

**SIMATS SCHOOL OF ENGINEERING**

**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES**

**CHENNAI-602105**

**BANK MANAGEMENT SYSTEM**

**A CAPSTONE PROJECT REPORT**

*Submitted in the partial fulfillment for the award of the degree of*

**BACHELOR OF ENGINEERING**

**IN**

**INFORMATION TECHNOLOGY**

**Submitted by**

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**DECLARATION**

We, **S. Shashavali , T. Teja**, students of **Bachelor of Engineering in Information Technology**, Department of Computer Science and Engineering, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, hereby declare that the work presented in this Capstone Project Work entitled **Bank Management System** is the outcome of our own bonafide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics.

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Place:

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**ABSTRACT**

developed to optimize banking operations and enhance customer interactions. This system automates core banking processes, including account creation, deposit and withdrawal transactions, fund transfers, balance inquiries, and account maintenance. It offers a secure and efficient platform for managing customer accounts while reducing manual workload and operational errors.

For administrators, the system provides tools for monitoring account activities, generating financial reports, managing customer information, and ensuring compliance with regulatory standards. Utilizing object-oriented programming principles, the system is designed to be modular, scalable, and easy to maintain, making it adaptable to various banking environments, from small credit unions to large financial institutions.

Data security and persistence are ensured through robust file-handling techniques or database integration, protecting sensitive customer and transaction data. Features such as role-based access control distinguish user functionalities for customers, tellers, and administrators, thereby enhancing operational security. Real-time processing of transactions and updates ensures the system's responsiveness and reliability.

The system incorporates advanced functionalities, including loan management, interest calculation, and account statement generation. Comprehensive error handling and input validation mechanisms are embedded to ensure smooth operation and minimize disruptions. Designed to support both standalone and networked deployments, the system offers cross-platform compatibility, catering to diverse banking needs.

By automating routine banking tasks, providing real-time analytics, and ensuring secure transactions, the Bank Management System in C++ delivers a modern solution for efficient financial management. It empowers banks to improve customer satisfaction and operational efficiency while maintaining the integrity of financial data and adhering to industry best practices.

**INTRODUCTION**

The Bank Management System in C++ is a sophisticated software application designed to streamline banking operations and provide customers with a seamless banking experience. The system enables customers to perform essential banking activities such as account creation, deposits, withdrawals, fund transfers, and balance inquiries, all through an intuitive and user-friendly interface.

For banking staff and administrators, the system offers robust tools for managing customer accounts, tracking transactions, generating financial reports, and monitoring overall operations. By automating routine tasks and providing advanced features, the system significantly reduces manual effort, minimizes errors, and optimizes efficiency.

Key features of the Bank Management System include:

1. Account Management: Enables the creation, updating, and deletion of customer accounts, ensuring efficient recordkeeping.
2. Transaction Processing: Facilitates real-time deposits, withdrawals, and fund transfers, ensuring secure and accurate transaction handling.
3. Loan and Interest Management: Supports the processing of loans, calculation of interest, and tracking of repayments.
4. Secure Data Handling: Employs robust file handling or database integration to protect sensitive customer and financial data.
5. Role-Based Access Control: Differentiates access levels for customers, tellers, and administrators, ensuring secure operations.

The system is built using object-oriented programming principles, ensuring modularity, scalability, and maintainability. Advanced functionalities like real-time updates, error handling, and input validation enhance the system’s reliability and usability. Designed for standalone and networked environments, it offers cross-platform compatibility, making it adaptable to various banking setups.

By integrating these features, the Bank Management System in C++ delivers a modern, efficient, and secure solution that improves customer satisfaction, streamlines administrative tasks, and empowers banks to meet the evolving demands of the financial sector.

**OBJECTIVES**

Streamline Banking Operations: Automate routine tasks such as account creation, transaction processing, and customer data management to reduce manual workload and improve operational efficiency.

Enhance Customer Experience: Provide an intuitive interface that allows customers to perform banking activities such as deposits, withdrawals, and balance inquiries with ease and convenience.

Ensure Data Accuracy and Security: Maintain accurate and up-to-date records of customer accounts and transactions while safeguarding sensitive data through robust encryption and secure access control mechanisms.

Optimize Resource Management: Enable real-time monitoring of transactions and account activities to assist in efficient resource allocation and fraud prevention.

