



GROUP 10

DESIGNING AND MANAGING A DATABASE FOR THE PROCESS RELATED TO SAVING SERVICE ON THE VIETCOMBANK APPLICATION

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FACULTY OF INFORMATION SYSTEMS



MID-TERM PROJECT REPORT

COURSE: DATABASE

**Topic: DESIGNING AND MANAGING A DATABASE FOR THE
PROCESS RELATED TO SAVING SERVICE ON THE
VIETCOMBANK APPLICATION**

Lecturer: Tran Quang Than, MSc.

Group 10

Ho Chi Minh City, December 2023

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ACKNOWLEDGEMENTS

Project “***Designing and managing a database for the process related to saving service on the Vietcombank application***” is the topic which our group chose to research recently

Our team would like to express my sincere gratitude to my supervisor, Mr. Tran Quang Than, a lecturer at the Faculty of Information Systems, whose expertise and insights were invaluable in shaping our research and writing. Not to mention, the University of Economics -Law deserves recognition for its enthusiastic support and supervision, which made it possible for the team to start and finish the research project.

We would also like to thank the University Economics and Law Library for their assistance in organizing and finishing the book and library data database. The team would not have been successful without the library's unwavering support.

The team is also grateful to our classmates and friends for their support and encouragement during this challenging process. They were always there to listen, share ideas, and offer advice. In order to create a product that is as practical and useful as possible, the team recognizes that despite their diligent attempts to improve the study topic's content during the research process, there may still be limitations and flaws in it. We look forward to hearing from our teachers, classmates, and friends about suggestions, comments, and advice so we may refine our research and make it more accurate, instructive, and useful.

We could not have finished the study project without the tremendous efforts of all of the participants, and we really appreciate all of the guidance and support we have received.

Respectfully, thank you!

COMMITMENT

The topic of "***Designing and managing a database for the process related to saving service on the Vietcombank application***" is one that the team is really interested in and excited to investigate for this project. Under the direction of Mr. Tran Quang Than, a lecturer at the Faculty of Information Systems, the team currently in attendance conducted the study and implemented the project.

We are committed to completing this project with honesty, integrity, and academic excellence. We will follow the guidelines and requirements of the assignment, and adhere to the standards of academic writing. We will use reliable and credible sources to support my arguments, and cite them properly using the appropriate referencing style. We will also respect the intellectual property rights of others, and avoid plagiarism and academic misconduct.

Our group is prepared to take on any challenges and seize any chances that this project may present. We recognize that authoring this project is a demanding and rewarding process. We will effectively manage our time and work, and when necessary, we will ask our instructor and fellow students for advice. We'll thoroughly edit and revise our project as well.

In our opinion, this project is more than just an assignment; it's also a chance for learning and personal development. We're determined to reach our objectives and give it our all. With this project, we wish to share our enthusiasm, interest, and commitment.

Ho Chi Minh City, 2023

Group 10

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CHAPTER 1: OVERVIEW OF VIETCOMBANK

1.1 Overview of Vietcombank

English name: Joint Stock Commercial Bank for Foreign Trade of Vietnam

Abbreviated name: Vietcombank

Phone: (84.4) 9.343.137

Fax: (84.4) 8.241.395

Telex: 411504/411209 VCB VT

Website: <http://www.vietcombank.com.vn>

Charter capital: 34,560 billion VND

Head office: 198 Tran Quang Khai, Tan Dinh Ward, District 1, Ho Chi Minh City, Vietnam

Type of company: Joint stock company

Stock code: VCB (on Ho Chi Minh City stock exchange)

Tax code: Tax code 0100112437 at Hanoi Tax Department



1.1.1 History of formation

Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank) was established on April 1, 1963, and is one of the largest and most prestigious commercial banks in Vietnam. Through many stages of development, Vietcombank has made important contributions to promoting finance and economic development in Vietnam.

1.1.2 Mission and vision

Vision to 2023: No. 1 bank in Vietnam, one of the 100 largest banks in Asia, one of the 300 largest financial and banking groups in the world, one of the 1000 largest listed enterprises worldwide. The bridge has made a great contribution to Vietnam's development.

Strategic goals until 2025:

- *No. 1 in terms of profit size and non-credit income*
- *Top in customer experience*
- *Number 1 in retail and investment banking*
- *Leading in human resource quality*
- *Leading in digital banking*
- *Best risk management*

1.1.3 Field of activity

Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank) is one of the leading banks in Vietnam. Established in 1963, Vietcombank has grown into one of the largest banks with a wide network of branches and agents domestically and internationally.

Vietcombank operates in many areas of the banking industry, including financial services and commercial banking. Services provided by Vietcombank include:

Personal Banking Services: Vietcombank provides financial products and services for individuals such as deposit accounts, credit cards, consumer credit, mortgage loans and electronic payment services.

Business banking services: Vietcombank supports businesses in the fields of financial management, capital financing, international transactions and banking services for business

activities. Investment banking services: Vietcombank provides investment financial services such as asset management, securities trading, investment consulting and international investment banking services.

Electronic banking services: Vietcombank provides online banking services that allow customers to conduct transactions and manage accounts conveniently via the Internet or mobile phone.

Vietcombank is also one of the banks with close cooperative relationships with international banks and financial institutions, demonstrated through cooperation in the fields of trade finance, international remittances and other services. banking and other international financial services.

With prestige and experience operating in the banking sector, Vietcombank has achieved many awards and noble titles in the industry, building trust with customers and business circles at home and abroad.



1.1.4 Operational services

| Individual | Enterprise | Financial Institution | VCB Digibank |
|-----------------------------|--|--|---------------------|
| -Account | -Payment service | -Payment service | -Online banking |
| -Savings & Investment Cards | -Check service | -Check service | -SMS Banking |
| private | -Automatic salary payment | -Automatic salary payment | -Phone Banking |
| -Transfer & multiply money | -Billing payment | -Billing payment | -VCB – Money |
| -Personal loans | -Guarantee service | -Guarantee service | -VCB – eTour |
| | -Lending service | -Lending service | -VCB – Topup |
| | -Financial lease purchase | -Financial lease purchase | |
| | -Issuing business domestic bonds and foreign | -Issuing business domestic bonds and foreign | |

1.1.5 Position of the enterprise in the industry

Vietcombank is one of the leading banks and is considered one of the most prestigious and reliable banks in the Vietnamese banking system. Vietcombank is highly appreciated for its scale, strong finances, quality services and ability to provide diverse and convenient banking services to customers. Vietcombank has a nationwide network, with more than 500

transaction points nationwide and many branches and representative offices abroad. This bank provides comprehensive banking services such as deposit accounts, loans, credit cards, payment services, foreign exchange services and other banking products and services.

Vietcombank also plays an important role in supporting Vietnam's economic development through financing large projects, supporting businesses and people with reliable banking and financial solutions.

