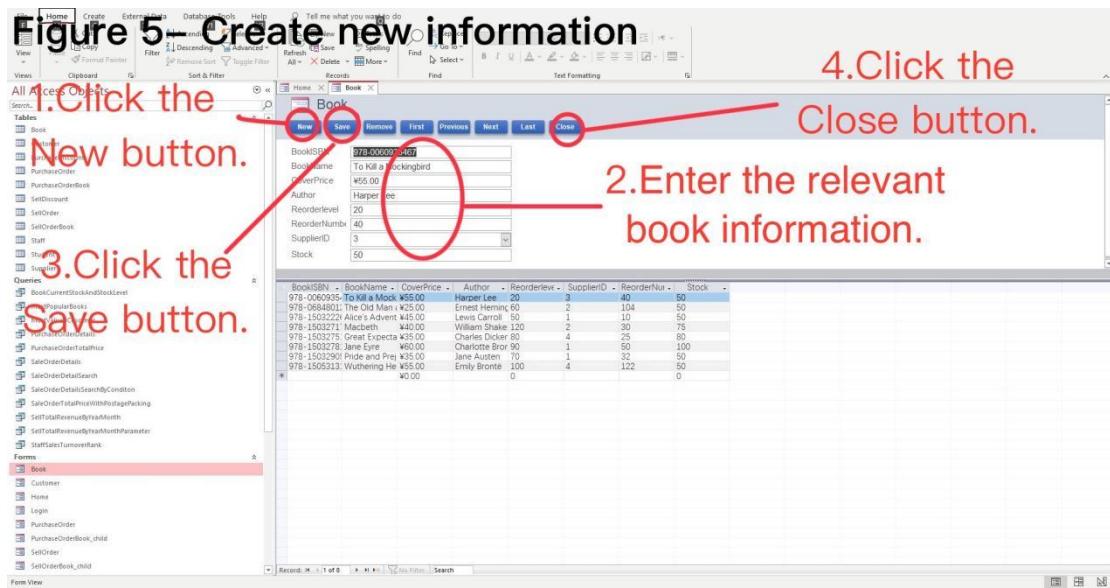
- In the Quick Search (Order) module, you can search for a customer's order or

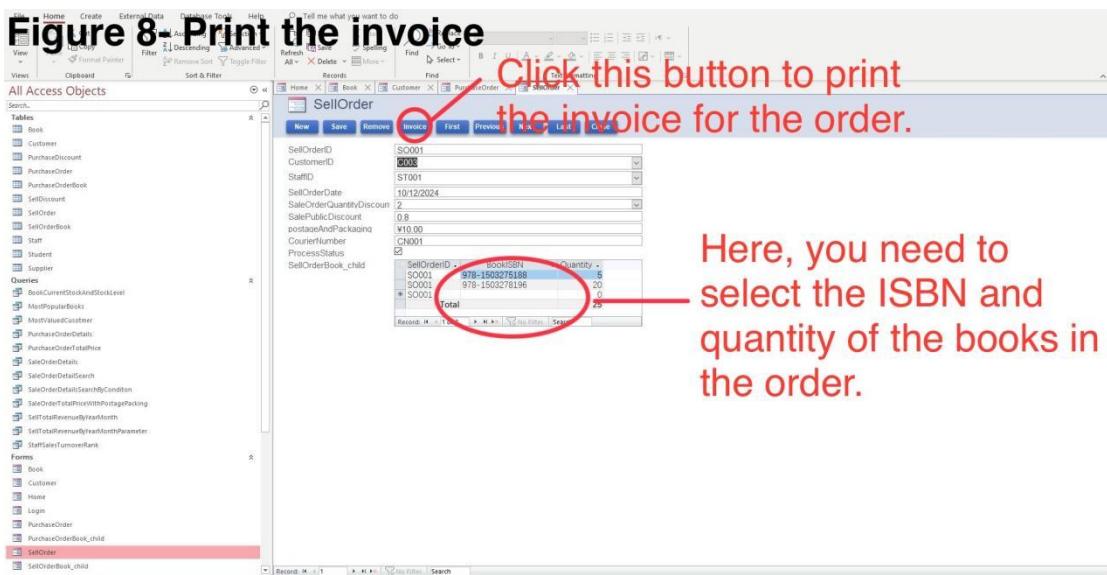
orders containing a specific book. You can also simultaneously query orders where a customer has purchased a particular book (as shown in Figure 4).



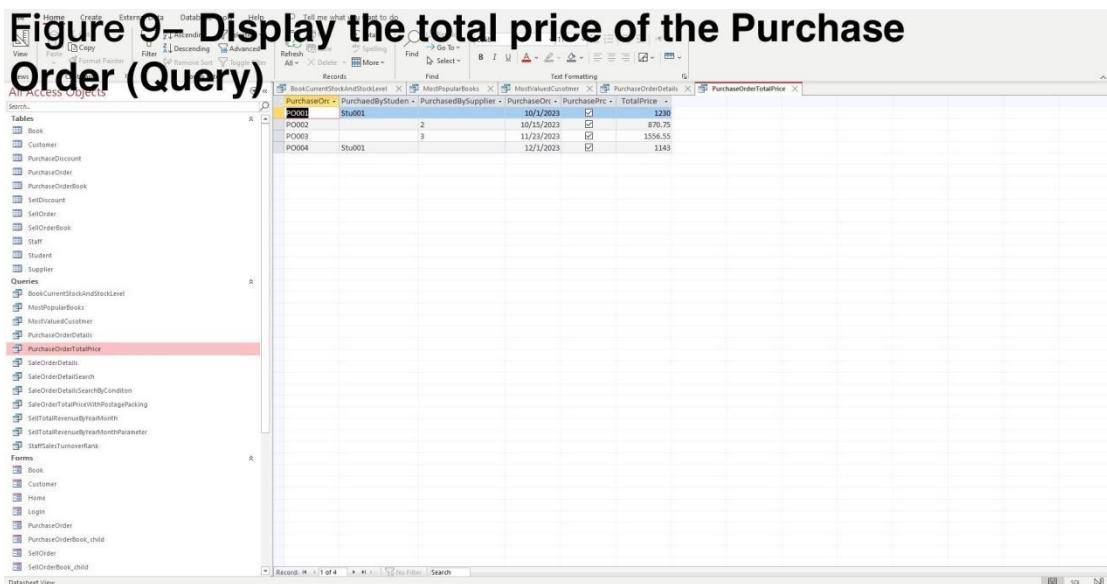
- In the Forms module, you can click on the six different buttons to access various Form pages.