Support Decision-Making: Generate detailed financial reports and analytics to aid administrators and decision-makers in evaluating bank performance and planning future strategies.

Facilitate Scalability: Design the system to accommodate growth, including the addition of new branches, services, or customer accounts, without requiring significant redevelopment.

Provide Flexibility: Offer a customizable solution adaptable to the needs of different financial institutions, ranging from small credit unions to large commercial banks.

Enable Cross-Platform Functionality: Ensure the system operates seamlessly on standalone or networked environments across various platforms like Windows, Linux, and MacOS.

Enhance Reliability: Incorporate robust error handling and input validation mechanisms to minimize system disruptions and maintain stability.

Promote Sustainability: Reduce reliance on paper-based processes by digitizing banking operations, contributing to environmentally sustainable practices.

**Demonstrate the Potential of C++:**

Performance Efficiency: Utilize C++’s high performance for handling complex operations and large-scale transaction processing with minimal latency.

File Handling: Leverage C++’s robust file-handling capabilities to securely store and retrieve customer data, account details, and transaction logs.

Database Integration: Integrate seamlessly with databases like MySQL or PostgreSQL using libraries such as ODBC and MySQL Connector for efficient and dynamic data management.

Flexibility: Utilize C++’s support for procedural and object-oriented programming to implement versatile features tailored to banking requirements.

Error Handling: Employ exception handling mechanisms to manage runtime errors gracefully, ensuring robustness and system reliability.

Extensibility: Design the system using a modular approach to facilitate the easy addition of advanced features like loan management, online banking, and multi-language support.

Cross-Platform Development: Compile the application for various operating systems, ensuring compatibility across diverse banking environments.

Standard Template Library (STL): Use STL components like vectors, maps, and algorithms to simplify the implementation of essential features such as sorting, searching, and transaction management.

Real-Time Processing: Exploit C++’s computational efficiency to handle real-time updates, such as transaction confirmations and balance updates, ensuring a smooth user experience.

**CASE DESCRIPTION**

The development of a Bank Management System (BMS) in C++ arises from the increasing need to modernize banking operations and provide a seamless customer experience in an era of rapid digital transformation. The system is designed to cater to the unique requirements of both bank administrators and customers, ensuring operational efficiency, security, and user satisfaction.

Bank administrators manage tasks such as account creation, transaction monitoring, and financial reporting, while customers rely on the system for smooth access to banking services such as deposits, withdrawals, and fund transfers. Traditional manual systems often suffer from inefficiencies, delays, and inaccuracies. The transition to a digital banking system aims to address these challenges by delivering an automated, efficient, and secure solution.

The implementation of the Bank Management System in C++ seeks to optimize banking workflows, minimize human errors, and enhance service quality. The system promises significant outcomes, including streamlined processes, improved resource management, robust data security, and enhanced customer satisfaction. By adopting a modern and customer-centric approach, the BMS contributes to the growth and sustainability of financial institutions.

**METHODS**

1. Role-Based Access Control: Separate logins for customers, tellers, and administrators, with password-protected access. Administrators can manage bank operations, while customers can perform transactions securely.
2. Account Management: Administrators can create, update, and delete customer accounts. Customers can view account details and request account modifications.
3. Transaction System: Customers can perform deposits, withdrawals, and fund transfers, with real-time updates ensuring accuracy and reliability.
4. Real-Time Updates: The system ensures real-time transaction processing and balance updates to maintain data integrity and avoid delays.
5. File Handling: Customer data, transaction histories, and account details are securely stored and retrieved using efficient file-handling mechanisms or database integration.
6. Error Handling: Comprehensive error handling ensures smooth operation, preventing disruptions due to invalid inputs or system errors.
7. Report Generation: Administrators can generate detailed reports on account activity, transaction summaries, and overall bank performance for decision-making and compliance purposes.
8. Loan Management: Includes features for processing loan applications, calculating interest, and tracking repayments.

