



Republic of the Philippines
University of Southeastern Philippines
Obrero, Davao City
College of Information and Computing



System : Personal Loan Management System
Company/Office : AB Finance Corporation

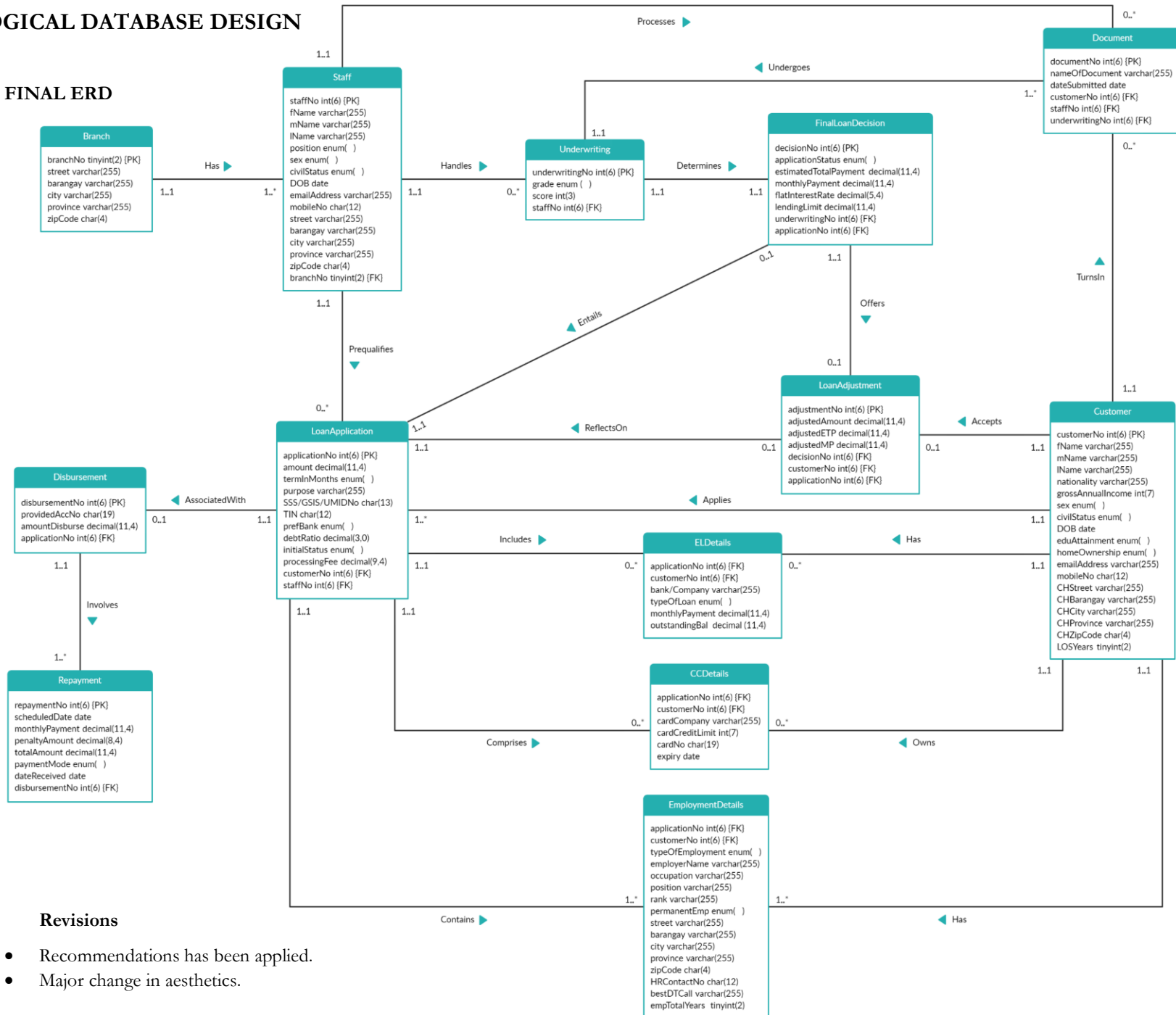
Project Stage : Physical Data Model

Date : December 3, 2020

Subject : CS 213 – Database Management System
Group Name : Team 007
Group Members : Kenith S. Lumantas – 2019-00260
Cyrelle John A. Domingo – 2019-00397 (Team Leader)
Edgardo V. Amigo – 2019-00409

