SE 201.3 - Systems Analysis and Design

Group Assignment

Fingerprint based ATM system with face unlock accessibility feature

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GITHUB Repository - https://github.com/KavinduLakmal2000/SAD_Project

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EXECUTIVE SUMMARY

ATM machines have become a crucial element in today's society. These machines are used by almost everyone to do banking transactions. But as important as these machines are, they are very cumbersome to operate. We have decided to propose a solution to this problem.

The currently implemented ATM systems use 4-digit pin numbers for login and security. This system is time-consuming, not feasible for disabled people, and poses a security risk. The newly proposed system looks to overcome these issues by using a fingerprint-based authentication system. As fingerprints can be used to identify each and every individual uniquely, this system eliminates the security risk associated with 4-digit pins. This system also streamlines the process of banking through ATM machines, by eliminating the need for ATM cards.

Doing ATM transactions is nearly impossible for disabled people, and as a solution for this, we have implemented a facial recognition system in the machine. Using either one of these methods the user has the ability to login to the system easily and complete their transactions.

This project was completed adhering to the Agile methodology, with the end goals being profitability, sustainable growth, customer and employee satisfaction, brand awareness, quality control, and revenue. Technical, economic, operational as well as schedule feasibilities were also taken into consideration while going forward with this project. With all these considerations, this new ATM system looks to redefine the way we do transaction activities.

Introduction

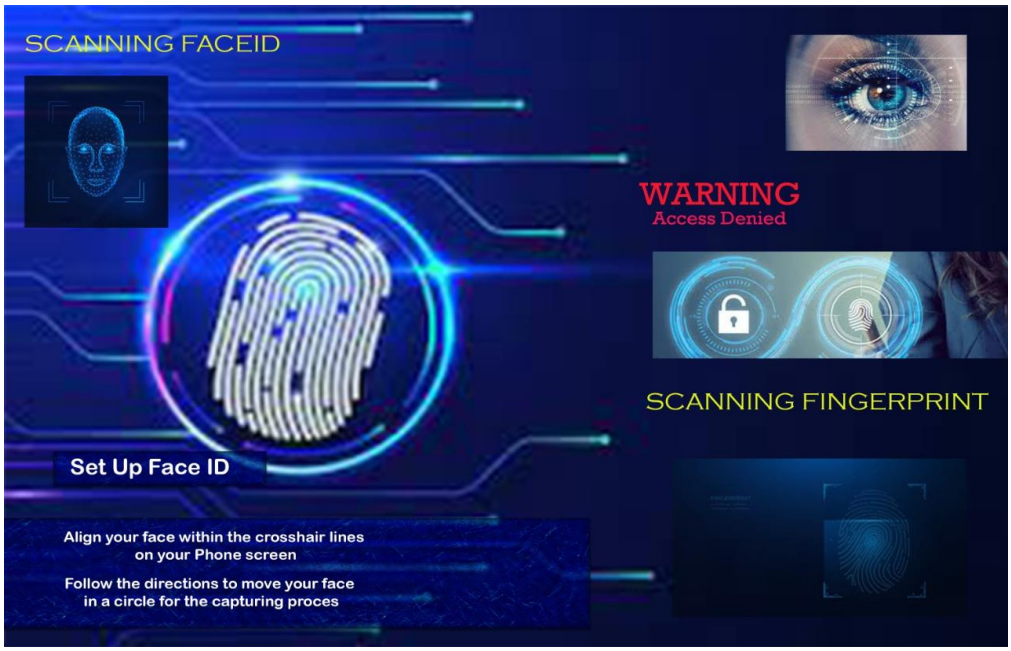
With the development of computer network technology and e-commerce, customers have become accustomed to self-service banking thanks to its feature of supplying high-quality service 24 hours a day. These days it is very common for ATMs to provide customers with convenient banking services like banknote trading. However, instances of financial crime have been increasing in recent years. There have been a number of cases of criminals stealing users' credit cards by illegal means from ATMs. Because of that in the modern financial world, the idea of carrying on a valid identity to the customer is becoming increasingly important. In traditional ATM systems, authentication is generally performed by using a credit card and password; however, the system has some weaknesses. Recent years have seen continuous improvements in the algorithm used to recognize fingerprints and faces. By combining with the original password authentication method, biometrics identification technology assists in verifying the client's identities and achieving the purpose of improving safety through the use of ATM machines. Throughout this project, we propose a face unlock and fingerprint-based ATM system.

Face unlock and fingerprint-based ATM is a desktop application where the face or fingerprint of the user is used as authentication. Fingerprint and face(iris) contain distinctive features for each individual, so it is possible to identify a person by their fingerprint and face. Then it is safer and more secure to use face unlock and fingerprint-based ATMs rather than ATM cards.

The author discusses the following in this paper:

- Business objectives
- Background
- Scope of the system (including WBS)
- Feasibility analysis
- User requirements analysis
- Graphical illustrations of the to be system design
- Necessary user interface that will meet the functional requirements
- Database design
- System architecture diagram
- Hardware & software specification

PROMOTIONAL POSTER



PROJECT PLAN

Because of these terrible pandemic scenarios, we decided to establish a brand-new project that saves a lot of time, is considerably more profitable, and is much easier for the customer.

Selecting a suitable methodology

The approach used will be determined by the project type, scope, and development team. One of the first considerations a project manager must choose which project methodology to use. The project approach we choose will have a direct influence on the project and the team's success. Adopting a project management technique provides several benefits to the project's progress.

A project management technique may assist organizations/companies by standardizing procedures, creating a plan that everyone understands, and assisting in the understanding of how to manage a project efficiently. This enables us to replicate successful parts while also learning from failures. This will result in a process of constant improvement. A methodology establishes a common basis for all initiatives inside a corporation or organization.

Benefits of project management methodology:

a. Boost the productivity and efficiency of the development team.
b. Deliver projects on schedule, meet, or exceed customer expectations, and remain under budget.
c. Increase the likelihood of a project's success while reducing the number of hazards.
d. Adapt to new difficulties quickly and easily and handle limited resources as efficiently as feasible.

We are upgrading an old existing atm system to a fingerprint and face recognition atm system, so we decided to best way is to apply **agile methodology** to this project.

Following this technique saves a lot of time since we can accomplish both development and implementation on the project at the same time, and it also cuts the project length in half compared to the waterfall methodology.