**Modules of Bank Management System:**

* Add Account
* Modify Account
* Delete Account
* Search Account
* Deposit Funds
* Withdraw Funds
* Transfer Funds
* Generate Reports

**PSEUDOCODE**

#include <iostream>

#include <string>

#include <vector>

#include <iomanip>

using namespace std;

struct Transaction {

string type;

double amount;

};

class Account {

private:

string username;

string password;

double balance;

vector<Transaction> transactionHistory;

public:

Account(string uname, string pwd) : username(uname), password(pwd), balance(0.0) {}

bool authenticate(string uname, string pwd) {

return username == uname && password == pwd;

}

void deposit(double amount) {

balance += amount;

Transaction t = {"Deposit", amount};

transactionHistory.push\_back(t);

cout << "\nAmount deposited successfully. New balance: $" << balance << endl;

}

void withdraw(double amount) {

if (amount > balance) {

cout << "\nInsufficient balance!" << endl;

return;

}

balance -= amount;

Transaction t = {"Withdrawal", amount};

transactionHistory.push\_back(t);

cout << "\nAmount withdrawn successfully. New balance: $" << balance << endl;

}

void showTransactionHistory() {

cout << "\nTransaction History:" << endl;

for (size\_t i = 0; i < transactionHistory.size(); ++i) {

cout << transactionHistory[i].type << " - $" << fixed << setprecision(2) << transactionHistory[i].amount << endl;

}

}

double getBalance() const {

return balance;

}

void viewBalance() const {

cout << "\nCurrent Balance: $" << fixed << setprecision(2) << balance << endl;

}

};

class Loan {

private:

double loanAmount;

double interestRate;

bool activeLoan;

public:

Loan() : loanAmount(0), interestRate(5.0), activeLoan(false) {}

void applyForLoan(double amount) {

if (activeLoan) {

cout << "\nYou already have an active loan!" << endl;

return;

}

loanAmount = amount;

activeLoan = true;

cout << "\nLoan approved for $" << loanAmount << " at an interest rate of " << interestRate << "% annually." << endl;

}

void showLoanDetails() {

if (!activeLoan) {

cout << "\nNo active loan." << endl;

return;

}

cout << "\nLoan Amount: $" << loanAmount << endl;

cout << "Interest Rate: " << interestRate << "%" << endl;

}

};

class FixedDeposit {

private:

double fdAmount;

double interestRate;

int tenure;

public:

FixedDeposit() : fdAmount(0), interestRate(7.0), tenure(0) {}

void createFixedDeposit(double amount, int years) {

fdAmount = amount;

tenure = years;

cout << "\nFixed Deposit created for $" << fdAmount << " for " << tenure << " years at " << interestRate << "% interest rate." << endl;

}

void showFDDetails() {

if (fdAmount == 0) {

cout << "\nNo Fixed Deposit found." << endl;

return;

}

cout << "\nFixed Deposit Amount: $" << fdAmount << endl;

cout << "Tenure: " << tenure << " years" << endl;

cout << "Interest Rate: " << interestRate << "%" << endl;

}

};

// Main function

int main() {

vector<Account> accounts;

Loan loanSystem;

FixedDeposit fdSystem;

int choice;

string username, password;

double amount;

int years;

Account \*loggedInAccount = NULL;

do {

cout << "\n=== Bank Management System ===";

cout << "\n1. Create Account";

cout << "\n2. Login";

cout << "\n3. Deposit";

cout << "\n4. Withdraw";

cout << "\n5. View Transaction History";

cout << "\n6. Apply for Loan";

cout << "\n7. View Loan Details";

cout << "\n8. Create Fixed Deposit";

cout << "\n9. View Fixed Deposit Details";

cout << "\n10. View Balance";

cout << "\n11. Logout";

cout << "\n12. Exit";

cout << "\nEnter your choice: ";

cin >> choice;

switch (choice) {

case 1:

cout << "\nEnter username: ";

cin >> username;

cout << "Enter password: ";

cin >> password;

accounts.push\_back(Account(username, password));

cout << "\nAccount created successfully!" << endl;

break;

case 2:

if (loggedInAccount) {

cout << "\nAlready logged in!" << endl;

break;

}

cout << "\nEnter username: ";

cin >> username;

cout << "Enter password: ";

cin >> password;

for (size\_t i = 0; i < accounts.size(); ++i) {

if (accounts[i].authenticate(username, password)) {

loggedInAccount = &accounts[i];

cout << "\nLogin successful!" << endl;

break;

}

}

if (!loggedInAccount) {

cout << "\nInvalid credentials." << endl;

}

break;

case 3:

if (!loggedInAccount) {

cout << "\nPlease login first!" << endl;

break;

