**Problem analysis**

The accompanying Entity relationship diagram and report is a solution for the problem posed for a banking system that requires staff, customers a bank and accounts. To best answer the brief, I decided to implement this database with all the required information and only added necessary attributes or relationships to simplify development and negate any problems that are initially presented. This approach allows the specification to be adjusted at a future date if additional requirements or constraints are imposed.

**Entities**

Below is a list of and brief description of the Entities used in the Entity-Relationship diagram I have developed.

Branch - location of bank. Hires employees, has customers

Employee -Works at a branch. Can also be a personal banker for several customers or a bank manager for a single branch. Personal bankers can also hold accounts and give credit limits to customers.

Customer - owns at least one account with a bank independently or as a joint holder. Has one personal banker. Performs account operations as an existing customer on accounts.

Transaction - operations on accounts are transaction entities. Existing customers can withdraw, deposit, transfer or close. Existing customers can view, withdraw, deposit their own account or transfer to another. Bank managers can perform these operations for the customer and close an account

**Entities with attributes**

Following on from the description of the entitles is a minimum list of attributes each entity will contain, as well as an explanation on what data will be held.

Branch

branchNumber - {PK} id number of branch

address - location of branch

manager - employee who is the bank’s manger

Employee

employeeID {PK} - id number of employee

name - full name of staff

branch - bank employee works at

contactDetails - phone number and email address

PersonalBanker {optional, OR} (inherits from employee)

personalBankerFor - list of customers this personal banker employee works for

BankManager (inherits from employee)

banksManaged - branch this employee is responsible for

Customer

customerID {PK} - unique id of customer

name - customers full name

localBranch - the main branch this customer uses

personalBanker - the employee who is responsible for the customer

accountDetails - transaction details, credit limits and other useful information for account

address - home address of customer

contactDetails - phone number and email address

account

type {PPK} - account can be mortgage accounts, savings accounts, current accounts and credit card accounts

owner {PPK} - customer who owns the account

interestRate - rate of interest to be applied to account

balance - current amount of funds in account

fee - monthly cost of account

personalBanker - staff member who manages account

JointAccount (inherits from account)

JointCustomer - additional customer(s) for account

MortgageAccount (inherits from account)

property - address of mortgage is for

transaction

transactionID {PK} - id given to each individual transaction

dateAndTime - date and local time of transaction

customer - customer(s) who requested transaction

account - account(s) which transaction should be applied to

transaction type - which type of transaction is to be conducted on each account

Transfer (inherits from transaction)

accounToTransferTo - account to be credited

**Entity and relationship requirements and implementation analysis**

This section of my report contains a more detailed explanation of the entities and how they relate to each other as well as mentioning sensible constraints where useful.

Branch

The physical branch contains three attributes.

A branch has at least one customer and an undefined upper-bound of customers.

A branch employees at least one employee and as many employees as wanted.

Employee

Has four attributes. An employee can also be a personal banker or a manager. An employee can only work for one branch. A personal banker manages between one and many customers and can assign each customer the manage a credit limit. A personal banker can also make transactions on accounts or place an account on hold to provide the best service.

Customer

A customer is either new or existing and has seven attributes. A customer can register for an account at any branch and have an account opened by a personal banker. Each customer is assigned one personal banker.

Existing customers can change their own address, view their own account and make withdrawals or deposits on any account they own wholly or jointly. Existing customers can also transfer funds to other accounts, have credit limits imposed by their personal banker. Account details are stored in customer records indicating which accounts the customer owns, funds on each, credit limits, transaction history and other notes as needed.

Account

Accounts are uniquely identified by they type of account and the customer id of the account. Accounts contain six attributes and there are two types of accounts that inherit from and add attributes two account. A customer can choose whether or not to have additional accounts or other customers on the same account.

A joint account contains a list of the additional customers (at least one) while a mortgage account contains details of the property the mortgage is for. Accounts can be placed on hold by a personal banker and have transactions performed on them by either customers or personal bankers.

Transaction

Transactions have five attributes and are either a withdraw, deposit, transfer or delete. All transactions are either recursively done on an account or performed by the customers personal banker. A transfer inherits from transaction and adds the attribute containing the unique details of the account to be transferred to.

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