STOCKX(STOCK EXCHANGE)

Group No -4

Group Id - 402

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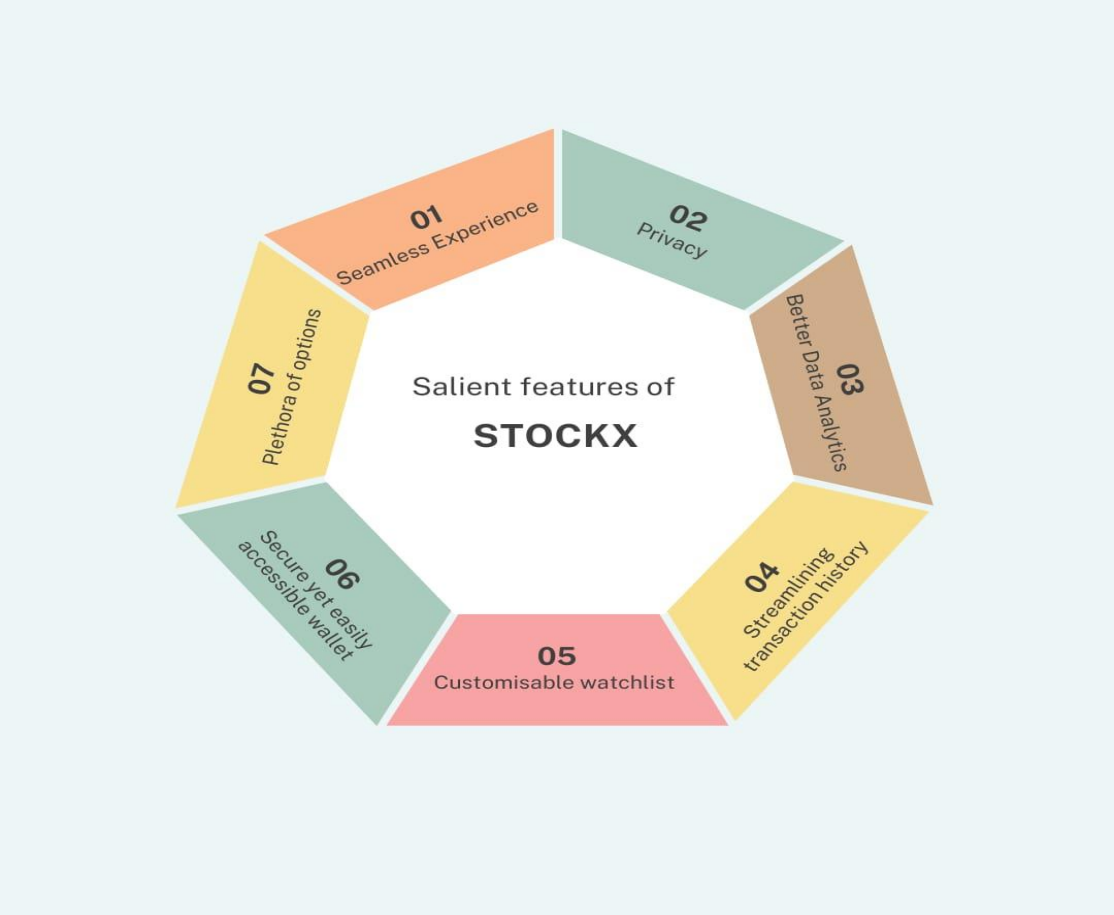
Objective

We are developing a Stock exchange-based database which will help millions of users in trading stocks and investing in new IPO's and Mutual funds (Sahi Hai). Through our database they will have seamless experience in scanning our database for potential "getting rich" techniques. This database is also very useful for government agencies to get relevant information like what is FDI and investment from different regions and other useful information.

Reason behind picking this project

We are pretty passionate about free markets and we believe that everyone should get a equal access to the best and the fastest database in this field. There are currently many stock exchanges in the world and we would like to provide our customers with great privacy and make more people invest in the stock market and together we will grow the economy.



Description

System

- The system will allow customers to create an account with our exchange by providing it's DEMAT account no., and a verified PAN No.. We also have a dedicated wallet to store your balance and a good transaction management system.

