

NID Based Anti-Corruption Tool

Shahariar Bhuiyan

2015-3-60-006

Mushfique Yeasir

2015-3-60-024

**A thesis submitted in partial fulfillment of requirements for the
degree of Bachelor of Science and Engineering**



**Department of Computer Science and Engineering
East West University
Dhaka-1212, Bangladesh**

May, 2021

Declaration

We, hereby, declare that the work presented in this thesis is the outcome of the investigation performed by us under the supervision of **Dr. Mohammad Salah Uddin**, Assistant Professor, Department of Computer Science and Engineering, East West University. We also declare that no part of this thesis/ project has been or is being submitted elsewhere for the award of any degree or diploma.

Countersigned

Signature

.....
Dr. Mohammad Salah Uddin
Supervision

.....
Shahariar Bhuiyan
2015-3-60-006

.....
Mushfique Yeasir
2015-3-60-024

Letter of acceptance

This project entitled” **NID Based Anti-Corruption Tool**” submitted by Shahariar Bhuiyan, ID: 2015-3-60-006 and Mushfique Yeasir, ID: 2015-3-60-024 to the Computer Science and Engineering Department, East West University, Dhaka-1212, Bangladesh is accepted as satisfactory for partial fulfillment of requirements for the Award of Degree of Bachelors of Science (B. Sc.) in Computer Science and Engineering on May, 2021.

Supervision

.....
Dr. Mohammad Salah Uddin
Assistant Professor, Department of Computer Science and Engineering
East West University

Abstract

There is no such thing as a perfect society, and there is no such thing as a society without corruption. International anti-corruption principles and their manifestations in various legal systems around the world. It has been decided that adopting and recognizing norms would not fix the issue in and of itself, which is why the world is still searching for new approaches to tackle corruption and testing new methods and strategies to influence corruption risks. But also, for the battle against corruption, ranging from e-government and courts to digital public services and tools that report on corruption reality, as well as the use of social media to influence society. The relationship between these principles is substantiated from the perspective of the effect of IT technology on fighting and preventing corruption in the area of digitalization of anti-corruption activities. This project summarizes recent technical advancements and their application in various legal structures around the world describes the role of information technology in the fight against corruption and develops an understanding of information technology as a mechanism to regulate and tackle corruption.

Acknowledgement

As it is true for everyone, we have also arrived at this point of achieving a goal in our life through various interactions with and help from other people. However, written words are often elusive and harbor diverse interpretations even in one's mother language. Therefore, we would not like to make efforts to find best words to express my thankfulness other than simply listing those people who have contributed to this thesis itself in an essential way. This work was carried out in the Department of Computer Science and Engineering at East West University, Bangladesh.

First of all, we would like to express our deepest gratitude to the almighty for His blessings on us. Next, our special thanks go to our supervisor, Dr. Mohammad Salah Uddin, who gave us this opportunity, initiated us into the field of Database management system, and without whom this work would not have been possible. His encouragements, visionaries and thoughtful comments and suggestions, unforgettable support at every stage of our B.Sc. study were simply appreciating and essential. His ability to muddle us enough to finally answer our own question correctly is something valuable what we have learned and we would try to emulate, if ever we get the opportunity.

We would like to thank Sir for his overall support and his valuable suggestion during our working session. Last but not the least, we would like to thank our parents for their unending support.

There are numerous other people too who have shown me their constant support and friendship in various ways, directly or indirectly related to our academic life. We will remember them in our heart and hope to find a more appropriate place to acknowledge them in the future.

Shahariar Bhuiyan
2015-3-60-006

Mushfique Yeasir
2015-3-60-024

Content

Contents

Declaration.....	1
Chapter 1	10
1.1 Introduction.....	10
1.2 Anti-corruption tool and strategies	11
1.3 Motivation.....	12
1.4 Problem statement	12
1.5 Outline.....	13
Chapter 2	14
2.1 NID in Bangladesh	14
2.2 Collecting Information	14
2.3 Information Analyze	15
Chapter 3	16
3.1 Background	16
3.2 Corruption definition.....	16
3.2.1 What is corruption?	16
3.2.2 What are the costs of corruption?	17
3.2.3 Types of corruptions	17
3.3 Background of Financial Information System	17
3.4 Law Enforcement Strategy	19
3.5 Using ICT Technologies to Reduce Corruption	19
3.6 Adapting Internet Application.....	19
3.7 Use of blockchain technologies in the fight against corruption.....	20
3.8 Use of IT technologies to combat and prevent corruption	20
3.9 Use of open data	20
3.10 Recent corruption situation of Bangladesh	21
3.11 Common anti-corruption Strategies.....	21
Chapter 4	23
Methodology	23
4.1 Methodology	23
4.2 Description of Methodology	24
4.2.1 Brainstorm.....	24

4.2.2 Design	24
4.2.3 Development	24
4.2.4 Quality Assurance	25
4.2.5 Deployment	25
4.3 Justification of Methodology	25
Chapter 5	26
5.1 Requirement Analysis	26
5.1.1 System Requirement	27
5.1.1.1 Hardware Requirements	27
5.1.1.2 Software Requirements	27
5.2 Functional Requirements	28
5.3 Non-Functional Requirements	28
5.4 Analysis Model	29
5.5 System Design & development	29
5.6 Class Diagram	30
5.7 Entity Relationship (E-R) Diagram	30
5.8 Use Case Diagram	31
5.8.1 Use Case Description	33
5.9 Sequence Diagram	43
5.10 Activity Diagram	57
5.11 White Box Testing :	58
5.11.1 Control flow Graph:	59
5.11.2 Statement Coverage:	59
5.11.3 Edge Coverage:	61
5.11.4 Condition Coverage:	68
5.11.5 Path Coverage:	74
5.11.6 Possible paths are for the following conditions:	79
Chapter 6	80
6.1 Design Goals	80
6.1.1 Performance Criteria	80
6.1.2 Dependability	81
6.1.3 Maintenance	81
6.1.4 End User Criteria	81
6.2 Architecture of the System	81
6.3 Persistent Data Management	82

6.3.1 Relationships among Tables.....	82
Chapter 7	85
7.1 System Interface.....	85
7.1.1 Login System	85
7.1.2 Home Page	86
7.1.3 Analyze Result.....	87
7.1.4 Profiling Page	88
Chapter 8	90
Conclusion & Future Work	90
8.1 Conclusion	90
8.2 Future Work.....	90

List of Figures

Figure 1.1: Anti-corruption tool and strategies	12
Figure 3.1: Financial information system	18
Figure 3.2: Recent corruption situation of Bangladesh.....	21
Figure 3.3: Common anti-corruption Strategies.....	22
Figure 4.1: Agile Development Methodology Diagram	23
Figure 5.1: Class diagram.....	29
Figure 5.2: Entity relationship diagram.....	30
Figure 5.3: Use-Case Diagram.....	32
Figure 5.4: Activity Diagram.....	57
Figure 6.1: Relationship Diagram of the Tables.....	83-84
Figure 7.1: Login System.....	85
Figure 7.2: Home Page.....	86
Figure 7.3: Suspected List.....	87
Figure 7.4: Suspected List with no person.....	88
Figure 7.5: Profiling page.....	89

Chapter 1

Introduction

1.1 Introduction

Corruption is now widely acknowledged as one of the world's most serious economic issues and corruption can destroy a country's basement. Since 2002 it has been known to the world that Bangladesh become champion in corruption. Corruption has a widespread impact of existence. It demoralizes democratic ideals, as well as ethical and social justice values. It always works against the progress of the country. It causes an economic and political crisis and severely impedes a country's trade. People bear the brunt of the negative consequences. Taking action against corruption does not always result in success; however, removing corruption from the source can be proven effective over time. E-Governance will help to reduce the origins of corruption and create barriers to wrongdoing. There are several concepts of E-governance available to researchers. "E-governance is more than just a government web site. It's described as "the use of electronic means to improve citizen-government interactions and government business, as well as the use of electronic means in internal government operations to simplify and improve democratic government and business aspects of government with the primary goal of increasing administrative performance." In short, "e-governance" is "the process of adapting electronic means in possible sectors and stages of government to ensure legitimate mass-access to administrative and service-oriented information with the potential to create transparency and accountability of Government operations and full service by redesigning and redistributing the administrative and operating system of Government". "E-Government offers opportunities to step forward with high-quality, cost-effective government service delivery and the creation of stronger citizen-government relationships. Ordinary citizens will be able to interact with the government on a regular basis at both the local and national levels through e-governance." [1] The developing world faces a significant challenge in combating corruption, which has developed as a result of poor administrative transparency, a lack of accountability, and a lack of oversight. The people' constitutional

rights are also being suppressed as a result of the manual paper-based administrative structure. With the introduction of E-governance, this can be successfully minimized. We can't expect e-governance to eradicate all corruption in the world, but it is expected to boost the overall governance situation, which will have a positive effect on corruption. Bangladesh's current situation suggests that good governance is needed to address the country's rampant corruption, and e-governance can be a useful tool in this regard. After recognizing the situation, the Bangladesh government began the process of introducing e-governance, but the process has stalled and is unlikely to hit the light at the end of the tunnel. Our goals are to identify the factors and actors that contribute to massive corruption in Bangladesh, as well as how e-governance can be used as a tool to reduce corruption through good governance and become a progress pillar.

1.2 Anti-corruption tool and strategies

Several reports have focused on attempts to use information and communication technology (ICT) as a key component of anti-corruption strategies. These researches focused on how to use information systems to develop e-government technologies, harness ICT applications, adapt different Internet applications. Information systems play a significant role in reducing revenue and expenditure corruption in the public financial sector. The findings are summarized in the figure: 1.1 which depicts electronic anticorruption tools and strategies [2]. The next subtopic discusses the methods that can be used to eliminate corruption.

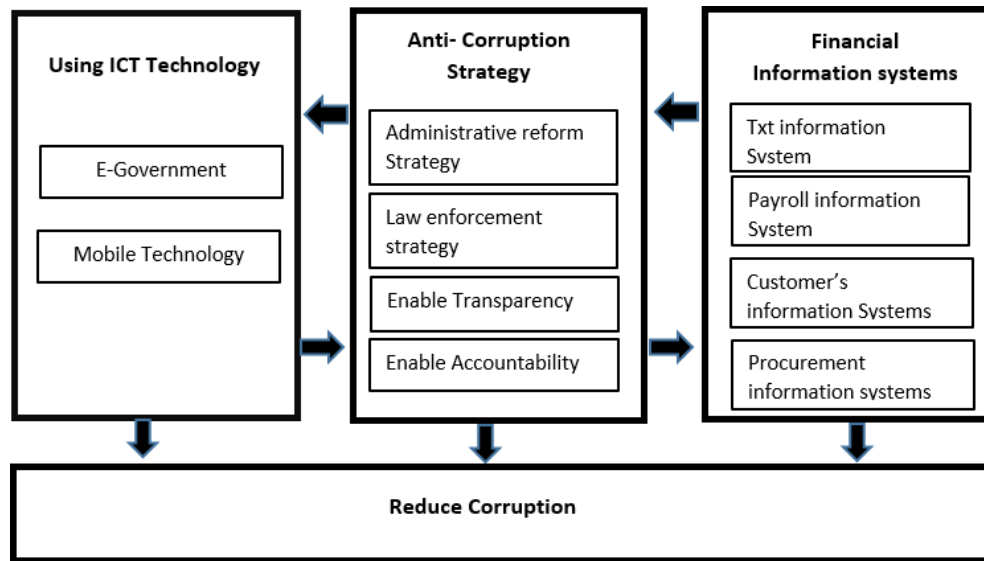


Figure: 1.1: Anti-corruption tool and strategies

1.3 Motivation

Corruption is now commonly recognized as one of the world's most important economic problems, and it has the potential to kill a country's basement and Bangladesh become champion in corruption. So we should to prevent this corruption otherwise the economy system collapse. We have lots of information about a person because this corruption occurs by Bank Accounts, E-Banking, Credit Card Transaction, Utilities Bill, Mobile Operator, Land Properties, Tax, Holding Tax, Stock Market, transportation etc. The Internet and other advanced communications technologies can bring this information quickly and more directly to person.

1.4 Problem statement

Many people in Bangladesh are connected with Bank Accounts, E-Banking, Credit Card Transaction, Utilities Bill, Mobile Operator, Land Properties, Tax, Holding Tax, Stock Market, transportation etc. this large number of transactions monitoring is so difficult without an automatic system. So our NID base anti-corruption tool can easily track this type of transaction. This large number of transactions we

can track by NID number because this is a unique number. So, our system can track this large number of transactions using NID numbers and calculate their annually income, property, banking transaction, all kinds e-transaction etc.

1.5 Outline

The way this paper is arrange is given below:

Chapter 1: Chapter 1 introduction about corruption, Anti-corruption tool and strategies, our motivation why we make a NID base Anti-corruption tool problem statement.

Chapter 2: Chapter 2 we described Overview of the NID Based Anti-Corruption Tool

Chapter 3: Chapter 3 we described our background study and also the related work we have done for this project.

Chapter 4: Chapter 4 we described our Methodology for this project.

Chapter 5: Chapter 4 we described our Requirement analysis, design and development.

Chapter 6: chapter 6 we described our system design.

Chapter 7: chapter 7 shows the Implementation of our project.

Chapter 8: Chapter 8 shows an overall summary of our entire work and explains some future works for this project topic.

Chapter 2

Overview of the NID Based Anti-Corruption Tool

The project is totally based on NID. With the help of NID we will try to collect and analyze all the digital data to find out the corrupt people of Bangladesh. We give an overview of this system.

2.1 NID in Bangladesh

NID is an important document for all the citizen of Bangladesh. In almost every sector we have to use this NID. So, almost every sector in Bangladesh is connected to NID.

NID is a verification for a citizen in Bangladesh. It's connected to almost every sector like Bank, Mobile Operator Service, Tax, Land Properties etc. From the NID mainly we get the person's Name, Date of Birth, and Father's Name, Mother's Name, Blood Group, Address and more. But mainly we get a number which is unique to every single person in Bangladesh.

So, in whatever sector this NID is used we can easily identify that person. Because this number is unique for everyone, we are using this number to collect all the information of that person to analyze if that person is corrupt or not.

2.2 Collecting Information

For the information we are totally relaying on others. In this system we will simply analyze the information we get to find out the corrupt person. So basically, we are not generating any new data. So, we contact Bank, WASA, PDB and all the different sector for their information as database. We mainly used their provided data to analyze in this system. So, without their information this system can't work.