Recently, according to Brand Finance's announcement, Vietcombank has increased 25 places and leads the list of 12 Vietnamese banks in the Top 500 most valuable banking brands in the world. Besides brand value, Brand Finance also publishes the brand strength index. The report shows that Vietcombank is the strongest brand with an AAA+ rating (reaching AAA in 2022).

| 2023 | 2022 | Logo | Tên | Quốc gia ↑ | 2023 | 2022 | 2023 | 2022 |
|-------|------|---|--|---|------|------|------|------|
| 137 ▲ | 162 |  | Vietcombank |  | 锁 | 锁 | 锁 | 锁 |
| 159 ▼ | 157 |  | agribank |  | 锁 | 锁 | 锁 | 锁 |
| 161 ▲ | 212 |  | Ngân hàng Đầu tư và Phát triển Việt Nam (BIDV) |  | 锁 | 锁 | 锁 | 锁 |
| 163 ▲ | 196 |  | Techcombank |  | 锁 | 锁 | 锁 | 锁 |
| 171 ▲ | 184 |  | NHCTVN |  | 锁 | 锁 | 锁 | 锁 |
| 173 ▲ | 205 |  | VP Bank |  | 锁 | 锁 | 锁 | 锁 |
| 230 ▲ | 248 |  | ngân hàng MB |  | 锁 | 锁 | 锁 | 锁 |
| 273 ▲ | 311 |  | ACB |  | 锁 | 锁 | 锁 | 锁 |
| 355 ▲ | 370 |  | Sacombank |  | 锁 | 锁 | 锁 | 锁 |
| 400 ▲ | 429 |  | Ngân hàng HD Bank |  | 锁 | 锁 | 锁 | 锁 |
| 420 ▲ | 456 |  | Ngân hàng Sài Gòn Hà Nội (SHB) |  | 锁 | 锁 | 锁 | 锁 |
| 492 | |  | VIB |  | 锁 | 锁 | 锁 | 锁 |

(12 Vietnamese banks made the list. Source: Brand Finance)

Brand Finance Banking 500 – Full Table

Top 500 most valuable brands 451-500.

| Rank 2015 | Rank 2014 | Brand name | Domicile | Brand value (\$m) 2015 | % change | Brand value (\$m) 2014 | Brand rating 2015 | Brand rating 2014 |
|-----------|-----------|-----------------------------------|---------------|------------------------|----------|------------------------|-------------------|-------------------|
| 451 | 399 | Bank of Kyoto | Japan | 183 | -13% | 211 | A+ | A+ |
| 452 | 393 | Clydesdale Bank | Australia | 183 | -14% | 213 | AA- | AA- |
| 453 | 457 | Trustmark | United States | 183 | 7% | 172 | AA | AA- |
| 454 | 392 | WGZ Bank | Germany | 183 | -15% | 214 | A- | A- |
| 455 | n/a | Mb Financial | United States | 182 | | n/a | AA | n/a |
| 456 | 452 | BEKB BCBE | Switzerland | 180 | 3% | 174 | A+ | AA- |
| 457 | 498 | Zions Bancorporation | United States | 180 | 22% | 147 | AA- | AA- |
| 458 | 492 | Oschadbank | Ukraine | 179 | 20% | 150 | A | A- |
| 459 | 339 | Portigon | Germany | 179 | -36% | 281 | A+ | A+ |
| 460 | 471 | Hokkaido Bank | Japan | 179 | 10% | 164 | A | A+ |
| 461 | 387 | Aozora Bank | Japan | 178 | -21% | 225 | A | A+ |
| 462 | 433 | Wilmington Trust | United States | 178 | -2% | 182 | A+ | AA- |
| 463 | 460 | Everbright Securities | China | 176 | 5% | 169 | AA- | AA- |
| 464 | 430 | Bank Nederlandse Gemeenten | Netherlands | 175 | -8% | 184 | A | A |
| 465 | 407 | Bank Islam | Malaysia | 174 | -14% | 203 | A+ | A |
| 466 | n/a | Hilltop Holdings | United States | 174 | | n/a | A- | n/a |
| 467 | 486 | Wintrust | United States | 174 | 11% | 156 | A+ | A+ |
| 468 | 464 | Gulf Bank | Kuwait | 172 | 3% | 167 | A | A+ |
| 469 | 499 | Shriram | India | 170 | 16% | 146 | A+ | A+ |
| 470 | 372 | Banque de Gestion Privée Indosuez | France | 168 | -29% | 238 | A+ | A+ |
| 471 | 450 | Liberbank Sa | Spain | 168 | -4% | 174 | A | A |
| 472 | n/a | Banca Carige | Italy | 167 | 17% | 142 | A | A+ |
| 473 | n/a | Philipp Nati Bnk | Philippines | 166 | | n/a | A+ | n/a |
| 474 | 493 | 77 Bank | Japan | 166 | 11% | 150 | A+ | A+ |
| 475 | n/a | Fulton Financial | United States | 165 | 33% | 124 | AA- | A+ |
| 476 | 412 | Iyo Bank | Japan | 165 | -17% | 198 | A+ | A+ |
| 477 | 459 | Hyakugo Bank | Japan | 164 | -4% | 170 | A | A+ |
| 478 | n/a | Orient Express Bank | Russia | 164 | 45% | 113 | A- | A |
| 479 | 431 | Harbin Bank | China | 163 | -11% | 184 | A | A- |
| 480 | n/a | BMCE Bank | Morocco | 163 | 13% | 144 | A | A+ |
| 481 | n/a | Valley National Bank | United States | 161 | | n/a | AA- | n/a |
| 482 | n/a | Sparebanken Vest | Norway | 161 | 28% | 126 | A+ | A |
| 483 | 437 | Nanto Bank | Japan | 160 | -11% | 181 | A | A+ |
| 484 | n/a | VUB banka | Slovakia | 158 | 12% | 141 | A | A |
| 485 | 468 | Spar Nord Bank | Denmark | 158 | -5% | 165 | A | A+ |
| 486 | 406 | Flagstar Bank | United States | 157 | -23% | 204 | A+ | A- |
| 487 | n/a | Vietcombank | Vietnam | 157 | | n/a | A+ | n/a |
| 488 | 485 | Hyakujuji Bank | Japan | 156 | 0% | 157 | A | A |
| 489 | 488 | Kagoshima Bank | Japan | 156 | 2% | 153 | A | A+ |
| 490 | 487 | BRD | Romania | 156 | 2% | 154 | A | A+ |
| 491 | n/a | Indian Bank | India | 156 | 8% | 145 | A | A |
| 492 | 428 | First Hawaiian bank | France | 156 | -17% | 187 | A+ | AA |
| 493 | n/a | Old National Bank | United States | 156 | 12% | 140 | A+ | A+ |
| 494 | n/a | Texas Capital Ba | United States | 156 | | n/a | AA- | n/a |
| 495 | 480 | Belarusbank | Belarus | 156 | -2% | 159 | A- | A |
| 496 | n/a | Access Bank | Nigeria | 155 | | n/a | AA- | n/a |
| 497 | 436 | Sinar Mas Multiartha | Indonesia | 154 | -15% | 181 | A- | A |
| 498 | n/a | Shiga Bank | Japan | 154 | 41% | 109 | A | A+ |
| 499 | 469 | Musashino Bank | Japan | 154 | -6% | 165 | A | A |
| 500 | 474 | San-In Godo Bank | Japan | 154 | -5% | 162 | A | A |

Brand Finance Banking 500 February 2015 27.