- We have created a portfolio specific to a certain user so he can track his investments telling him the current stock price and the price at which he brought and also tells him his current profit/loss so that he makes a sound decision regarding his investment. Each customer has a unique ID for his account as well his wallet.

- Each customer also has a dedicated watchlist tabs in which he can keep his favourite stocks and track their movements every day.

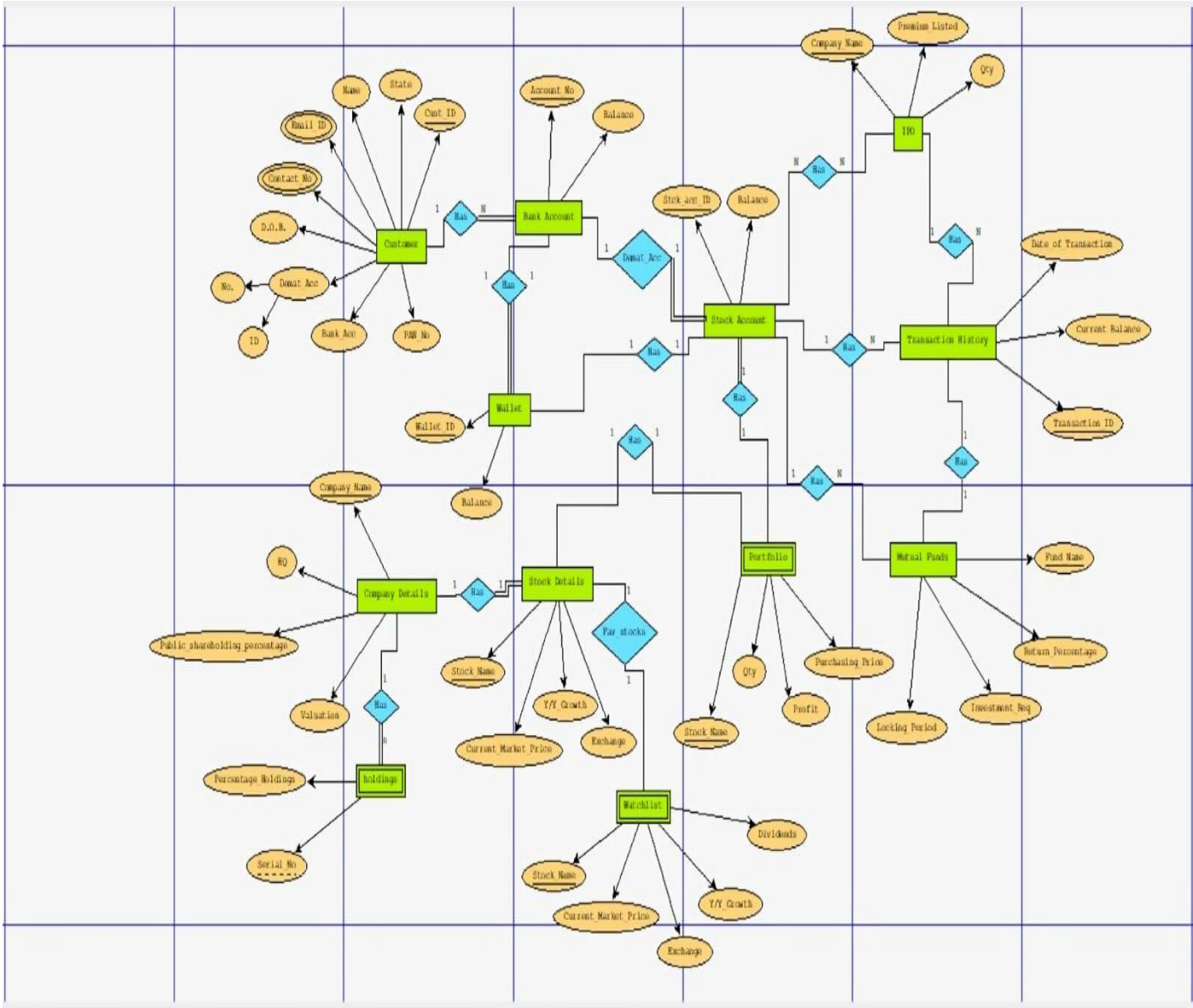
- We also provide the customer with his transaction history so that we have transparency in our system and all the customers know about the transactions they make.