III. LOGICAL DATABASE DESIGN

3.1 FINAL ERD



Revisions

- Recommendations has been applied.
- Major change in aesthetics.

3.2 FINAL DATA DICTIONARY

Branch

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
branchNo	Branch Unique No	Tiny Integer	2	No	Yes	Yes	No	
street	Street	Variable Character		No	No	No	No	
barangay	Barangay	Var Char		No	No	No	No	
city	City	Var Char		No	No	No	No	
province	Province	Var Char		No	No	No	No	
zipCode	Zip Code	Char	4	No	No	No	No	

Staff

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
staffNo	Staff Unique No	int	6	No	Yes	Yes	No	
fName	First Name	var char		No	No	No	No	
mName	Middle Name	var char		Yes	No	No	No	
lName	Last Name	var char		No	No	No	No	
position	Position	enum		No	No	No	No	
sex	Sex	enum		No	No	No	No	
civilStatus	Civil Status	enum		No	No	No	No	
DOB	Date of Birth	date		No	No	No	No	
emailAddress	Email Address	var char		No	No	No	No	
mobileNo	Mobile No	char	12	No	No	No	No	
street	Street	var char		No	No	No	No	
barangay	Barangay	var char		No	No	No	No	
city	City	var char		No	No	No	No	
province	Province	var char		No	No	No	No	
zipCode	Zip Code	char	4	No	No	No	No	
branchNo	Branch Unique No	tiny int	2	No	Yes	No	Yes	Branch

Customer

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
customerNo	Customer Unique No	Integer	6	No	Yes	Yes	No	
fName	First Name	Var Char		No	No	No	No	
mName	Middle Name	Var Char		Yes	No	No	No	
lName	Last Name	Var char		No	No	No	No	
nationality	Country of Birth	Var Char		No	No	No	No	
grossAnnualIncome	Annual Earnings Before Tax	Integer	7	No	No	No	No	
sex	Sex	Enum		No	No	No	No	
civilStatus	Civil Status	Enum		No	No	No	No	
DOB	Date of Birth	Date		No	No	No	No	
eduAttainment	Highest Level of Education Completed	Enum		No	No	No	No	
homeOwnership	Owner of Current Home Residence	Enum		No	No	No	No	
emailAddress	Email Address	Var Char		No	No	No	No	
mobileNo	Mobile No	Char	12	No	No	No	No	
CHStreet	Current Home Street	Var Char		No	No	No	No	
CHBarangay	Current Home Barangay	Var Char		No	No	No	No	
CHCity	Current Home City	Var Char		No	No	No	No	
CHProvince	Current Home Province	Var Char		No	No	No	No	
CHZipCode	Current Home Zip Code	Char	4	No	No	No	No	
LOSYears	Length of Stay In Years	Tiny Int	2	No	No	No	No	

Underwriting

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
underwritingNo	Underwriting Unique No	Int	6	No	Yes	Yes	No	
grade	Quality Score of a Loan	Enum		No	No	No	No	
score	Credit Score	Int	3	No	No	No	No	
staffNo	Staff Unique No	Int	6	Yes	Yes	No	Yes	Staff