(Vietcombank's ranking in 2022)

Through its 60-year journey of establishment and development, Vietcombank has made great contributions to the development of the country's economy, creating important impacts on the regional financial community. With the action motto "Transformation - Efficiency - Sustainability" and the operating direction perspective

"Responsibility - Aggressiveness - Creativity", in 2022, the entire Vietcombank system is consolidating a solid foundation to continue develop and make even stronger breakthroughs in the coming time.

CHAPTER 2: INTRODUCTION BUSINESS MODEL

2.1. Reason for choosing the topic

2.1.1. Context of the problem

In the 4.0 technology era, all convenient and fast transactions will gradually take over and replace traditional forms. Online savings deposits are no exception to this trend and are gradually taking over, replacing direct savings deposits at the counter.

The two most popular savings methods at banks today are savings at the counter and savings through internet banking/mobile banking applications.

Online savings deposits have higher interest rates than at the counter because this form helps banks reduce operating costs, improve competitiveness, and attract customers to use non-cash transactions. This is also a general trend that is always encouraged by the government.

Online savings deposits bring attractive profits to depositors compared to traditional savings deposits. Because high interest rates mean depositors will have high interest amounts and optimize profitability on idle capital.

VietcomBank is known as one of the prestigious banks with a long history. Perhaps that is why the number of customers participating in savings deposits at VietcomBank is increasing.

In recent years, research activities, application of science and technology, improvement initiatives and innovations at Vietcombank have developed strongly, positively contributing to the growth of Vietcombank. Human resources and financial resources for innovation activities are prioritized for strong investment. A series of new products and services have been provided by Vietcombank to customers such as Digibank, DigiBiz, PCM CashUp... and have been very positively received by the market. Many transformation projects, capacity building, technological innovation, management... have been successfully deployed and put into operation such as the Core Banking replacement project, Basel II program, MPA multi-dimensional profit analysis system. , new Trade Finance system, CTOM, RTOM, IFRS 9... Action program to implement the Transformation Strategy, with a focus on digital

transformation with the goal of reaching the top in digital transformation maturity in the region by 2025 has also been built by Vietcombank and is being implemented drastically with the advice of BCG.

To address this issue, designing a database related to the saving process on Vietcombank application will help readers gain more insight and accuracy into this process. Not only that, the team has tried to optimize and simplify the steps so that readers can easily access the process that the team has created.

In summary, designing a database about the savings process on the Vietcombank app is a practical and important topic to help improve service quality and meet customer needs. Furthermore, this project also actively contributes to helping customers understand the process related to their cash flow and different forms of savings, from there, customers will have a decision to choose their goal.

2.1.2. Goals

Customers need some savings to prevent risks and target pre-set financial goals (buying a car, paying tuition, buying a house). Therefore, a savings book will generate good profits because your money will be paid interest at a certain interest rate, helping your money increase instead of keeping the original number.

Depositing money in a bank will ensure the safety of your money and reduce the risks of theft and fire. This is a highly safe form of investment because bank operations are always closely monitored by the State to help ensure the safety of your money.

Instead of leaving money in one place, customers can still make money from this money with fixed and pre-calculated interest. Customers do not need to waste time calculating interest when investing in stocks, real estate, or banking. Flexible terms help customers solve financial problems in accordance with their capital use plans.

Not only that, they can also withdraw money when they need to use it for essential needs.

2.1.3. Expected results

Developed to help readers clearly see the process of opening a savings account on the Vietcombank app.

Design and manage database for Vietcombank Digital Banking application

2.2. Introducing the business model:

2.2.1. General description of the company's business model

The online savings model of a bank is a financial service that allows customers to deposit money into a savings account without the need to visit the bank in person. It is a convenient and flexible form of banking that helps customers save time and effort in managing their personal finances.

The online savings model has become a popular trend in the banking and financial industry. With the rapid development of information technology and the internet, many banks worldwide have implemented this service to meet the needs of customers. Banks provide online interfaces or mobile applications that enable customers to open savings accounts, deposit funds, withdraw money, and manage their accounts easily.

The target market for the online savings model is individuals and businesses who have a desire to save money but prefer the convenience of accessing and managing their accounts online. It particularly caters to tech-savvy users, online consumers, and individuals with a dynamic lifestyle.

The online savings model caters to the needs of customers who want to save money safely and effectively. Customers can open savings accounts from anywhere and at any time through online interfaces or mobile apps. They can deposit funds into their accounts through bank transfers, credit cards, or other payment methods. The model also provides additional benefits such as attractive interest rates, flexibility in withdrawals, and online account management.

The online savings model offers several advantages over traditional savings methods. Firstly, customers can save time and effort in financial transactions without the need to visit the bank in person. Secondly, customers can easily monitor and manage their accounts, check

balances, transaction history, and interest rates through the online interface. Thirdly, this model often offers more attractive interest rates compared to traditional savings accounts.

The online savings model of a bank combines information technology and financial services to provide a convenient and flexible savings method for customers. Customers can open savings accounts online through the bank's website or mobile app. After registration, customers can deposit funds into their accounts by transferring money from other bank accounts, using credit cards, or other electronic payment methods.

The online savings model provides benefits such as attractive interest rates, flexibility in withdrawals, and online account management. Customers can check balances, view transaction history, and manage their accounts from anywhere with an internet connection. The model also often provides tools and features to help customers track savings progress and set up regular deposits.

While the online savings model has many advantages, it is important to note that online banking carries potential security risks. Therefore, banks typically implement strong security measures to protect customer information and accounts.

In summary, the online savings model of a bank is a popular and convenient online financial service. It targets individuals and businesses who desire a convenient way to save money through the internet. The model offers attractive interest rates, flexibility, and the ability to manage accounts online, allowing customers to optimize their personal financial management.

2.2.2. User object:

Individuals who want to save money: This is the widest and most diverse group of people using online savings services. This group includes workers, families, housewives and people with stable income. Saving online allows them to manage their finances effectively, accumulate surplus money and earn interest on their deposits.

Students and young people: Younger user groups, including students and recent graduates, tend to seek convenient and flexible financial solutions. Online savings gives them the ability to easily manage their personal finances through an online interface or mobile app. They can easily open an account and save a portion of their income to achieve their short-term and long-term financial goals.

Small businesses and organizations: Online savings users can also be small businesses, startups or non-profit organizations. Saving online helps them manage cash, build reserves, and earn interest on deposits. This provides them with flexibility and convenience in managing their business finances.

Investors: Online savings users also include investors who want to invest cash in financial products that are safer and have more attractive yields than traditional savings accounts. Saving online can provide them with investment options such as term savings accounts, savings certificates or other investment models.

People with busy lifestyles: People with busy lifestyles, with little time to visit a physical bank or transact in person, often seek the convenience of saving online. They can manage their cash flexibly through an online interface or mobile application, and can make transactions whenever and wherever there is an internet connection.