- We provide a plethora of options to our user like they can trade equities, or invest in the new IPO's or can purchase a stake in mutual fund all while maintaining and storing all your data transparently and securely.

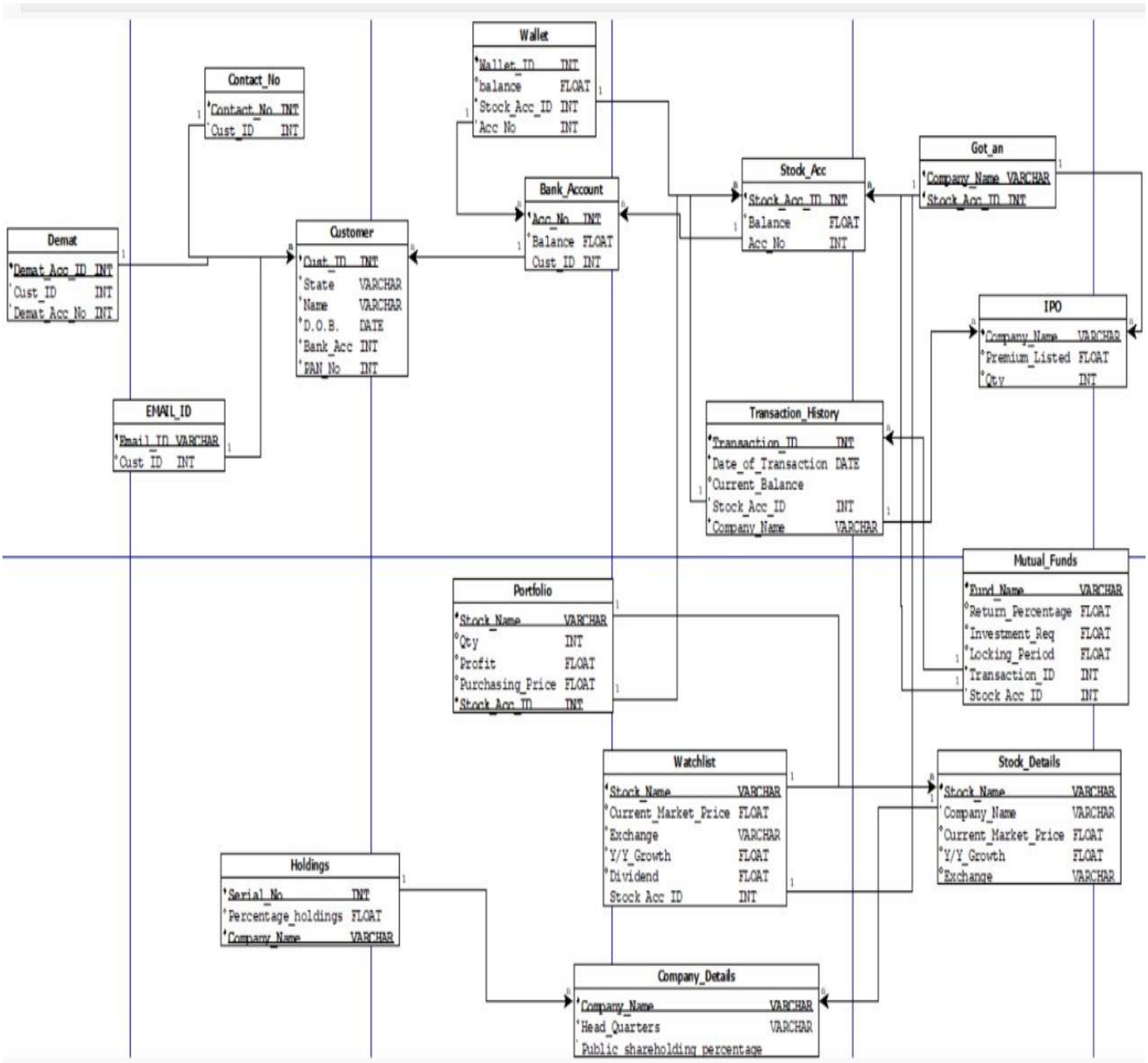
- Our database also provides the customers with all the details regarding the company's shareholding pattern and also where are the headquarters of the company located to gain extra information about the company and also some metrics related to company so you can make a sound decision to invest in that particular stock.