2.3 Information Analyze

After getting all the information we need to work this system we start our analyze part. Here we find out all the balance a person has with the help of this NID. We sum up all the balance like Bank, Mobile Banking, and Credit Card all and compare the net balance with the annually income he has. If the gap is huge then we mark that person as suspected. At the same time, we also check all the transaction occurred linked with these accounts. If there is any anomaly, we also mark that transaction as suspected transaction. To justify that person, we also compare those balance and transaction with his/her family members too in case those balance and transactions is made by them on her accounts. If after that too that person still suspected then we listed him/her as suspected corrupt person list.

Chapter 3

Literature Review

3.1 Background

International organizations have been paying more attention in recent years to the effect of corruption on economic, social, and political growth[3]. To that end, a number of countries have introduced anti-corruption instruments that codify legislation to combat certain activities in foreign commercial transactions, such as, but not limited to. Around the same time, due to questionable activities within foreign agencies and non-governmental organizations, a number of development programs are collapsing and services are not being provided. As a result, the use of assistance allocated to a project is not being maximized, and its effect is being decreased. As a result, the world's poorest and most marginalized people bear the brunt of the repercussions and have little meaningful recourse.

3.2 Corruption definition

3.2.1 What is corruption?

Corruption is a broad concept that encompasses a wide range of practices. Bribery, kickbacks, ethics breaches, illegal asset accumulation, procurement rules violations, political nepotism, cronyism, campaign and party finance violations, money laundering, illegal transactions, freedom of information, and other topics are studied by corruption students. Despite the fact that different definitions of corruption can be found in the literature depending on the study's emphasis, there is agreement on a common definition that defines corruption as the misuse of public power for private gain.

3.2.2 What are the costs of corruption?

Bribery raises the cost of public works and facilities, renders contractor procurement inefficient, and spends money that could be better used covering illegal activity and collecting political rentals based on manipulated political decisions and security. In addition to these immediate economic costs, corruption has long-term negative effects, primarily in the form of weak public government and widespread citizen distrust of a compromised state's political institutions. Corruption not only impedes public policy, but it also has the potential to significantly undermine a compromised state's democratic institutions, eroding public support for and confidence in political institutions. Finally, corrupt members of the political elite offer many ways for organized crime networks to join the political system. Essentially, the expenses incurred as a result of corruption are the reason why it should be combated.

3.2.3 Types of corruptions

Divide's corruption into two groups [4].

Administrative Corruption: Corruption that tampers with the execution of laws, such as obtaining a license even though you don't meet the requirements.

Political Corruption: Corruption that has an effect on the creation of rules, legislation, and policies, such as revoking all licenses and taking full control of a beer or gas monopoly.

3.3 Background of Financial Information System

Financial information system usually collects and analyzes financial data in order to make good financial management decisions. It aids in the tracking and processing of accounting transactions in practical modules like accounts receivable, payable, payroll, and trial balance. Ratio analysis, pattern estimation, and financial planning modeling are all methods for evaluating financial data. Financial Management Information System (FMIS) refers to the computerization of public spending management systems, such as budget creation, budget execution, and accounting, using a fully integrated financial

Management system. Especially in ministries and other government-funded organizations. The FIMS should secure integration and coordination with other related information systems because the integrity of the system is critical.

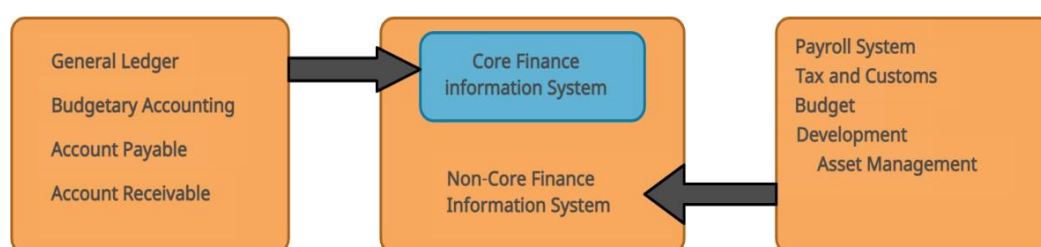


Figure: 3.1: Financial information system

General ledger, accounts payable, and receivable are included in the expanded module. Financial reporting, fund management, and expense management are some of the things that can be used. The expanded module also contains several standalone applications that have been incorporated with the core framework, such as human resources payroll, budgeting, inventory and property management. Revenue systems, such as tax and customs systems, as well as procurement information systems, are included [5]. By authorizing budget tracking and monitoring real cash flows, the expanded model has paved the way for anti-corruption reforms. This model aids in the management of key assets while also promoting decentralization by facilitating local planning and decision-making while also increasing accountability and transparency. In both models, the financial information system eliminates political discretion and consolidates all financial-management information, allowing for better financial resource management

3.4 Law Enforcement Strategy

This strategy is a part of the institutional reforms that ensures a proper mechanism for punishing those who are corrupt. It significantly increases the penalties and punishments that can be imposed for accepting bribes. The prosecution of corruption cases gives all officials a harsh lesson. It also clarifies and reinforces the expected attitude expectations for government employees. FISs keep track of all financial transactions and the records associated with them in order to aid in the prosecution of dishonest individuals [6].

3.5 Using ICT Technologies to Reduce Corruption

ICT systems have recently allowed the general public to track corruption-prone operations for permits or approvals, as well as to raise concerns if there are any irregularities. Many studies have concentrated on using information and communication technologies (ICT) as critical tools for reducing corruption. Some of these literatures have concentrated on developing e-Government technologies, adapting Internet software, using social media, and utilizing mobile technology to reduce corruption. Through integrating a web browser, a display standard, and a web server as the entry point into back-end operating structures, web-based financial services unify the Internet as a communication standard. The following subsections go into some of the ways of using ICT to combat corruption.

3.6 Adapting Internet Application

Because of its positive effect in sharing knowledge about official wrongdoing, the growth of the Internet is likely to serve as a corruption suppressor, the identification of politicians and public officials and thereby reducing corrupt behavior [7]. The literatures show that Internet adoption has a statistically important but limited impact on the reduction of corruption. According to some reports, the Internet can help to reduce corruption.

3.7 Use of blockchain technologies in the fight against corruption

While blockchain technologies are difficult to envision as a weapon in the fight against corruption on their own, their current use raises expectations that they can be used to monitor assets and regulate government contracts [7]. However, the use of blockchain technology and its effect on public relations raise legal concerns. Related organizations are also conducting research on the effect of blockchain on social change. Blockchain, as a mechanism for addressing knowledge asymmetries, could be able to empower people who do not have access to adequate resources and assist in the resolution of social issues. Since both of these systems are intertwined with the processing and transfer of personal data, there can be risks for the whole system in the form of identity theft, cybercrime, and fraud, in addition to the benefits.

3.8 Use of IT technologies to combat and prevent corruption

The main goal of automating standard, paper, outdated systems, and operations used to interact with people. This should make public services open, accessible, and convenient for citizens. This should make public services open, accessible, and convenient for citizens. There are already a range of digital solutions in use around the world that help to ensure government accountability, openness, and fair access to public services for the general public.

3.9 Use of open data

By publishing data on budget procurement, land ownership, education and medicine, crime statistics, financial reports of government agencies and the state, government contracts, foreign procurement, environmental statistics, and more, open data will improve government accountability. Open government data is now being developed and promoted by the general public. The Open Data Barometer is a summary of the Global Indicator of How Governments Publish and Use Open Data for Accountability, Innovation, and Social Impact provided by the World Wide Web. Open data ensures government accountability and, as a result, helps to minimize the risk of the state and civil servants

Becoming corrupted; it also expands opportunities for business growth and involvement in government procurement, thus growing competitiveness in the product and service sector.

3.10 Recent corruption situation of Bangladesh

Between 1996 and 2020, Bangladesh's corruption index averaged 21.66 points, with a high of 28 points in 2017 and a low of 4 points in 2001[8]. This page includes the most recent data for - Bangladesh Corruption Index - as well as historical high and low values, short-term and long-term forecasts, an economic calendar, survey consensus, and breaking news.

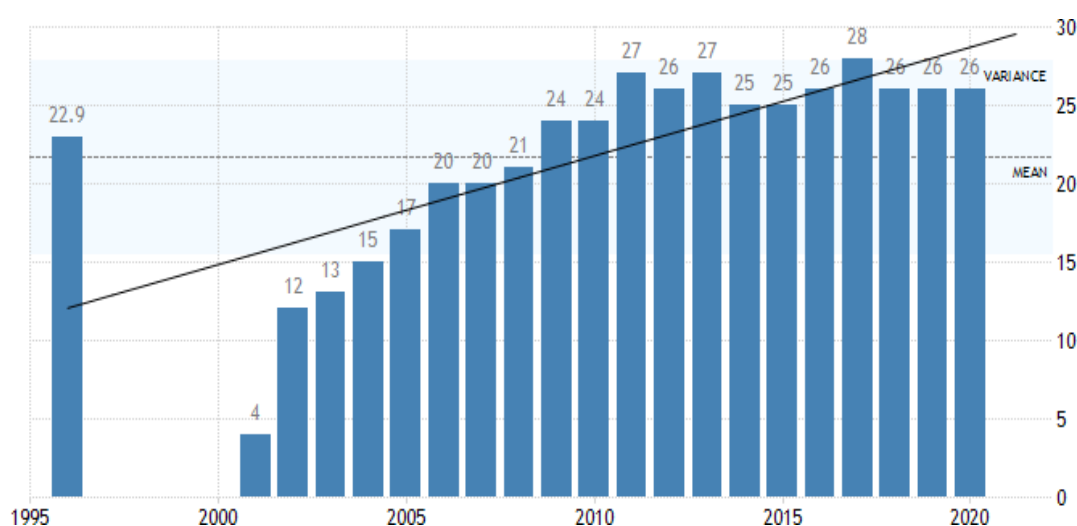


Figure: 3.2: Recent corruption situation of Bangladesh

3.11 Common anti-corruption Strategies

In 1997 the World Bank prepared common anti-corruption strategies. The strategy proposes a solution to corruption by preventing fraud, assisting countries in the fight against corruption, raising concerns about corruption, and actively supporting international efforts to tackle corruption. Theoretical and empirical studies, which were conducted on anti-corruption discipline, have focused on different strategies. The majority of these policies have focused on increasing openness, reducing monopolies,

Reducing prudence, increasing accountability, empowering independent justice, and fostering a society that is hostile to the media, bureaucracy, and corruption.



Figure 3.3: Common anti-corruption Strategies

Chapter 4

Methodology

4.1 Methodology

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. The Methodology is mainly the set of methods, rules and a particular procedure or set of procedures for gain proposed model's objectives. In this project, we use Agile Development Methodology [9]. We have following these steps to complete this project.

Following is a diagrammatic representation of different steps is given below:

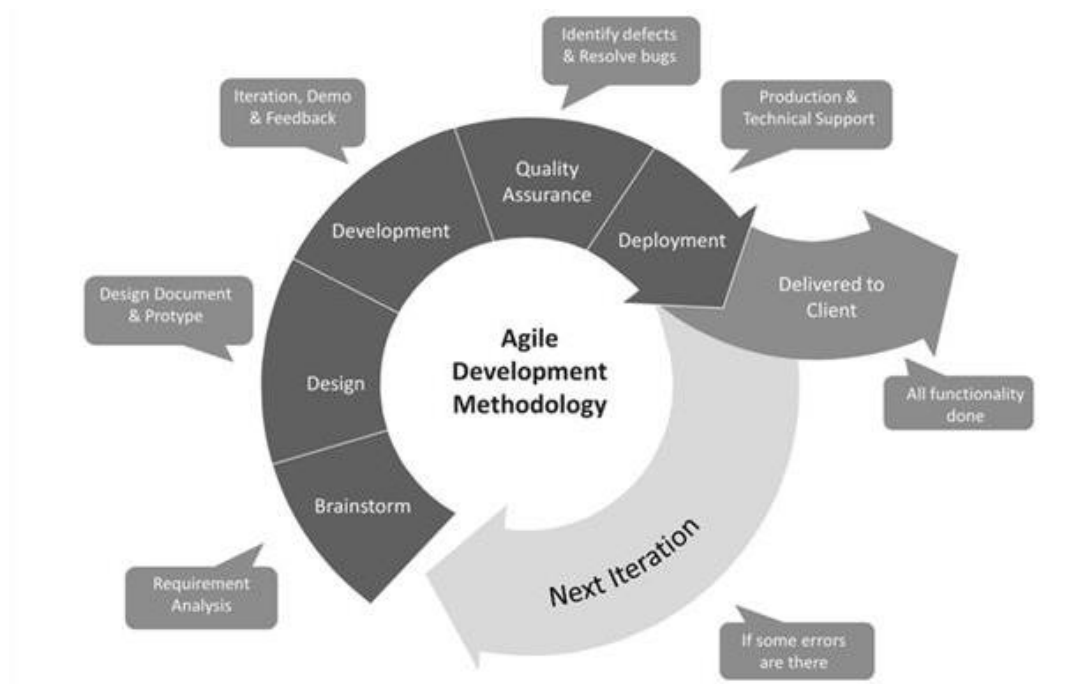


Figure 4.1: Agile Development Methodology Diagram

4.2 Description of Methodology

The main target is design and developed finish the project sequentially and good way.

The Sequential steps in agile model are:

4.2.1 Brainstorm

Brainstorm is the first phase of agile model. All possible requirements of the system to be developed are captured in this phase and documented in a requirement specification document. At this stage we planned about the project's resources and requirements, literature studies and schedule to get more information in this study. By gathering information and knowledge can be identified problem and that can be solved. In this step we have research and collect knowledge from internet, books, papers, and previous related works and also collect information from various teachers of related this problem. This part is the most significant phase in SDLC.

4.2.2 Design

Design is the intentional creation of a plan or specification for the construction of an object or system or for the implementation of an activity or process. We designed several kinds of diagram in our design step also we have compiled several designs of our project such as Data Entity Relationship Diagram, Use-Case Diagram, and Sequence Diagram.

4.2.3 Development

We have used HTML5, CSS, PHP and MySQL. In first step, we made a static design using a HTML5 and CSS and second step we create the database according to design, then in third step we have dynamited static design step by step according to design and database structure.

4.2.4 Quality Assurance

Quality Assurance (QA) is defined as an activity to ensure that an organization is providing the best possible product to customer. In this part we have tested our project used several test modules of the software that is Functionality Testing, Usability Testing, Interface Testing, compatibility Testing and identified defect and resolve bugs [10]. We can assure that the application system is functioning properly and can be accepted by the real-time users.