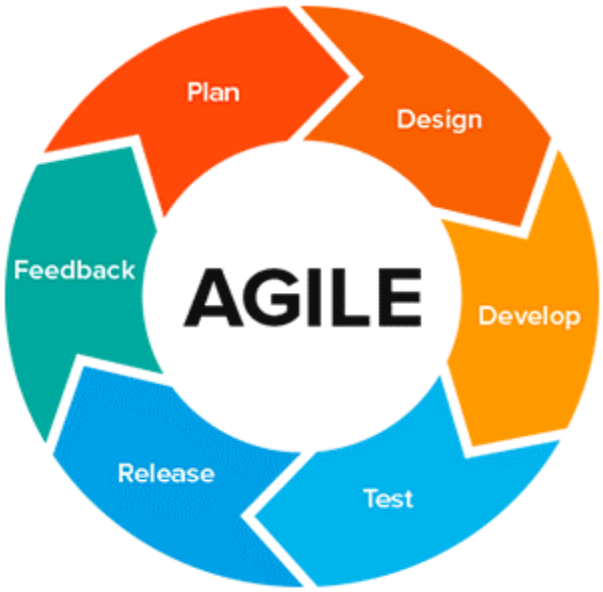
Agile methodology

The Agile method is a project management methodology that breaks a project into phases. Once the work starts, teams go through a design, execution, and evaluation process.

It is vital to maintain constant communication with team members and project stakeholders. Agile focuses on facultative teams that produce in digestible pieces to increase responsiveness to changing business demands.

Agile software development's ideals and concepts are as follows:

- Adapting to change rather than sticking to an idea.
- It is impossible to overestimate the significance of working software over detailed documentation.
- Customers are cooperating with the above-mentioned contract discussions.
- Individuals and their connections with one another, rather than works and tools.



Why we use agile?

There are several benefits of Agile methodology for this Fingerprint & face recognition project.

- **Focuses on Users**

User stories, together with business-focused approval criteria, are commonly used in Agile to design product upgrades. By focusing features on the wants of actual consumers, each addition gradually adds value, not just an IT component. This also allows you to beta test software after each Sprint, giving you valuable feedback early on and allowing you to make required modifications.

- **Early and Predictable Delivery**

By using time-boxed, fixed schedule Sprints of 1-4 weeks, new features are delivered quickly and consistently, with a high level of predictability. If the product has a high financial value, it can potentially be launched, or beta-tested earlier than intended.

- **Transparency**

Clients have a unique opportunity to participate in all aspects of the project when adopting an Agile methodology, from feature prioritization through iteration planning and review meetings to frequent software build that incorporate new features. In return for the greater value of transparency, clients must be aware that they are watching a work in progress.

- **At A Time, One Small Task:**

Because the development team members are students, breaking the project down into smaller sub-projects will help them stay on track. It will keep us from interfering with one other's work. Because the development team must operate remotely, it will also be beneficial to focus on a modest project at a time.

- **Project Management:**

Because the development team must complete the system on or before May 6, 2022, using Agile technique will aid in time management. It will be beneficial to concentrate on the team's performance.

BUSINESS OBJECTIVES

Business objectives are what you aim to accomplish in order to accomplish the vision you have for the company in the future. Having clear goals allows you to achieve your mission statement And a long-term vision for the business. Depending on the organization, these objectives can range from financial objectives to organizational-specific objectives .and also measurable, specific, and time-bound business objectives make for good business. Business objectives can also be a great way for employees to identify their strengths and areas for improvement.
Each business will have specific goals based on its industry, team, product, and financial standing, but they often fall into four general categories.

- Economic
- Human
- Organic
- Social

Is it important to have business objectives?

Yes. because having a solid business objective is crucial to an organization's success.
From that,

1. Employees are kept focused on growth
2. Ensures more effective budgeting and cost control
3. Encourages team cooperation and collaboration
4. Organizes work and responsibilities
5. Market share can be increased

The business objectives of our project

1. **Profitability –** In order to maintain profitability, revenue must remain higher than costs. Making progress toward your company's overall mission becomes easier when achieving and maintaining profitability.
2. **Sustainable growth –** You may not see any direct consequence to your business, but demonstrating your environmental consciousness can help you reach the clients you're targeting.
3. **Customer satisfaction** – Customer satisfaction should be the primary objective of the organization. Because client retention and repeat revenue are dependent on good customer service.
4. **Brand awareness** – Brands are what customers associate with a company's product or service, and how one company differentiates from its competitors. Understanding how customers perceive your brand and how they feel about your brand compared to your competitors is an important part of brand awareness.

5. **Revenue** – By setting revenue-driven goals, you can balance your income and costs to remain in business.
6. **Employee satisfaction and engagement** – Improving employee satisfaction is the key to reducing employee turnover. Provide value to team members through competitive salaries, career advancement opportunities, education reimbursement programs, and flexible work schedules.
7. **Quality control** – Businesses that improve their product or services should receive fewer complaints and more positive feedback from customers and clients. In addition, customers will be more inclined to recommend your products or service, which results in a better business reputation, increased customer retention, and increased brand awareness.

BACKGROUND

ATM

An automated teller machine (atm) is a computerized telecommunications device that offers financial transactions like deposits, transfers, balance inquiries, mini statements, withdrawals, and quick cash to clients of any financial institution. And also this process does not require a cashier, bank teller, or clerk to be present.
Atm can be divided into two parts based on the work performed.

1 only used to withdraw cash and to receive a balance report.
2 used for deposits and money transfers.
People usually use the first type of atm.
Several ATMs are located throughout the cities providing easy access to the clients' accounts. A customer's atm card is issued by the financial institution where the transaction is to be performed, and they are given a personal identification number (pin) with the card for authorization to access their account. But nowadays, pin security is not enough to guarantee the customer's account's security. And also pin may not be easily remembered and recognized by people who are not familiar with the concept. And also a lot of people distrust pins. To increase the account's security and authentication we have to find a method. For that, we can use biometric characteristics. A fingerprint, hand geometry, iris, retina, ear, voice, and face are some of the biometric characteristics. Each of these features has its advantages and disadvantages, and the selection of biometrics depends on the application's requirements and authentication. The selection is made based on fingerprints and faces.
Face unlock and fingerprint-based atm system is a desktop application where the face or fingerprint of the user is used as authentication. Biometric fingerprints have more authentication power than pins because they are unique to everyone. But if some people can't

Use their fingerprints because of some disabilities then, they can use their face for it. The fingerprint minutiae functions and iris are distinctive for every human being so the user may be recognized uniquely. Then users will feel more at ease when face and fingerprint recognition is used because their accounts will be protected from others, and they will have greater peace of mind.

