P3(Final)

P3 Final ERD(Logical model)

Changes to initial ERD:

- **Suggested changes:**

  From the suggestions for P2, we have removed the relationship between transaction and customer entities.

- **Removing redundant relationships**

We left out the relationship between mobile banking and accounts in our ER diagram because it's unnecessary. Since customers are connected to accounts, and accounts are tied to banking, having a direct link between mobile banking and accounts would be redundant.

- **Generalization**

Earlier, we had a separate entity for mobile banking. Now, we've introduced online banking as another entity. By combining them through a process called generalization, we created a more general "banking" entity. This new entity includes things like BankingID, CustomerID, RegistrationDate, and LastAccessedDate.

- **Specialization**

Previously, transactions were linked to Mobile Banking, ATM, and Branch. Now, we've made it clearer by creating specific types of transactions. So, we have Online Transaction, Mobile Transaction, ATM Transaction, and Branch Transaction as separate entities.

We decided to add ATM alerts to notify when ATMs are running low on money. To make this happen, we introduced a "Balance" attribute to the ATM entity, keeping track of the current money in the ATM. If the balance drops below a certain limit, it triggers alerts. We then split alerts into two types: Customer Alerts and ATM Alerts. Customer Alerts are triggered by transactions, while ATM Alerts are set off by changes in ATM balances.

In a branch, there are several employees, but not all of them are managers. To make things clearer, we introduced a subtype called "manager" from the general "employee" category and manager supervises branch and other employees.

- **Modified relationships after specialization**

Now, the Online Banking initiates Online Transactions, Mobile Banking initiates Mobile Transactions, ATMs initiates ATM Transactions, and Branches initiates Branch Transactions.

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- **Normalization**

Initially,

We used to have the address as a regular attribute in **Customer and Employee**.

Customer →CustomerID, Name,Address,Mobile No,Email

Employee →EmployeeID,Name,Position,BranchID,Address

Now, we've changed it to a composite attribute to organize things better.

Customer →CustomerID,Name,Address(HouseNumber,Street,City,State,County),Mobile No,Email

Employee →EmployeeID,Name,Position,BranchID,Address(Street,City,State,County)

However, this change caused some dependencies, like state, city, and county relying on zip code. To sort this out and follow the rules of the third normal form, we decided to create a separate entity for ZipCode, making sure Customer and Employee data stay organized.

Customer →CustomerID,Name, HouseNumber,Street,Zipcode,Mobile No,Email

Employee →EmployeeID,Name,Position,BranchID,Street,Zipcode

Zipcode →Zipcode,County,State,City

Just like with address in Customer and Employee, we looked at the Location attribute in **Branch and ATM**. We thought it would be better to make it a composite attribute. However, doing that led to dependencies between zipcode, state, city, and county – with everything connected to zip code. To keep things organized and follow the third normal form, we decided to use zipcode entity.

Similarly after normalization Branch and ATM would look like this:

Branch →BranchID,Name,Location,Street,Zipcode,ManagerID

ATM→ATMID,BranchID,Street,Zipcode,Balance

Zipcode →Zipcode,County,State,City

- **Miscellaneous changes**

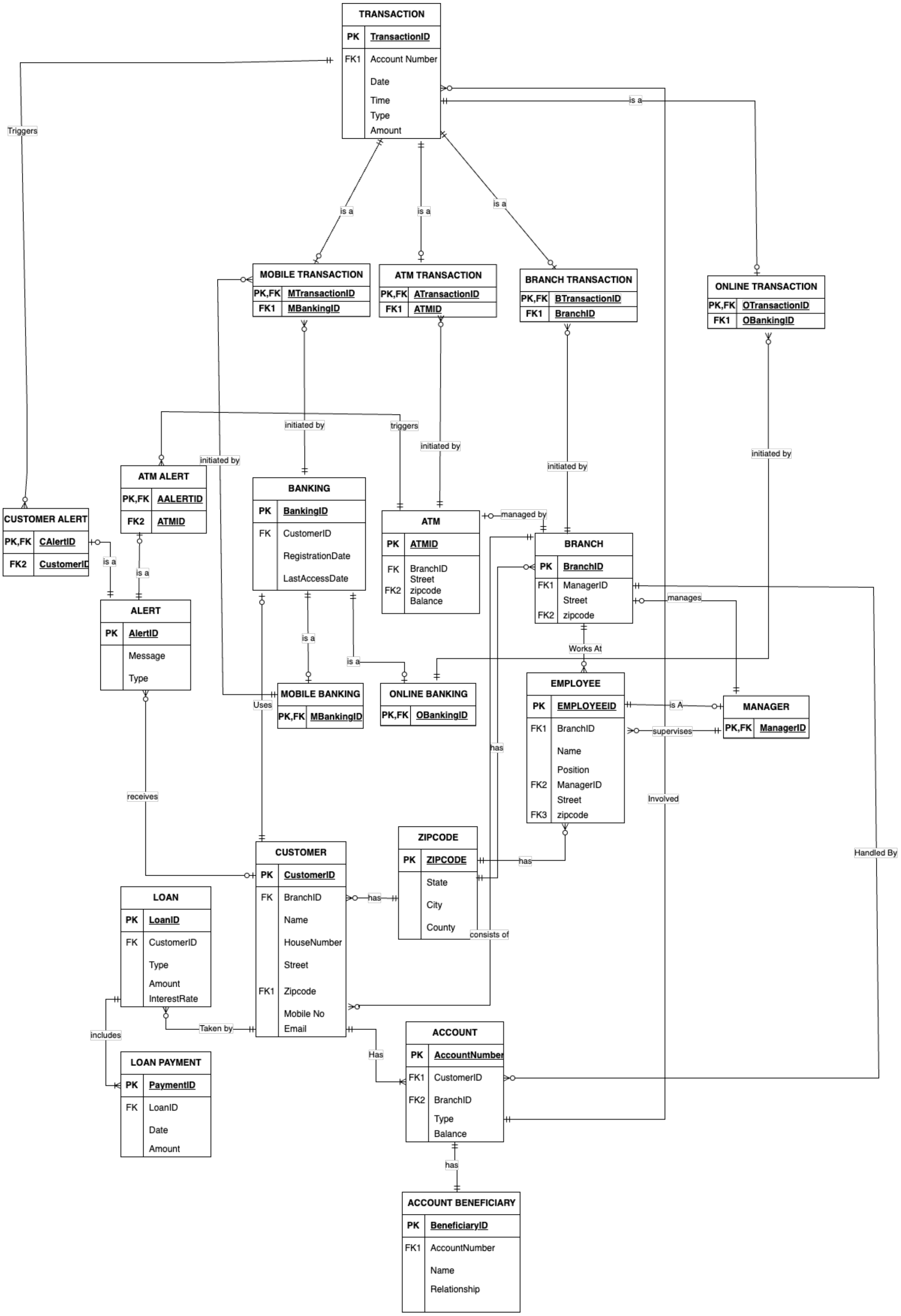
We have also added a new relationship that each ATM will be managed by a bank.

We added address attribute in Employee.

We made ContactInfo of customer as a composite attribute composed of Mobile No and Email.

FINAL ERD BELOW

P3(Final)


TRANSACTION
PK TransactionID
FK1 Account Number
Date
Time
Type
Amount
Triggers
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MOBILE TRANSACTION
PK,FK MTransactionID
FK1 MBankingID
ATM TRANSACTION
PK,FK ATransactionID
FK1 ATMID
BRANCH TRANSACTION
PK,FK BTransactionID
FK1 BranchID
ONLINE TRANSACTION
PK,FK OTransactionID
FK1 OBankingID
initiated by
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FK2 ATMID
CUSTOMER ALERT
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PK BankingID
FK CustomerID
RegistrationDate
LastAccessDate
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FK LoanID
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has
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Name
Relationship