4.2.5 Deployment

Once the functional and non-functional testing & Quality assurance is done, the product is ready for deployed in the customer environment or published into the market.

4.3 Justification of Methodology

Each software needs to use a method for development according to the SDLC. There are many types of software development methods. Each has its own type of advantage. Software development method refers to planning, creating, testing and developing the project. After observing our work, we find out that the agile method is good for our development. There are some advantages of agile method such as reduce risk, high product quality, high customer satisfaction. There are no ambiguous requirements for all requirements clear and fixed. There are enough resources to support the system.

Chapter 5

Requirement analysis, design and development

5.1 Requirement Analysis

Requirement Analysis it's also known as Requirement Engineering, it is the process of defining user expectations for a system being built or modified. Requirement analysis involves documenting all aspects of the project development process, from beginning to end, to determine specific feature expectations with users of the system, to resolve conflicts or ambiguities as needed by different users or groups of users. For that requirement analysis is analyzed documents, validations, system requirements and hardware requirements. High-quality requirements help to identify documented, actionable, measurable, testable, traceable, business opportunities, and define system design advantages. So that in the future, the system is easy to understand and easy to modify.

Requirement of this software:

1. Government authorized user can login.
2. Government authorized user can connect NID database.
3. Government authorized user can connect Bank database.
4. Government authorized user can connect Bank transaction database.
5. Government authorized user can connect Utility database.
6. Government authorized user can connect Utility Bill's database.
7. Government authorized user can connect Land properties database.
8. Government authorized user can connect Tax database.

9. Government authorized user can connect Tax history database.
10. Government authorized user can start analyses.
11. Government authorized user can see suspected list.
12. Government authorized user can send notification to the suspected persons.
13. Government authorized user can check suspected person profile.
14. Government authorized user can logout.

Requirement Analysis is two categories:

- System Requirements
- User Requirements

5.1.1 System Requirement

This section describes the hardware components and software requirements needed for effective and efficient running of the system.

There are two types of requirements under system requirements-

- Hardware Requirements
- Software Requirements

5.1.1.1 Hardware Requirements

- Processor: Corei3
- Hard disk: 500 GB
- Memory: 4 GBRAM

5.1.1.2 Software Requirements

- Operating System: Windows 10, minimum Windows 7
- SQL DB – Database Management
- HTML – Hypertext Markup Language
- CSS – Cascading Style Sheets

- PDF – Portable Document Format
- JSON – JavaScript Object Notation

Language

–PHP

Design

–HTML5

– CSS & JS

Storage

– MySQL

5.2 Functional Requirements

The functional requirements of the system are:

- Identify the suspected person list,
- Generate suspected person profile.

5.3 Non-Functional Requirements

Security requirements is very important factor in this system because all the important information like NID, Bank, and Tax are stored in the database. As this system mainly designed for the government to use so only government authorized person will be able to access the system with the login validation. No one other than that can use this system.

This system will work on its own. There will be no need for any user input information. The user has to do is start the analyse after login rest the system will do it self and will provide a suspected person list. Then the user can check the person profile as a report.

This system can be operated by almost anyone because it's too much user-friendly and it has basically only one button do its work. But it can't be maintained by any-other person rather than the developer as all the work done in backend of the system.

5.4 Analysis Model

To make a perfect model for this system we need to construct the analysis model focused on structuring and formalizing the requirements of the system. Analysis model mainly contains three model. One is functional, two object and last dynamic model. The functional model is described by use case diagram. Class diagram describe the object model. Dynamic model is mainly described using sequence diagram. For this project we have described the analysis model in terms of the functional model and dynamic models using use case and sequence diagrams.

5.5 System Design & development

The purpose of the design phase is to plan for specific problems by requirements. The goal of system design is to identify the modules contained in the system, the details of those modules and how they interact with each other to create results. The goal of the design process is to create a system or the presentation of a system can be used later to create that system.

In this part, we had included 4 types of diagrams. Following is a diagrammatic representation of different types of design,

- Class diagram
- Entity relationship diagram
- Use-case diagram
- Sequence diagram

5.6 Class Diagram

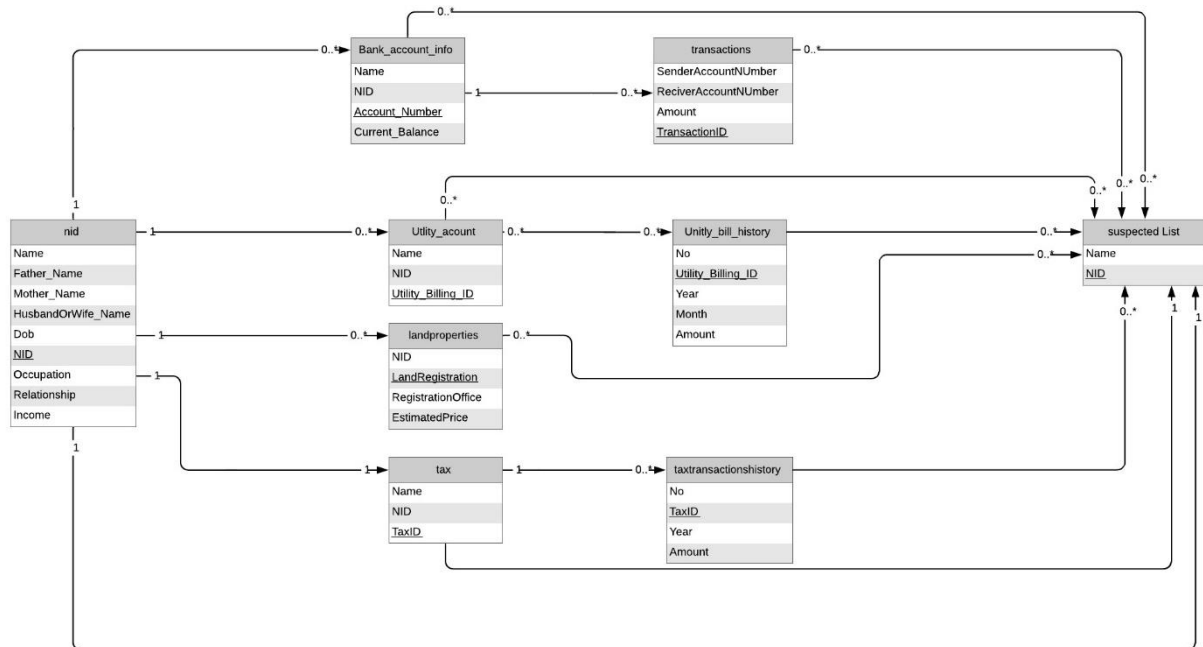


Figure 5.1: Class diagram

5.7 Entity Relationship (E-R) Diagram

Entity-relationship (ER) image is a special graphic that depicts the inter-relationship between entities in a database (Figure 5.1) [11]. ER diagrams often use symbols to represent different types of information. Boxes are commonly used to represent entities and variable are used to represent qualities.

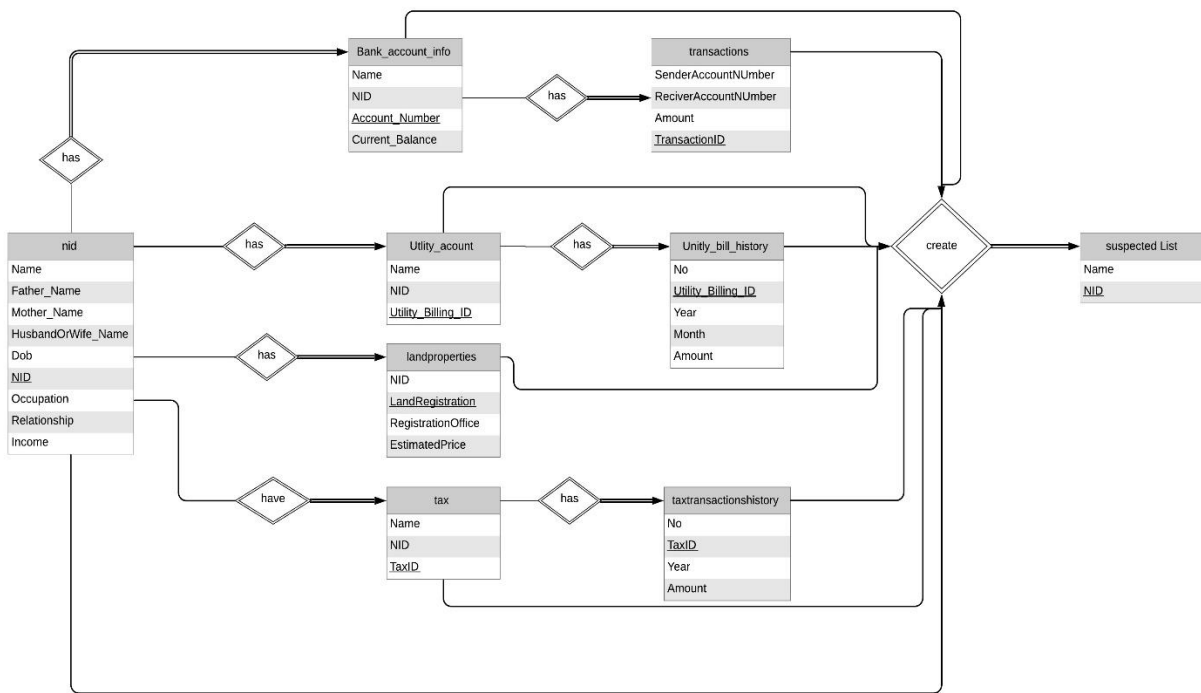


Figure 5.2: Entity relationship diagram

Here **nid**, **landproperties**, **bank_account_info**, **Utility_account**, **tax**, **suspected list** are the entities in (figure 4.1)

In **nid** table we have all the basic information about a person like name, family members name, nid occupation, income etc. With the help of “**NID**” we tracked his land properties, Bank information, Utilities bill information and Tax information. And the “**suspected list**” will hold all the suspected person after analyzing is one by the system.

5.8 Use Case Diagram

A use case diagram is a graphic depiction of the interactions among the elements of a system. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements [12].