Why fingerprint and face

The reason for this selection can be summarized as follows.

- **Permanent** – time doesn't change the characteristics of the face or fingerprint. Structure-wise, they remain unchanged throughout the fetal stage.
- **Storage** – storage requirements for fingerprint and face are minimal
- **Accuracy** – comparatively, fingerprints and faces are more accurate than other biometrics.
- **Inexpensive** – it is relatively inexpensive to acquire, operate, and maintain fingerprints and faces.
- **Reliable** – a fingerprint and iris is unique to each individual
- **Universality** – every person in the world has a fingerprint or face.

How to use

In this proposed system customer has three options.

1. Fingerprint
2. Face
3. Pin

These are used for authentication purposes.
First, start the cardless menu at the atm. Place your registered finger on the fingerprint scanner or use your face to webcam. If your face or fingerprint fits with the database client names will be displayed on the atm machine. After that, you can withdraw money, view your account balance, transfer money, or do something else.

Features of face unlock and fingerprint-based atm system

- **Login** – Logging into the system will be done using the user's fingerprint or face
- **Add pin code** – In order to make the transaction, the user must scan their face or finger and add a pin code
- **Withdrawal of cash** – The user can withdraw cash by entering the amount he wants to withdraw
- **Transfer of money** – By entering the account number, a user can transfer funds between accounts.
- **View balance** – Each user is able to see the balance available in their respective accounts.
- **View transaction** – It is possible for users to view the five most recent transactions.

Advantages

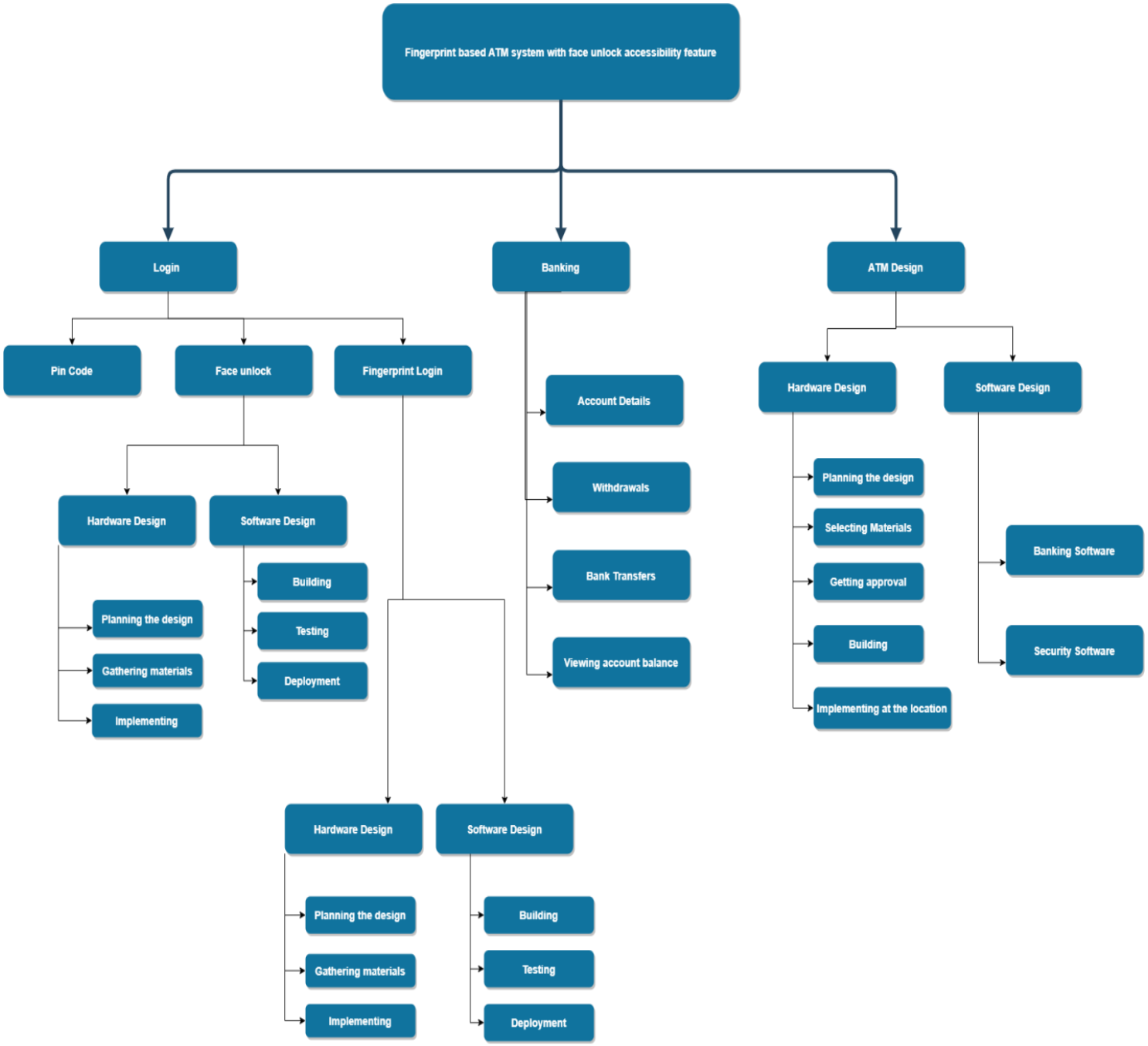
When compared to the existing system, the proposed system has these advantages.

1. Getting into the system is simple and quick
2. No need to remember anything such as a pin code
   Helps rural residents who are less educated to remember their pin, thus relieving their stress.
3. There are three options available to users when accessing the system
   - Fingerprint
   - Face
   - Pin code
4. Anytime, anywhere, the user can conduct an atm transaction by using his fingerprints or face, allowing him to completely eliminate the need to carry an atm card

5. Face unlock and fingerprint-based atm system provides better security than a conventional atm card.

If a pin is used as a password, everyone who knows the pin can access the account, whereas the reference fingerprint allows only one other person access, resulting in a win-win situation for both banks and their customers.

SCOPE OF THE SYSTEM BY USING WBS



FEASIBILITY ANALYSIS

A feasibility study is essential to evaluate costs and benefits
Proposed system.