- We also have a mutual funds section where you can surf through options and choosing the right one before investing.

ER Diagram:



Relational Diagram:



Tables:

Customer

The service provider first needs to create a new customer entry which will consist information about customer such as their name, DOB, email ID, Address, contact number, PAN ID, Demat account and creating customer will generate a unique Cust_ID(Customer ID).

Bank

A bank account is connected to the to the customer account which contains information about bank account number and available balance.

Stock Account

The service provider creates a stock account for the customer which tracks all

the activity carried out by the customer. Creating a stock account will generate a unique Stock_acc_ID.

Wallet

Following table has information about the available balance in the stock account which will be uniquely identified by wallet_ID.

Transaction History

The interface keeps a systematic track of transaction made by the customer with Transaction_ID being unique and other information such as Date_of_Transaction, Current_Balance.

IPO

The interface provides the customer with latest information on releasing or released IPOs in which Company_Name will be unique and the other datils such as Premium_listed and Qty(quantity).

Mutual Funds

The interface provides the customer with options of mutual funds with Fund_Name being unique along with other information such as Return_Percentage, Investment_Req, Locking_period.

Stock Details

This table contains the information about the stocks listed on exchanges with Stock_Name being unique and other details such as Company_Name, Exchange, Current_Market_Price and Y/Y_Growth(year on year growth).

Watchlist

This table contains the details about the stocks the customer has viewed or wants to include in his portfolio with Stock_Name, Current_Market_Price, Exchange, Y/Y_Growth (year on year growth), Dividend as relevant details.

Portfolio

The interface provides the customer with the details of stocks the customer has invested in with information such Stock_Name ,Qty(quantity), Profits, Purchasing_Price.

Company Details

This table contains the information of the company whose stocks and mutual funds are listed on the interface.

Holdings

This table contains details about the shareholders of a company along with their name and percentage share.

Minimal FD and BCNF Forms:

Minimal FD:

A minimal cover of a set of functional dependencies (FD) α is a minimal set of dependencies F that is equivalent to β.

The formal definition is: A set of FD α to be minimal if it satisfies the following conditions −

- Every dependency in α has a single attribute for its right-hand side.
- We cannot replace any dependency X->A in α with a dependency Y->A, where Y is a proper subset of X, and still have a set of dependencies that is equivalent to α.
- We cannot remove any dependency from α and still have a set of dependencies that are equivalent to α.

By calculating the functional dependencies for various attributes of our database, by observing we found out that normally the minimal FD are those which are having FD : α→β, where α is the key of the set.

BCNF (Boyce-Codd normal form):

Boyce-Codd normal form (BCNF) is a normal form used in database normalization. It is a slightly stronger version of the third normal form (3NF). BCNF was developed in 1974 by Raymond F. Boyce and Edgar F. Codd to address certain types of anomalies not dealt with by 3NF as originally defined. BCNF is like a subset of 3 NF which is indeed a subset of 2 NF.
FD : $\alpha \rightarrow \beta$ where α is a determinant and β is dependent.
A relation is in BCNF if every determinant α is a candidate key. A determinant is any attribute whose value determines other values within a row. A candidate key is a minimal set of attributes that can uniquely identify each tuple in a relation.

1) Customer

R(Customer ID, State, Date of Birth, Bank Account No., PAN No.)

Keys: Cust_ID,
Bank_Acc_No.,
PAN_No.

Minimal FD: Cust_ID ⟶ State Cust_ID ⟶ Name Cust_ID ⟶ DOB Cust_ID ⟶ Bank_Acc_No. Cust_ID ⟶ PAN_No. Bank_Acc_No. ⟶ PAN_No.
(Cust_ID Bank_Acc_No.)$^+$ = R(**Cust_ID, State, DOB, Bank_Acc_No., PAN_No.**) Hence, Cust_ID BanK_Acc_No. is the key
BCNF Proof: For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

2) Bank Account

R(Bank_Acc_No., Balance)

Keys: Bank_Acc_No.

