# DESIGNING AND DEVELOPING A DATABASE

# FOR

# BUSINESS DEVELOPMENT BANK OF CANADA

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# CONTENT

## INTRODUCTION

The purpose of this case study is to build a database for an organization which helps in its mission statement and objectives. For the purpose of this assignment the chosen organization is business development bank of Canada. For a brief history of the company we see that on September 30, 1944, the Canadian Parliament proclaimed the creation of the Industrial Development Bank (IDB)—the first name under which BDC was known. BDC is 'Canada's Development Bank' and a financial crown corporation wholly owned by the Government of Canada. For more than 60 years, BDC has been only financial institute solely dedicated to the development of Canadian small and medium enterprises. Hence it is a good organization which would benefit from a robust and efficient database.

## MISSION

"The aim is to support Canadian entrepreneurs by providing financing, capital and advisory services with a focus on small and medium size enterprise."

As stated in their mission statement BDC aims to create a supportive business environment for Canadian entrepreneurs and SMEs. They achieve this by providing capital or financing to businesses and also giving guidance or advice to them. The aim of the database will be to streamline this process or help in improving its efficiency.

## OBJECTIVES

"The objective is to support Canadian entrepreneurs to build strong and resilient businesses which will indirectly contribute in creating more prosperous, competitive and inclusive Canada."

Like its mission statement the objective of BDC is to make sure Canadian businesses are resilient and up to modern standards and make their efforts industry focused so that they can increase their reach. Apart from this, BDC aims to provide flexible financing solutions, offer expert advisory services, support sustainable business practices.

The objective of the database is to make employee and client interactions more convenient and efficient. Focus on industries which are lacking, the database will give a snapshot of all the industries which are lacking or performing well so that the bank can focus its efforts accordingly.

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# DATABASE DESIGN

## TABLES:

**How many tables were needed to design this database?**

For the purpose of this database we created 8 tables, which we feel encompasses all the operations which will be done by a bank like BDC. These are the entities through which BDC's database runs:

1. Client table
2. Loan table
3. Services table
4. Employees table
5. Transaction table
6. Industries table
7. Branches table
8. Surveys table

**Brief description of each table:**

The clients table will include all the businesses that BDC deals with. The table will provide a brief outlook of the business, it will have a primary key which is ClientID, then it will have its name, contact information, will let us know industry type and the date they joined.

Loans are the essential part of a bank's operations. Loan table will give us which loans have been approved for which clients, Loan ID is the primary key, it will give us interest rate at which the loan was approved and how long is the term.

As BDC also provides services such as consulting, financing planning etc. For the table purpose we will put Service ID as primary key, service name and description of the service, and at what cost would it be.

For Employees Table, Employee ID is the primary key. Employee Name, Position, Department ID, and Hire Date will be the fields of the table. This table will give a breakdown of everything related to the employees of the organization.

Our fact table or main table will be the transaction table, it will have everything which is related to day-to-day operation. Transaction ID will be the primary key, Client ID is our foreign key, Employees ID, Branch ID, Service ID, and Loan ID are all foreign keys. Date is the date on which the transaction has been done and if any Amount was involved that field will cover it. Transaction Type will tell us whether it was regarding loan or consulting.

Industries Table will give us a breakdown of all the industries the businesses are in. Industry ID is our primary key, Industry Name so that we can know which industry. Description will tell us about the industry.

Branches Table is for all the branches of BDC, it is imperative to note this as every region has its own identity. Branch ID is the primary key for this table, Location, Contact Info are fields of the table.

For the purpose of recording employee client interactions we have Surveys Table where Survey ID is the primary key and Client ID is the foreign key. Date completed and Responses are the fields of table which will give us a review by the client regarding the services of BDC.