- Technical feasibility
- Economic feasibility
- Operational feasibility
- Schedule feasibility

Technical Feasibility

Much of resource determination is related to technical feasibility assessment. It considers the technical requirements of the proposed project. In Technical Feasibility study, one must test whether the proposed system can be developed using existing technology or not. It is planned to implement the proposed system using C# technology. It is evident that the necessary hardware and software are available for development and implementation of the proposed system. Hence, the solution is technically feasible. This project is a complete web-based application. the key technologies and tools that are combined with the system are,

- Html
- CSS
- Jsp
- MySQL
- Js
- NetBeans
- Diagram drawing tools
  Visio
  Draw.io

Economic Feasibility

Being a Web Application This system has associated hosting costs. It is financially viable. No need to spend more than money. This system is mainly built on existing devices only. Because we use Visual Studio .NET as the front-end, it was the most powerful, portable platform and operating system on both the original and binary levels. The project also reduces workers' wages.

Value of product

The project targeted human needs are met only during the final stages of production, project lifecycle, activation, and maintenance. Targeted public interests are valued by associating them with market value and accounting. In this way, the value of the product or service is determined.

Cost of products or services

The different stages of the life of an engineering product or project are related to the value offered to create the price or value of use. These fees are carried at each stage, namely:

a. Creating and budgeting.
b. Cost of construction or construction.
c. Expenditure and maintenance costs.

Being a Web Application This system has associated hosting costs.

	LKR
Total fixed assets	27,365,675.00
Total working capital	5,731,6515.00
Working capital for 3 months	5688778.75
Total cost of project	31,548,454.00
Total depreciation cost	1,917,048.00
Total cost of ropery per annum	70,697,258.00

Operational feasibility

Operational Feasibility belong to part of solving issues with the support of another proposed system. Keep in mind that the administration and clients support the project. There are six parts to the structure, and they lead to troubleshooting operational problems that can be identified. They are performance, information, economy, control, efficiency, and services, which must be focused on with a definite end goal for the clinical administration systems project to succeed.

PERFORMANCE: This implies a general delay between the work done and the demand over a period and the response to that request. The current clinic administration system took a long time to complete, and the system lags in delivering results due to further attractiveness.

The new system project will allow the clinical administration system to minimize time consuming, deliver programs in a short period of time and deliver a more productive outcome. Online registration and database data recording will enable the system to be more efficient in bringing the best results.

INFORMATION: This gives server termination and supervisors accurate, occasional, patient, and useful organizational data. The current system needs to provide data and does not provide accurate data. Information and data are not maliciously stored everywhere and are no longer efficient. The new system project will allow the clinic management system to provide accurate data and store it in the database so that no data is lost and kept on a safe path.

Economic: If there is a cost devaluation as well as an increase in benefits, it allows for acceptance.

It also allows the business to recognize whether it has cost-effective data management. The current system makes it difficult at the end of the day to decide whether the clinic has the potential to benefit or be unlucky. This cost the clinic a lot of money for financial gains. The new system requires them to move to a more publicized system so that they can understand all the costs and transactions required during an investment period. The new project can know the price of their items and the amount they need to submit with a definite end goal to reap the benefits they can win.

control: This system allows to determine the implementation of powerful controls to ensure against fraud and to ensure the competence and security of information and data. The current system risks controlling the system while securing their documents and data because of the way they store documents that can be easily stolen or lost. The new clinic management project provides a database that protects records and data well by providing certification of their records and data. Similarly, it enables them to save their data and documents in the database system. The new project will be able to get the system by chance after such a procedure.

Efficiency: Complete information makes it difficult to deal with important data and is less efficient from this point on. It is important to rearrange some data and it is difficult to maintain a key distance from the redundancy and henceforth it is a moderate and less efficient system. In the new system, the relevant data can be easily captured in this way to be handled more efficiently and quickly. The new project aims to maintain a strategic distance from the surplus and is therefore a fast and efficient system.

services: Such a system agrees to accept if the administration is decent, adaptable, and comfortable. The current system, which does not provide much labor manually as it takes longer to register at the clinic, creates a longer waiting list for patients. The new system project will allow online registration and system data recording.

Schedule feasibility

Testing, activation, installation, and system maintenance can all begin once everything is clear. An urgent part is system analysis, identifying tasks and issues that need to be explained and developed in the system, and if done incorrectly, the whole system upgrade process will be shortened and then the client's requirements will not be met. Thus, it takes 44 long days to explore correctly. It takes a long time to understand the system functionality, because this is the final test and use of the system before it is delivered to the customer for use. The performance of the entire system is monitored and tested from start to finish to ensure that all designed capacities are running smoothly.

Numbers Project Management Duration(days)

ID	Name	Start Date	End Date	Duration
1	executive summary	Mar 08, 2022	Mar 09, 2022	2 days
2	business objectives	Mar 09, 2022	Mar 10, 2022	2 days
3	background	Mar 10, 2022	Mar 11, 2022	2 days
4	scope of the system	Mar 15, 2022	Mar 18, 2022	4 days
5	feasibility study	Mar 15, 2022	Mar 18, 2022	4 days
6	user requrement analysis	Mar 18, 2022	Mar 21, 2022	2 days
7	graphical illustrations of the to be system	Mar 21, 2022	Mar 24, 2022	4 days
8	functional requirments	Mar 24, 2022	Mar 28, 2022	3 days
9	database design	Mar 28, 2022	Apr 01, 2022	5 days
10	system architecture diagram	Apr 01, 2022	Apr 12, 2022	8 days
11	hardware &software specification	Apr 12, 2022	Apr 22, 2022	9 days

USER REQUIREMENTS ANALYSIS

The user needs to define customer expectations in terms of objectives, environment, constraints, and measures of the effectiveness of the system. The main users in this system are money depositors and cash withdrawals people, bill payment people, and administrators.

- **Operational set- up:**

ATMs can significantly increase revenue for retailers, financial institutions, the hospitality industry, the sports industry and much more. Let's look at some of the businesses, industries, and locations where ATM placement works best. Banks, credit unions, and other financial institutions are among the first places people look for an ATM, Nightclubs and Bars, Hotels, Grocery Stores, Gas Stations, Festivals and Events, Casinos, Dispensaries.

- **Mission:**

ATM is a special computer that makes it easy for a bank account owner to manage funds. It allows a person to view account balances, withdraw or deposit money, print out a statement of account activities or transactions, and even purchase stamps. The main objective of this project is to provide fingerprinting as an authorized identity and to create a more secure ATM system There are several items located throughout the city that provide easy access to customer accounts. The financial institution to which the transaction takes place will issue a customer an ATM card and provide a Personal Identification Number (PIN) with the card for authorization to access their account. But at present, PIN security is not sufficient to ensure the security of the customer's account. Also, the PIN number is not easy to remember and cannot be identified by people who do not know the concept. And a lot of people disbelieve Pins. We need to find a way to increase account security and authentication. For that we can use biometric features. Fingerprint, face biometric features. The choice of biometrics depends on the requirements and verification of the application. Selection is based on fingerprints and faces.