Minimal FD: Bank_Acc_No. → Balance
(Bank_Acc_No.)$^+$ = R(Bank_Acc_No.,Balance) Hence Bank_Acc_No. is the key
BCNF Proof: For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

3) Stock Account

R(Stock_Acc_ID, Balance)

Keys: Stock_Acc_ID

Minimal FD: Stock_Acc_ID → Balance
{ Stock_Acc_ID }$^+$ = R(Stock_Acc_ID, Balance) Hence { Stock_Acc_ID } is the key
BCNF Proof: For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

4) Wallet

R(Wallet ID, Balance)

Keys: Wallet_ID

Minimal FD: Wallet_ID →Balance
{ Wallet_ID }$^{+}$ = R(Wallet_ID, Balance) Hence { Wallet_ID} is the key
BCNF Proof: For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

5) IPO

R(Company_Name,
Premium_Listed , Qty)

Keys: Company_Name

Minimal FD: Company_Name → Premium_Listed Company_Name → Qty
{Company_Name}$^{+}$ = R(Company_Name, Premium_Listed, Qty) Hence {Company_Name} is the key
BCNF Proof: For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

6) Transaction History

R(Transaction_ID, Current_Balance ,Date_Of_Transaction)

Keys: Transaction ID

Minimal FD: Transaction_ID ⟶ Current_Balance Transaction_ID ⟶ Date_of_Transaction
$(Transaction\_ID)^+$ = R(Transaction_ID, Current_Balance, Date_of_Transaction) Hence Transaction_ID is the key.
BCNF Proof: For every minimal FD dependency listed above α is the candidate key, hence the relation is in BCNF.

7) Mutual Funds

R(Fund_Name, Return_Percentage, Investment_Req)

Keys: Fund_Name

Minimal FD: Fund_Name⟶ Return_Percentage Fund_Name ⟶ Investment_Req
$(Fund\_Name)^+$ = R(Fund_Name, Return_Percentage ,Investment_Req) Hence Fund_Name is the key
BCNF Proof: For every minimal FD dependency listed above α is the candidate key, hence the relation is in BCNF.

8) Stock Details

R(Stock_Name, Current_Market_Price, Y/Y Growth, Exchange)

Keys: Stock_Name

Minimal FD:
Stock_Name Exchange⟶
Current_Market_Price
Stock_Name Exchange ⟶
Y/Y_Growth

{Stock_Name, Exchange }$^{+}$ = R(Stock_Name, Exchange, Current_Market_Price, Y/Y_Growth)

Hence {Stock_Name, Exchange} is the key

BCNF Proof:

For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

9) Company Details

R(Company_Name, HQ, Public_Share_Holding_Percentage, valuation)

Keys: Company_name

Minimal FD:

(Company_Name)(Public_Share
_Holding
_Percentage)(Valuation)⟶ HQ

{(Company_Name)(Public_Share_Holding_Percentage)(Valuation) }$^{+}$ =R(Company _Name, Public_Shareholding_Percentage, Valuation, HQ)

Hence {(Company_Name)(Public_Shareholding_Percentage)(Valuation) } is the key

BCNF Proof:

For every minimal FD dependencies listed above α is the candidate key, hence the relation is in BCNF.

Some BCNF Decomposition

- We had demat account and its detail in the customer table initially but then we found out that it was a multi value attribute and hence would not satisfy the BCNF form, thus deciding it to form a separate table having a foreign key relation with the customer table. The same happens with emailID and contactNo.
    - Final Table and Minimal FD set of the customer table satisfies the BCNF form as it has one primary key.
- We also had holdings first incorporated into the company details but while doing the decomposition we got a fault in first normal form, where the same public percentage shareholding can be available for different available companies, so we had to decompose the table and make another holding table and another original table for company details. Therefore finally we have two tables coming from the original table.
    - Company Details is now in BCNF form and it has the minimal FD set as {Company_Name)(Public_Share _Holding_Percentage)(Valuation)→ HQ}

DDL Scripts:

Attached in zip

Data Insertion scripts:

Attached in zip

SQL Queries:

Attached in zip