EmploymentDetails

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
applicationNo	Application Unique No	Int	6	No	Yes	No	Yes	LoanApplication
customerNo	Customer Unique No	Int	6	No	Yes	No	Yes	Customer
typeOfEmployment	Type of Employment	Enum		No	No	No	No	
employerName	Person or Organization	Var Char		No	No	No	No	
occupation	Occupation	Var Char		No	No	No	No	
position	Position	Var Char		No	No	No	No	
rank	Rank	Var Char		No	No	No	No	
permanentEmp	Permanent Employee	Enum		Yes	No	No	No	
street	Street	Var Char		No	No	No	No	
barangay	Barangay	Var Char		No	No	No	No	
city	City	Var Char		No	No	No	No	
province	Province	Var Char		No	No	No	No	
zipCode	Zip Code	Char	4	Yes	No	No	No	
HREContactNo	HR Contact No	Char	12	No	No	No	No	
bestDTCall	Best Day/Time to Call	Var Char		No	No	No	No	
empTotalYears	Total Years at Work	Tiny Int	2	No	No	No	No	

ELDetails

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
applicationNo	Application Unique No	Int	6	No	Yes	No	Yes	LoanApplication
customerNo	Customer Unique No	Int	6	No	Yes	No	Yes	Customer
bank/Company	Bank/Company of Existing Loan	Var Char		No	No	No	No	
typeOfLoan	Type of Loan	Enum		No	No	No	No	
monthlyPayment	Monthly Payment	Decimal	11,4	No	No	No	No	
outstandingBal	Outstanding Balance	Decimal	11,4	No	No	No	No	

CCDetails

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
applicationNo	Application Unique No	Int	6	No	Yes	No	Yes	LoanApplication
customerNo	Customer Unique No	Int	6	No	Yes	No	Yes	Customer
cardCompany	Credit Card Issuer	Var Char		No	No	No	No	
cardCreditLimit	Card Credit Limit	Integer	7	No	No	No	No	
cardNo	Card No	Char	19	No	No	No	No	
expiry	Expiration Date	Date		No	No	No	No	

Document

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
documentNo	Document Unique No	Int	6	No	Yes	Yes	No	
nameOfDocument	Name of Document	Var Char		No	No	No	No	
dateSubmitted	Date Document Submitted	Date		No	No	No	No	
customerNo	Customer Unique No	Int	6	No	Yes	No	Yes	Customer
staffNo	Staff Unique No	Int	6	Yes	Yes	No	Yes	Staff
underwritingNo	Underwriting Unique No	Int	6	No	Yes	Yes	No	

FinalLoanDecision

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
decisionNo	Decision Unique No	Int	6	No	Yes	Yes	No	
applicationStatus	Application Status	Enum		No	No	No	No	
estimatedTotalPayment	Estimated Total Payment	Decimal	11,4	No	No	No	No	
monthlyPayment	Monthly Payment	Decimal	11,4	No	No	No	No	
flatInterestRate	Lock Interest Rate	Decimal	5,4	No	No	No	No	
lendingLimit	Maximum Amount Available to Borrow	Decimal	11,4	No	No	No	No	
underwritingNo	Underwriting Unique No	Int	6	No	Yes	No	Yes	Underwriting
applicationNo	Application Unique No	Int	6	No	Yes	No	Yes	LoanApplication

LoanApplication

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
applicationNo	Application Unique No	Int	6	No	Yes	Yes	No	
Amount	Amount Requested	Decimal	11,4	No	No	No	No	
termInMonths	Duration of Repayment	Enum		No	No	No	No	
purpose	Purpose of the Loan	Var Char		Yes	No	No	No	
TIN	Tax Idenification No	Char	12	No	No	No	No	
SSS/GSIS/UMIDNo	Customer Id No	Char	13	No	No	No	No	
prefBank	Preferred Bank for Disbursement	Enum		No	No	No	No	
debtRatio	Ratio of Total Debt and Total Assets	Decimal	3,0	No	No	No	No	
initialStatus	Prequalification Status	Enum		No	No	No	No	
processingFee	Total Charge for Processing the Loan	Decimal	9,4	No	No	No	No	
customerNo	Customer Unique No	Int	6	No	Yes	No	Yes	Customer
staffNo	Staff Unique No	Int	6	No	Yes	No	Yes	Staff