**LIST OF FIELDS:**

1. **Client Table**
   -ClientID
   -Business Name
   -Contact Info
   -Industry Type
   -Date Joined

| ClientID | BusinessName | ContactInfo | IndustryType | DateJoined |
|---|---|---|---|---|
| 1 | Acme Corp | contact@acmecorp.com, 555-1234 | Technology | 2023-01-15 |
| 2 | Global Foods | info@globalfoods.com, 555-5678 | Food & Beverage | 2023-02-20 |
| 3 | City Movers | support@citybank.com, 555-9012 | Logistics | 2023-03-10 |
| 4 | Green Energy Co | hello@greenenergy.com, 555-3456 | Energy | 2023-04-05 |

2. **Loan Table**
   -Loan ID
   -Loan Amount
   -Interest Rate
   -Term
   -Status
   -ClientID

| LoanID | ClientID | LoanAmount | InterestRate | Term | Status | Application... | ApprovalD... |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 100000.00 | 5.25 | 60 | Approved | 2023-05-01 | 2023-05-15 |
| 2 | 2 | 250000.00 | 4.75 | 120 | In Progress | 2023-06-10 | NULL |
| 3 | 3 | 500000.00 | 4.50 | 180 | Approved | 2023-07-05 | 2023-07-20 |
| 4 | 4 | 75000.00 | 5.50 | 36 | Rejected | 2023-08-15 | 2023-08-30 |

3. **Service Table**

- Service ID
- Service Name
-Description
-Cost

| ServiceID | ServiceName | Description | Cost |
|---|---|---|---|
| 1 | Business Loan Consultation | One-on-one consultation to discuss business loan options | 250.00 |
| 2 | Financial Planning | Comprehensive financial planning for businesses | 500.00 |
| 3 | Credit Analysis | In-depth analysis of business credit history | 150.00 |
| 4 | Loan Application Assistance | Help with preparing and submitting loan applications | 300.00 |

4. **Employees Table**

-Employee ID
-Employee Name
-Position
-Department ID
-Hire Date

| EmployeeID | Name | Position | DepartmentID | HireDate |
|---|---|---|---|---|
| 1 | John Doe | Loan Officer | 1 | 2022-03-15 |
| 2 | Jane Smith | Financial Analyst | 2 | 2021-07-01 |
| 3 | Mike Johnson | Customer Service Representative | 3 | 2023-01-10 |
| 4 | Sarah Brown | Branch Manager | 4 | 2020-11-22 |

5. **Transaction Table**

- Transaction ID
-Client ID
-Employees ID
-Branch ID
-Service ID
-Loan ID
-Date
-Amoun

-Transaction Type

6. **Industries Table**

-Industry ID

-Industry Name

-Description

| IndustryID | IndustryName | Description |
|---|---|---|
| 1 | Technology | Companies involved in research, development, and distribu… |
| 2 | Food & Beverage | Businesses that process, package, and distribute edible g… |
| 3 | Logistics | Organizations that deal with supply chains and logistics |
| 4 | Energy | Companies involved in production and supply of energy, in… |

7. **Branches Table**

-Branch ID

-Location

-Contact Info

-Manager ID

| BranchID | Location | ContactInfo | ManagerID |
|---|---|---|---|
| 1 | 123 Main St, Cityville, State 12345 | Phone: 555-1234, Email: cityville@bank.com | 4 |
| 2 | 456 Oak Ave, Townsburg, State 67890 | Phone: 555-5678, Email: townsburg@bank.com | 1 |
| 3 | 789 Pine Rd, Villageton, State 13579 | Phone: 555-9012, Email: villageton@bank.com | 2 |
| 4 | 101 Elm Blvd, Hamletville, State 24680 | Phone: 555-3456, Email: hamletville@bank.com | 3 |

8. **Survey Table**

-Survey ID

-Client ID

-Date completed

-Responses

| SurveyID | ClientID | DateCompleted | Responses |
|---|---|---|---|
| 1 | 1 | 2023-09-15 | {"satisfaction": 5, "recommend": true, "comments": "Great service!"} |
| 2 | 2 | 2023-09-16 | {"satisfaction": 4, "recommend": true, "comments": "Good experience overall."} |
| 3 | 3 | 2023-09-17 | {"satisfaction": 3, "recommend": false, "comments": "Service was okay, could be improved."} |
| 4 | 4 | 2023-09-18 | {"satisfaction": 5, "recommend": true, "comments": "Excellent support and products!"} |

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## IMPORTANCE OF DATABASE DESIGN:

### Why database design is important?

Database design is crucial for several reasons:

1. **Efficiency**: A well-designed database ensures that data is stored in an organized manner, making it easier and faster to retrieve and manipulate information.