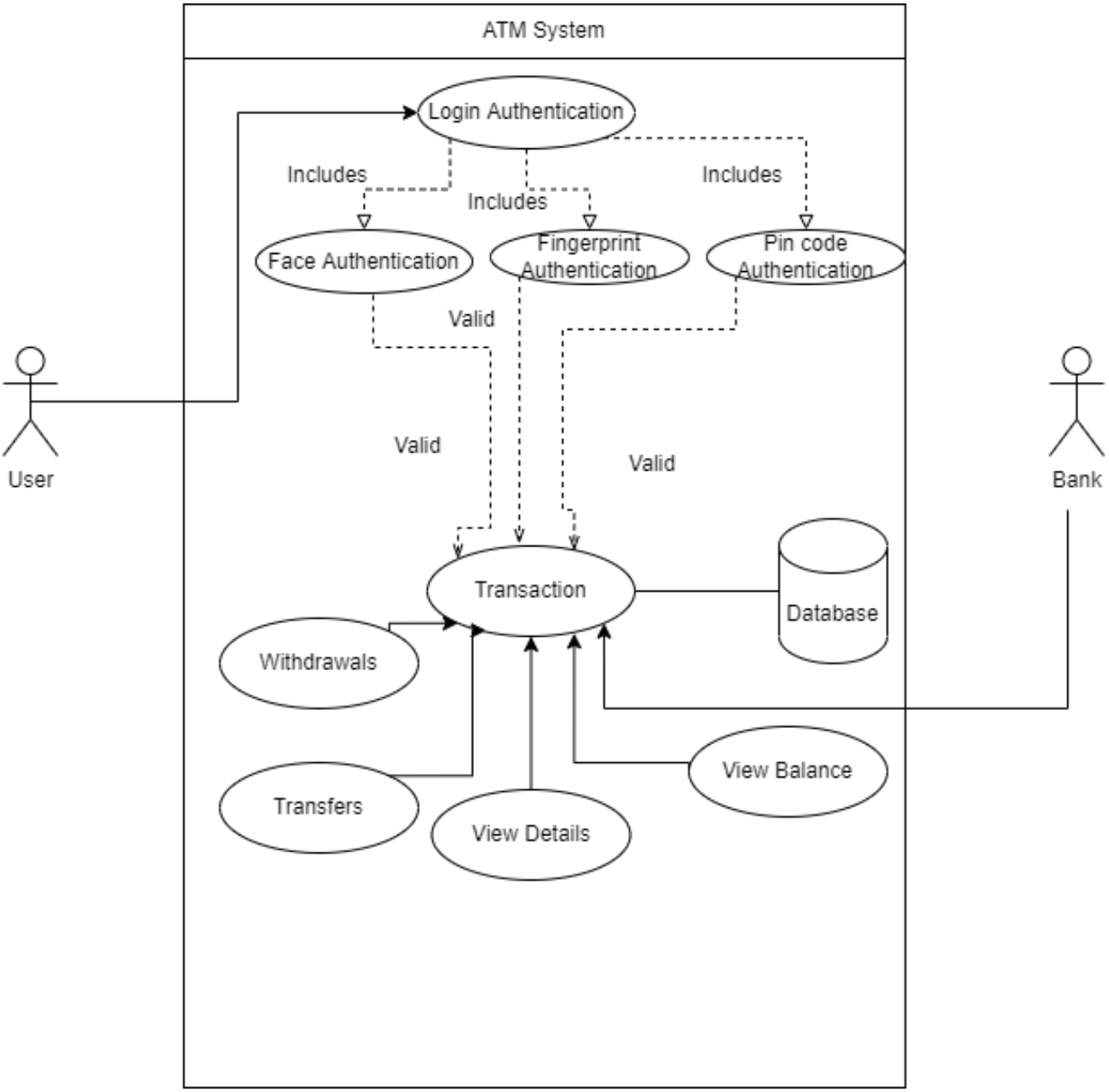
- **Utilization:**

Fingerprint and face Based ATM desktop application uses user fingerprint and face scanner. Fingerprint minutiae features vary from person to person so that the user can be uniquely identified. ATM Cards ATM cards are safer and more secure than using fingerprint compatible ATM cards. Based on biometric technology. It helps to see if someone is in front of the ATM. Facial recognition models can be enabled with a video camera on any self-service terminal, whose purpose is to prevent fraud. When someone reaches an ATM, it falls into the eye of the camera. An image is taken as soon as the user starts contacting the ATM. The special face recognition model analyzes the image, detects a face according to specific parameters, and generates a set of attributes that define the object, without any external element.
Features
* Login: - The user then logs into the system using his fingers and face screener.
* Add Pin Code: - User must add a pin code to make a transaction.
* Withdrawals: - The user can withdraw money by setting up the required withdrawals.
* Check Balance: - The user can see the balance in his account