1. On these pages, you can add (as shown in Figure 5), modify (as shown in Figure 6) , or delete (as shown in Figure 7) relevant information.
2. In the SellOrder (Form), you can also print the invoice for the corresponding order (as shown in Figure 8).





- In the **Queries** module, you can click on the seven different buttons to view various information filters and query results (as shown in Figure 9).



- In the **Reports** module, you can click on the six different buttons to view various reports (as shown in Figure 10).

Figure 10- Display the book inventory and restock reminder (Table)

BookISBN	BookName	CoverPrice	Author	ReorderLevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSelected	CurrentStock	StockLevel
978-00609395	To Kill a Mockingbird	55	Harper Lee	20	40	3	50	40	71	19	Low Stock
978-1503271	Macbeth	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503290	Pride and Prejudice	35	Jane Austen	70	32	1	50	32	14	68	Low Stock
978-1503275	Great Expectations	35	Charles Dickens	80	25	4	80	25	5	100	Sufficient Stock
978-1503278	Jane Eyre	60	Charlotte Bronte	90	50	1	100	50	23	127	Sufficient Stock
978-1503222	Alice's Adventures in	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0684901	The Old Man and the	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

- **Other situations:** The following are the operations to be performed in case of other situations (specific scenarios and actions are shown in Figure 11).

Figure 11- Other situations (Query and Table)

1. Enter the corresponding number of the information you want to query in the text box.

2. Click the OK button to display the relevant information.

Significant Database Features

1. Order form

- **Key Features:** The database features an order form that allows users to seamlessly add new orders while automatically updating inventory in real time(as shown in Figure 12 - Figure 16). This ensures inventory levels remain accurate, enabling efficient order management and enhancing customer satisfaction. The form collects essential information, such as book ISBN, quantity, and customer details, to process the order and deduct the corresponding product from inventory, ensuring smooth operations for customers and organizations.

Figure 12 Existing SellOrder records

The screenshot shows a Microsoft Access application window titled "Figure 12 Existing SellOrder records". The main area displays a datasheet with data from the "SellOrder" table. The columns are: SellOrderID, CustomerID, CustomerName, StaffID, StaffName, SellOrderDate, percentage, SalePublicDiscount, postageAndPackaging, CourierNumber, ProcessStatus, and ID. The data includes records for S0001 through S0004, with various staff names like Jonny, Mark, Tim, and Andy, and dates ranging from 8/13/2024 to 10/12/2024. The "percentage" column shows values like 95.00%, 90.00%, 92.50%, and 87.50%. The "SalePublicDiscount" column shows values like \$10.00, CN003, and CN004. The "postageAndPackaging" column shows values like \$10.00, CN002, and CN001. The "CourierNumber" column shows values like CN003, CN004, and CN002. The "ProcessStatus" column shows values like 578-01, 578-01, 578-01, and 578-01. The "ID" column shows values like 578-01, 578-01, 578-01, and 578-01. The left sidebar shows the navigation pane with various objects like BookCurrentStockAndStockLevel, MostPopularBooks, MostValueCustomer, PurchaseOrderDetails, PurchaseOrderDataAve, SaleOrderDetails, SaleOrderDetailSearch, SaleOrderDetailSearchByCondition, SaleOrderDetailPriceWithPostagePacking, GetTotalRevenueByYearMonth, GetTotalRevenueByYearMonthParameter, StaffSalesTurnoverRank, Home, Book, Customer, Login, PurchaseOrder, PurchaseOrderBook_child, SellOrder, SellOrderBook_child, Student, Supplier, Reports, and Macros. The status bar at the bottom indicates "Record: 1 of 8" and "Datasheet View".

SellOrderID	CustomerID	CustomerName	StaffID	StaffName	SellOrderDate	percentage	SalePublicDiscount	postageAndPackaging	CourierNumber	ProcessStatus	ID
S0001	C0001	Jonny	ST001	Mark	8/13/2024	1	95.00%	0.8	\$10.00, CN003	578-01	578-01
S0002	C0001	Jonny	ST001	Mark	8/13/2024	1	90.00%	0.8	\$10.00, CN004	578-01	578-01
S0003	C0004	Black	ST004	Tim	9/10/2024	2	92.50%	0.8	\$10.00, CN004	578-01	578-01
S0004	C004	Black	ST004	Tim	9/10/2024	2	92.50%	0.8	\$10.00, CN004	578-01	578-01
S0002	C002	Ben	ST002	Tom	9/12/2024	4	87.50%	0.8	\$10.00, CN002	578-01	578-01
S0002	C002	Ben	ST002	Tom	9/12/2024	4	87.50%	0.8	\$10.00, CN002	578-01	578-01
S0001	C003	Jony	ST001	Andy	10/12/2024	2	92.50%	0.8	\$10.00, CN001	578-01	578-01
S0001	C003	Jony	ST001	Andy	10/12/2024	2	92.50%	0.8	\$10.00, CN001	578-01	578-01

Figure 13- Each book has an existing inventory record

BookCurrentStockAndStockLevel

BookISBN	BookName	CoverPrice	Author	ReorderLevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSold	CurrentStock	StockLevel
978-006935467	To Kill a Mockingbird	55	Harper Lee	20	40	3	50	40	71	19	Low Stock
978-1503271722	Macbeth	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503290598	Pride and Prejudice	35	Jane Austen	70	32	1	50	32	14	68	Low Stock
978-1503275180	Great Expectations	35	Charles Dickens	80	25	4	80	55	5	130	Sufficient Stock
978-1503278196	Jane Eyre	60	Charlotte Bronte	90	50	1	100	50	23	127	Sufficient Stock
978-1503226887	Alice's Adventures in Wonderland	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0544801223	The Old Man and the Sea	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313109	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

SellOrder

SellOrderID	SO005																
CustomerID	C003																
Sum	ST002																
SellOrderDate	12/2/2024																
SaleOrderQuantityDiscount	0.8																
SalePublicDiscount	¥10.00																
postageAndPackaging	¥10.00																
CourierNumber	123																
ProcessStatus	Open																
SellOrderBook_child	<table border="1"> <tr> <td>SellOrderID</td> <td>SO005</td> <td>BookISBN</td> <td>Quantity</td> </tr> <tr> <td></td> <td>978-1503275180</td> <td>60</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>Total</td> </tr> <tr> <td></td> <td></td> <td></td> <td>60</td> </tr> </table>	SellOrderID	SO005	BookISBN	Quantity		978-1503275180	60					Total				60
SellOrderID	SO005	BookISBN	Quantity														
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Figure 14- Create a new SellOrder