2.2.3. Design business model:

Main objects participating in the model include Customer, Certificate, Saving Account and Bill

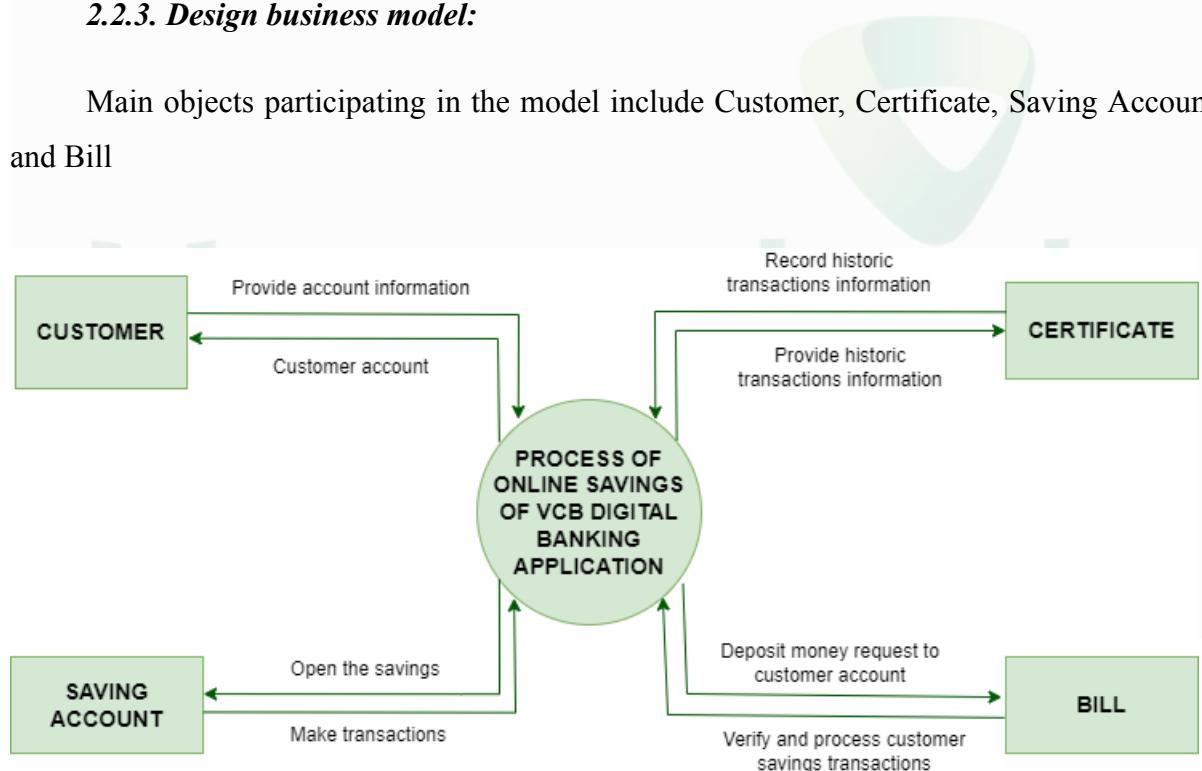


Figure 2.1. Business model of VCB Bank's online savings process

2.3.1. General description of business processes

Vietcombank's online savings product is an online deposit service that allows customers to deposit or withdraw savings via the internet. Using this product, customers can access the bank's website to transfer funds from their checking account to their online savings account.

This savings product is an optimal solution for customers looking to save time on deposits and maximize the efficiency of idle funds without incurring costs, safely and effectively.

While making a savings deposit is quick and easy, the online savings process involves 6 key players: customers, the banking system, Digital Banking accounts, savings accounts, deposit certificates, and support staff. The general procedure for each participant is as follows:

2.3.1.1. Customers

Target audience: Vietnamese individual customers wishing to use savings services on the VCB Digibank application.

To perform the online savings service, customers need to enter transaction information: deposit term, deposit amount, interest payment method, etc. Specific details about transaction information are specified in VCB's terms of use.

Customers have 5 options for VCB's online savings service including: Regular savings, Flexible savings, Accumulated deposits, Deposits for children, Automatic savings settings. Each type of savings may have differences in providing transaction information, so customers carry out online savings procedures according to the regulations of each type of service.

Customers can open online savings at any time except for some special holidays and system maintenance.

Customers need to commit to comply with the terms and conditions of the Agreement on opening and using term deposits on electronic banking channels and Basic Terms according to regulations for each type of VCB savings product.

2.3.1.2. Digital Banking Account

A payment account is a customer's demand deposit account opened at Vietcombank.

A payment account is like an "ID card number" when using banking services. All financial transactions are performed based on a payment account.

Digital Banking account is a payment account of a customer who has registered for VCB Digibank service.

To use the online savings service, customers are required to have a Digital Banking account.

2.3.1.3. Saving Service

After logging in to the VCB Digibank application, customers access the "Savings" feature.

Depending on the purpose of saving, customers can choose the features they want:

There are two forms of savings: regular savings and flexible savings. The difference between the two forms is: for regular savings, when the time comes to maturity, customers will withdraw money. will receive both interest and principal. If you withdraw before maturity, you can only withdraw the principal and may be fined (no interest). As for flexible savings, customers can easily withdraw their deposits gradually, and interest will be calculated according to the remaining amount.

There are two forms of return: interest transfers to current account and compound interest. Interest transfers to a current account is a form of interest calculation where interest will flow to the payment account upon maturity, and compound interest is a form of interest calculation when depositing savings at a bank. Accordingly, when the savings term ends, the interest accumulated in the previous term will be combined with the principal and mature in the next savings term.

Procedures for opening savings: first open savings book -> fill in information -> confirm information -> authenticate (by password/ VCB - Smart OTP/ SMS OTP).

2.3.1.4. Certificate

Certificate of deposit is a certificate sent by Vietcombank to each customer, specifying detailed information of the savings account and transaction information for opening a savings account after completing the deposit transaction on VCB Digibank.

A deposit certificate is sent by VCB to the customer after completing the online savings transaction to the email address the customer registered with VCB.

2.3.1.5 Bill

Invoice is a document confirming the purchase, sale, exchange of goods and services, payment, financial settlement, determination of reasonable costs when calculating corporate income tax and other issues according to regulations under the law.

After each active transaction, there will be an invoice to certify the customer's completed activities. Customers can easily download invoice images to authenticate with partners that they have made that transaction.

Thanks to the system's electronic invoices, the bank declares it in the year's financial report to pay taxes to the tax authority.

2.3.1.6 History

This is a way for customers to proactively look up and review their transactions so that when necessary, customers can review the amount of money deposited, added, and withdrawn. At the same time, when banks need access, they can easily search for transactions related to customers' savings.

2.3.2 The process of customer

- Customers log in to their account: If the customer uses a phone, go to the VCB Digital application, or can also open it on a laptop, because with the same account, VCB Digibank digital bank is built based on the integration Unifying separate transaction platforms on Internet Banking and Mobile Banking, providing seamless and unified experiences for customers on electronic media such as computers (PC/Laptop) and mobile devices (phones).