Disbursement

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
disbursementNo	Disbursement Unique No	Int	6	No	Yes	Yes	No	
providedAccNo	Provided acc no pref bank	Char	19	No	No	No	No	
amountDisburse	Amount Disburse	Decimal	11,4	No	No	No	No	
applicationNo	Application Unique No	Int	6	No	Yes	No	Yes	LoanApplication

Repayment

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
repaymentNo	Repayment Unique No	Int	6	No	Yes	Yes	No	
scheduledDate	Date of Repayment	Date		No	No	No	No	
monthlyPayment	Monthly Payment	Decimal	11,4	No	No	No	No	
penaltyAmount	Penalty Amount	Decimal	8,4	No	No	No	No	
totalAmount	Toal Amount	Decimal	11,4	No	No	No	No	
paymentMode	Payment Mode	Enum		No	No	No	No	
dateReceived	Date of Repayment Received	Date		No	No	No	No	
disbursementNo	Disbursement Unique No	Int	6	No	Yes	No	Yes	Disbursement

LoanAdjustment

Attribute	Description	Type	Size	Null	Unique	Part Of PK	FK	FK Relation
adjustmentNo	Adjustment Unique No	Int	6	No	Yes	Yes	No	
adjustedAmount	Adjusted Amount	Decimal	11,4	No	No	No	No	
adjustedETP	Adjusted Estimated Total Payment	Decimal	11,4	No	No	No	No	
adjustedMP	Adjusted Monthly Payment	Decimal	11,4	No	No	No	No	
decisionNo	Decision Unique No	Int	6	No	Yes	No	Yes	FinalLoanDecision
customerNo	Customer Unique No	Int	6	No	Yes	No	Yes	Customer
applicationNo	Application Unique No	Int	6	No	Yes	No	Yes	LoanApplication

Entity Types Description

Entity Type	Description
Branch	General term describing all branch by AB Finance Corporation.
CCDetails	General term describing all credit card own by a customer.
Customer	General term describing all customer.
Disbursement	General term describing the funding or sending of the requested loan. Disbursement is along with the creation of the disbursement account in which the money will be disburse in that account.
Document	General term describing all documents required by a staff particularly loan officer that is for processing, verification and underwriting that will be used for the final loan decision of the loan application.
ELDetails	General term describing all existing loan in AB Finance Corporation or other financial institution offering different types of loan. Existing loan details will be used to calculate the debt ratio of customer.
EmploymentDetails	Employment details of customer that is part of loan application.
FinalLoanDecision	General term describing the final loan decision of the loan application.
LoanAdjustment	General term for adjusting a loan, this also called loan revision that optionally offered when customer can borrow more money or the loan application and the document provided contradicts that will result in loan revision or adjustment.
LoanApplication	General term describing the loan application applied by a customer.
Repayment	General term describing the repayment of the disbursement amount or loan application.
Staff	General term describing all staff employed by AB Finance Corporation which has specific roles in processing the loan application.
Underwriting	Part of processing the loan application, which is handled by an staff particularly an underwriter.

Relationship

Entity Type	Multiplicity	Relationship	Multiplicity	Entity Type
Branch	1..1	has	1..*	Staff
Customer	1..1	turnsin	0..*	Document
	1..1	accepts	0..1	LoanAdjustment
	1..1	applies	1..*	LoanApplication
	1..1	has	0..*	ELDetails
	1..1	owns	0..*	CCDetails
	1..1	has	1..*	EmploymentDetails
Disbursement	1..1	involves	1..*	Repayment
Document	1..*	undergoes	1..1	Underwriting
FinalLoanDecision	0..1	entails	1..1	LoanApplication
	1..1	offers	0..1	LoanAdjustment
LoanAdjustment	0..1	reflectson	1..1	LoanApplication
LoanApplication	1..1	associatedwith	0..1	Disbursement
	1..1	includes	0..*	ELDetails
	1..1	comprises	0..*	CCDetails
	1..1	contains	1..*	EmploymentDetails
Staff	1..1	processes	0..*	Document
	1..1	handles	0..*	Underwriting
	1..1	prequalifies	0..*	LoanApplication
Underwriting	1..1	determines	1..1	FinalLoanDecision