}

cout << "\nEnter amount to deposit: $";

cin >> amount;

loggedInAccount->deposit(amount);

break;

case 4:

if (!loggedInAccount) {

cout << "\nPlease login first!" << endl;

break;

}

cout << "\nEnter amount to withdraw: $";

cin >> amount;

loggedInAccount->withdraw(amount);

break;

case 5:

if (!loggedInAccount) {

cout << "\nPlease login first!" << endl;

break;

}

loggedInAccount->showTransactionHistory();

break;

case 6:

if (!loggedInAccount) {

cout << "\nPlease login first!" << endl;

break;

}

cout << "\nEnter loan amount: $";

cin >> amount;

loanSystem.applyForLoan(amount);

break;

case 7:

loanSystem.showLoanDetails();

break;

case 8:

if (!loggedInAccount) {

cout << "\nPlease login first!" << endl;

break;

}

cout << "\nEnter amount for Fixed Deposit: $";

cin >> amount;

cout << "Enter tenure in years: ";

cin >> years;

fdSystem.createFixedDeposit(amount, years);

break;

case 9:

fdSystem.showFDDetails();

break;

case 10:

if (!loggedInAccount) {

cout << "\nPlease login first!" << endl;

break;

}

loggedInAccount->viewBalance();

break;

case 11:

if (loggedInAccount) {

loggedInAccount = NULL;

cout << "\nLogged out successfully!" << endl;

} else {

cout << "\nYou are not logged in!" << endl;

}

break;

case 12:

cout << "\nThank you for using the Bank Management System!" << endl;

break;

default:

cout << "\nInvalid choice. Please try again." << endl;

}

} while (choice != 12);

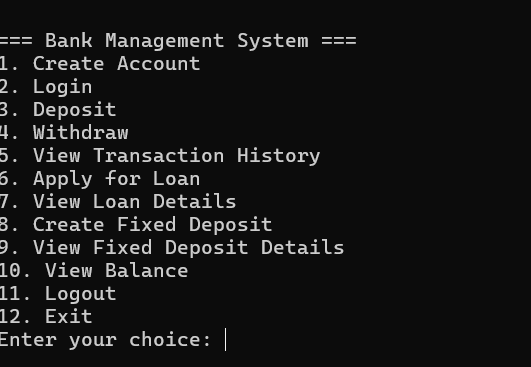
}

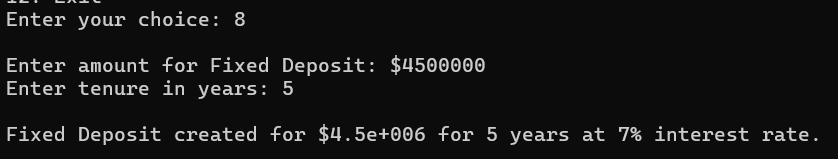
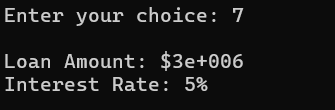
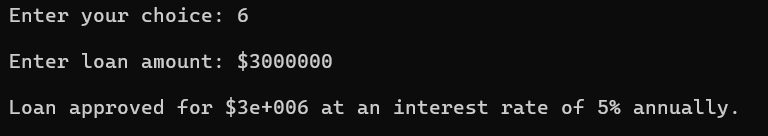
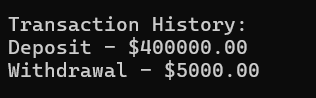
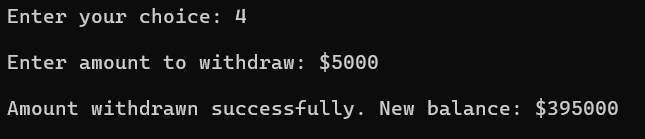
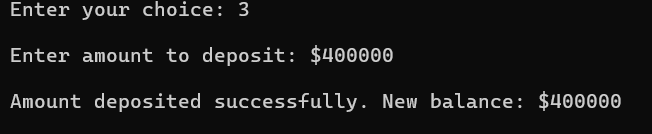
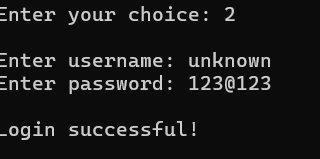
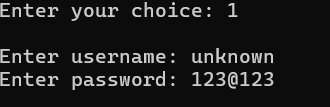
**EXPLANATION**