/tablet). Enter the Username and password you created when registering an account at the bank. Enter the test code then press Login.

- Savings opening process: Go to the VCB Digibank application on your phone. On the home page, scroll down to the "Savings" feature. Then select "Open savings" (including the following services: regular savings, flexible savings, accumulated deposits, automatic savings settings, deposits for children). Select Source account, select Deposit term, select Deposit amount, select interest payment method, Click the button to agree to the savings deposit terms. Confirm the information and choose an authentication method. Proceed to enter the password to authenticate the transaction.

- Process to deposit more money: When the customer wants to deposit more money into the savings account, click on the "Deposit more money" section, then click on the source account, select the savings account you want to deposit more money, then enter. additional amount you want to pay. Click continue to reconfirm the Customer information. After confirming and entering the password, the Customer will receive SMS OTP to authenticate the transaction. Completing all the above steps, the customer will receive a certificate displaying the transaction information just made, including: savings amount, transaction code, current balance.

- Withdrawal process (withdrawal before maturity): After logging in to the VCB application, at the main interface select "Savings" then select "Closing savings". Customers select the savings account to be settled and the account to receive money. Confirm payment information and receive OTP code sent to the Customer's phone number. Successfully receiving notification, the amount will be transferred to your payment account, and the Customer will receive a bill notifying the withdrawn amount and remaining balance of the savings account.

2.3.3 The process of enterprise

The process of the bank for recording bank deposits through the mobile banking app: After logging into the app, customers select the deposit function and enter the amount they want to deposit, the account number to receive and some other information. Then, customers confirm the transaction with a password or fingerprint. The bank will check the information and process the transaction as quickly as possible. When the transaction is completed,

customers will receive a confirmation notification via the app or message. This process helps customers save time and cost when depositing money to the bank, while enhancing security and safety for transactions. The bank will record the deposit information of customers into the system and update the account balance of customers on the mobile banking app. The bank will also send customers a message or email confirming the successful transaction and detailed information about the savings deposit.



CHAPTER 3: DESIGN ENTITY RELATIONSHIP MODEL

3.1. Identify and describe entities, define entity attributes

3.1.1. Entities participating in the model

Customer : Information provided by customers to open an account saving on the VCB Digibank and money can be withdrawn by the customer.

Account Saving : Information for logging in and managing customer savings deposits.

Bill: Information about the bills of customers when making transactions.

History (Weak entity of Bill): Information about the history of each customer when they conduct a transaction.

Certificate : Information for customers after they add money to an account saving which exited or open a new account saving.

Table 3.1. Description of entities and their attributes

| Table Name | Attribute | Key | Attribute Type | Description |
|-----------------------|------------------|-------------|----------------------|-------------|
| 1. CUSTOMER | Cus-No | Primary key | Identifier attribute | |
| | Cus_Name | | Single Value | |
| | DateofBirth | | Single Value | |
| | Password | | Single Value | |
| | Phone | | Single Value | |
| | Cus_ID | | Single Value | |
| 2. | AccountSaving_ID | Primary key | Identifier attribute | |

| | | | | |
|---------------------------------|-------------------|----------------------------|----------------------|----------------------|
| ACCOUNT SAVING | AccountSaving_No | Primary key | Identifier attribute | |
| | AccountStart_Date | | Single Value | |
| | Maturity_Date | | Single Value | |
| | Interest_Rate | | Single Value | |
| | Interest_Type | | Single Value | |
| | Cus_No | Foreign Key | Identifier attribute | |
| 3. BILL | Bill_Code | Primary key | Identifier attribute | |
| | Money_Amount | | Single Value | |
| | Time_Date | | Single Value | |
| | AccountSaving_ID | Foreign Key | Identifier attribute | |
| | AccountSaving_No | Foreign Key | Identifier attribute | |
| 4. HISTORY | History_No | Partial Key of Primary key | Composite identifier | *Weak entity of BILL |
| | Bill Code | Partial Key of Primary key | Composite identifier | |
| | Transaction_Type | | Single Value | |
| | Money_Balance | | Single Value | |
| 5. CERTIFICATE | Certificate_No | Primary key | Identifier attribute | |

| | | | | |
|--|--------------------|-------------|----------------------|--|
| | Interest_rate | | Single Value | |
| | Amount | | Single Value | |
| | AccountSaving_Type | | Single Value | |
| | AccountSaving_ID | Foreign Key | Identifier attribute | |
| | Transaction Date | | Single Value | |
| | Term | | Single Value | |
| | AccountSaving_No | Foreign Key | Identifier attribute | |

3.2 Business rules related to entities:

Customer - Account Saving: Each customer can only create one account and an account can only be created by one customer.

Account Saving - Certificate: At different times, each customer can conduct many transactions, one account saving has one certificate. After each transaction, there will be a new certificate.

Account Saving - Bill: Each account saving can create many bills. After each transaction, there will be a new bill to record this transaction.

Bill - History: One history can store many bills. After conducting a transaction and creating a bill, this bill is stored in history. There is only one history for each bill.

*Note: With cancel savings, this transaction is only stored in the bill without creating a new certificate. In history, they will save the previous certificate and recently created bill.

3.3. Identify relationships between entities

Table 3.2. Identify relationships between entities

| Relationship | Relationship Type | Describe |
|-------------------------------------|-------------------|---|
| <i>Customer - Account Saving</i> | <i>1 - N</i> | <i>A customer can have one or many account saving.</i> <i>An account saving belongs to only one particular customer.</i> |
| <i>Account Saving - Certificate</i> | <i>1 - N</i> | <i>An account saving can have one or many certificates.</i> <i>One certificate belongs to only one account saving.</i> |
| <i>Account Saving - Bill</i> | <i>1 - N</i> | <i>An account saving can have one or many bills.</i> <i>One and only one bill is updated</i> |
| <i>Bill - History</i> | <i>1 - N</i> | <i>One bill can be stored in one history.</i> <i>One history contains one or many bills.</i> |