SellOrderDetails

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<td>ST0</td></tr></table>	SellOrderID	SO005	CustomerID	StaffID	StaffName	SellOrderDate	SellOrderDiscountID	percentage	SalePublicDiscount	postageAndPackaging	CourierNumber	ProcessStatus		SO005	C003	ST002	Tom	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C002	ST002	Tom	9/12/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C003	ST001	Andy	10/12/2024	2	92.50%	¥10.00	¥10.00	CN001	Open			C002	ST002	Tom	9/12/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/2024	2	92.50%	¥10.00	¥10.00	CN004	Open			C003	ST002	Tom	12/2/2024	4	87.50%	¥10.00	¥10.00	CN002	Open			C003	ST003	Malk	8/13/2024	1	95.00%	¥10.00	¥10.00	CN003	Open			C004	ST004	Tim	9/10/20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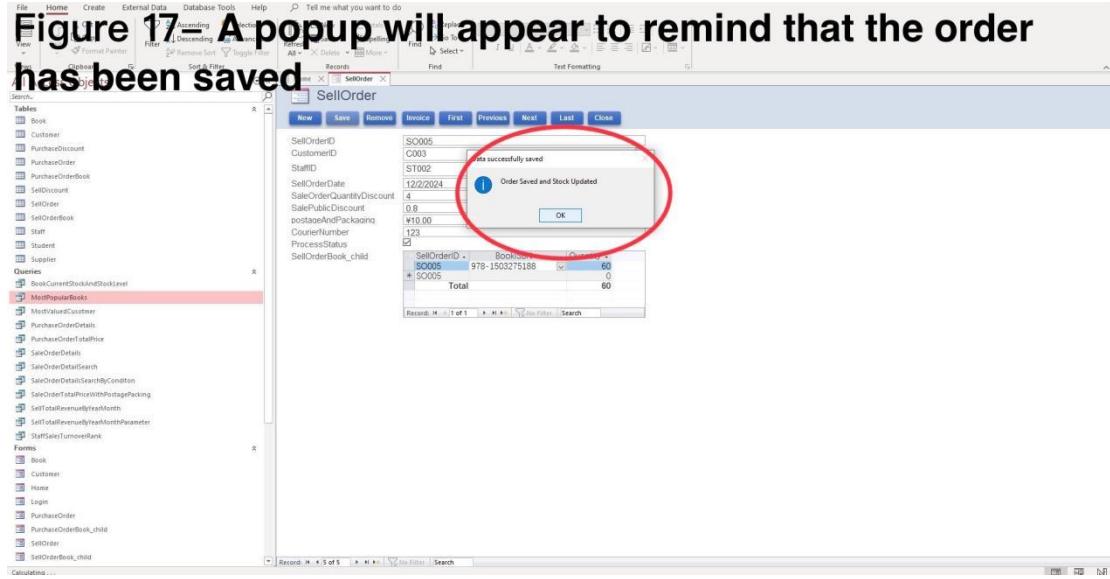
Figure 16 Inventory records after creating a SellOrder

BookISBN	BookName	CoverPrice	Author	Reorderlevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSold	CurrentStock	StockLevel
978-0060935467	To Kill a Mockingbird	55	Harper Lee	20	40	3	50	40	71	19	Low Stock
978-1503271722	Macbeth	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503275189	Great Expectations	35	Charles Dickens	80	25	4	80	25	65	40	Low Stock
978-1503290563	Pride and Prejudice	35	Jane Austen	70	32	1	50	32	14	68	Low Stock
978-1503271916	Jane Eyre	60	Charlotte Brontë	90	50	1	100	50	23	127	Sufficient Stock
978-1503222867	Alice's Adventures in Wonderland	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0684801223	The Old Man and the Sea	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313109	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

Thursday, December 19, 2024

100 (original inventory) - 60 (quantity in SellOrder) = 40 (current inventory)

- **Addressed requirements/limitations:** This feature addresses the issue of manual inventory tracking. By automatically updating inventory, it eliminates the need for multiple manual interventions, reduces human error, and improves operational efficiency.
- **Heuristic method:** "Provide informative feedback" is used in the design of our order form. Each user action should get feedback that clearly tells the user the result of the action. (Shneiderman, 1987) When the user saves the Order, the system will automatically pop up a reminder box to inform the user "Order Saved and Stock Updated"(as shown in Figure 17).



2. Automatic discount calculation

- **Key Features:** The system integrates with order forms and invoicing to automatically calculate discounts based on preset rules, such as customer type, order quantity, or promotional offers(as shown in Figure 15 and Figure 18). This ensures accurate and consistent pricing for every order, enhancing billing efficiency and building stronger customer relationships. By seamlessly applying discounts and updating invoices, it helps organizations optimize operations and improve customer satisfaction.

Figure 15—Generate a new SellOrder record

SellOrderID	CustomerName	StaffID	StaffName	SellOrderDate	SellOrderDiscountID	percentage	SalePublicDiscount	postageAndPackaging	CourierNumber	ProcessStatus	Bill
SO001	C001	ST001	Andy	9/10/2024	2	92.50%	0.8	\$10.00	CN001	checked	578-1
SO002	C004	Black	ST004	Tim	9/10/2024	2	92.50%	0.8	\$10.00	CN004	checked
SO003	C002	Beck	ST002	Tom	9/12/2024	4	87.50%	0.8	\$10.00	CN002	checked
SO003	C003	Jony	ST003	Malk	8/13/2024	1	95.00%	0.8	\$10.00	CN003	checked
SO001	C003	Jony	ST001	Andy	10/12/2024	2	92.50%	0.8	\$10.00	CN001	checked
SO003	C002	Ben	ST002	Tom	9/12/2024	4	87.50%	0.8	\$10.00	CN002	checked
SO003	C003	Tom	ST003	Malk	8/13/2024	1	95.00%	0.8	\$10.00	CN003	checked
SO004	C004	Black	ST004	Tim	9/10/2024	2	92.50%	0.8	\$10.00	CN004	checked
SO005	C003	Jony	ST002	Tom	9/12/2024	4	87.50%	0.8	\$10.00	123	checked

Automatically calculate based on the discount rules:

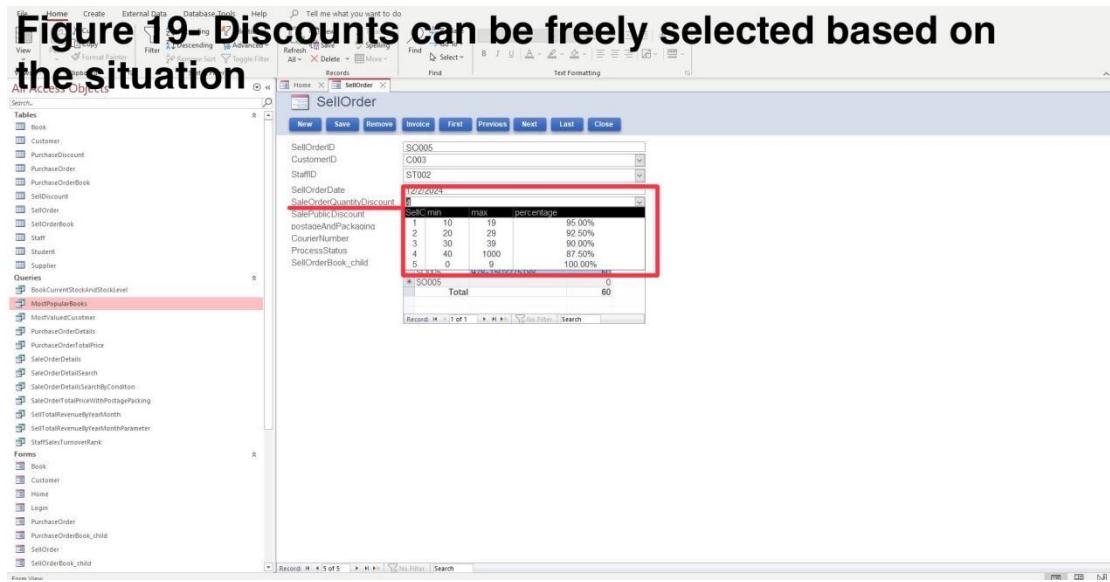
$$60 \text{ (quantity)} * 35 \text{ (cover price)} * 0.8 \text{ (standard discount)} * 87.5\% \text{ (quantity discount)} + 10 \text{ (shipping fee)} = 1480.$$

Figure 18—The result of the automatic calculation

CustomerID: C004 CustomerName: Black CustomerCity: Suzhou CustomerTelephone: 13884515888 CustomerEmail: Black@outlook.com	StaffID: ST004 StaffName: Tim	TotalAmount: \$526.80
SellOrderID: SO004 CourierNumber: CN004	SellOrderDate: 9/10/2024 ProcessStatus: checked	
CustomerID: C003 CustomerName: Jony CustomerCity: Guangzhou CustomerTelephone: 13800138000 CustomerEmail: Jony@outlook.com	StaffID: ST002 StaffName: Tom	TotalAmount: \$997.90
SellOrderID: SO005 CourierNumber: 123	SellOrderDate: 12/2/2024 ProcessStatus: checked	TotalAmount: \$1,480.00 (circled)

- **Addressed needs/limitations:** Prior to the implementation of this feature, organizations had difficulty manually applying the correct discounts, resulting in errors and customer dissatisfaction. Automated systems not only reduce the risk of errors, but also speed up the process of calculating discounts and improve the overall customer experience.
- **Heuristic method:** In our automatic discount calculation design, "User Control and Freedom" is used. Users can easily operate and avoid irreversible errors. (Nielsen, 1994). When creating an order, users are free to choose which offer to apply

according to the conditions, or adjust the relevant content in the order, so that they can see immediate feedback on changes in the discount (as shown in Figure 19).



Queries

Query 1: Most Popular Books Query (MostPopularBooks)

Description and Usefulness:

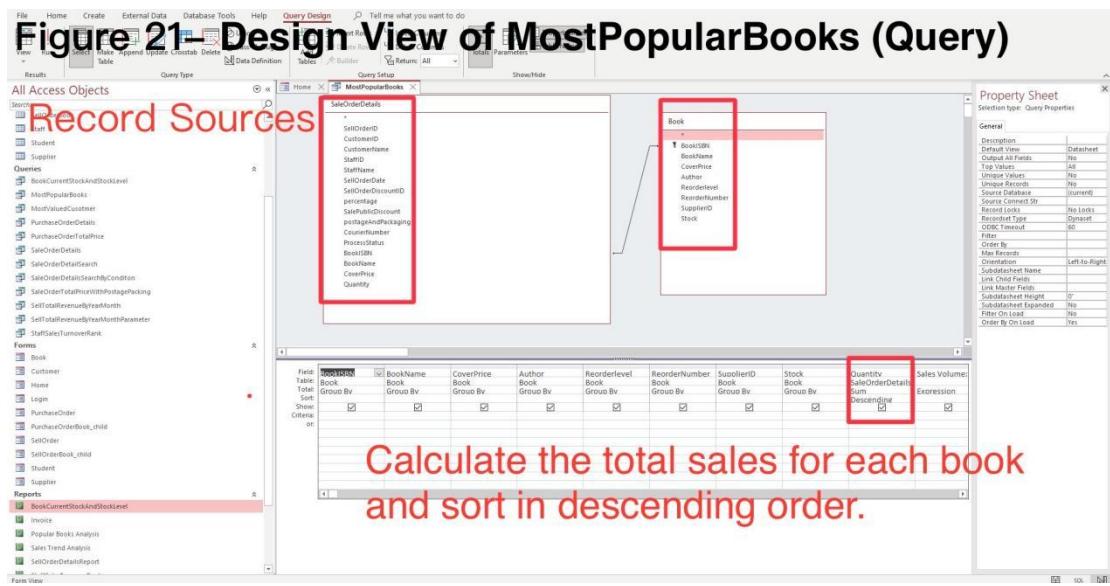
The objective of this query is to identify the most popular books based on their total quantity sold (as shown in Figure 20). It calculates total sales for each book and ranks them in descending order, highlighting best-sellers (as shown in Figure 21). This helps the organization analyze sales trends, prioritize inventory, adjust reorders, and ensure sufficient stock for high-demand books to drive revenue and meet customer demand.