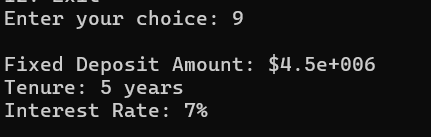
* Account Management: The Account class encapsulates account-specific functionalities, including balance management, transaction handling, and authentication. This ensures that operations related to a customer’s account are neatly organized and accessible through the class interface. For security, a simple authentication mechanism checks credentials before allowing access to account functionalities like deposits, withdrawals, and transaction history.
* Loan Processing: The Loan class manages loan-specific functionalities, such as applying for a loan and displaying loan details. This separation ensures that the core banking operations remain distinct from auxiliary services, maintaining code modularity. The implementation includes basic checks to prevent customers from applying for multiple loans simultaneously.
* Fixed Deposit Management: The FixedDeposit class enables users to create fixed deposits with specified amounts and tenures. It includes functionality to display FD details, providing a clear and concise view of the customer's savings investments.
* Transaction History: Transactions (deposits and withdrawals) are logged using the Transaction structure, which stores details about the transaction type and amount. This log allows users to review their account activity, fostering transparency and accountability.
* Persistent Storage: While the current implementation uses in-memory storage (e.g., vectors) for accounts, it can be extended to use file handling or database integration for persistent storage. This would ensure data continuity across sessions, as demonstrated in other financial software systems.
* User Interaction: The main program employs control structures (loops and conditionals) to handle user interactions, such as login/logout, account operations, and administrative tasks. Input validation and simple error-handling mechanisms ensure the system remains reliable even when incorrect or invalid inputs are provided.
* Extensibility and Scalability: OOP allows the BMS to be easily extended. For instance, new features such as credit card management or advanced reporting tools can be added without modifying existing functionalities. Cross-platform compatibility can be achieved by compiling the code for different operating systems.

In conclusion the application of object-oriented design principles and structured programming techniques enabled the development of a fully functional Bank Management System that meets the core requirements of banking operations. While certain limitations exist, such as reliance on a basic interface and runtime data storage, the system lays a solid foundation for future enhancements. It demonstrates the flexibility and power of C++ in building modular, scalable, and user-friendly financial software.

**RESULT**







**DISCUSSION**

The Bank Management System (BMS) successfully addresses core banking operations such as account management, transactions, loan processing, and fixed deposits. By providing users with functionalities like balance inquiries, transaction history, and loan management, the system ensures streamlined operations and customer satisfaction. The modular design facilitates easy management of distinct features while maintaining data security through authentication mechanisms. During development, challenges such as error handling, secure transaction storage, and multi-user support were encountered and effectively resolved. However, limitations such as the reliance on a console-based interface, absence of real-time notifications, and lack of advanced analytics remain. The system's architecture, built on object-oriented principles, ensures flexibility and scalability for future enhancements. To improve usability and competitiveness, future upgrades could include GUI development, database integration for persistent data storage, and role-based access for administrators and customers. Despite its limitations, the BMS meets its primary goals by providing a reliable and efficient platform for core banking operations.

**Future Scope:**

The future scope of the Bank Management System focuses on enhancing functionality and user experience. Key improvements include expanding multilingual support, developing a mobile app for on-the-go banking, and integrating AI features like personalized financial advice and fraud detection. Advanced analytics tools will provide insights for better decision-making, while third-party platform integration will offer more transaction options. Chatbots and voice assistants will improve customer support, and blockchain technology will enhance transaction security. Sustainability features and offline functionality will cater to environmentally conscious users and those with limited connectivity. These advancements will ensure the system remains innovative, secure, and competitive.

**CONCLUSION**

The Bank Management System provides a foundational framework for essential banking operations, including account management, transaction handling, and loan processing. The use of object-oriented programming principles ensures modularity, maintainability, and scalability. While challenges such as error handling and secure storage were addressed, limitations like the console-based interface and lack of advanced features highlight areas for future improvements. Incorporating GUI, database support, and advanced analytics tools will enhance usability and functionality. Furthermore, AI integration, mobile app development, and blockchain technology will ensure the system remains competitive in the evolving financial services landscape. Overall, the BMS demonstrates the potential of C++ in developing efficient and scalable banking solutions while laying the groundwork for future innovation.

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