3.4. Enhanced Entity Relationship Diagram

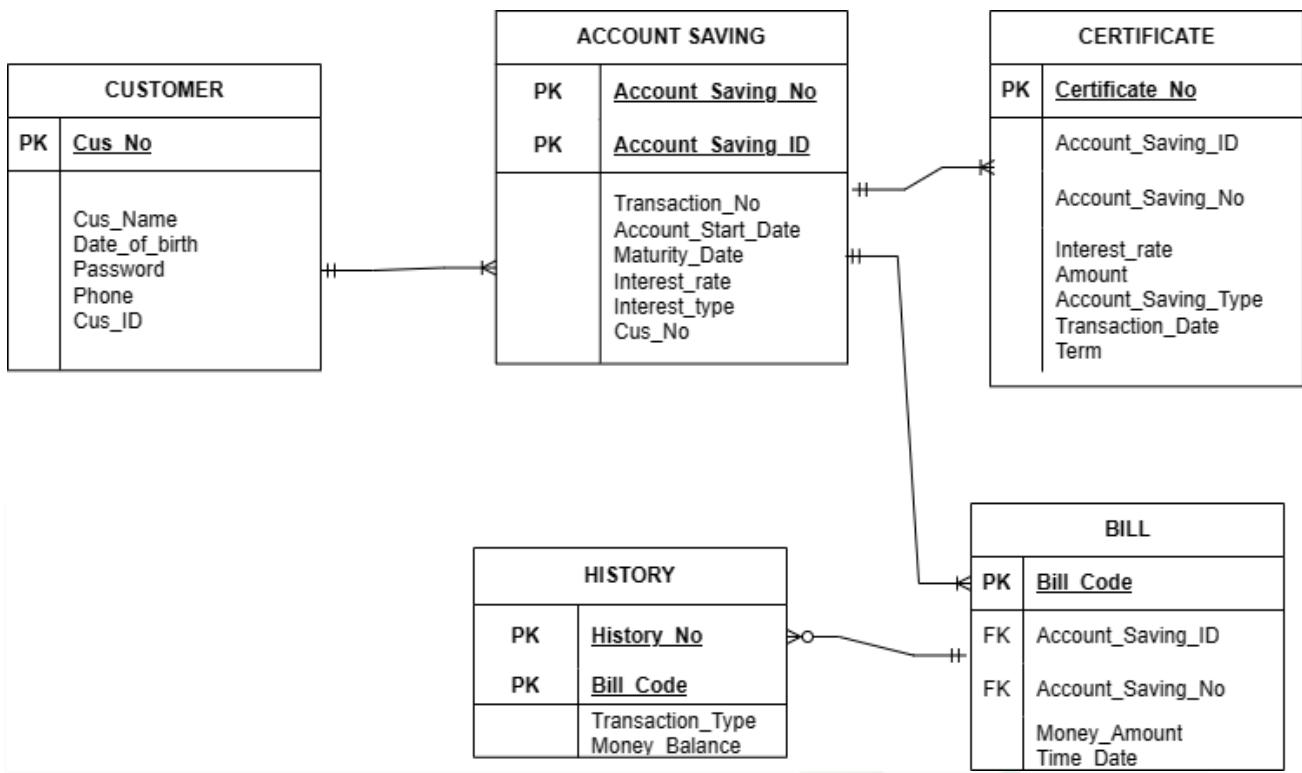


Figure 3.4. Entity Relationship Diagram

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Together for the future

CHAPTER 4: LOGICAL DESIGN DATABASE

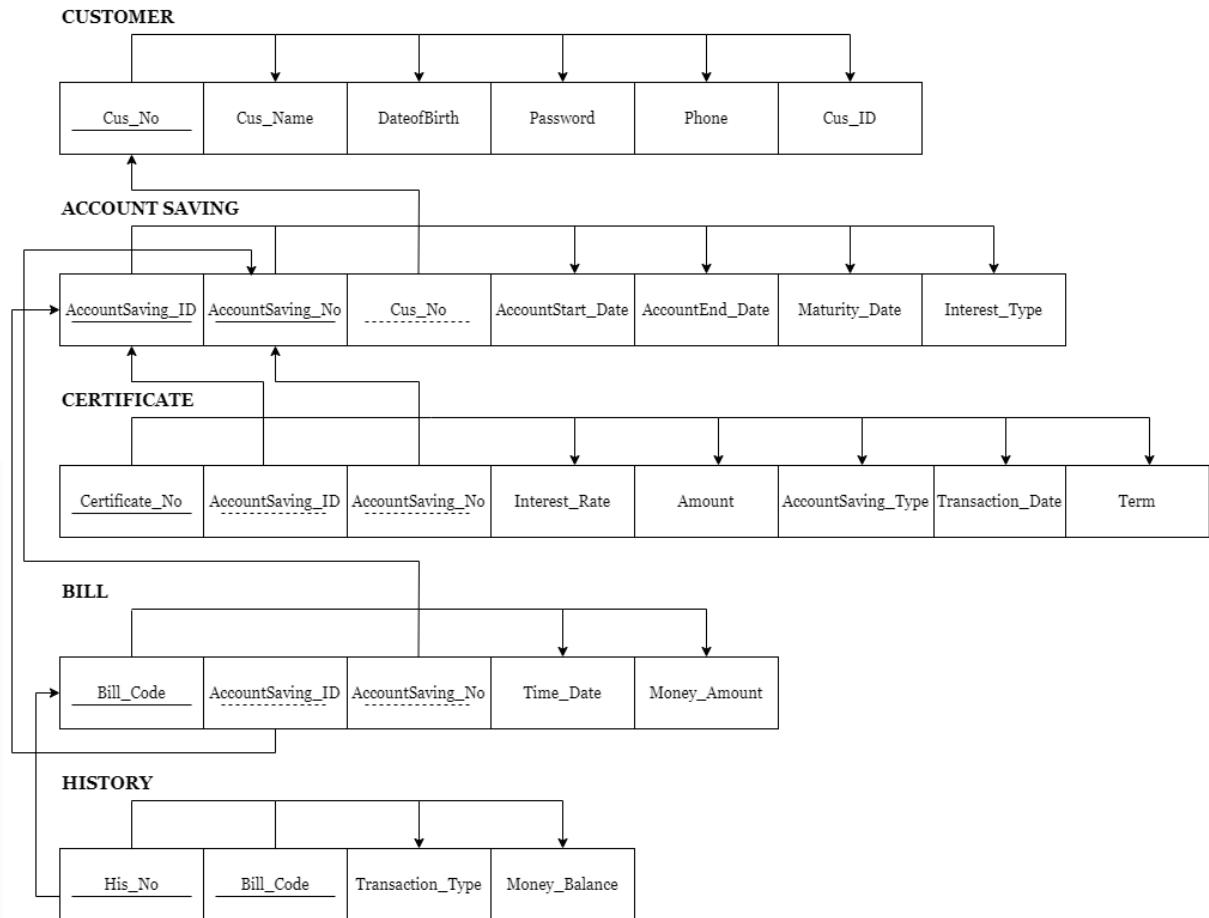


Figure 4.1. 3NF relations - Mapping relationship & functional dependency diagram

CHAPTER 5: PHYSICAL DESIGN DATABASE

5.1. Define SQL data types for the attributes in the normalized relations

Table 5.1. SQL data types for attributes in the normalized relations.