Figure 20– Output of MostPopularBooks (Query)

BookISBN	BookName	Author	ReorderLevel	ReorderNumber	SupplierID	Stock	SumOfQuan	SalesVolum
978-0009015468	To Kill a Mockingbird	Harper Lee	20	40	3	50	71	¥2,779.00
978-1505313106	Jane Eyre	Charlotte Brontë	90	40	1	100	28	¥1,140.00
978-1505313043	Pride and Prejudice	Jane Austen	70	21	1	50	14	¥140.00
978-1505313109	Wuthering Heights	Emily Brontë	100	122	4	50	6	¥250.00
978-15053275188	Great Expectations	Charles Dickens	80	25	4	80	5	¥129.50

Why It Is a Non-Trivial Query:

- **Multi-Table Join:** Uses an INNER JOIN to combine data from the Book table and SaleOrderDetails table, linking book details with their corresponding sales data.
- **Aggregation Functions:** Utilizes the SUM() function to calculate the total quantity sold (SumOfQuantity) and the total sales volume for each book.
- **Grouping and Sorting:** Groups results by book attributes (e.g., BookISBN, BookName) and sorts them in descending order of total quantity sold.
- **Business Value:** Highlights the best-selling books, enabling the organization to better manage stock, focus on popular products, and optimize sales strategies.



SQL Code:

```

SELECT Book.BookISBN, Book.BookName, Book.CoverPrice, Book.Author,
Book.Reorderlevel, Book.ReorderNumber,
Book.SupplierID, Book.Stock,
Sum(SaleOrderDetails.Quantity) AS SumOfQuantity,
Sum([saleorderdetails].[CoverPrice]*[Quantity]*[percentage]*[SalePublicDiscount])
AS [Sales Volume]
FROM SaleOrderDetails
INNER JOIN Book ON SaleOrderDetails.BookISBN = Book.BookISBN
GROUP BY Book.BookISBN, Book.BookName, Book.CoverPrice, Book.Author,
Book.Reorderlevel,
Book.ReorderNumber, Book.SupplierID, Book.Stock
ORDER BY Sum(SaleOrderDetails.Quantity) DESC;

```

Explanation of SQL Code:

1. Purpose of Nz():

Handles null values when no purchase or sales data is found for a book:

- Nz(DSum("[PurchaseQuantity]", "[PurchaseOrderDetails]", "[bookisbn]="" & [bookisbn] & ""), 0) calculates the total number of books purchased.
- Nz(DSum("[Quantity]", "[SaleOrderDetails]", "[bookisbn]="" & [bookisbn] & ""), 0) calculates the total number of books sold.

2. Dynamic Stock Calculation:

- [Stock]-[TotalSelled] + [TotalPurchased] AS CurrentStock calculates the current stock by combining the initial stock with total purchases and sales.

3. Conditional Logic:

- IIf([CurrentStock] < [Reorderlevel], "Low Stock", "Sufficient Stock") classifies the stock status based on the current stock level compared to the reorder threshold.

4. Output:

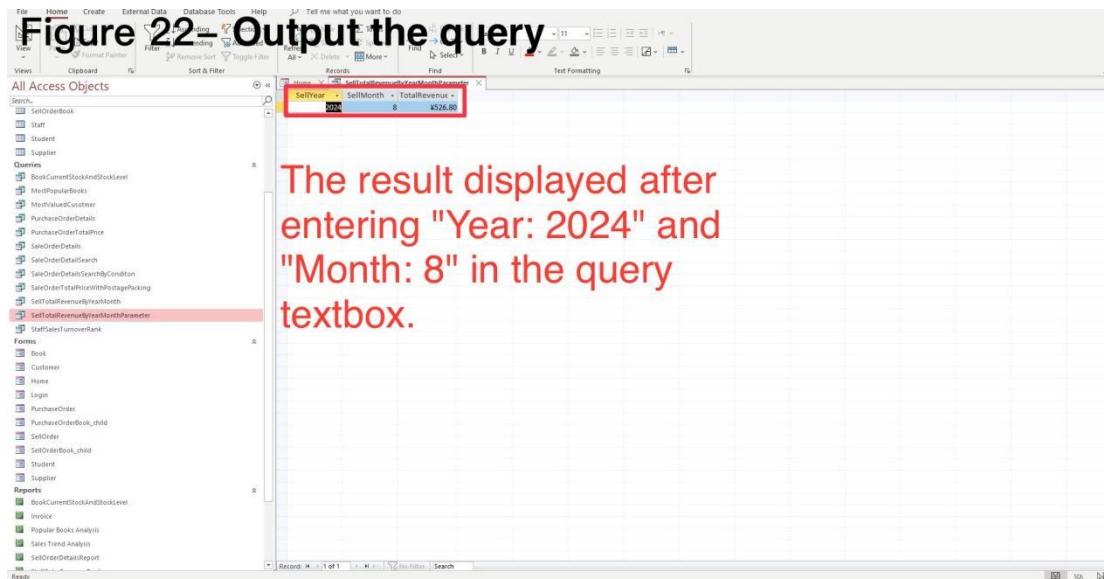
- Returns key inventory information: book details, purchase and sales totals, current stock, and stock status.

Query 2: Monthly Sales Revenue Query (SellTotalRevenueByYearMonthParameter)

Description and Usefulness:

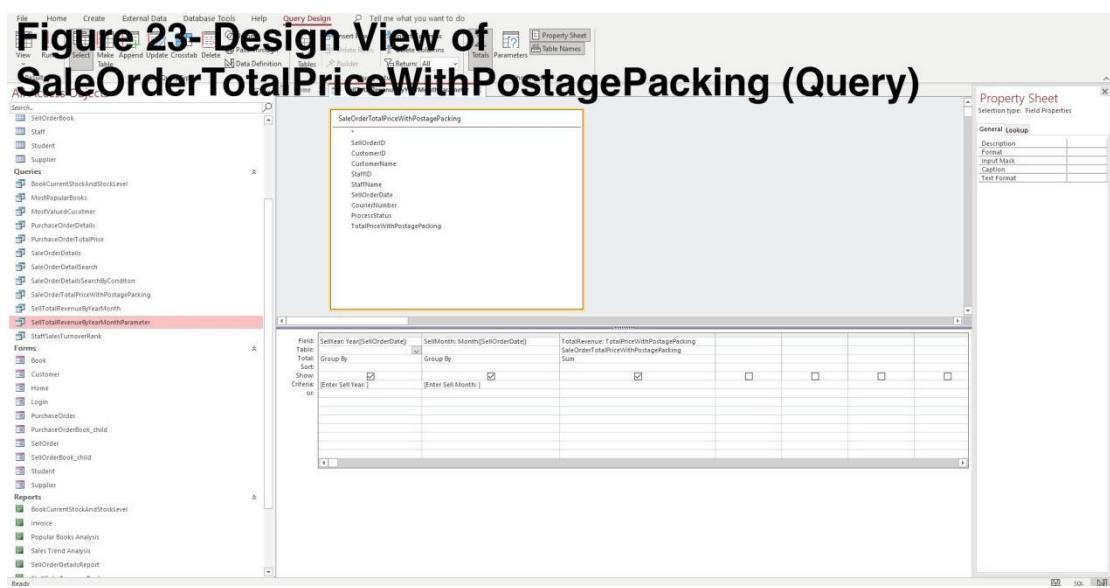
This query calculates total monthly revenue by grouping sales data by year and month, with dynamic filtering for user-specified periods (as shown in Figure 22 and Figure

23). It helps the organization analyze sales trends, identify peak revenue months, adjust marketing strategies, and optimize inventory planning. The dynamic input feature enables flexible, customized analysis, supporting data-driven decisions to achieve revenue goals.