Domain of Attributes

Attribute	Domain
adjustedAmount	1.0000-9999999.9999
adjustedETP	1.0000-9999999.9999
adjustedMP	1.0000-9999999.9999
adjustmentNo	1-999999
amount	30000.0000-2000000.9999
amoutDisburse	1.0000-9999999.9999
applicationNo	1-999999
applicationStatus	Approved, Needs Revision, Suspended, Rejected
barangay	Barangay in the Philippines
branchNo	1-99
cardCreditLimit	1-9999999
city	City in the Philippines
civilStatus	Single, Married, Widow, Separated, Annuled
customerNo	1-999999
debtRatio	1-100
decisionNo	1-999999
disbursementNo	1-999999
documentNo	1-999999
eduAttainment	College, Post Graduate, Undergraduate, Vocational
empTotalYears	0-99
estimatedTotalPayment	1.0000-9999999.9999
flatInterestRate	1.0000-4.9999
grade	A, B, C, D, E, F, G
grossAnnualIncome	150000-9999999
homeOwnership	Owned, Mortgaged, Rented, Used Free/Living with Parents/Relatives
HRCContactNo	Valid Number in the Philippines
initialStatus	Approved, Rejected
lendingLimit	1.0000-9999999.9999
LOSYears	0-99
mobileNo	Starts With 09
monthlyPayment	1.0000-9999999.9999
outstandingBal	1.0000-9999999.9999
paymentMode	Online, Over-The-Counter
penaltyAmount	0-9999.9999
permanentEmp	Yes, No
position	Branch Manager, Underwriter, Loan Processor, Loan Officer
prefBank	Union Bank, BDO, Land Bank, Security Bank, BPI
processingFee	1-10000
province	Province in the Philippines
repaymentNo	1-999999
score	0-999
sex	Male, Female
staffNo	1-999999
street	Street in the Philippines
termMonths	12, 18, 24, 36
totalAmount	1.0000-9999999.9999
typeOfEmpoyment	Government, Private, Self-Employed
typeOfLoan	Personal Loan, Auto Loan, Home Loan
underwritingNo	1-999999
zipCode	Zip Code in the Philippines