| Table Name | Column | Key | Data type | Domain Constraint | Description |
|-----------------------------|-------------------|-------------|--------------|-------------------|-----------------------------|
| 1. CUSTOMER | Cus_No | Primary Key | Varchar(20) | 0 - 20 | Not NULL |
| | Cus_Name | | Nvarchar(40) | 0-40 | Not NULL |
| | DateofBirth | | date | yyyy-mm-dd | Not NULL Default sysdate |
| | Password | | Varchar(20) | 0 - 20 | Not NULL |
| | Phone | | Varchar(12) | 0 - 12 | Not NULL |
| | Cus_ID | | Char(12) | 12 | Not NULL |
| 2. ACCOUNT SAVING | AccSaving_ID | Primary key | Varchar(20) | 0 - 20 | Not NULL |
| | AccountSaving_No | Primary key | Varchar(20) | 0 - 20 | Not NULL |
| | AccountStart_Date | | date | yyyy-mm-dd | Not NULL Default |

| | | | | |
|----------------|------------------|--------------|---------------|---|
| | | | | sysdate |
| | Maturity_Date | date | yyyy-mm-dd | Not NULL Default sysdate |
| | Interest_Rate | Varchar (10) | 0 - 10 | Not NULL |
| | Interest_Type | Varchar(60) | 0 - 60 | Not NULL Values are: “compound interest” “Interest transfers to current account” |
| | Cus_No | Foreign Key | Varchar(20) | 0 - 20 Not NULL |
| 3. BILL | Bill_Code | Primary Key | Varchar(20) | 0 - 20 Not NULL |
| | Money_Amount | | Numeric(20,4) | 0 - 24 Not NULL |
| | Time_Date | Date | yyyy-mm-dd | Not NULL Default sysdate |
| | AccountSaving_ID | Foreign Key | Varchar(20) | 0 - 20 Not NULL |
| | AccountSaving_No | Foreign Key | Varchar(20) | 0 - 20 Not NULL |

| | | | | | |
|---------------------------|--------------------|----------------------------|----------------|------------|---|
| 4. HISTORY | History_No | Partial Key of Primary key | Varchar(20) | 0-20 | Not NULL |
| | Bill_Code | Partial Key of Primary key | Varchar(20) | 0-20 | Not NULL |
| | Transaction_Type | | Varchar(8) | 0-8 | Not NULL Values are: “Open” “Add”, ‘Withdraw’, ‘Close’ |
| | Money_Balance | | Varchar(30) | 0 - 30 | Not NULL |
| 5. CERTIFICATE | Certificate_No | Primary key | Varchar(20) | 0-20 | Not NULL |
| | Interest_Rate | | Varchar(10) | 0 - 10 | Not NULL |
| | Amount | | numeric(20, 4) | 0 - 24 | Not NULL |
| | AccountSaving_Type | | Varchar(16) | 0-16 | Not NULL Values are: “term deposit” “demand deposit” |
| | Transaction_Date | | Date | yyyy-mm-dd | Not NULL Default |

| | | | | |
|------------------|-------------|-------------|--------|-------------|
| | | | | sysdatetime |
| Term | | Nvarchar(9) | 0 - 9 | Not NULL |
| AccountSaving_ID | Foreign Key | Varchar(20) | 0 - 20 | Not NULL |
| AccountSaving_No | Foreign Key | Varchar(20) | 0 - 20 | Not NULL |

5.2. Create a physical database in MS SQL Server

5.2.1. CUSTOMER table

```
CREATE TABLE CUSTOMER (
```

```
Cus_No VARCHAR(20) PRIMARY KEY NOT NULL,
```

```
Cus_Name NVARCHAR(40) NOT NULL,
```

```
DateofBirth DATE NOT NULL DEFAULT SYSDATETIME(),
```

```
Password VARCHAR(20) NOT NULL,
```

```
Phone VARCHAR(12) NOT NULL,
```

```
Cus_ID CHAR(12) NOT NULL);
```

5.2.2. ACCOUNT SAVING table

```
CREATE TABLE ACCOUNTSAVING(
```

```
AccountSaving_ID VARCHAR(20) NOT NULL,
```

```
AccountSaving_No VARCHAR(20) NOT NULL,
```

```

AccountStart_Date DATETIME DEFAULT SYSDATETIME() NOT NULL,
Maturity_Date DATETIME DEFAULT SYSDATETIME()NOT NULL,
Interest_rate VARCHAR(10) NOT NULL,
Cus_No VARCHAR(20) NOT NULL,
Interest_Type VARCHAR(60) NOT NULL CHECK(Interest_Type IN
('compound_interest','Interest transfers to current account')),
PRIMARY KEY (AccountSaving_ID,AccountSaving_No),
FOREIGN KEY (Cus_No) REFERENCES CUSTOMER(Cus_No))

```

5.2.3. BILL table

```

CREATE TABLE BILL (
Bill_Code VARCHAR(20) NOT NULL,
Money_Amount NUMERIC(20,4) NOT NULL,
Time_Date DATETIME DEFAULT SYSDATETIME() NOT NULL,
AccountSaving_ID VARCHAR(20) NOT NULL,
AccountSaving_No VARCHAR(20) NOT NULL,
PRIMARY KEY (Bill_Code),
FOREIGN KEY (AccountSaving_ID, AccountSaving_No) REFERENCES
ACCOUNTSAVING (AccountSaving_ID, AccountSaving_No))

```

5.2.4. *CERTIFICATE* table

```
CREATE TABLE CERTIFICATE (
    Certificate_No VARCHAR(20) PRIMARY KEY NOT NULL,
    Interest_rate VARCHAR(10) NOT NULL,
    Amount NUMERIC(20, 4) NOT NULL,
    AccountSaving_Type VARCHAR(16) NOT NULL CHECK (AccountSaving_Type IN
        ('Online savings', 'Flexible Savings')),
    Transaction_Date DATETIME DEFAULT SYSDATETIME() NOT NULL,
    Term NVARCHAR(9) NOT NULL,
    AccountSaving_ID VARCHAR(20) NOT NULL,
    AccountSaving_No VARCHAR(20) NOT NULL,
    FOREIGN KEY (AccountSaving_ID, AccountSaving_No) REFERENCES
    ACCOUNTSAVING (AccountSaving_ID, AccountSaving_No));
```

5.2.5. *HISTORY* table

```
CREATE TABLE HISTORY (
    History_No VARCHAR(20) NOT NULL,
    Bill_Code VARCHAR(20) NOT NULL,
    Transaction_type VARCHAR(8) NOT NULL CHECK (Transaction_type in
        ('Open', 'Add', 'Withdraw', 'Close')),
    Money_Balance VARCHAR(30) NOT NULL,
    PRIMARY KEY (History_No, Bill_Code))
```