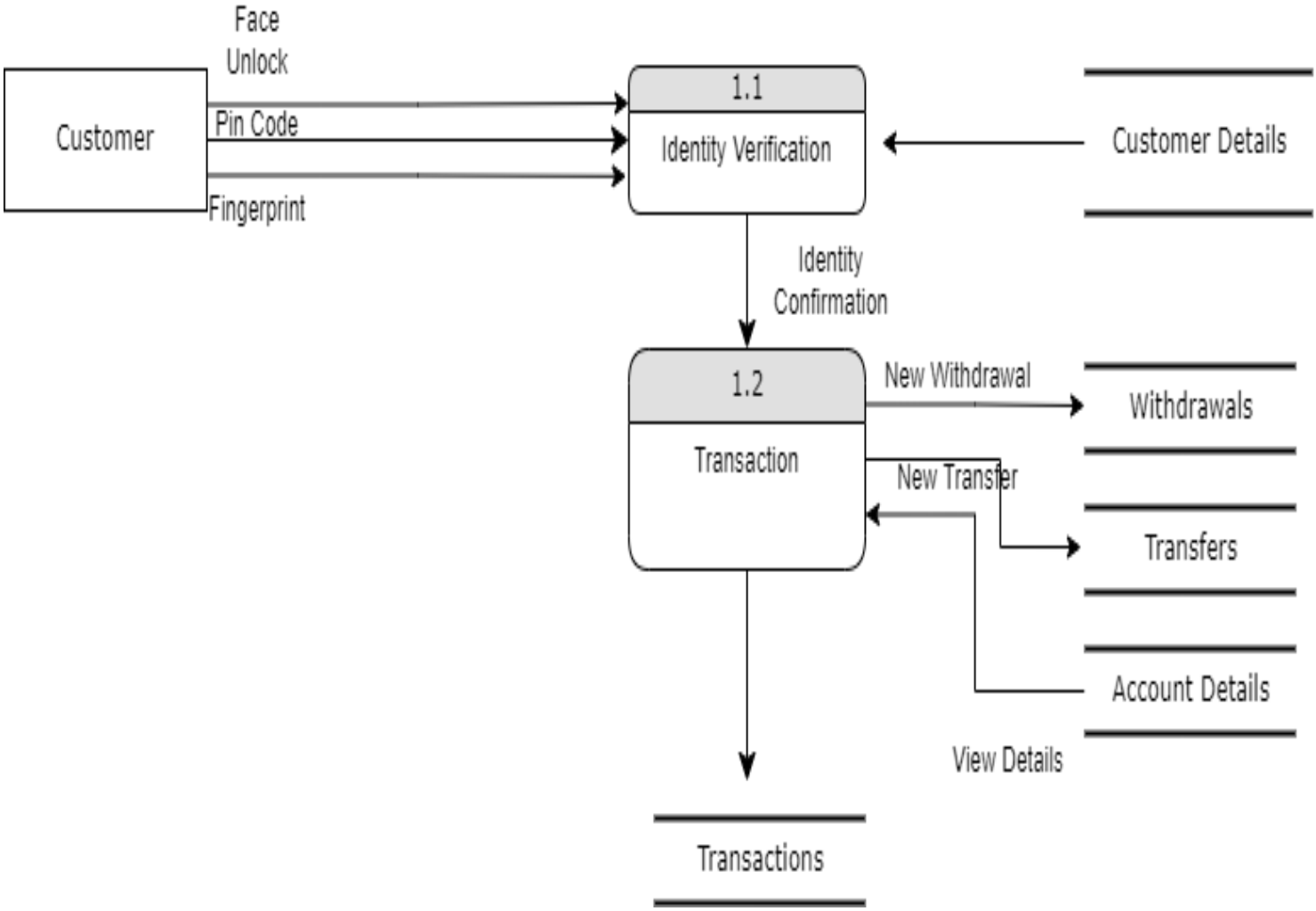
- **Effectiveness:**

ATM is a must-have item for all people. By using ATMs, people can make money transactions in their daily lives and perform different related tasks. The most common authentication mechanism used in ATMs has long been the card with a PIN for secure transactions. But with the advancement of technology today, it is important for security ATMs to overcome the problem, as banking and ATM users are waking up fearful. This study examines the most recent and popular authentic methods related to ATM security and recommends positive feedback from previous studies to increase ATM security during the ATM certification process and to protect the ATM machine from illegal training. This study compares different authentication methods, including the PIN type method, and promotes the best solution by measuring four key characteristics: security performance, order, cost, and flexibility in terms of security. Based on quantitative measures measured by comparison, this study promotes a safe solution as a combination of two methods from previous studies. A two-step verification system with PIN and Fingerprint or OTP with S-code was considered the best solution, as it is more secure and flexible for users, and another method with GPS and sensors was recommended to protect it from illegal physics. Provide activism and tracking capabilities.