Relational Schema

Branch (branchNo, street, barangay, city, province, zipCode) Primary Key branchNo
Staff (staffNo, fName, mName, lName, position, sex, civilStatus, DOB, emailAddress, mobileNo, street, barangay, city, province, zipCode, branchNo) Primary Key staffNo Foreign Key branchNo references Branch(branchNo) ON UPDATE CASCADE ON DELETE NO ACTION
Customer (customerNo, fName, mName, lName, nationality, grossAnnualIncome, sex, civilStatus, DOB, eduAttainment, homeOwnership, emailAddress, mobileNo, CHStreet, CHBarangay, CHCity, CHProvince, CHZipCode, LOSYears) Primary Key customerNo
Underwriting (underwritingNo, grade, score, underwriterStaffNo, documentNo) Primary Key underwritingNo Foreign Key underwriterStaffNo references Staff(staffNo) ON UPDATE CASCADE ON DELETE SET NULL
EmploymentDetails (applicationNo, customerNo, typeOfEmployment, employerName, occupation, position, rank, permanentEmp, street, barangay, city, province, zipCode, HRContactNo, bestDTCall, empTotalYears) Foreign Key applicationNo references LoanApplication(applicationNo) ON UPDATE CASCADE ON DELETE NO ACTION Foreign Key customerNo references Customer(customerNo) ON UPDATE CASCADE ON DELETE NO ACTION
ELDetails (applicationNo, customerNo, bank/Company, monthlyPayment, outstandingBal) Foreign Key applicationNo references LoanApplication(applicationNo) ON UPDATE CASCADE ON DELETE NO ACTION Foreign Key customerNo references Customer(customerNo) ON UPDATE CASCADE ON DELETE NO ACTION
CCDetails (applicationNo, customerNo, cardCompany, cardCreditLimit, cardNo, expiry) Foreign Key applicationNo references LoanApplication(applicationNo) ON UPDATE CASCADE ON DELETE NO ACTION Foreign Key customerNo references Customer(customerNo) ON UPDATE CASCADE ON DELETE NO ACTION
Document (documentNo, nameOfDocument, dateSubmitted, customerNo, loanProcessorStaffNo, underwritingNo) Primary Key documentNo Foreign Key customerNo references Customer(customerNo) ON UPDATE CASCADE ON DELETE NO ACTION Foreign Key loanProcessorStaffNo references Staff(staffNo) ON UPDATE CASCADE ON DELETE SET NULL Foreign Key underwritingNo references Underwriting(underwritingNo) ON UPDATE CASCADE ON DELETE NO ACTION

Repayment (repaymentNo, scheduledDate, monthlyPament, penaltyAmount, totalAmount, paymentMode, dateReceived, disbursementNo)

Primary Key repaymentNo

Foreign Key disbursementNo **references** Disbursement(disbursementNo) ON UPDATE CASCADE ON DELETE NO ACTION

Disbursement (disbursementNo, providedAccNo, amountDisburse, applicationNo)

Primry Key disbursementNo

Foreign Key applicationNo **references** LoanApplication(applicationNo) ON UPDATE CASCADE ON DELETE NO ACTION

LoanApplication (applicationNo, amount, termInMonths, purpose, SSS/GSIS/UMIDNo, prefBank, debtRatio, initialStatus, processingFee, customerNo, loanOfficerStaffNo, decisionNo, adjustmentNo)

Primary Key applicationNo

Foreign Key customerNo **references** Customer(customerNo) ON UPDATE CASCADE ON DELETE NO ACTION

Foreign Key loanOfficerStaffNo **references** Staff(staffNo) ON UPDATE CASCADE ON DELETE NO ACTION

FinalLoanDecision (decisionNo, applicationStatus, estimatedTotalPayment, monthlyPayment, flatInterestRate, lendingLimit, underwritingNo, applicationNo)

Primary Key decisionNo

Foreign Key underwritingNo **references** Underwriting(underwritingNo) ON UPDATE CASCADE ON DELETE NO ACTION

Foreign Key applicationNo **references** LoanApplication(applicationNo) ON UPDATE CASCADE ON DELETE NO ACTION

LoanAdjustment (adjustmentNo, adjustedAmount, adjustedETP, adjustedMP, customerNo, applicationNo)

Primary Key adjustmentNo

Foreign Key decisionNo **references** FinalLoanDecision(decisionNo) ON UPDATE CASCADE ON DELETE NO ACTION

Foreign Key customerNo **references** Customer(customerNo) ON UPDATE CASCADE ON DELETE NO ACTION

Foreign Key applicationNo **references** LoanApplication(applicationNo) ON UPDATE CASCADE ON DELETE NO ACTION

3.3 TRANSFORMATION OF ERDS TO NORMALIZED RELATIONS

ALL RELATIONS ARE ALREADY NORMALIZED

Branch

branchNo	address
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Staff

staffNo	name	position	sex	civilStatus	DOB	emailAddress	mobileNo	address
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Underwriting

underwritingNo	grade	score
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Document

documentNo	nameOfDocument
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FinalLoanDecision

decisionNo	applicationStatus	estimatedTotalPayment	monthlyPayment	flatInterestRate	lendingLimit
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LoanApplication

applicationNo	amount	term	purpose	SSS/GSIS/UMIDNo	TIN	prefBank	debtRatio	initialStatus
processingFee								