5.3. Database Diagram

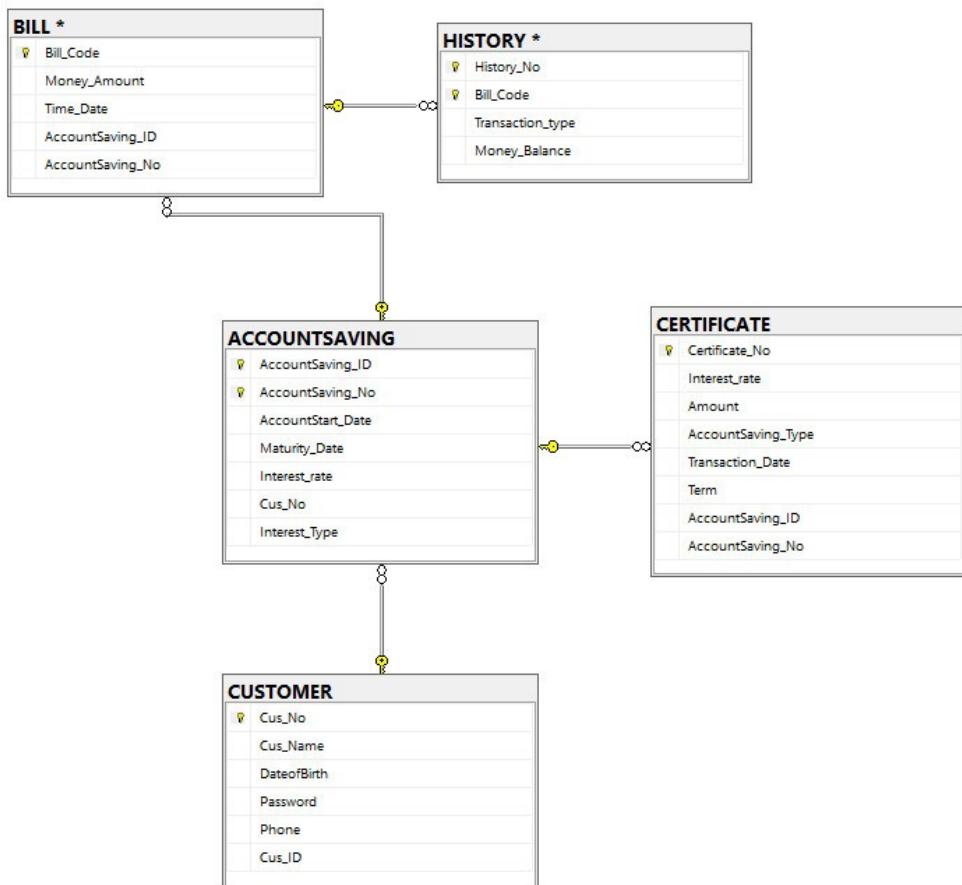


Figure 5.3 Database Diagram

CHAPTER 6: QUERY

6.1. Query 1

Query requirement: Number of transactions made by each customer, write a query that retrieves Customer Number, Customer Name and Customer ID.

```
SELECT c.Cus_Name, c.Cus_ID, count(h.History_No) as N 'Số lần giao dịch'  
FROM CUSTOMER c  
JOIN ACCOUNTSAVING a  
ON c.Cus_No = a.Cus_No  
JOIN BILL b  
ON a.AccountSaving_ID = b.AccountSaving_ID  
and a.AccountSaving_No = b.AccountSaving_No  
JOIN HISTORY h  
ON b.Bill_Code = h.Bill_Code  
GROUP BY c.Cus_Name, c.Cus_ID
```

6.2. Query 2

Query requirement: Write a query that retrieves Customer Name, Customer ID, AccountSaving_ID and Maturity Date with the condition that customers have a flexible saving account with maturity from 1/1/2023 to 1/1/2024.

```
SELECT c.Cus_Name  
FROM ACCOUNTSAVING a  
JOIN CUSTOMER c on a.Cus_No = c.Cus_No  
WHERE a.AccountStart_Date BETWEEN '2023-01-01' AND '2024-01-01'  
GROUP BY c.Cus_Name
```

6.3. Query 3

Query requirement: Write a query that retrieves Customer Name, Bill Code with the condition that customer made the transaction from January 1, 2024.

```
SELECT Bill_Code, Time_Date  
FROM BILL  
WHERE Time_Date > '2024-01-01'
```

6.4. Query 4

Query requirement: write a query that retrieves the customer name, Saving ID, interest rate, and Account type with the condition that customers have compound interest accounts with an interest rate:3.7%

```
SELECT a.Interest_rate,a.Interest_Type,c.Cus_Name  
FROM ACCOUNTSAVING a  
JOIN CUSTOMER c  
ON a.Cus_No=c.Cus_No  
WHERE Interest_rate = '3,70%' and Interest_Type = 'compound_interest'
```

6.5. Query 5

Query requirement: write a query that retrieves the Customer's name,AccountSavingID, interest rate , amount of money, Account start date with condition that the customer has a flexible account and term long from 15 months or longer

```
SELECT Distinct Cus_Name, acc.AccountSaving_ID, acc.Interest_rate, Amount,  
Transaction_Date  
FROM dbo.CUSTOMER cus INNER JOIN dbo.ACOUNTSAVING acc
```

```

ON cus.Cus_No = acc.Cus_No

INNER JOIN dbo.CERTIFICATE cer

ON acc.AccountSaving_ID = cer.AccountSaving_ID

WHERE AccountSaving_Type = 'Flexible Savings'

AND convert(int,replace(term,'months', ' ')) > 15

```

6.6. Query 6

Query requirement: Write a query to retrieve customer name, customer ID, number of savings accounts and type of savings account for a specific customer.

```

SELECT Distinct Cus_Name, cus.Cus_No, count(acc.AccountSaving_No) AS
'Number_of_AccountSaving', AccountSaving_Type

FROM dbo.CUSTOMER cus INNER JOIN dbo.ACOUNTSAVING acc

INNER JOIN dbo.CERTIFICATE cer

ON acc.AccountSaving_ID = cer.AccountSaving_ID

ON cus.Cus_No = acc.Cus_No

WHERE acc.AccountSaving_ID IN

(SELECT AccountSaving_ID

FROM CERTIFICATE)

GROUP BY Cus_Name, cus.Cus_No, AccountSaving_Type

```

6.7. Query 7

Query requirement: Write a query to retrieve customer name, customer ID, savings account ID, amount of deposit and account opening date of customers opening accounts from 01/01/2023 to 01/01/2024.

```
SELECT    c.Cus_Name,    c.Cus_ID,    a.AccountSaving_ID,    b.Money_Amount,  
a.AccountStart_Date  
  
FROM CUSTOMER c  
  
JOIN ACCOUNTSAVING a  
  
ON c.Cus_No = a.Cus_No  
  
JOIN BILL b  
  
ON a.AccountSaving_ID = b.AccountSaving_ID AND a.AccountSaving_No  
= b.AccountSaving_No  
  
JOIN HISTORY h  
  
ON b.Bill_Code = h.Bill_Code  
  
WHERE h.Transaction_type = 'Open' and (a.AccountStart_Date BETWEEN  
'01/01/2023' and '01/01/2024') and a.AccountSaving_No = 1
```

6.8. Query 8

Query requirement: Write a query to retrieve the transaction history of a specific customer over a specific period of time.

```
SELECT    c.Cus_Name,    c.Cus_ID,    a.AccountSaving_ID,    h.History_No,  
h.Transaction_type, b.Time_Date, b.Money_Amount, h.Money_Balance  
  
FROM CUSTOMER c
```

JOIN ACCOUNTSAVING a

ON c.Cus_No = a.Cus_No

JOIN BILL b

ON a.AccountSaving_ID = b.AccountSaving_ID AND a.AccountSaving_No =
b.AccountSaving_No

JOIN HISTORY h

ON b.Bill_Code = h.Bill_Code

WHERE c.Cus_Name = 'Pham Gia Linh' and c.Cus_ID = 53241197 and
(b.Time_Date between '01/01/2023' and '01/01/2025')