USE-CASE DIAGRAM



DATA FLOW DIAGRAM



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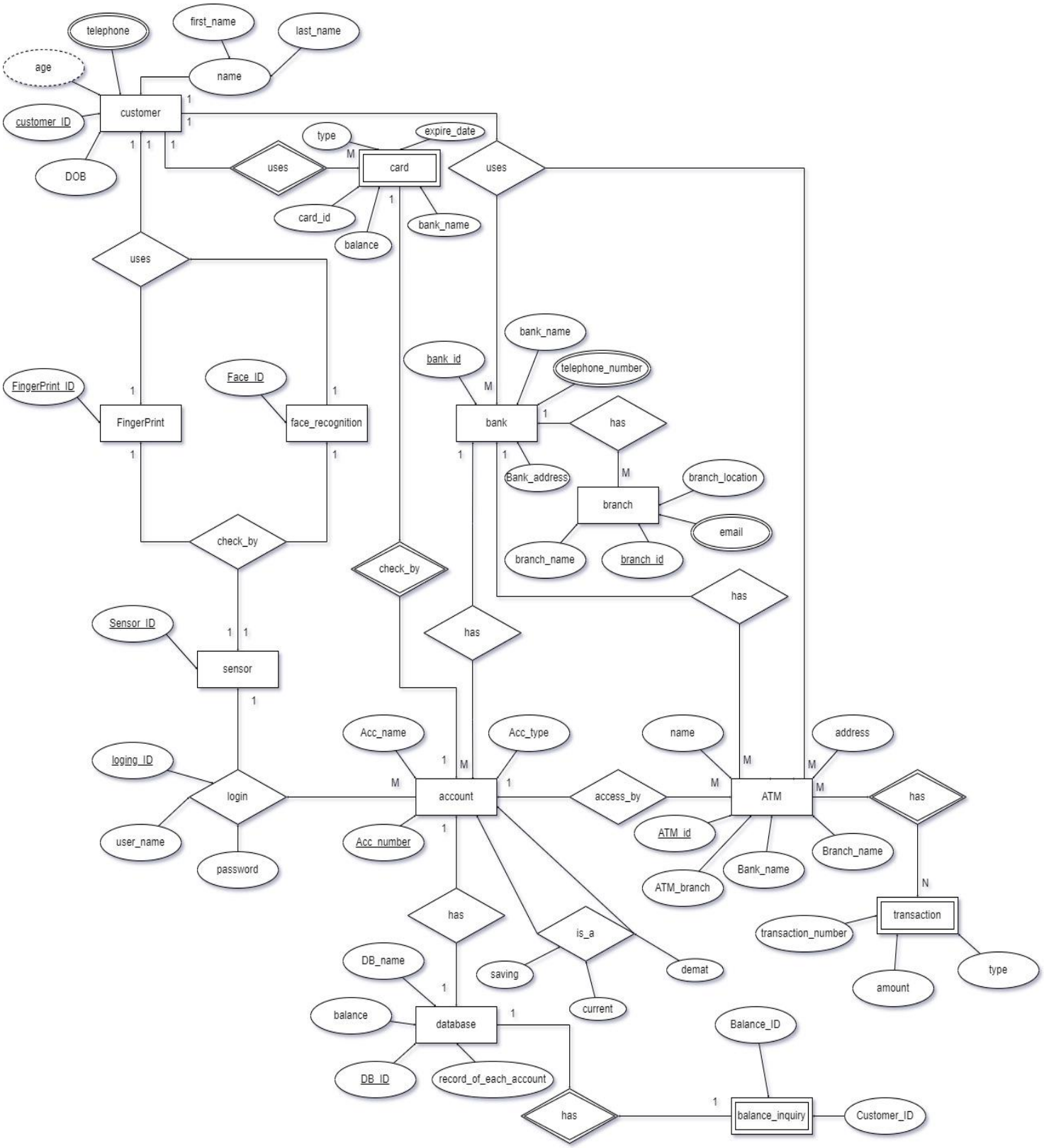
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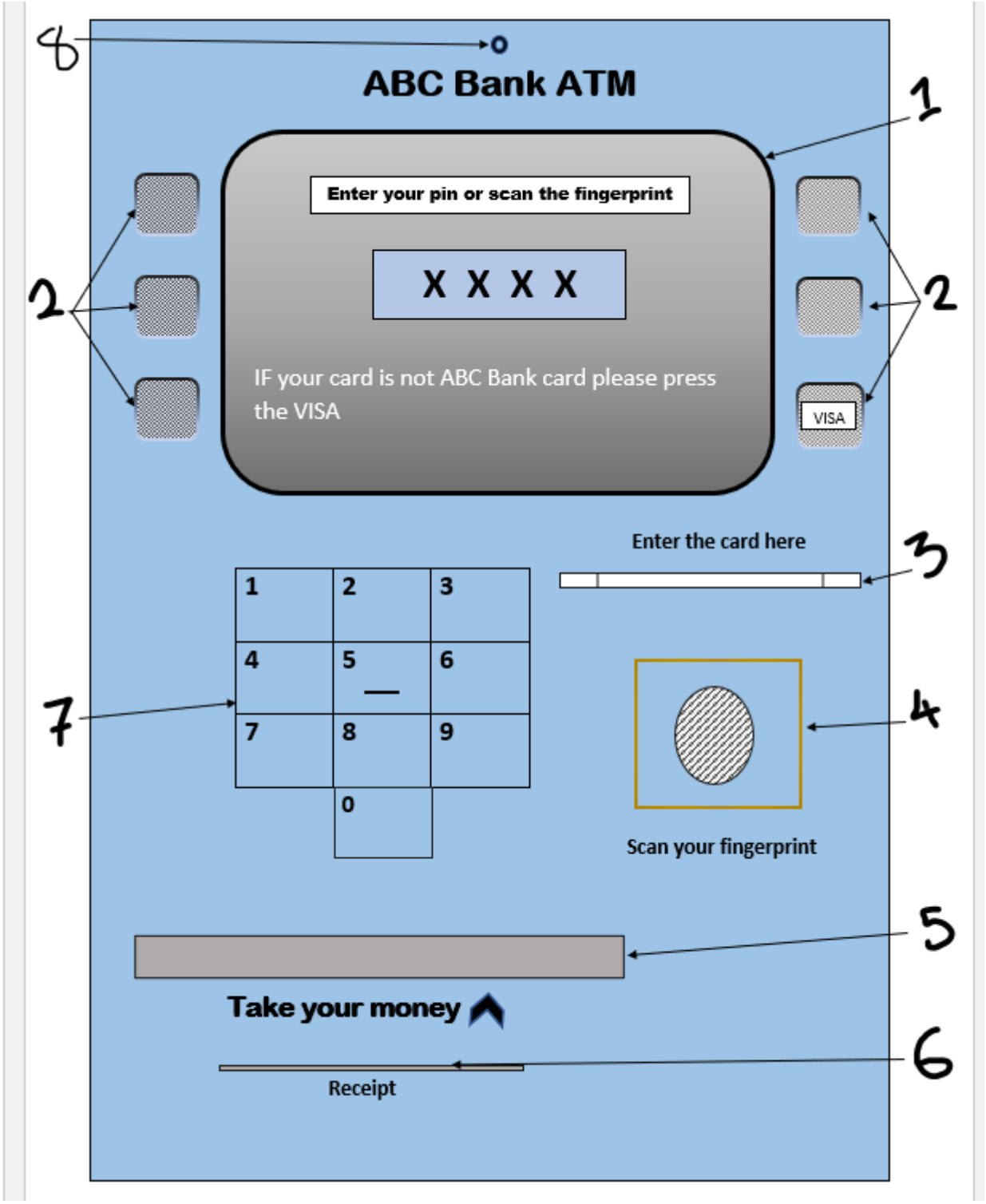
balance
database
current
Balance_ID
DB_ID
record_of_each_account
has
balance_inquiry
Customer_ID