Why It Is a Non-Trivial Query:

- Date Functions:** This query uses the Year() and Month() functions to extract the year and month from the SellOrderDate field, grouping the data based on these time attributes.
- Dynamic Parameters:** It includes dynamic input parameters ([Enter Sell Year:] and [Enter Sell Month:]) to allow users to filter the query for a specific year and month, making it flexible and adaptable.
- Aggregation Functions:** Utilizes the SUM() function to calculate the total revenue (TotalRevenue) for the specified month.
- Business Value:** This query helps organizations monitor monthly revenue performance, identify trends, and plan future business strategies by evaluating seasonal sales patterns or monthly performance.



Management Reports

Report 1: BookCurrentStockAndStockLevel

Objective:

This report provides real-time insights into the stock levels of all books (as shown in Figure 25). It identifies books that need replenishment by comparing current stock levels against predefined reorder thresholds.

Figure 24—Design view of BookCurrentStockAndStockLevel (Management Report)

The screenshot shows the Microsoft Access Report Design view. The ribbon at the top includes File, Home, Create, External Data, Database Tools, Help, Report Design, Arrange, Format, Page Setup, and a Tell me what you want to do search bar. The left pane displays the navigation pane with various queries, forms, and reports. The main area shows the report structure with three sections: Page Header, Detail, and Page Footer. The Detail section contains fields for BookISBN, BookName, CoverPrice, Author, Reorderlevel, ReorderNumber, SupplierID, Stock, TotalPurchased, TotalSold, CurrentStock, and StockLevel. A parameter field 'GetReplenishmentYearMonthParameter' is also present in the Detail section. The status bar at the bottom indicates the date as Wednesday, December 18, 2024.

Figure 25—Output of BookCurrentStockAndStockLevel (Management Report)

BookISBN	BookName	CoverPrice	Author	Reorderlevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSold	CurrentStock	StockLevel
978-0060925467	To Kill a Mockingbird	55	Harper Lee	20	40	3	80	40	71	19	Low Stock
978-1503271722	Moby-Dick	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503209563	Pride and Prejudice	35	Jane Austen	70	32	1	50	32	14	68	Low Stock
978-1503275169	Great Expectations	35	Charles Dickens	80	25	4	80	25	5	100	Sufficient Stock
978-1503270318	Jane Eyre	60	Charlotte Bronte	90	50	1	100	50	23	127	Sufficient Stock
978-1503228687	Alice's Adventures in Wonderland	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0544801223	The Old Man and the Sea	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313109	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

Why It Is Non-Trivial:

- **Calculated Fields:** The CurrentStock is dynamically computed using sales and purchase data from related tables.
- **Conditional Logic:** Uses IIf() to categorize books as "Low Stock" or "Sufficient Stock," automating the stock management process.
- **Multi-Table Aggregation:** Data is pulled and calculated from the PurchaseOrderDetails and SaleOrderDetails tables.

Usefulness:

The report enables proactive inventory management by highlighting low-stock books, ensuring timely restocking and reducing order delays.

Report 2: StaffSalesTurnoverRank

Objective:

This report ranks staff members based on their total sales turnover and the number of orders they processed (as shown in Figure 27), providing insights into individual performance and contributions to revenue.

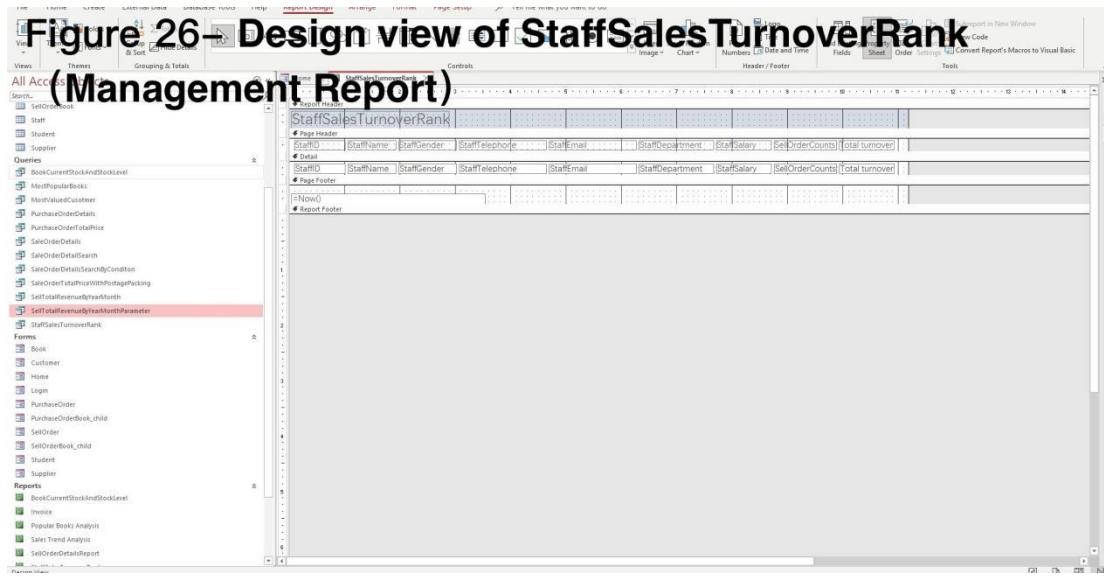


Figure 27- Output of StaffSales TurnoverRank (Management Report)

StaffID	StaffName	StaffGender	StaffTelephone	StaffEmail	StaffDepartment	StaffSalary	SellOrderCounts	Total turnover
ST002	Tom	female	14500356000	Tom@outlook.com	Purchasing Departm	¥ 6000.00	1	¥2,033.00
ST001	Andy	male	13600226000	Andy@outlook.com	Sale Department	¥ 7000.00	1	¥1,027.50
ST004	Tim	male	13389145522	Tim@outlook.com	Purchasing Departm	¥ 7500.00	1	¥997.90
ST003	Malk	male	16993540000	Malk@outlook.com	Sale Department	¥ 9000.00	1	¥526.80

Why It Is Non-Trivial:

- **Join Operation:** Combines staff information with sales data using INNER JOIN.
- **Aggregations:** Uses Count() to calculate the total number of sales orders and Sum() to compute total sales turnover.
- **Ranking Logic:** Ranks employees based on their sales performance using ORDER BY.