Disbursement

disbursementNo	providedAccNo	amountDisburse
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Repayment

repaymentNo	scheduledDate	monthlyPayment	penaltyAmount	totalAmount	paymentMode	dateReceived
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LoanAdjustment

adjustmentNo	adjustedAmount	adjustedETP	adjustedMP
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1NF

Customer

customerNo	name	nationality	grossAnnualIncome	sex	civilStatus	DOB	eduAttainment	homeOwnership
emailAddress	mobileNo	CHAddress	typeOfEmployment	employerName	occupation	position	rank	
permanentEmp	address	HRContactNo	bestDTCall	empTotalYears	bank/Company	typeOfLoan		
monthlyPayment	outstandingBal	cardCompany	cardCreditLimit	cardNo	expiry			

ALTERNATIVE 1NF

Customer

customerNo	name	nationality	grossAnnualIncome	sex	civilStatus	DOB	eduAttainment	homeOwnership
emailAddress	mobileNo	CHAddress	LOSYears					

EmploymentDetails

typeOfEmployment	employerName	occupation	position	rank	permanentEmp	address	HRContactNo
bestDTCall	empTotalYears						

ELDetails

bank/Company	typeOfLoan	monthlyPayment	outstandingBal
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CCDetails

cardCompany	cardCreditLimit	cardNo	expiry
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Alternative approach of 1NF is used on this relation where the repeating data is place along with a copy of the original key attributes, in a separate relation. This approach also normalized into the same set of 3NF relations.

IV. PHYSICAL DATABASE DESIGN

4.1 GENERAL CONSTRAINTS

- Customer must aged 21 and above.
- Customer must be no older than 65 upon loan maturity.
- Customer must be a Philippine citizen.
- Customer must have an active Philippine mobile number.
- Customer must have a minimum gross annual income of ₱150,000.
- Customer can reapply for a loan after 6 months of last application.
- Customer can apply one loan at a time.
- Allowable loan amount is ₱30,000 - ₱2,000,000.
- Customer can only have two loans.
- Initial status of loan application must be approved to submit documents.
- Staff must aged 21 and above.
- The business will hire staff who are not higher than 65 years old.

4.2 TRANSACTIONS

STAFF

- Enter the details for the new loan application of customer and update customer information including the existing loan, credit card and employment details.
- Update the details of the loan application due to the loan adjustment.
- Identify the assign loan application of staff.

BRANCH

- D. Update value of qualified debt ratio and other qualification for initial status of loan application.
- E. Identify documents submitted by customers for underwriting.
- F. Identify the assign staff of particular loan application to update the disbursement.

Transaction / Relation	(A)				(B)				(C)				(D)				(E)				(F)			
	I	R	U	D	I	R	U	D	I	R	U	D	I	R	U	D	I	R	U	D	I	R	U	D
Branch													X						X					X
Staff		X				X			X															X
Customer			X																X					
Underwriting																			X					
EmploymentDetails			X																					
ELDetails			X																					
CCDetails			X																					
Document																			X					
FinalLoanDecision																								
LoanApplication	X						X		X						X								X	
Disbursement																								X
Repayment																								
LoanAdjustment						X																		

4.3 CHOSEN FILE ORGANIZATION

- **B+ Tree** is chosen as file organization in this project as it supports referential integrity constraints and since file organizations depends on the storage engine, InnoDB is used, the default storage engine of our chosen Database Management System, MySQL.

4.4 CHOSEN INDEX

- **Primary** and **Cluster Index** will present in this project. Primary index present most on the primary key attribute and cluster index present most on the non-key attributes.