Assumptions

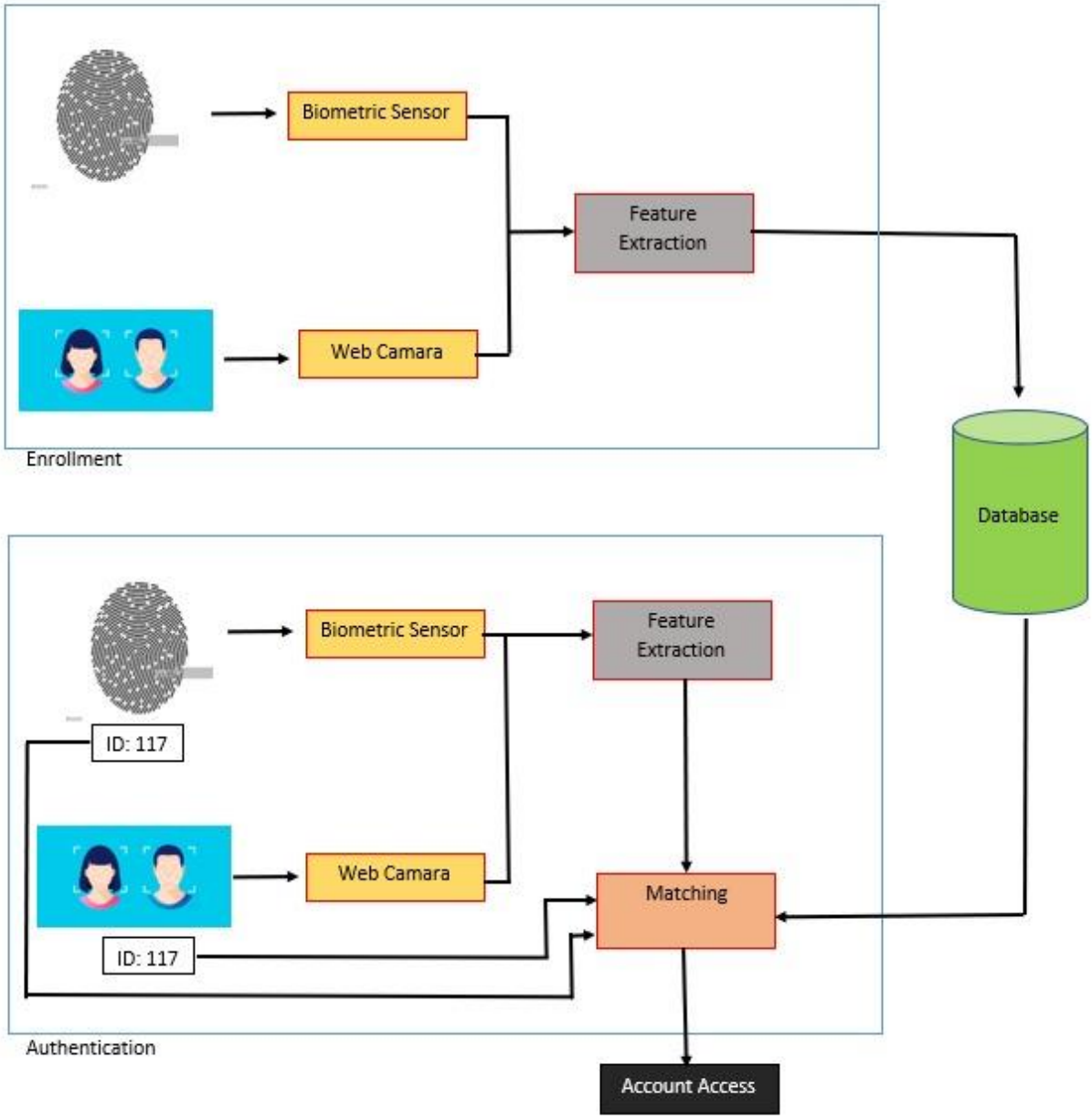
- Customer name is taken as a composite attribute.
- Customer telephone number is taken as a multi-valued attribute.
- Customer age is taken as a derived attribute.
- Card is taken as a weak entity.
- Bank telephone number is taken as a multi-valued attribute.
- Branch email is taken as a multi-valued attribute.
- Balance inquiry taken as a weak entity.
- Transaction taken as a weak entity.

USER INTERFACE



1. **Display** – The display brings about the cardholder through each step of transaction process.
2. **Switches –** The switch selects the actions that the user performs in the ATM machine.
3. **Card reader** – Cardholders can enter their card into this, and this is the first step of the ATM's process
4. **Fingerprint scanner** – Scanner works by capturing the ridge and valley pattern on a finger of cardholder. And it compared to list of fingerprints. If it matches the cardholder can carry on his deal with the ATM.
5. **Money counter** – Cardholder can take his money from this counter doing after the process with ATM machine.
6. **Receipt counter** – Cardholder can take summery of his bank account from receipt.
7. **Keypad –** Cardholder's pin or the value of money he wants can selected through the keypad.
8. **Camera** – Camera can record every process of ATM machine and its users, so it helps to stop stealing. But in here camera main process is identify the cardholder by using the face recognize system.

SYSTEM ARCHITECTURE DIAGRAM



SOFTWARE AND HARDWARE REQUIREMENTS

This section outlines the software and hardware requirements for the system.
Face recognition and fingerprints have been developed as an extra means to access the account in this suggested system. Fingerprints and images of the face are used in this method. The face image of a person is used to authenticate the person. After that, the picture was compared to the database image, and finally the image was compared to the database image. Fingerprint recognition When both recognition techniques are used access to the account if you match with the same single person. will be made available. In this case, the Raspberry Pi microcontroller is employed. the portion in charge Ids for fingerprint scanners and facial recognition are both available. searched a database for the user's additional information. The account will be kept. The Raspberry Pi is a small computer with a microcontroller. carries out a database search and sends the results to a display device the information that is required

SOFTWARE REQUIREMENTS

- Windows 7 is suitable for this system. Because Windows-7 is more reliable, has more functionality, and is more user-friendly, it is used as the operating system.
- MySQL/No SQL is used as a database because it is straightforward to manage and retrieve entries using basic English queries that are easy to comprehend and construct.
- Programming languages and development tools The WWE code and Web pages are written in JavaScript and HTML, including JavaScript for styling and PHP for server-side scripting.

HARDWARE REQUIREMENTS

- Raspberry pi.
- We can continue to work on our project without any issues if we use the Intel Atom(or) Intel Dual Core Processor.
- A minimum of 512 MB of RAM and 1.10 GB of free space are required (or more).
- Fingerprint sensor requires.
- Camera requires for face identification.

Raspberry pi: -

The Raspberry Pi 3 is a family of small single-board computers created in the United Kingdom for use in computer science programs in schools and developing countries.

The first model was a lot more popular than predicted, and it was sold for things like robotics outside of its original market. It excludes all extraneous items (such as keyboards, mice, and cases).

Web Camera: -

A web camera is a device that allows you to take pictures and record movies. It's often used for video conferencing and picture and video capture for authentication and verification. In Our prototype, the Logitech camera, this approach is used to conduct out. It is one of the most cost-effective and useful web cams available. market. Other cameras can also be used to record faces. The Logitech camera includes a 5MP sensor and can record video in 720p. capturing a picture A 5MP picture is more than plenty for a decent shot. The camera, which is often used, supports USB 2.0 serial communication. Consequently, integrating this camera into the system is straightforward. There is no need to download the camera's driver software separately. The universal driver, which is available for all operating systems, will support the Logitech web camera. There is no need to install any additional drivers for the Logitech camera.

Fingerprint sensor: -

The fingerprint sensor is the project's most crucial component. just like face identification, fingerprint also use for recognition for the people. Consider the case of identical twins, in which the facial image is crushed, and the account is recognized via fingerprint ID. Although fingerprint identification is more reliable, gesture identification is being used to separate people with similar appearances. It is impossible for two persons to have the same fingerprint since they are formed based on a variety of factors

PROPOSED SYSTEM