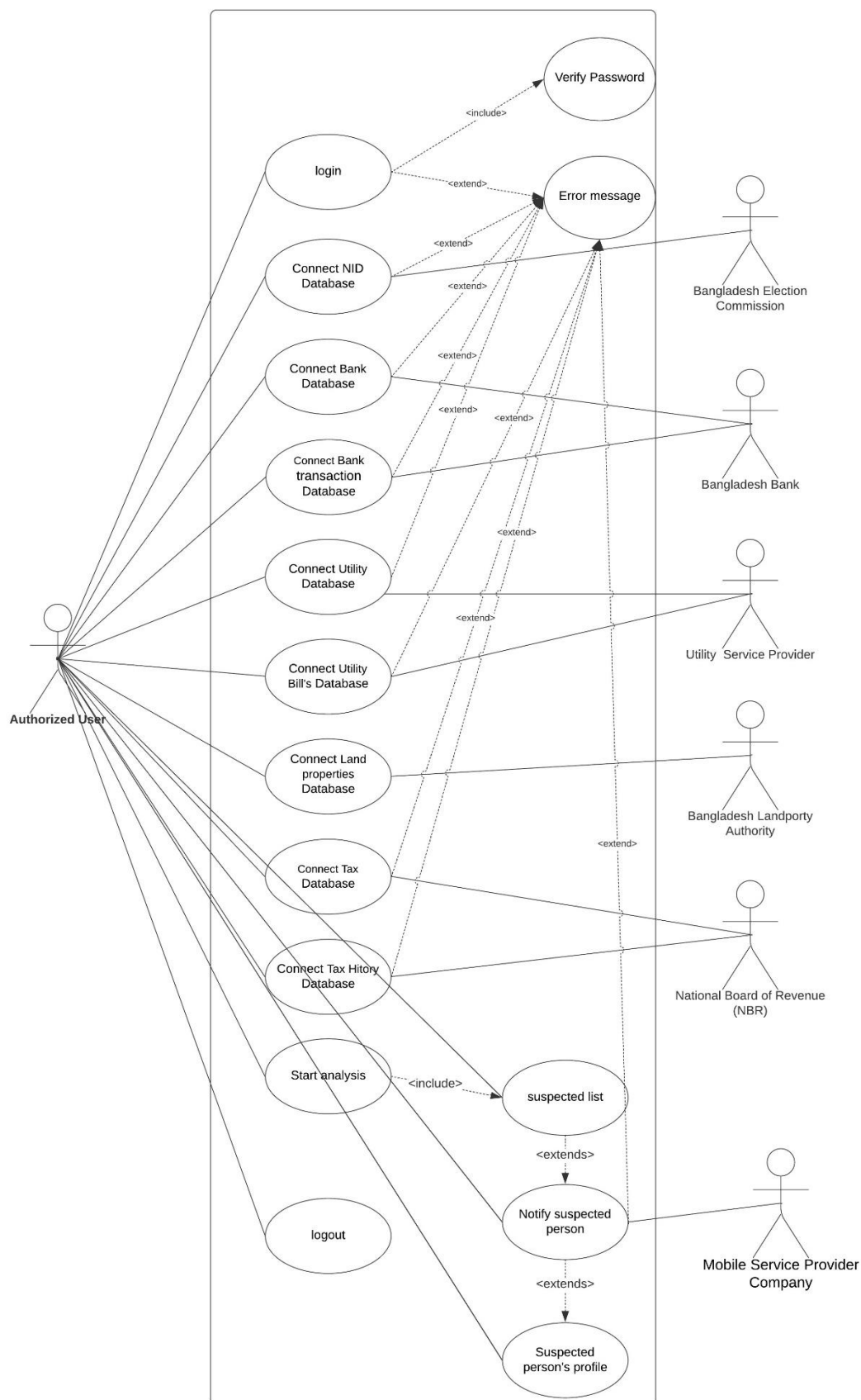


Figure 5.3: Use-Case Diagram

5.8.1 Use Case Description

Use Case: 1	Loge in	
Goal in Context	This use case allowed authorized user to loge in the system	
Precondition	The NID base anti-corruption tool should be up and running	
Success End Condition	The user will successfully login to the system.	
Failed End Condition	The user will fail to login to the system	
Primary Actor	Authorized User	
Secondary Actor	None	
Trigger	When user click login button after entering required information in the login page.	
Description	Step	Action
	1	User will go to the login page
	2	User will input required information.
	3	The user will click on the login button.
	4	The system will check if the user id and password is correct or not.
	5	The user will be taken to home page signifying successful login.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 2	Connect NID database	
Goal in Context	This use case allowed user to connect to Bangladesh Election Commission's database to collect NID's information.	
Precondition	Bangladesh Election Commission's database server should be up and running	
Success End Condition	The system will have the NID's information.	
Failed End Condition	The system won't be able to collect required information about the NID's information.	
Primary Actor	Authorized User	
Secondary Actor	Bangladesh Election Commission	
Trigger	When user click Connect NID Database in Home page.	
Description	Step	Action
	1	User will send a connect request to Bangladesh Election Commission's database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 3	Connect Bank database	
Goal in Context	This use case allowed user to connect to Bangladesh Bank's database to collect all the bank account information.	
Precondition	Bangladesh Bank server should be up and running	
Success End Condition	The system will have bank account information.	
Failed End Condition	The system won't be able to collect required information about the bank accounts information.	
Primary Actor	Authorized User	
Secondary Actor	Bangladesh Bank	
Trigger	When user click Connect Bank Database in Home page.	
Description	Step	Action
	1	User will send a connect request to Bangladesh Bank database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 4	Connect Bank Transaction database	
Goal in Context	This use case allowed user to connect to Bangladesh Bank Transaction database to collect all the bank account information.	
Precondition	Bangladesh Bank server should be up and running	
Success End Condition	The system will have bank transaction information.	
Failed End Condition	The system won't be able to collect required information about the bank transaction information.	
Primary Actor	Authorized User	
Secondary Actor	Bangladesh Bank	
Trigger	When user click Connect Bank Transaction Database in Home page.	
Description	Step	Action
	1	User will send a connect request to Bangladesh Bank database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 5	Connect Utility database	
Goal in Context	This use case allowed user to connect to utility service provider's database to collect all the utility account information.	
Precondition	utility service provider's server should be up and running	
Success End Condition	The system will have utility accounts information.	
Failed End Condition	The system won't be able to collect required information about the utility accounts information.	
Primary Actor	Authorized User	
Secondary Actor	Utility Service Provider	
Trigger	When user click Connect Utility database in home page.	
Description	Step	Action
	1	User will send a connect request to Utility service provider's database
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 6	Connect Utility bill database	
Goal in Context	This use case allowed user to connect to utility service provider's database to collect all the utility bills information.	
Precondition	utility service provider's server should be up and running	
Success End Condition	The system will have utility bills information.	
Failed End Condition	The system won't be able to collect required information about the utility bills information.	
Primary Actor	Authorized User	
Secondary Actor	Utility Service Provider	
Trigger	When user click Connect Utility bills database in home page.	
Description	Step	Action
	1	User will send a connect request to Utility Service Providers database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 7	Connect Land Properties database	
Goal in Context	This use case allowed user to connect to Bangladesh Land Properties database to collect all the utility bills information.	
Precondition	Bangladesh Land Properties database server should be up and running	
Success End Condition	The system will have Land Properties information.	
Failed End Condition	The system won't be able to collect required information about the Land Properties information.	
Primary Actor	Authorized User	
Secondary Actor	Bangladesh Land Properties	
Trigger	When user click Connect Land Properties Database in home page.	
Description	Step	Action
	1	User will send a connect request to Bangladesh Land Properties database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 8	Connect Tax database	
Goal in Context	This use case allowed user to connect to National Board of Revenue (NBR) database to collect all the Taxpayer information.	
Precondition	National Board of Revenue (NBR) database server should be up and running	
Success End Condition	The system will have Taxpayer information.	
Failed End Condition	The system won't be able to collect required information about the Taxpayer.	
Primary Actor	Authorized User	
Secondary Actor	National Board of Revenue (NBR)	
Trigger	When user click Connect Tax Database in home page.	
Description	Step	Action
	1	User will send a connect request to National Board of Revenue (NBR) database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 9	Connect Tax History Database	
Goal in Context	This use case allowed user to connect to National Board of Revenue (NBR) database to collect all the Taxpayer History information.	
Precondition	National Board of Revenue (NBR) database server should be up and running	
Success End Condition	The system will have Taxpayer History information.	
Failed End Condition	The system won't be able to collect required information about the Taxpayer's History.	
Primary Actor	Authorized User	
Secondary Actor	National Board of Revenue (NBR)	
Trigger	When user click Connect Tax History Database in home page.	
Description	Step	Action
	1	User will send a connect request to National Board of Revenue (NBR) database.
	2	After getting the access the system will have the necessary information.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case: 10	Start Analysis	
Goal in Context	This use case allowed user to start the analysis process.	
Precondition	All the database should be connected to the system.	
Success End Condition	The system will start the analysis.	
Failed End Condition	The system won't start the analysis process.	
Primary Actor	Authorized User	
Secondary Actor	None	
Trigger	When user click Start Analysis in home page.	
Description	Step	Action
	1	User will Start Analysis all the connected database information.

Use Case: 11	Suspected List
Goal in Context	This use case allowed user to See the Suspected list after the analysis process.
Precondition	Analysis processes should be completed.
Success End Condition	The system will show suspected list.
Failed End Condition	The system won't show the suspected list.
Primary Actor	Authorized User
Secondary Actor	None
Trigger	When the analysis process is complete.

Use Case: 12	Notify Suspected Person.	
Goal in Context	This use case allowed user to notify all the suspected person that they are in suspected list.	
Precondition	Suspected list should be generated after analysis process.	
Success End Condition	The system will notify all the suspected list's person that they are suspected for anti-corruption.	
Failed End Condition	The system won't notify the suspected list's person that they are suspected for anti-corruption.	
Primary Actor	Authorized User	
Secondary Actor	Mobile Service Provider Company	
Trigger	When user click Notify Suspected Person in suspected list page.	
Description	Step	Action
	1	User will notify all the suspected person in the suspected list.
Extension or Variations	step	Branching Action
	1	Error message will be shown

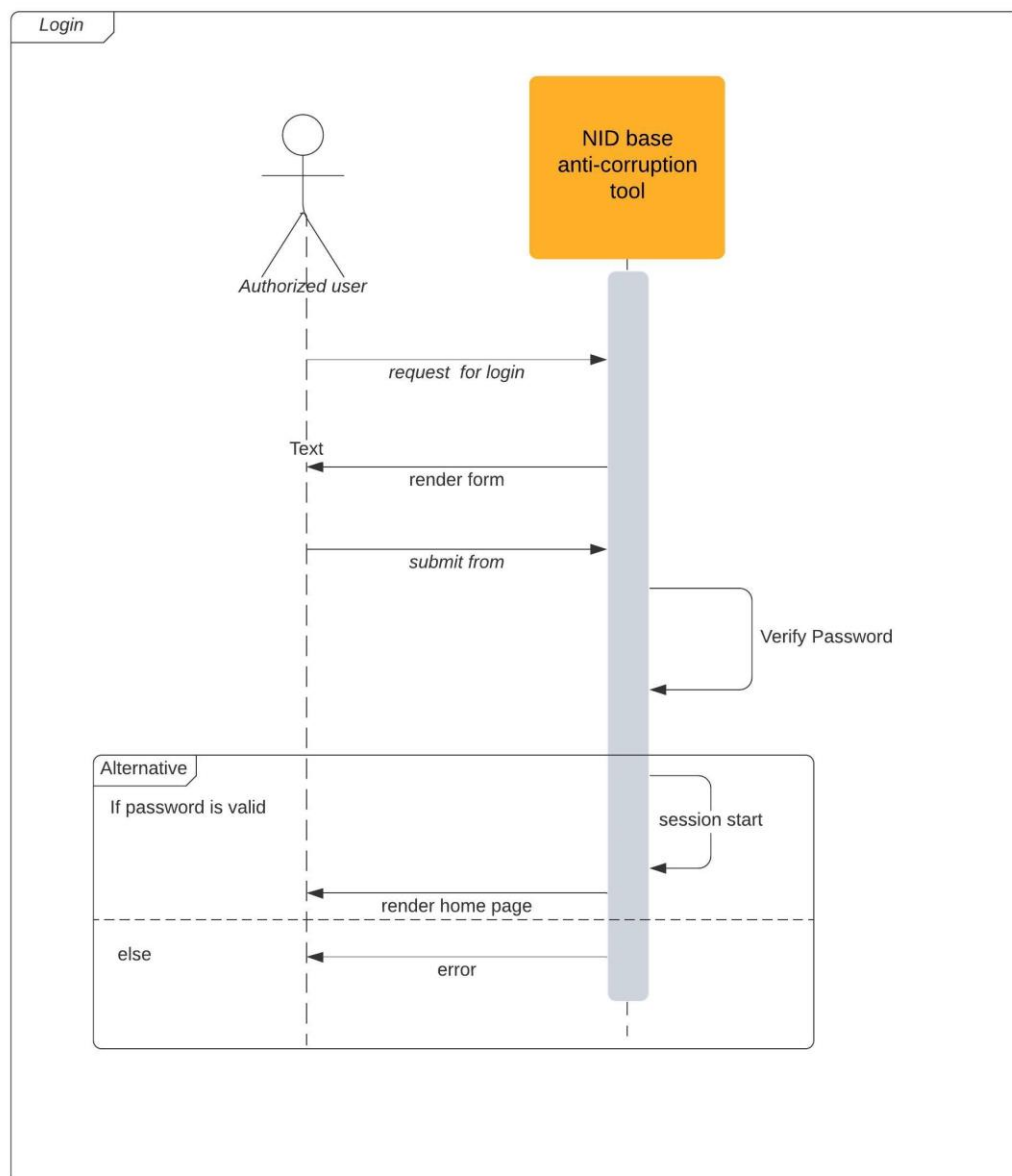
Use Case: 13	Suspected Person Profile.	
Goal in Context	This use case allowed user to check an individual suspected person profile using his NID.	
Precondition	Suspected list should be generated after analysis process.	
Success End Condition	The system will show the profile of an individual suspected person profile.	
Failed End Condition	The system won't show the profile of an individual suspected person profile.	
Primary Actor	Authorized User	
Secondary Actor	None	
Trigger	When user click search with the NID of a suspected person in the search bar.	
Description	Step	Action
	1	A profile will be generated of that individual suspected person.
Extension or Variations	step	Branching Action
	1	Error message will be shown

Use Case :14	Logout	
Goal in Context	This use case allows the user to logout from the system.	
Precondition	The NID based anti-corruption tool should be up and running	
Success End Condition	The user will successfully logout from the system.	
Failed End Condition	The user will fail to logout from the system	
Primary Actor	User	
Secondary Actor	None	
Trigger	When user clicks logout button on any page.	
Description	Step	Action
	1	User will click on the logout button
	2	The system will end the user's session
	3	The user will be taken to the login page
Extension or Variations	Step	Branching Action

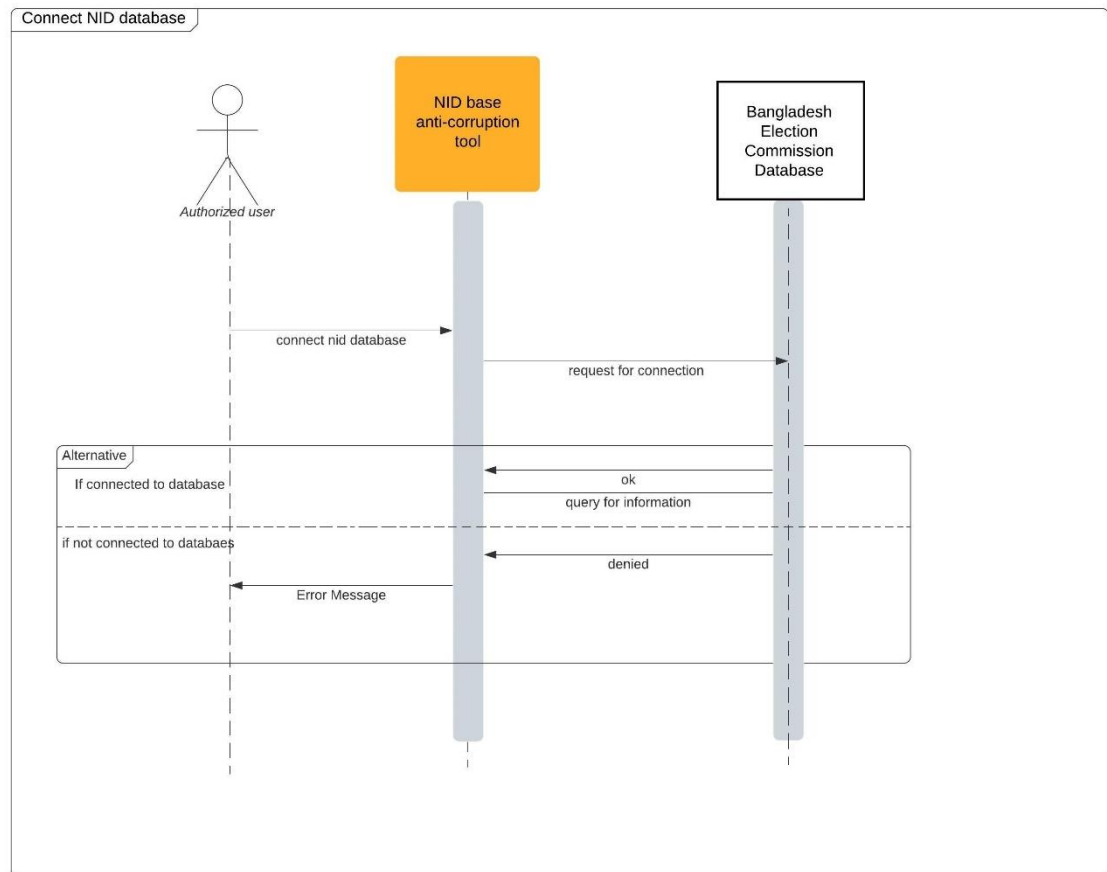
5.9 Sequence Diagram

A sequence diagram is an interaction diagram. By the name it is quite clear that the diagram deals with some sequences, these are the sequence of messages flowing from one object to another. Interaction among the components of a system is very important from implementation and execution perspective. So, sequence diagram is used to visualize the sequence of calls in a system for performs a specific functionality [13].