Usefulness:

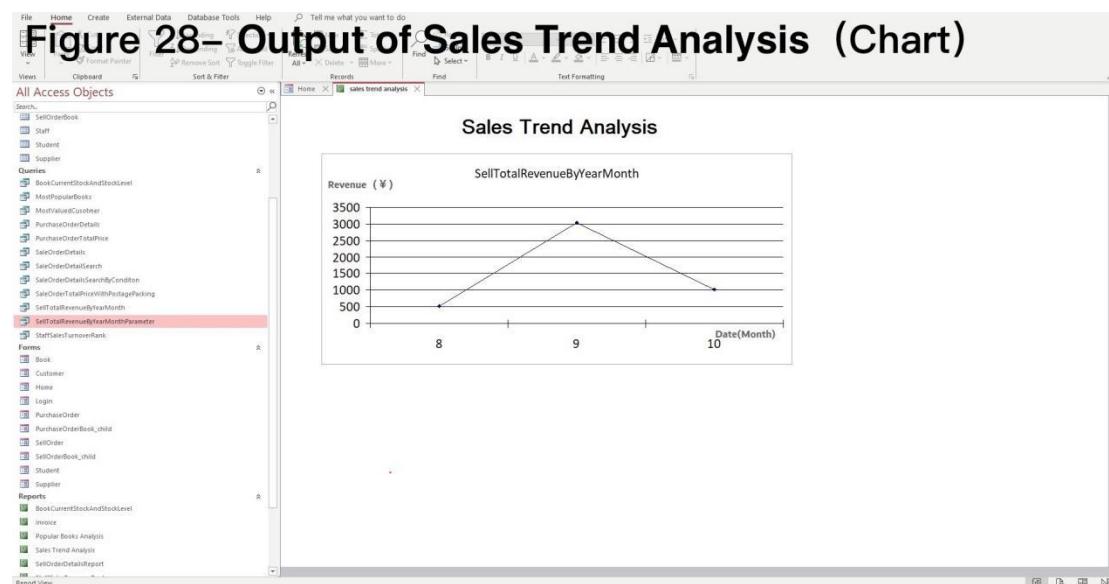
This report helps management recognize top-performing staff, identify areas for improvement, and make informed decisions about rewards or training programs.

Charts

Sales Trend Analysis Chart

Objective:

This chart visualizes monthly sales revenue trends (as shown in Figure 28), providing insights into fluctuations across different months.



Linked Query:

The chart is based on the `SellTotalRevenueByYearMonth` query, which groups sales data by month and calculates the total revenue using the `SUM()` function. The query utilizes fields such as `SellMonth` and `TotalRevenue` to generate monthly totals.

Usefulness:

The chart helps the organization identify peak and low sales months, enabling better inventory planning and resource allocation. By understanding sales patterns, the organization can optimize marketing strategies to target high-demand periods and address low-revenue months efficiently.

Testing Database

1. Test Case 1: Verify inventory update function

To test the inventory update, I first created a new `SellOrder` for the book "Great Expectations" (as shown in Figure 14). After the order was placed, I checked the inventory, and the stock quantity decreased. In the `BookCurrentStockAndStockLevel` report, the Stock Level changed from "Sufficient Stock" to "Low Stock" (as shown in Figure 13 and Figure 30). Next, I created a new `PurchaseOrder` for the same book to replenish the inventory (as shown in Figure 29). The stock quantity increased, and the Stock Level returned to "Sufficient Stock" in the report (as shown in Figure 31).

Figure 13- Each book has an existing inventory record

BookISBN	BookName	CoverPrice	Author	Reorderlevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSold	CurrentStock	StockLevel
978-0060935467	To Kill a Mockingbird	55	Harper Lee	20	40	3	50	40	71	19	Low Stock
978-1503271722	Macbeth	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503290563	Pride and Prejudice	35	Jane Austen	70	32	1	50	32	14	68	Low Stock
978-1503275184	Great Expectations	35	Charles Dickens	80	25	4	80	25	5	100	Sufficient Stock
978-1503278196	Jane Eyre	60	Charlotte Bronte	90	50	1	100	50	23	127	Sufficient Stock
978-1503222687	Alice's Adventures in Wonderland	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0684801223	The Old Man and the Sea	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313109	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

Figure 14- Create a new SellOrder

Figure 30– Inventory records after creating a SellOrder

BookISBN	BookName	CoverPrice	Author	Reorderlevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSold	CurrentStock	StockLevel
978-006935467	To Kill a Mockingbird	55	Harper Lee	20	40	3	50	40	71	19	Low Stock
978-1503271722	Macbeth	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503275188	Great Expectations	35	Charles Dickens	80	25	4	80	25	65	40	Low Stock
978-1503290563	Pride and Prejudice	35	Jane Austen	70	32	1	50	32	14	68	Low Stock
978-1503278196	Jane Eyre	60	Charlotte Brontë	90	50	1	100	50	23	127	Sufficient Stock
978-1503228687	Alice's Adventures in Wonderland	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0684801223	The Old Man and the Sea	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313109	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

Thursday, December 19, 2024

100 (original inventory) - 60 (quantity in SellOrder) = 40 (current inventory)

Figure 29– Create a new PurchaseOrder

New Save Remove First Previous Next Last Close

PurchaseOrderID	PO005									
PurchasedByStudent										
PurchasedBySupplier	3									
PurchasedByDiscount	0.3									
PurchaseQuantityDiscountID	2									
StaffID	S1001									
PurchaseOrderDate	12/4/2024									
PurchaseProcessStatus										
PurchaseOrderBook_child	<table border="1"> <tr> <td>PurchaseOrderID</td> <td>BookISBN</td> <td>PurchaseQuantity</td> </tr> <tr> <td>PO005</td> <td>978-1503275188</td> <td>80</td> </tr> <tr> <td></td> <td>Total</td> <td>80</td> </tr> </table>	PurchaseOrderID	BookISBN	PurchaseQuantity	PO005	978-1503275188	80		Total	80
PurchaseOrderID	BookISBN	PurchaseQuantity								
PO005	978-1503275188	80								
	Total	80								