2. **Data Integrity**: Proper design enforces rules and constraints, helping to maintain accuracy and consistency of data throughout its lifecycle.

3. **Scalability**: Good design anticipates future growth. It allows the database to expand and adapt to increasing amounts of data and user demands without significant rework.

4. **User Experience**: A thoughtfully structured database can enhance the user experience by providing relevant data quickly and intuitively.

5. **Reduced Redundancy**: Effective design minimizes data duplication, which saves storage space and reduces the likelihood of discrepancies.

6. **Security**: A strong database design incorporates security measures that protect sensitive information from unauthorized access.

7. **Maintenance**: Well-structured databases are easier to maintain, update, and optimize, which can lead to lower long-term costs.

8. **Performance**: Efficient design can significantly improve the performance of queries and transactions, which is vital for user satisfaction.

9. **Compliance**: Proper design helps ensure that the database adheres to legal and regulatory requirements regarding data storage and management.

Overall, investing time and resources in database design pays off by creating a robust foundation for data management that can support an organization's goals effectively.

**RELATIONS OF TABLES :**

**HOW TABLES ARE RELATED TO EACH OTHER?**

There are mainly three ways by which tables can relate with each other:

1. **Client table:**
   Client table have one to many relationship with loan table,transaction table and survey table as a client can take multiple loan, can perform various transaction as well as can provide several surveys.

2. **Service table:**
   Each service is linked to one client, but a client can offer multiple services.

3. **Survey table:**
   Each survey links to one client and one service, but a client can submit surveys for different services.

4. **Industry table:**
   Each industry can have multiple services offered by different clients.
   Clients can be associated with one industry, depending on your design.

5. **Employees table:**
   Each employee belongs to one branch, but a branch can have many employees.
   Employees can handle multiple transactions or serve multiple clients.

6. **Loan table:**
   Each loan is associated with one client, but a client can have multiple loans.

7. **Transaction table:**
   Each transaction is tied to a single client and can be linked to a loan if applicable.
   A transaction may also reference a service if the transaction relates to a service fee.

8. **Branches table:**
   Each branch can have multiple employees.
   A branch may also serve multiple clients through its employees.

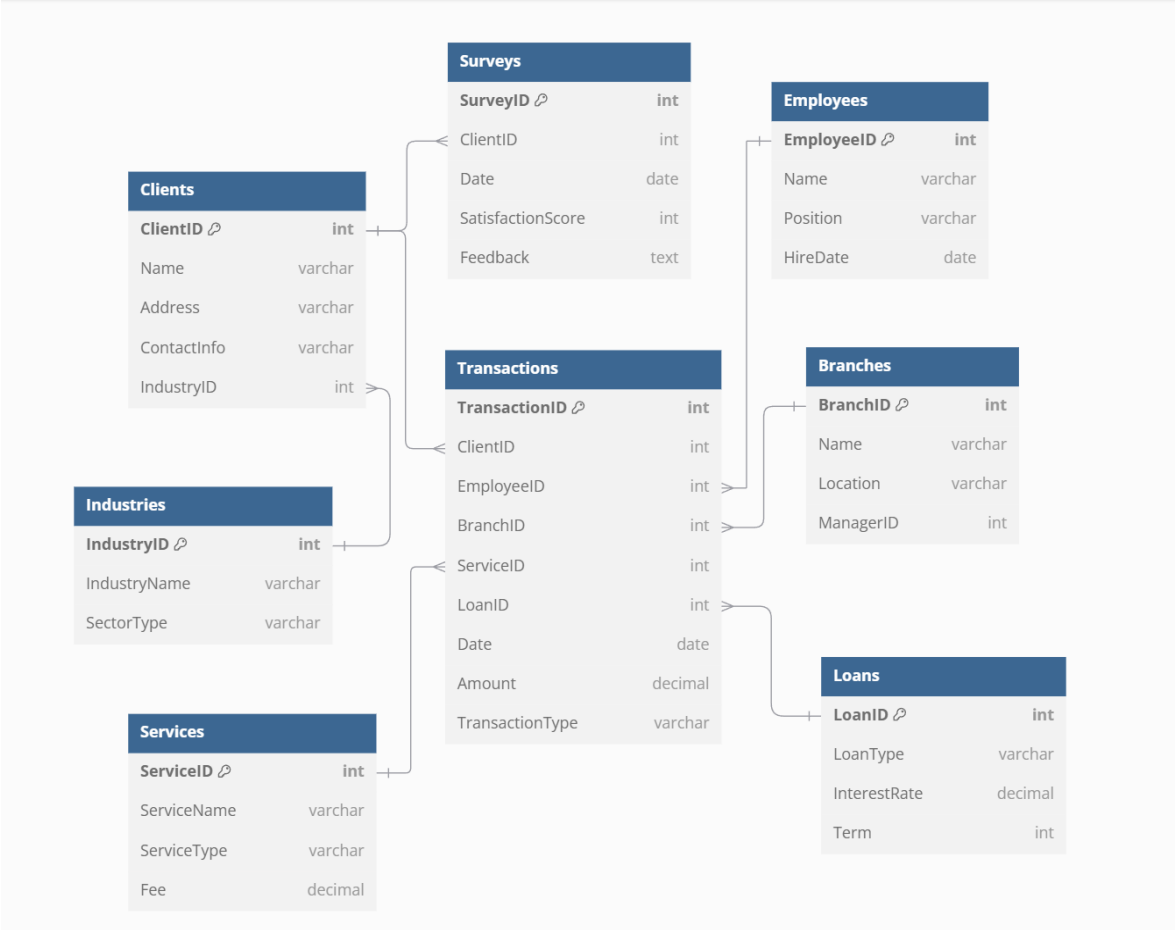
## ENTITY RELATIONSHIP DIAGRAM:

### Description of ER Diagram:

This design allows for efficient querying of transaction data across various dimensions. The Transactions contains the measurable, quantitative data about each transaction, while the dimension tables provide the descriptive attributes that give context to the transactions.

For example, you can easily analyze:

- Transaction volumes by branch or employee
- Loan performance across different industries
- Client satisfaction in relation to services used
- Employee performance in terms of transaction amounts or loan approvals



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## DEVELOPING DATABASE

We created a database,entered a fake data and to run the database we wrote some queries to retrieve certain data.

Here are some queries we ran:

**KEY QUERIES:**

```
SELECT c.client_id, c.client_name, b.branch_name
FROM client c
JOIN branches b ON c.branch_id = b.branch_id;
```

This query retrieves all clients along with the names of the branches they are associated with by joining the client and branches tables on branch_id.

```
SELECT l.loan_id, c.client_name, s.service_name
 FROM loan l JOIN client c
 ON l.client_id = c.client_id
JOIN transaction t
ON l.loan_id = t.loan_id
JOIN service s ON t.service_id = s.service_id
WHERE s.service_name = '[Specific Service]';
```

This query lists all loans taken by clients who have used a specific service, joining the loan, client, transaction, and service tables.

```
SELECT e.employee_id, e.employee_name,
 COUNT(t.transaction_id)
 AS total_transactions
 FROM employees e
 LEFT JOIN transaction t
```

**ON e.employee_id = t.employee_id**

**GROUP BY e.employee_id, e.employee_name;**

This query counts the total number of transactions handled by each employee, using a left join between the employees and transaction tables.