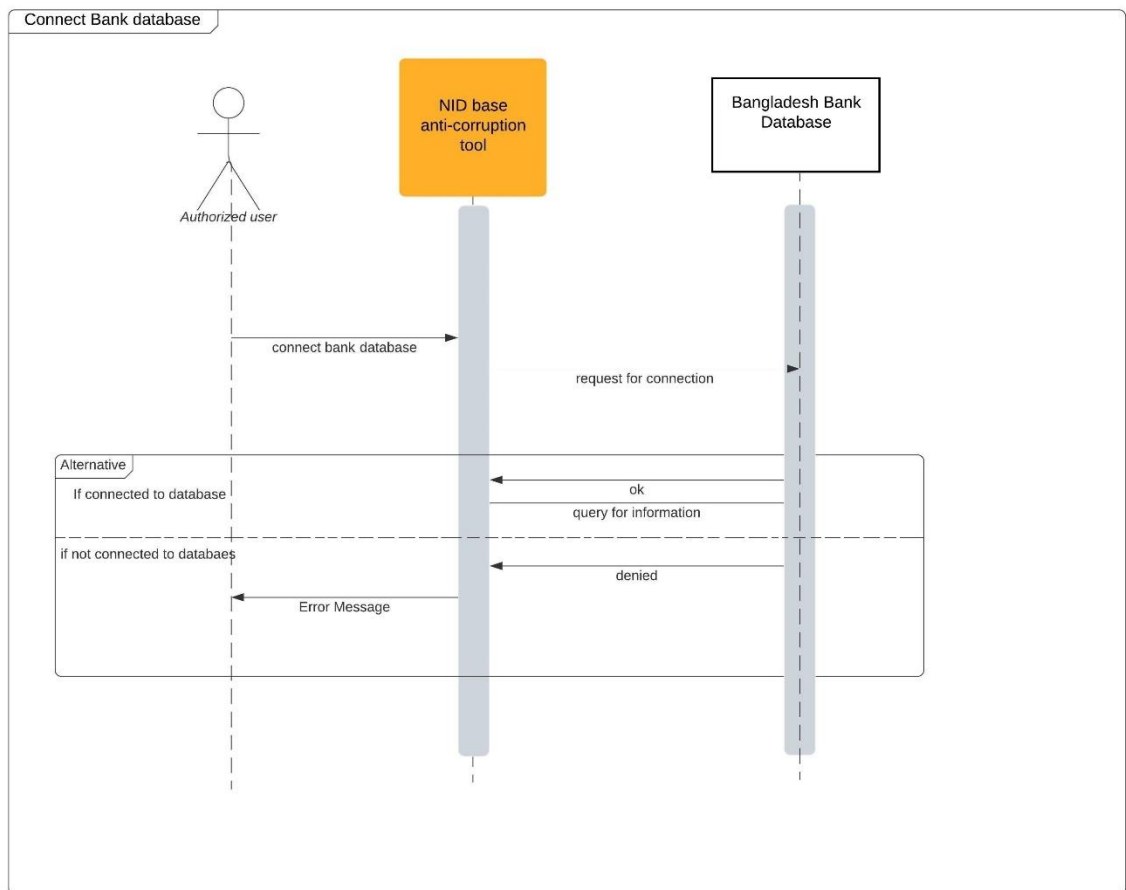
1. Login



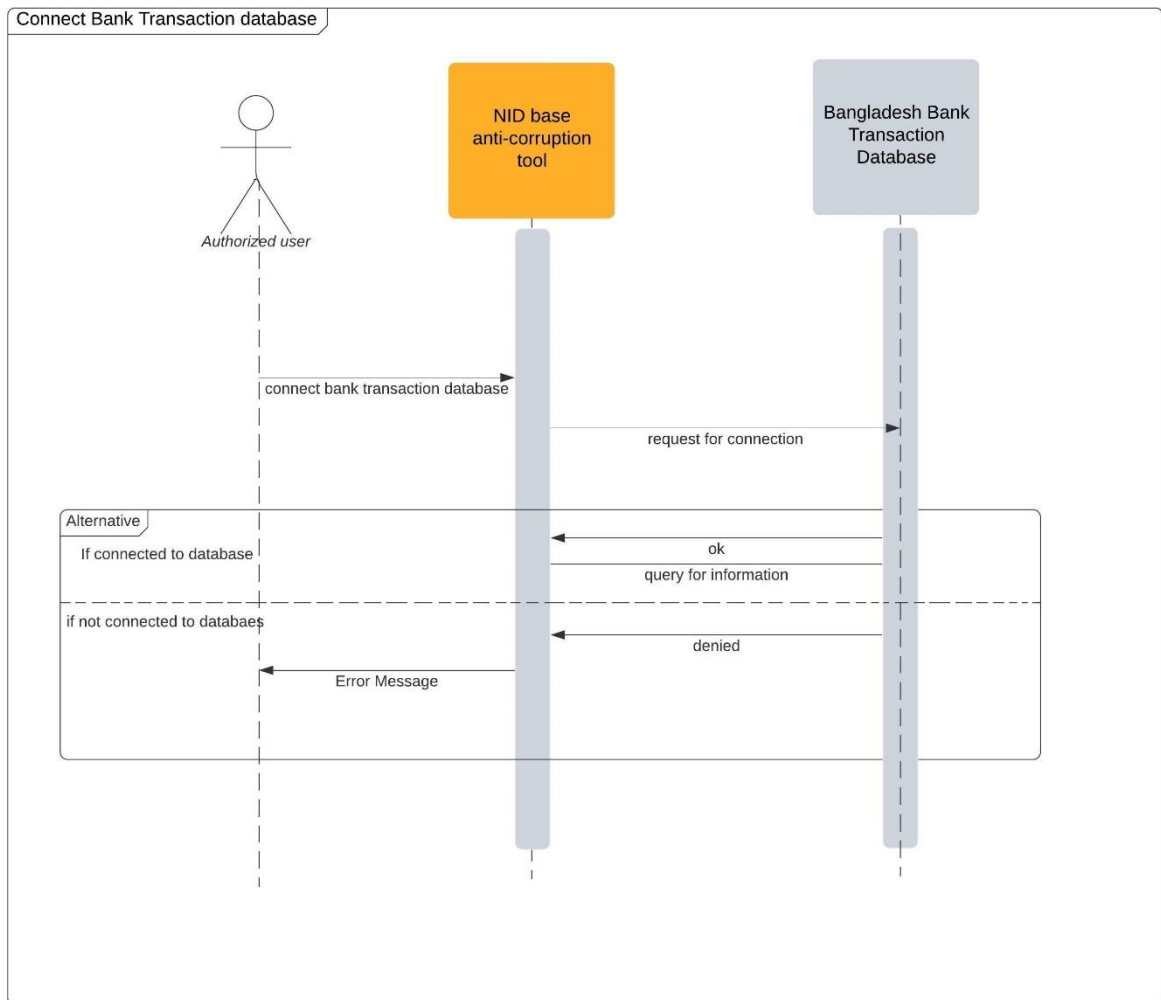
2. Connect NID Database



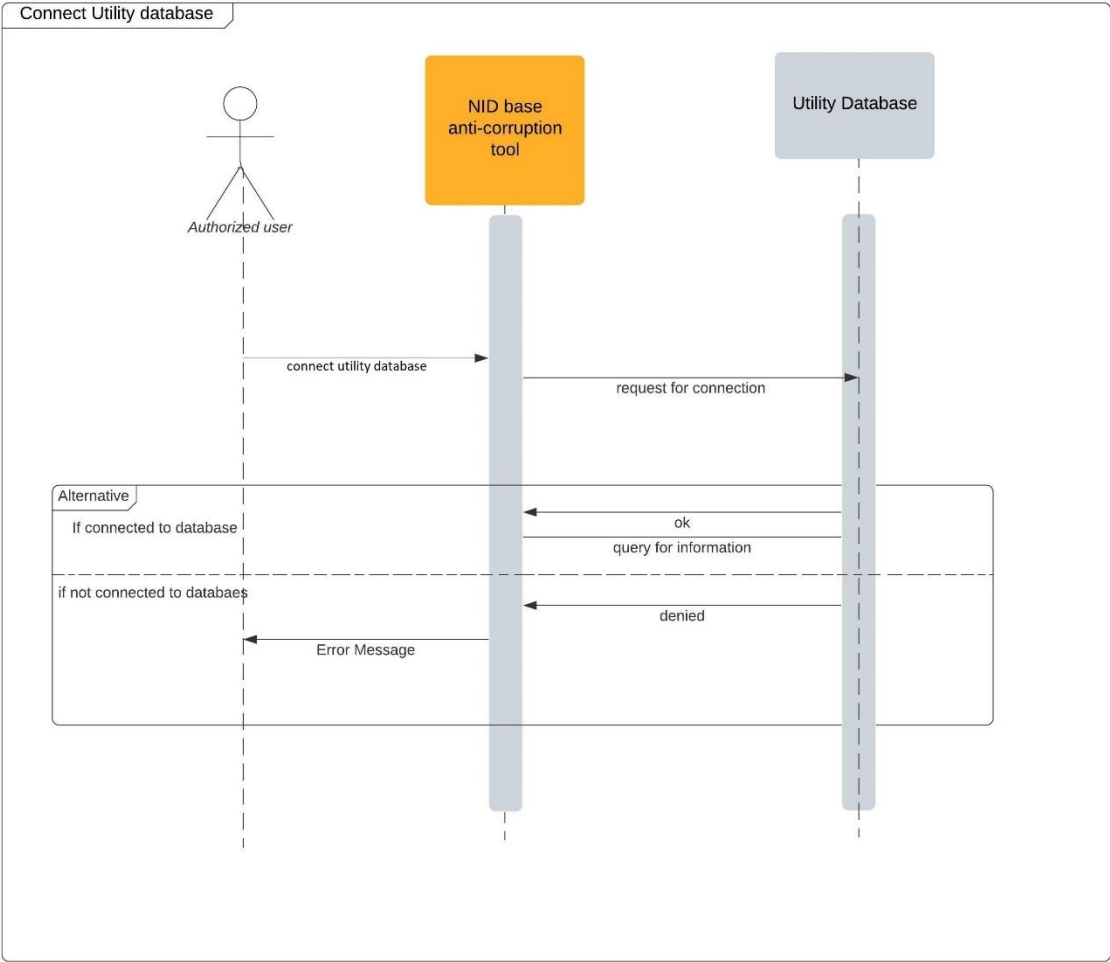
3. Connect Bank Database



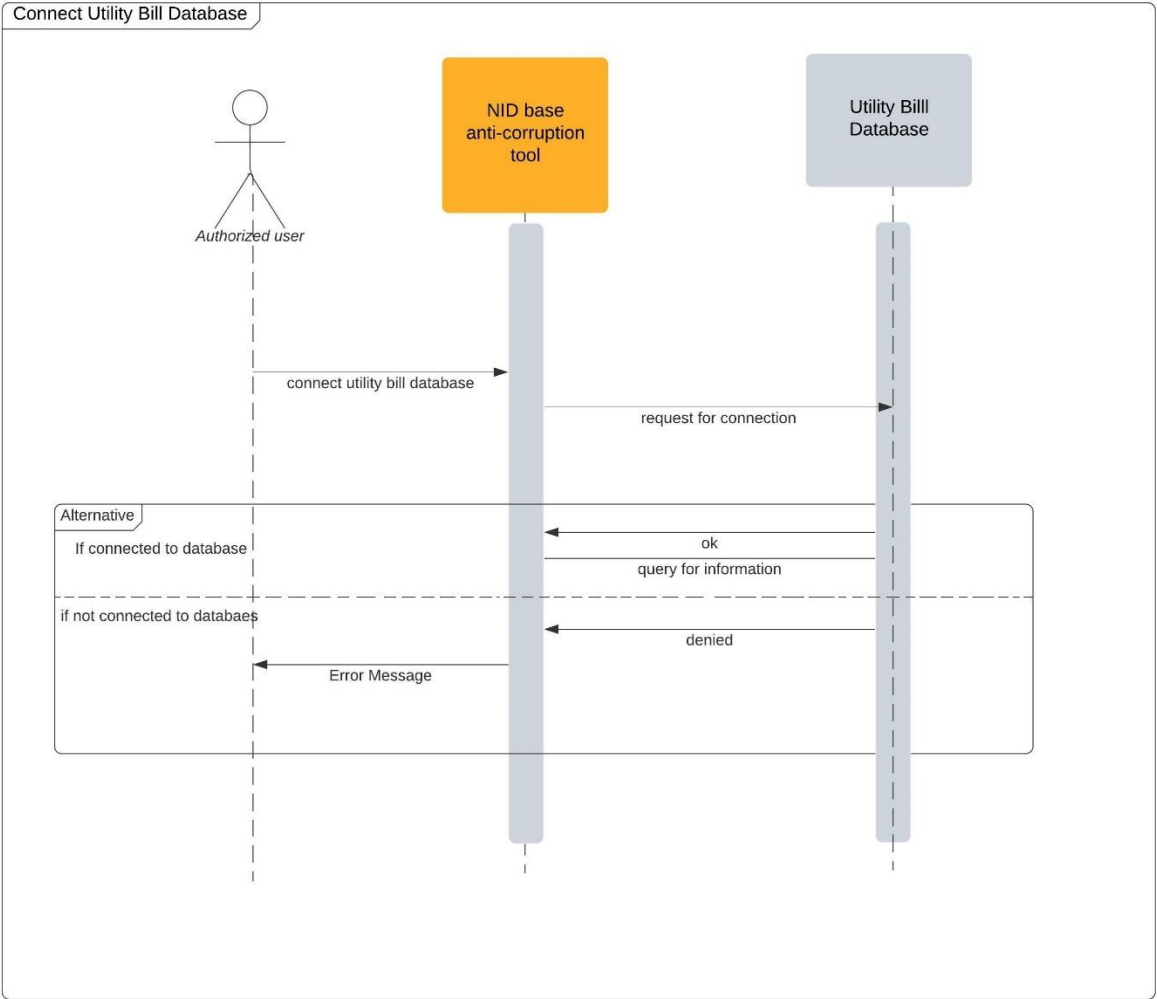
4. Connect Bank Transaction Database



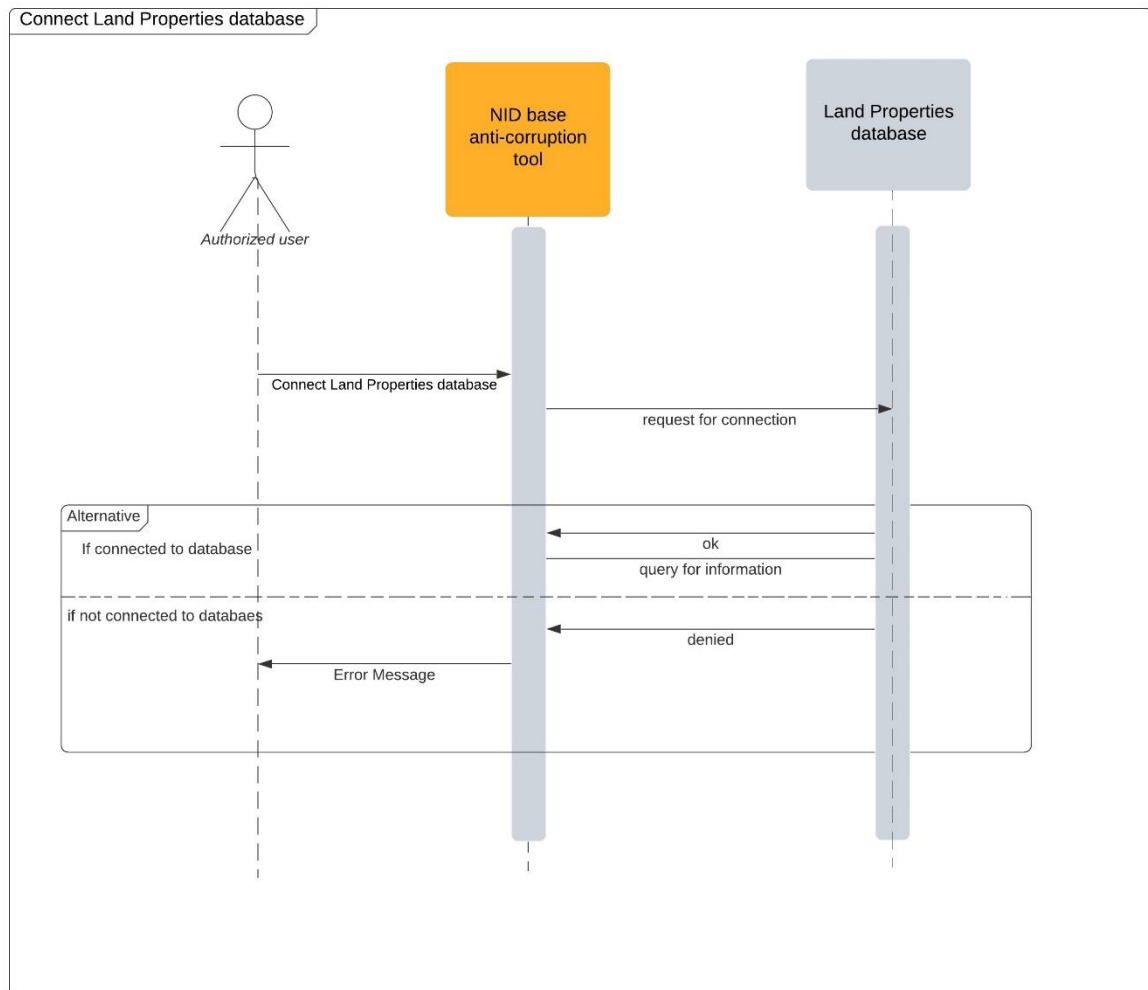
5. Connect Utility Database



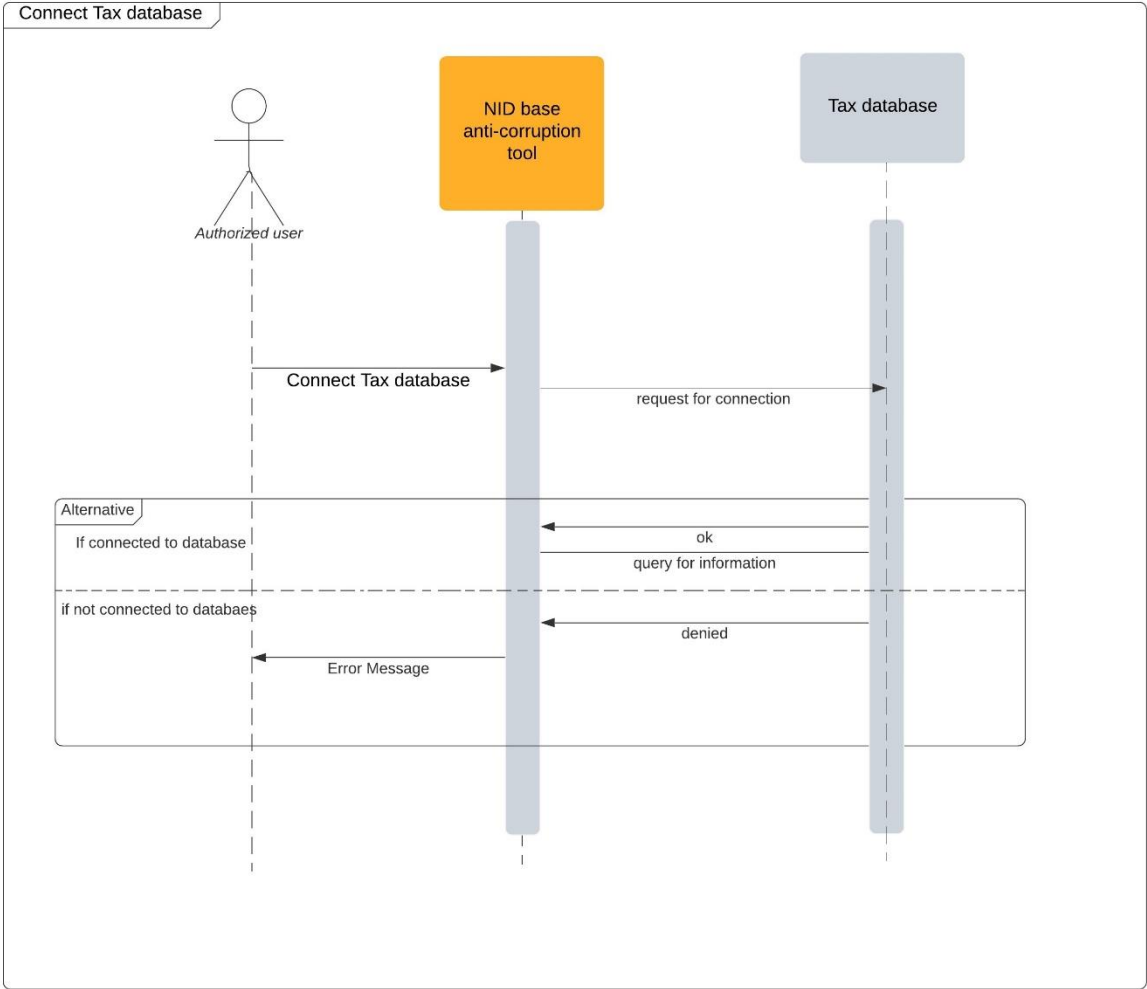
6. Connect Utility Bill Database



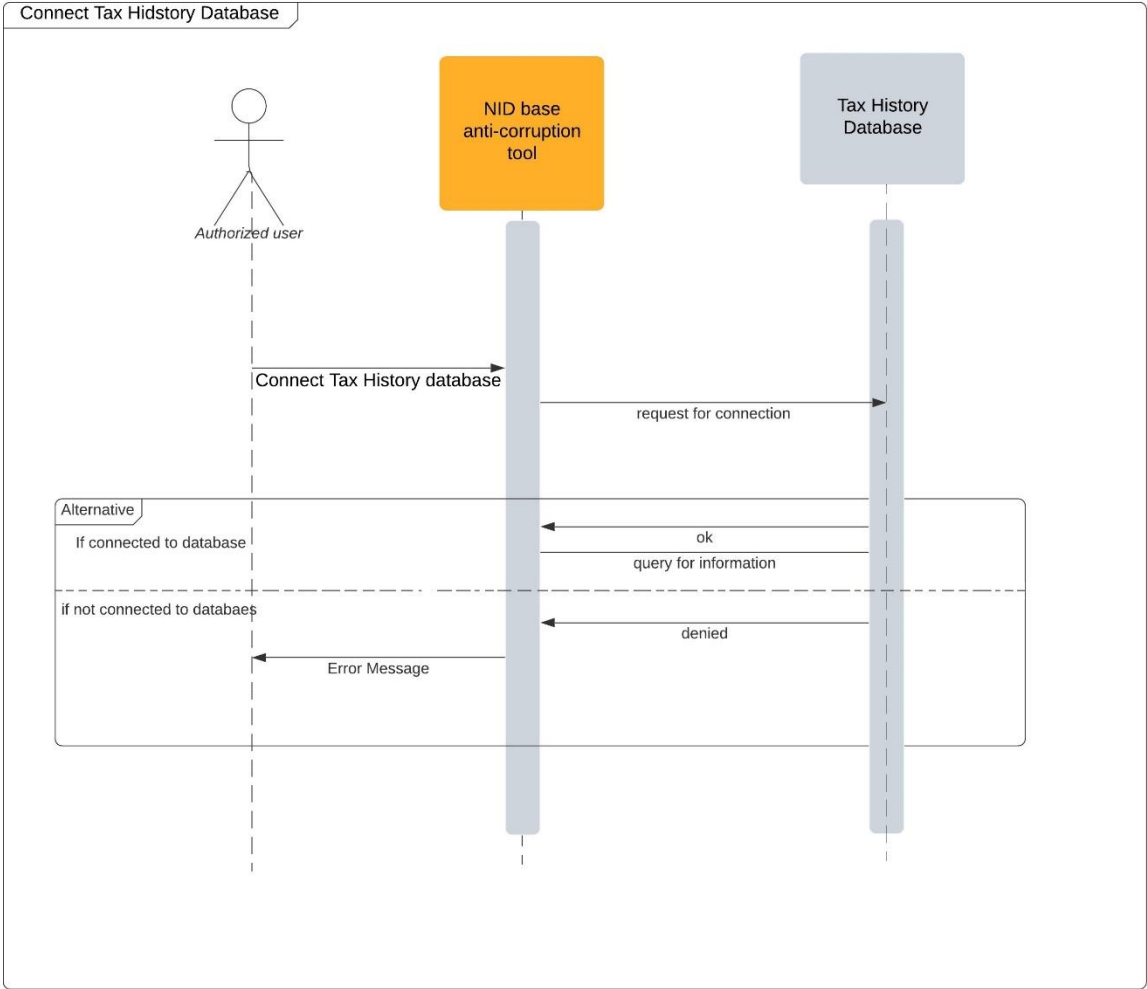
7. Connect Land Properties Database



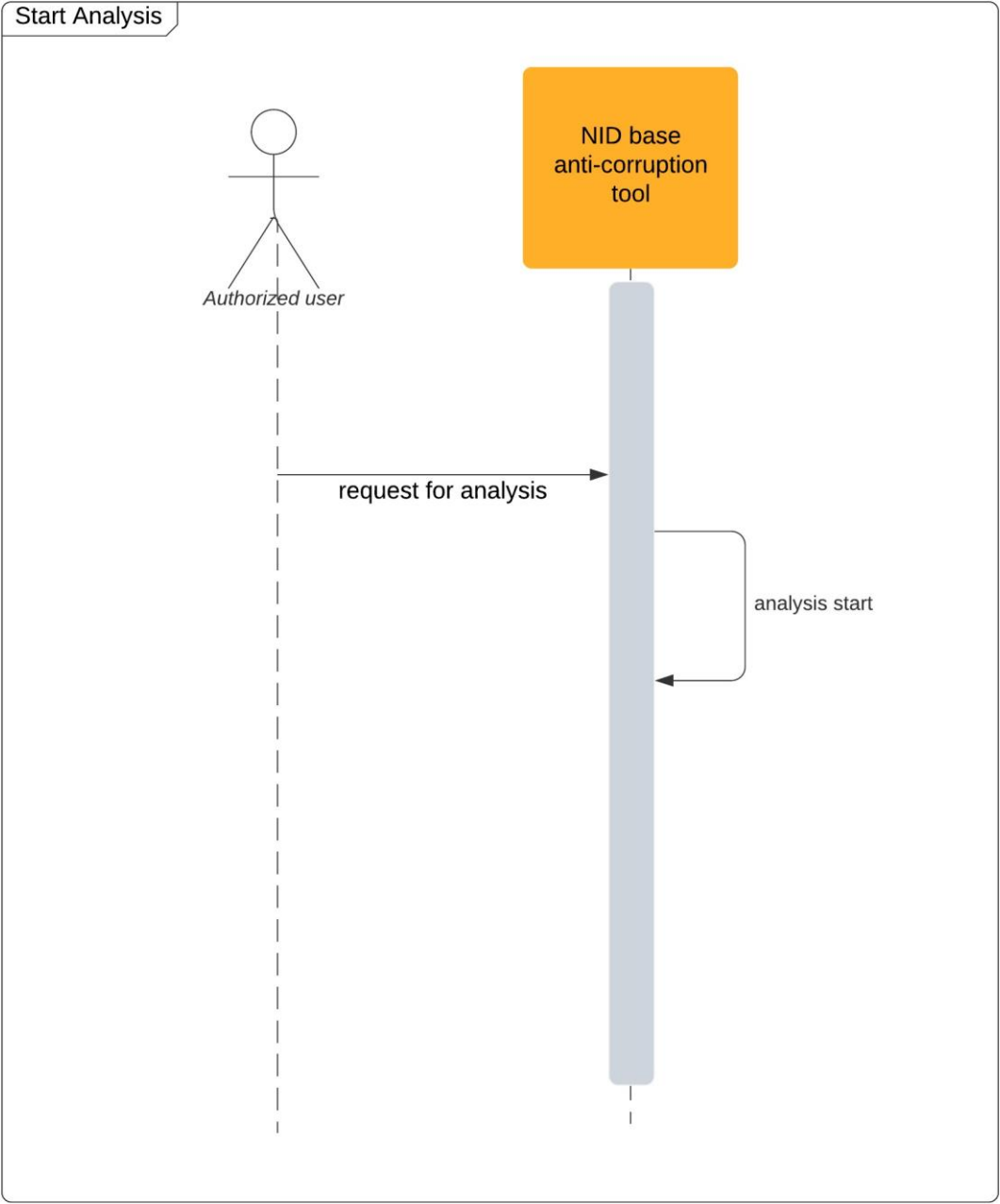
8. Connect Tax Database



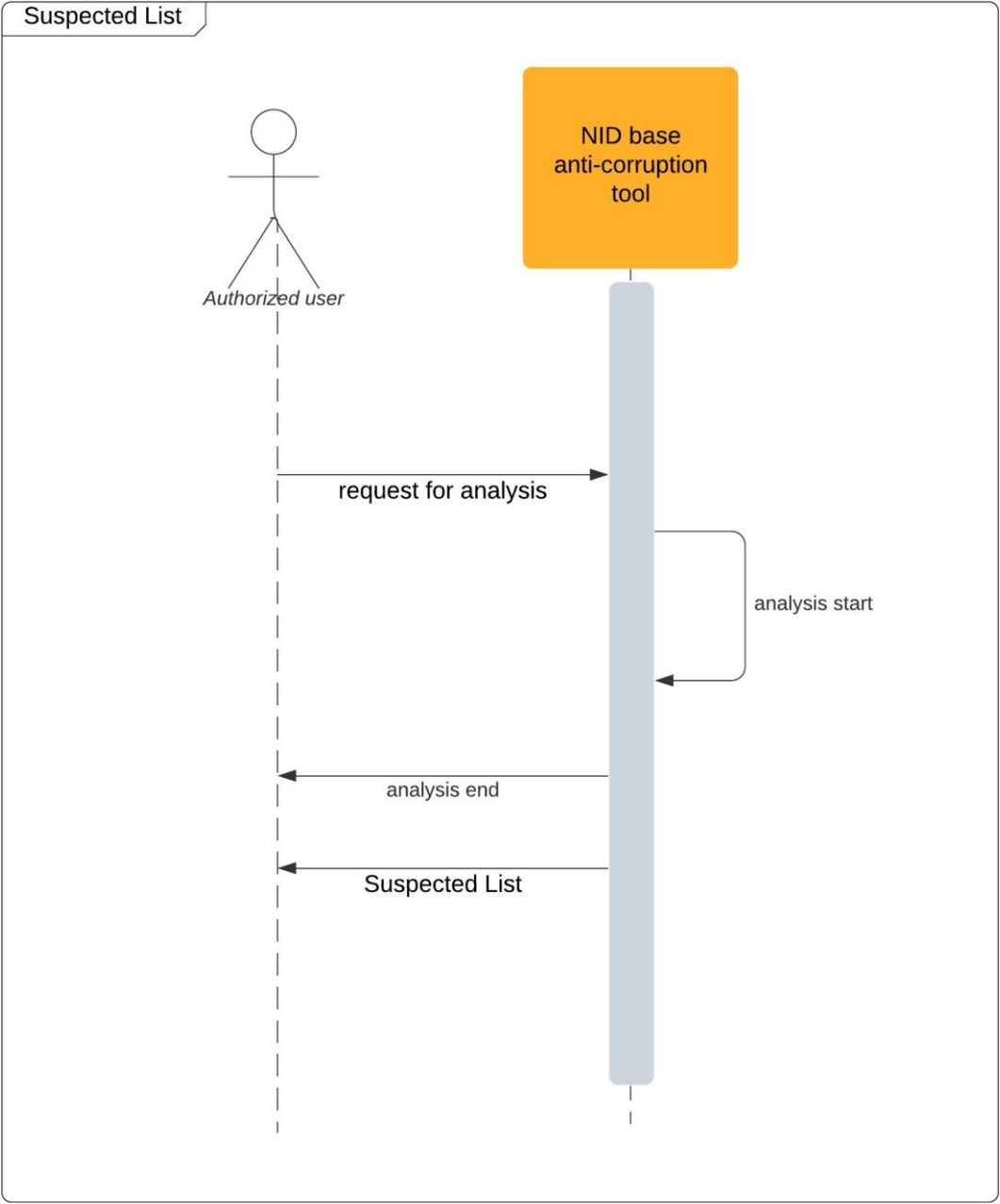
9. Connect Tax History Database



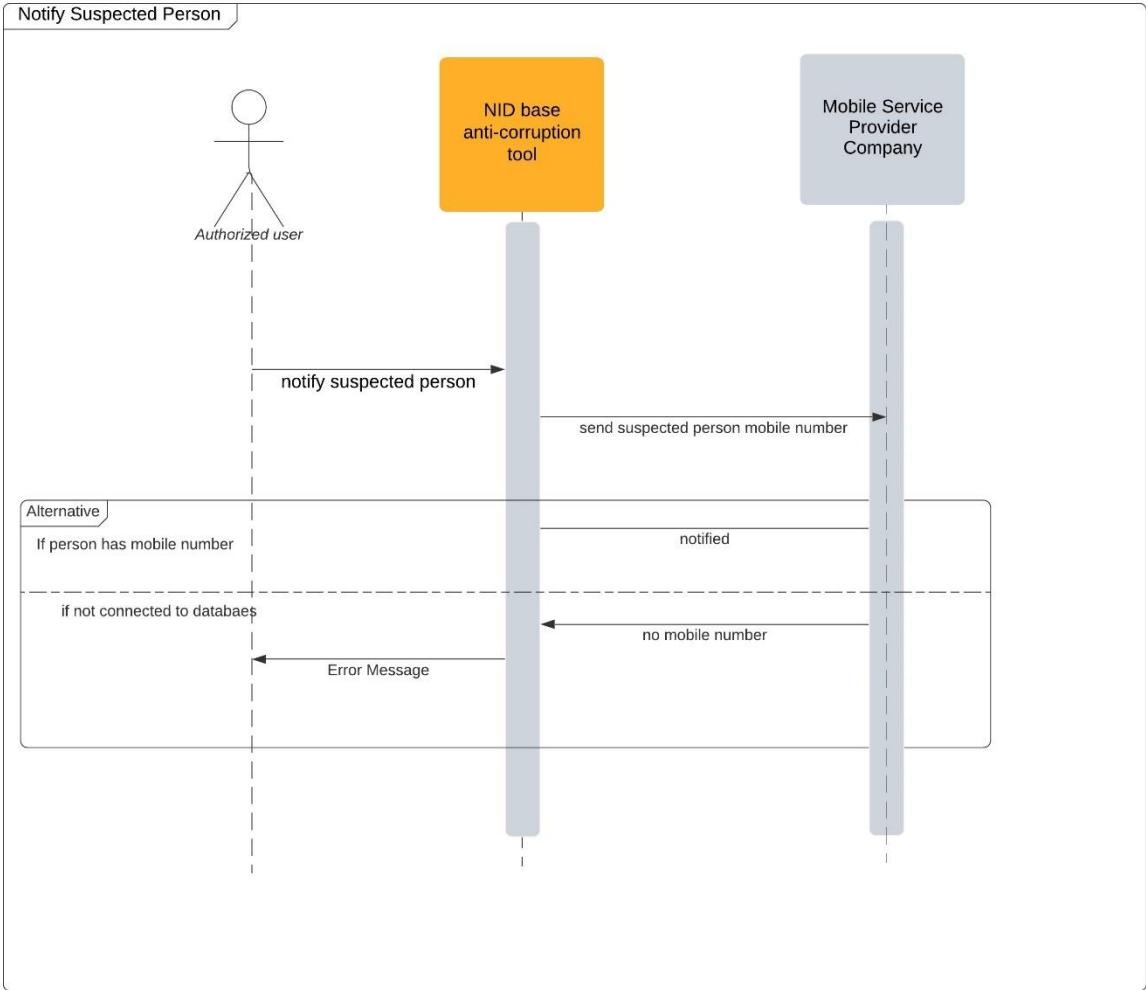
10. Start Analysis



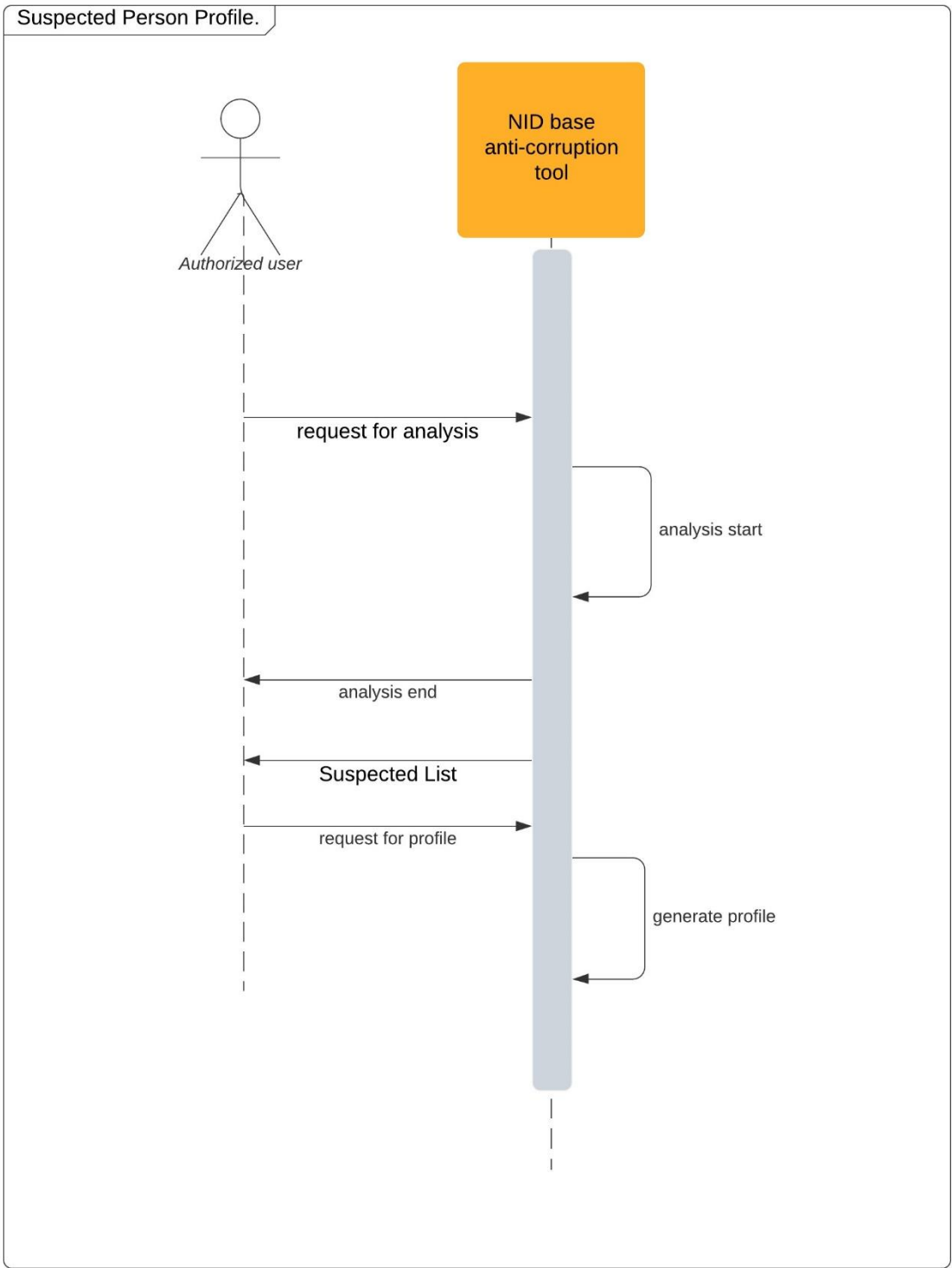
11. Suspected List



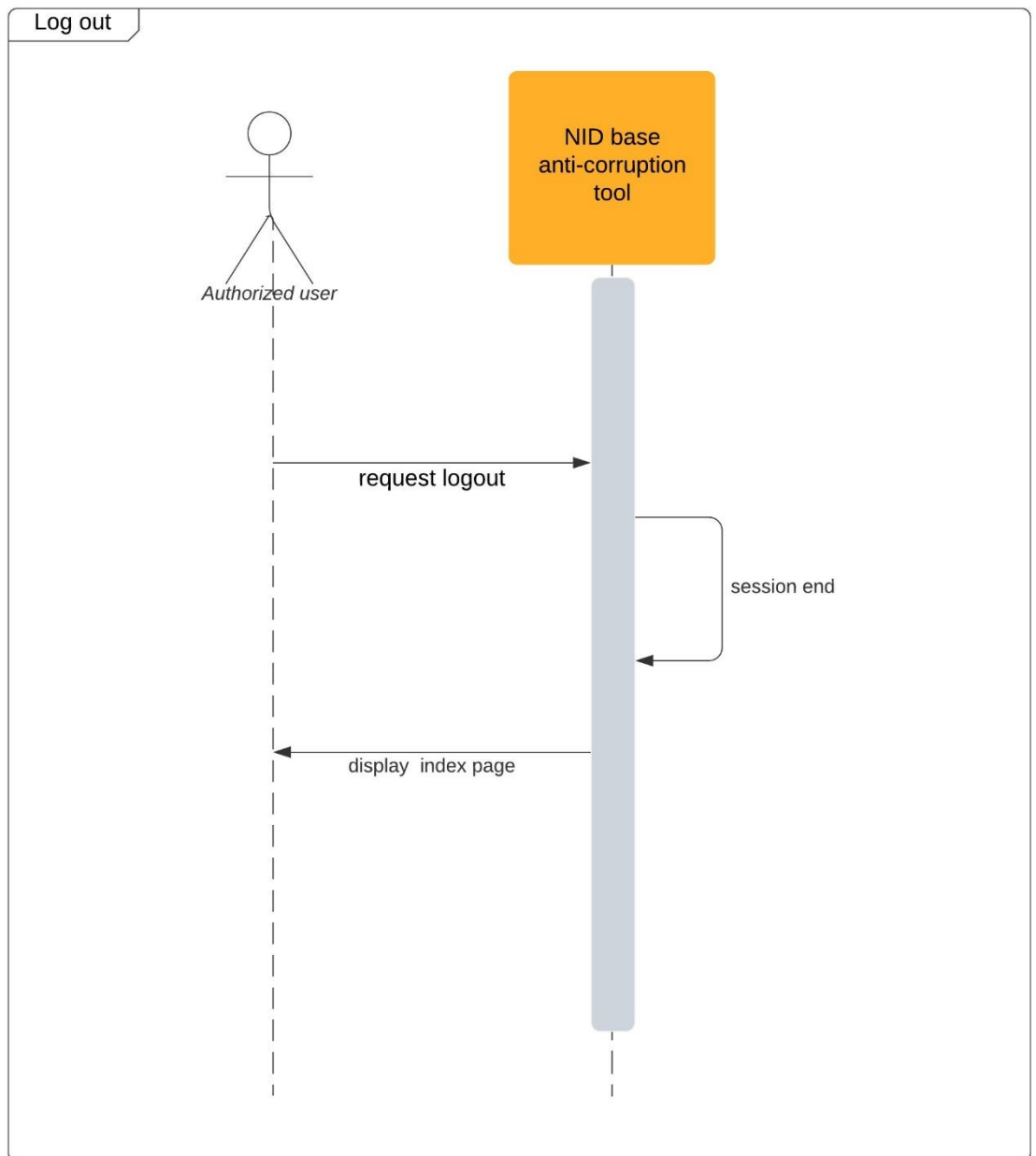
12. Notify Suspected Person



13. Suspected Person Profile



14. Logout



5.10 Activity Diagram

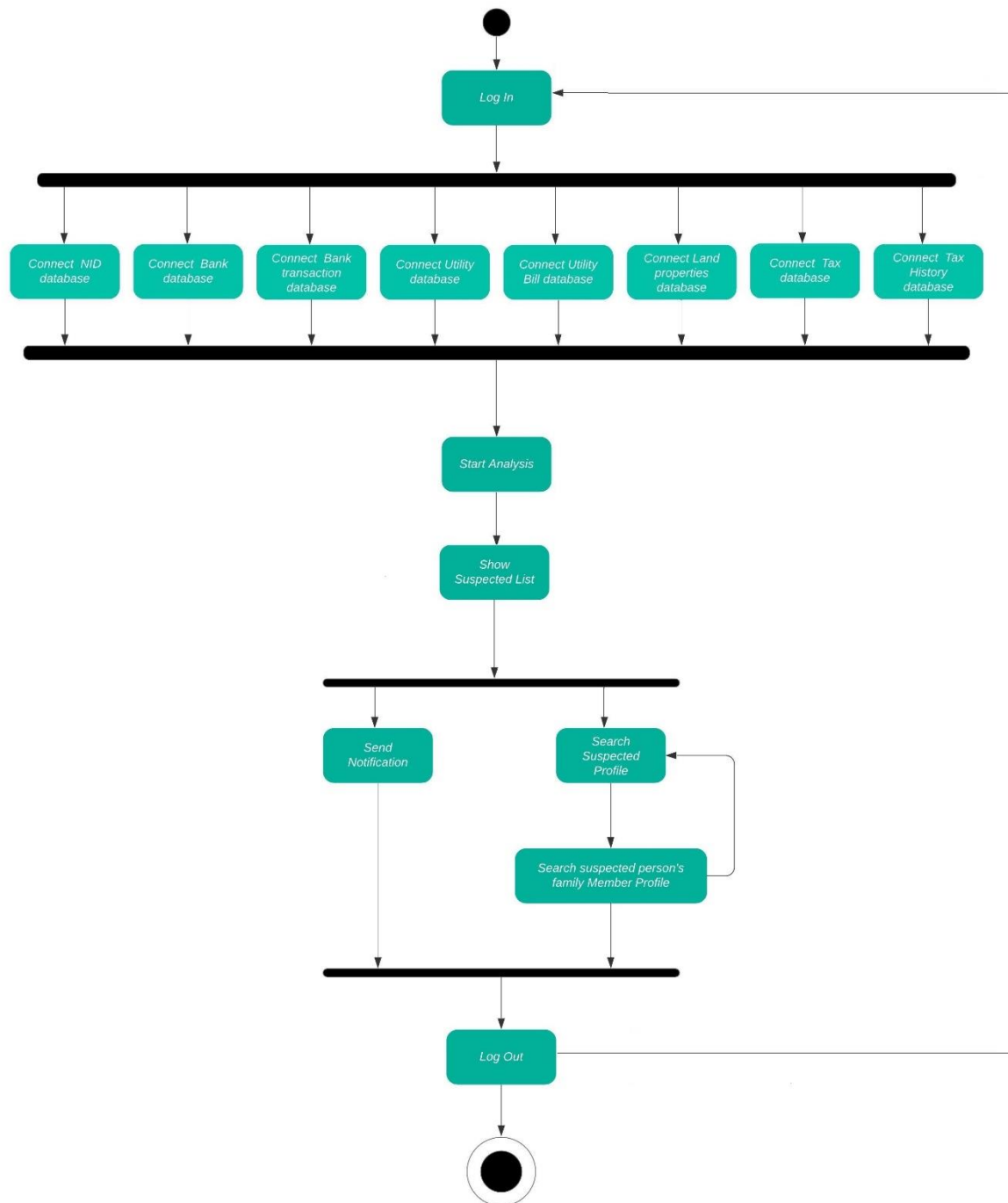
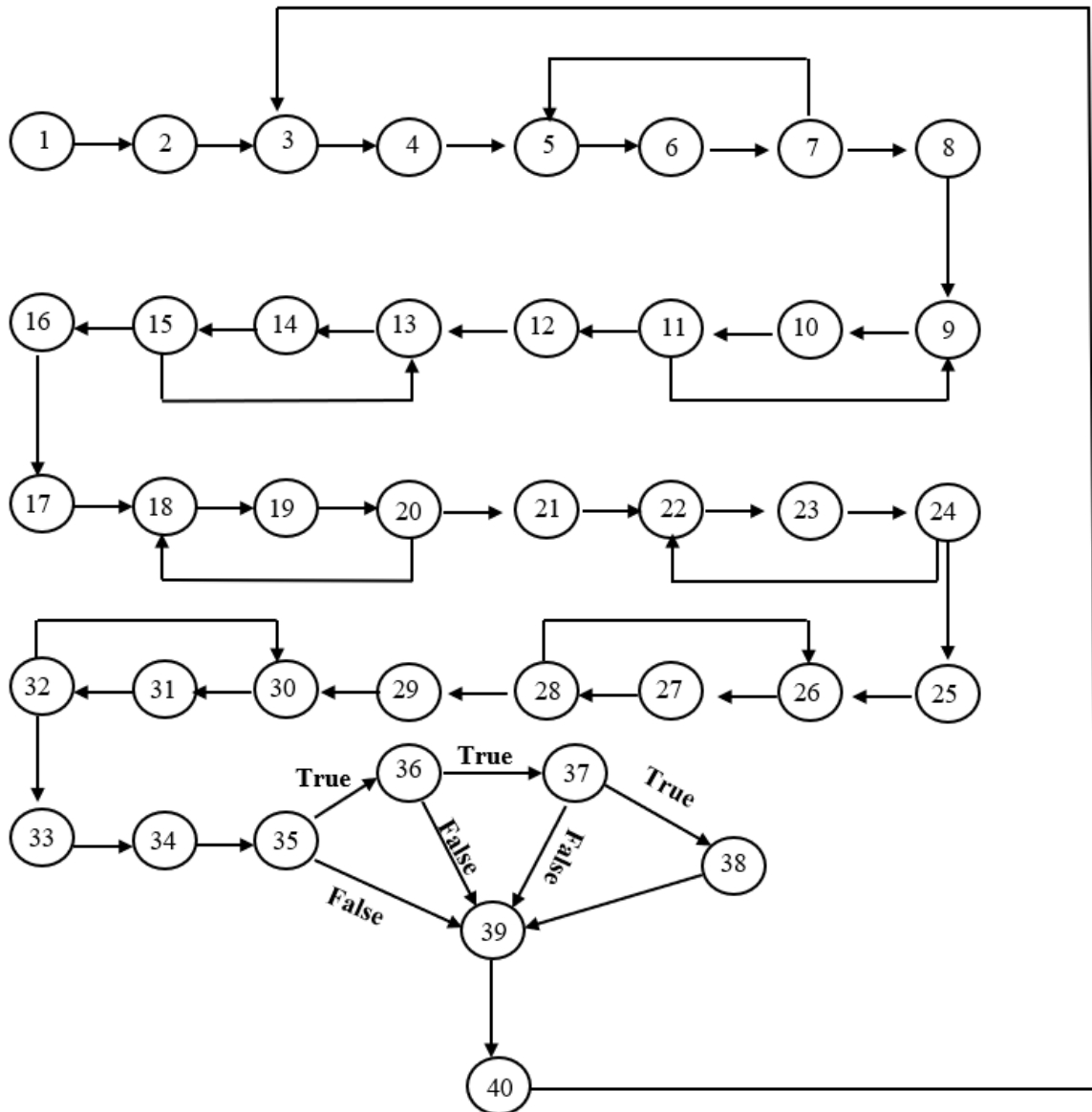