Figure 31– Inventory records after creating a PurchaseOrder

BookISBN	BookName	CoverPrice	Author	Reorderlevel	ReorderNumber	SupplierID	Stock	TotalPurchased	TotalSold	CurrentStock	StockLevel
978-006935467	To Kill a Mockingbird	55	Harper Lee	20	40	3	50	40	71	19	Low Stock
978-1503271722	Macbeth	40	William Shakespeare	120	30	2	75	30	0	105	Low Stock
978-1503275188	Great Expectations	35	Charles Dickens	80	25	4	80	105	65	120	Sufficient Stock
978-1503278196	Jane Eyre	60	Charlotte Brontë	90	50	1	100	50	23	127	Sufficient Stock
978-1503228687	Alice's Adventures in Wonderland	45	Lewis Carroll	50	10	1	50	70	0	120	Sufficient Stock
978-0684801223	The Old Man and the Sea	25	Ernest Hemingway	60	104	2	50	104	0	154	Sufficient Stock
978-1505313109	Wuthering Heights	55	Emily Bronte	100	122	4	50	122	6	166	Sufficient Stock

Thursday, December 19, 2024

40 (inventory after SellOrder) + 80 (quantity in PurchaseOrder) = 120 (current inventory)

Result: Pass.

2. Test Case 2: Verify the quick search function

To test the Quick Search feature on the Home page, I entered the "Black" (CustomerName) in the search bar (as shown in Figure 32). The system successfully displayed the purchase records for two books, both belonging to the same order (as shown in Figure 33). This confirmed that the Quick Search function accurately retrieves orders based on the customer name.

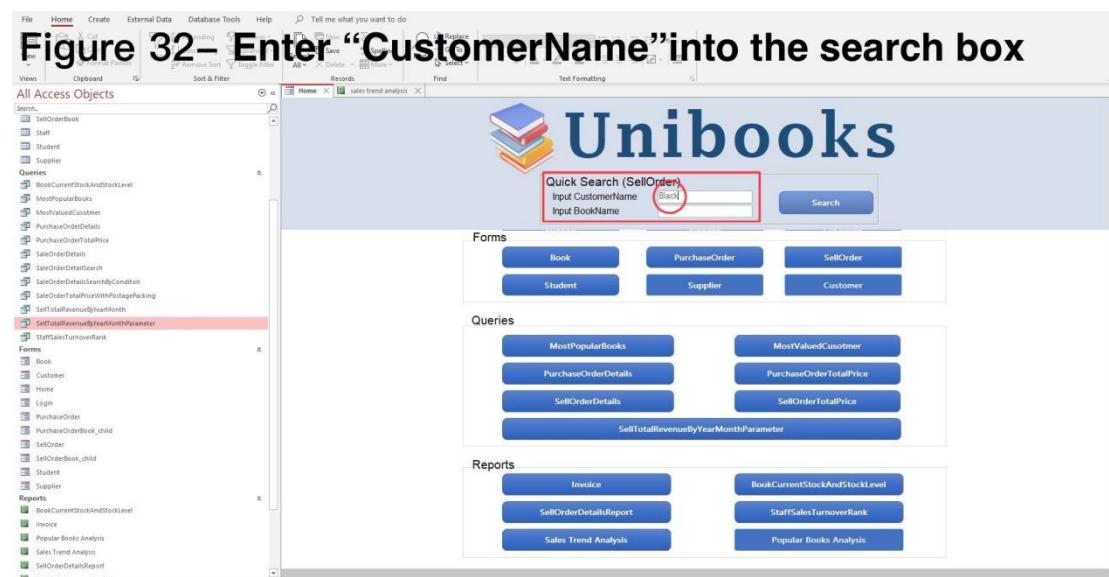


Figure 33– Display the records related to the “CustomerName”

This screenshot shows the results of the search for 'Black' in the 'SellOrder' table. The table has columns: RecordID, CustomerName, StaffID, StaffName, SellOrderDate, SellOrderDiscountID, percentage, SalePublicDiscount, postageAndPackaging, CourierNumber, ProcessStatus, and Qty. Two rows are visible, both corresponding to CustomerName 'Black' and StaffID ST004. The second row is highlighted with a red box. The bottom of the screen shows a toolbar with various icons and a status bar indicating 'Records: 1 of 2'.

RecordID	CustomerName	StaffID	StaffName	SellOrderDate	SellOrderDiscountID	percentage	SalePublicDiscount	postageAndPackaging	CourierNumber	ProcessStatus	Qty
SO004	Black	ST004	Tim	9/10/2024	2	92.50%	0.8	\$10.00	CN004	Completed	578.31
SO004	Black	ST004	Tim	9/10/2024	2	92.50%	0.8	\$10.00	CN004	Completed	578.31

Result: Pass.

Reflection

Strengths

1. Quick Search Feature:

The Quick Search function on the Home page allows users to efficiently locate SellOrder records by directly entering a customer name or book name. This feature significantly improves navigation and saves time, enhancing the user experience.

2. Book Current Stock And Stock Level Report:

This report dynamically compares current stock levels against reorder thresholds, highlighting low-stock books in red as “Low Stock.” This visual cue enables proactive inventory management, ensuring timely replenishment and reducing the risk of stockouts.

Weaknesses

1. Purchase Order Form Limitation:

The form currently requires users to manually select the quantity discount, even after specifying the student identity. Although I differentiate discount types by identity(as shown in Figure 34), the process is not automated, which reduces efficiency.

Figure 34– PurchaseOrder Form Limitation

Differentiate quantity discounts based on identity.

2. SellOrder Form Limitation:

In the SellOrder form, when creating a new order, there is no mechanism to prevent selecting book quantities that exceed available stock (as shown in Figure 35). This limitation may cause errors or incorrect inventory updates.

Figure 35– SellOrder Form Limitation

Unable to restrict the selection of books exceeding the inventory quantity.

Enhancements

1. Automate Discount Selection:

Enhance the PurchaseOrder form to automatically apply discounts based on selected identity (student or publisher) and purchase quantity. This feature will improve accuracy and user efficiency.

2. Inventory Validation for SellOrder:

Implement a validation feature in the SellOrder form that restricts users from selecting quantities exceeding current stock. This enhancement will improve inventory control and prevent order discrepancies.

Reference

Shneiderman, B., 1987. *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. 2nd ed. Addison-Wesley, Philosophy Monograph Series; 7. ISBN 0201165058, 9780201165050.

Nielsen, J., 1994. *Usability Engineering*. 2nd ed. Morgan Kaufmann. ISBN 0125184069, 9780125184069.