**SELECT s.service_name,**

**SUM(t.amount)**

**AS total_revenue**

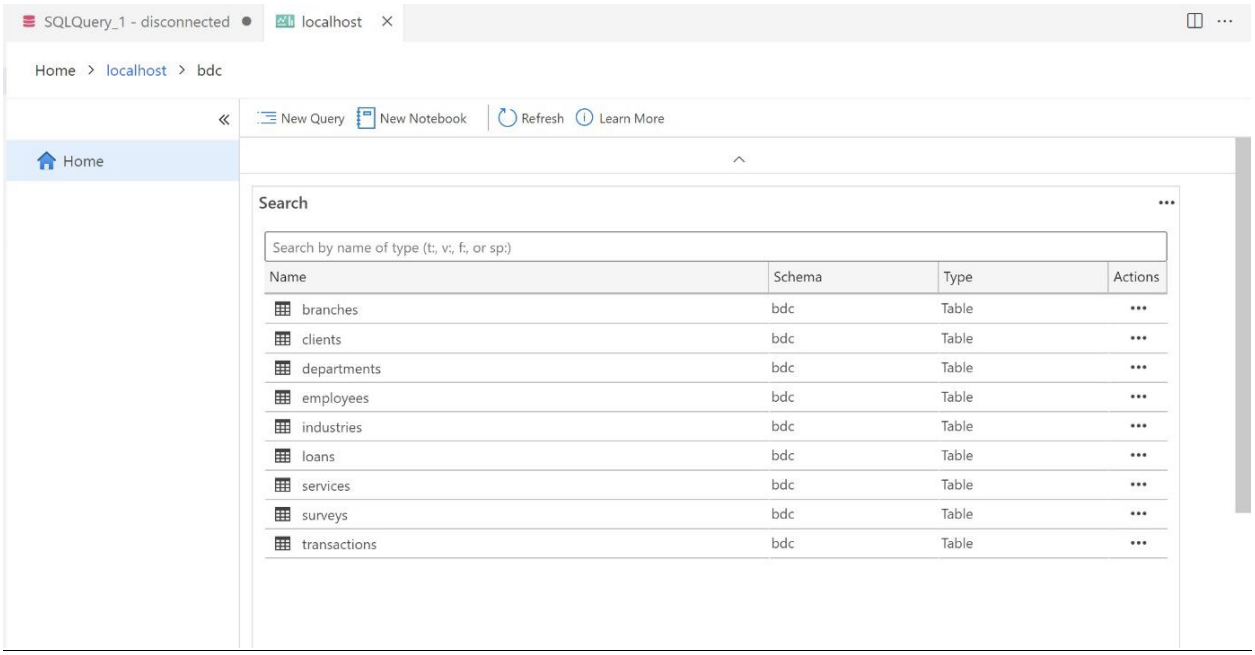
**FROM service s**

**JOIN transaction t**

**ON s.service_id = t.service_id**

**GROUP BY s.service_name;**

This query calculates the total revenue generated from each service by joining the service and transaction tables.



```sql
CREATE TABLE Loans (
LoanID INT PRIMARY KEY AUTO_INCREMENT,
ClientID INT,
LoanAmount DECIMAL(15, 2) NOT NULL,
InterestRate DECIMAL(5, 2) NOT NULL,
Term INT NOT NULL,
Status ENUM('Approved', 'Rejected', 'Paid Off', 'In Progress', 'Default') NOT NULL,
ApplicationDate DATE NOT NULL,
ApprovalDate DATE,
FOREIGN KEY (ClientID) REFERENCES Clients(ClientID)
);
```

| LoanID | ClientID | LoanAmount | InterestRate | Term | Status | Application... | ApprovalD... |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 100000.00 | 5.25 | 60 | Approved | 2023-05-01 | 2023-05-15 |
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## CONCLUSION

A well-structured bank database is vital for the efficient management of financial operations, client relationships, and regulatory compliance. By integrating various tables such as client, loan, service, employees, transaction, survey, branches, and industries the database provides a comprehensive view of all interactions and transactions.

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## APPENDIX

**SELECT * FROM client;**

This query selects all columns from the client table, providing a complete list of clients.

**SELECT c.client_name, l.amount**

**AS loan_amount, l.interest_rate**

**FROM loan l**

**JOIN client c**

**ON l.client_id = c.client_id**

**WHERE l.interest_rate > 5.0;**

This query retrieves clients who have taken out loans with an interest rate greater than a specified value (in this case, 5.0%). It filters results using the WHERE clause.

**SELECT e.employee_name, b.branch_name**

**FROM employees e J**

**OIN branches b**

**ON e.branch_id = b.branch_id;**

This query lists all employees alongside the branches they work in, joining the employees and branches tables to obtain the relevant information.

**SELECT c.client_name,**

**MAX(t.transaction_date)**

**AS last_transaction_date**

**FROM client c**

**LEFT JOIN transaction t**

**ON c.client_id = t.client_id**

**GROUP BY c.client_name;**

This query retrieves clients along with the date of their last transaction. It uses MAX() to get the most recent transaction date and LEFT JOIN to include clients with no transactions.