Figure 5.4: Activity Diagram

5.11 White Box Testing:

```
1. begin
2. NID_list[ ] = query()
3. loop_1 NID_list
4. bank_account[ ] = for NID_list[i] query(bank account)
5. loop_2 bank_account
6. total_current_balance_of_bank = for bank_account[i] query(current_ammount)
7. end loop_2
8. mobile_banking_account[ ] = for NID_list[i] query(mobile banking account)
9. loop_3 mobile_banking_account
10. total_current_balance_of_mobile_banking = for mobile_banking_account[i]
    query(current_ammount)
11. end loop_3
12. credit_card_account[ ] = for NID_list[i] query(credit card)
13. loop_4 credit_card_account
14. total_current_balance_of_credit_card = for mobile_banking_account[i]
    query(current_ammount)
15. end loop_4
16. total_balance = total_current_balance_of_bank +
    total_current_balance_of_mobile_banking + total_current_balance_of_credit_card
17. bank_transaction[] = for NID_list[i] query(transaction)
18. loop_5 bank_transaction
19. total_bank_transaction = for bank_transaction[i] query(amount)
20. end loop_5
21. mobile_bank_transaction[] = for NID_list[i] query(transaction)
22. loop_6 mobile_bank_transaction
23. total_mobile_bank_transaction = for mobile_bank_transaction[i] query(amount)
24. end loop_6
25. credit_card_transaction[] = for NID_list[i] query(transaction)
26. loop_7 credit_card_transaction
27. total_credit_card_transaction = for credit_card_transaction [i] query(amount)
28. end loop_7
29. utility_account[] = for NID_list[i] query(utility account)
30. loop_8 utility_account
31. total_utility_bills = for utility_account(amount)
32. end loop_8
33. tax_bill = for NID_list[i] query(tax amount)
34. total_expense = total_bank_transaction + total_mobile_bank_transaction + total_
    credit_card_transaction + total_utility_bills + tax_bill
35. if( total_expense > total_balance *2)
36. then if (total_expense > total_balance_of_father *2)
37. then if(total_expense >total_balance_of_mother*2)
38. then NID_list[i]= suspected
39. end loop_1
40. end
```

5.11.1 Control flow Graph:



5.11.2 Statement Coverage:

test case 1:

```
NID_list[1] = '880011111'[database]
total_current_balance_of_bank = 4000 [database]
bank_account[1] = '123212141'[database]
mobile_banking_account[1] = '01745688540'[database]
total_current_balance_of_mobile_banking = 5000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
```

total_balance = 14000 [database]

bank_transaction[1] = '123214' [database]

total_bank_transaction = 6000 [database]

mobile_bank_transaction[1] = '21211' [database]

total_mobile_bank_transaction = 10000 [database]

credit_card_transaction[1] = '21214' [database]

total_credit_card_transaction = 14000 [database]

utility_account[1] = '01211451' [database]

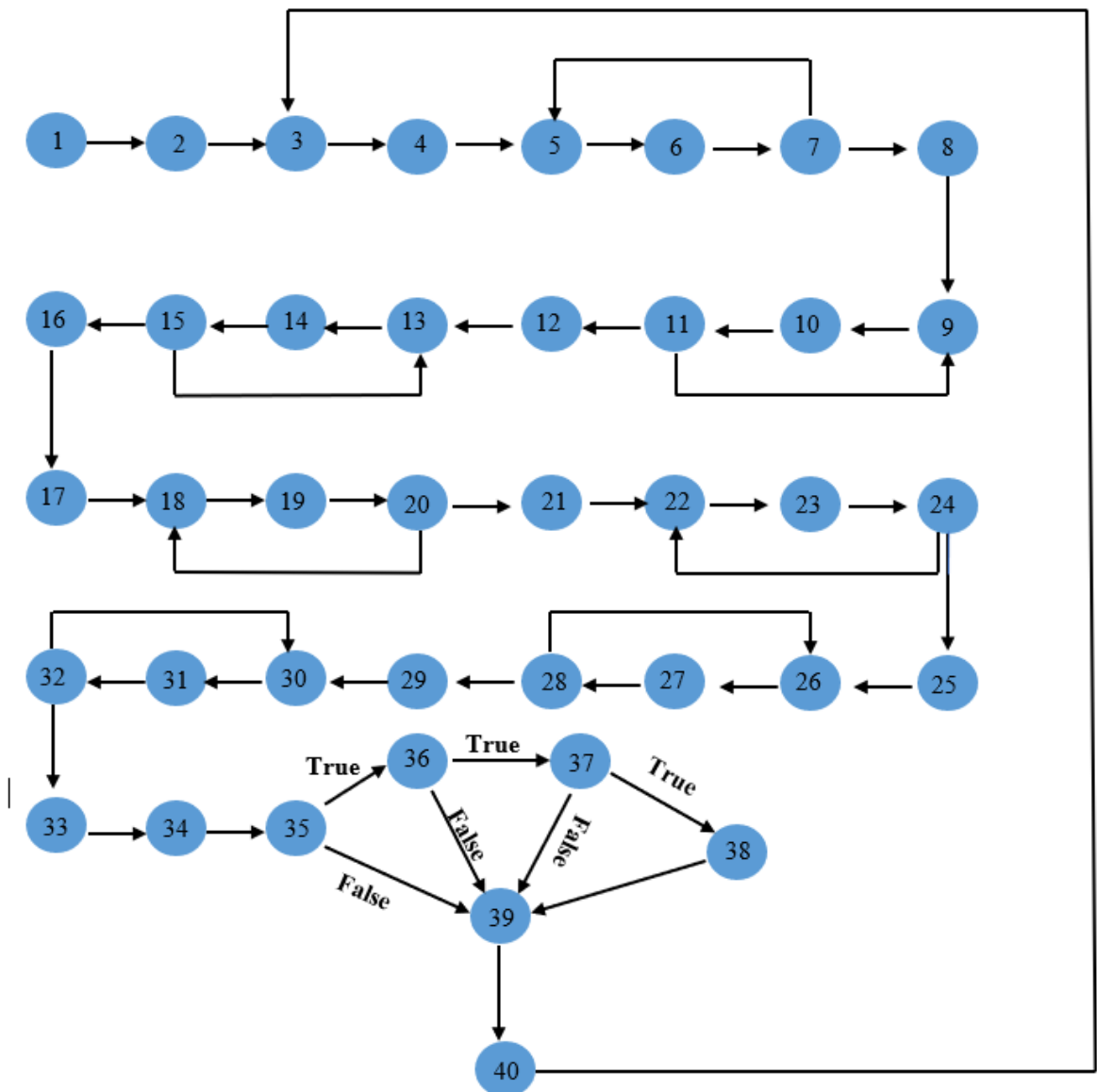
total_utility_bills = 5000 [database]

tax_bill = 5000 [database]

total_expense = 40000 [database]

total_balance_of_father = 30000 [database]

total_balance_of_mother = 0 [database]



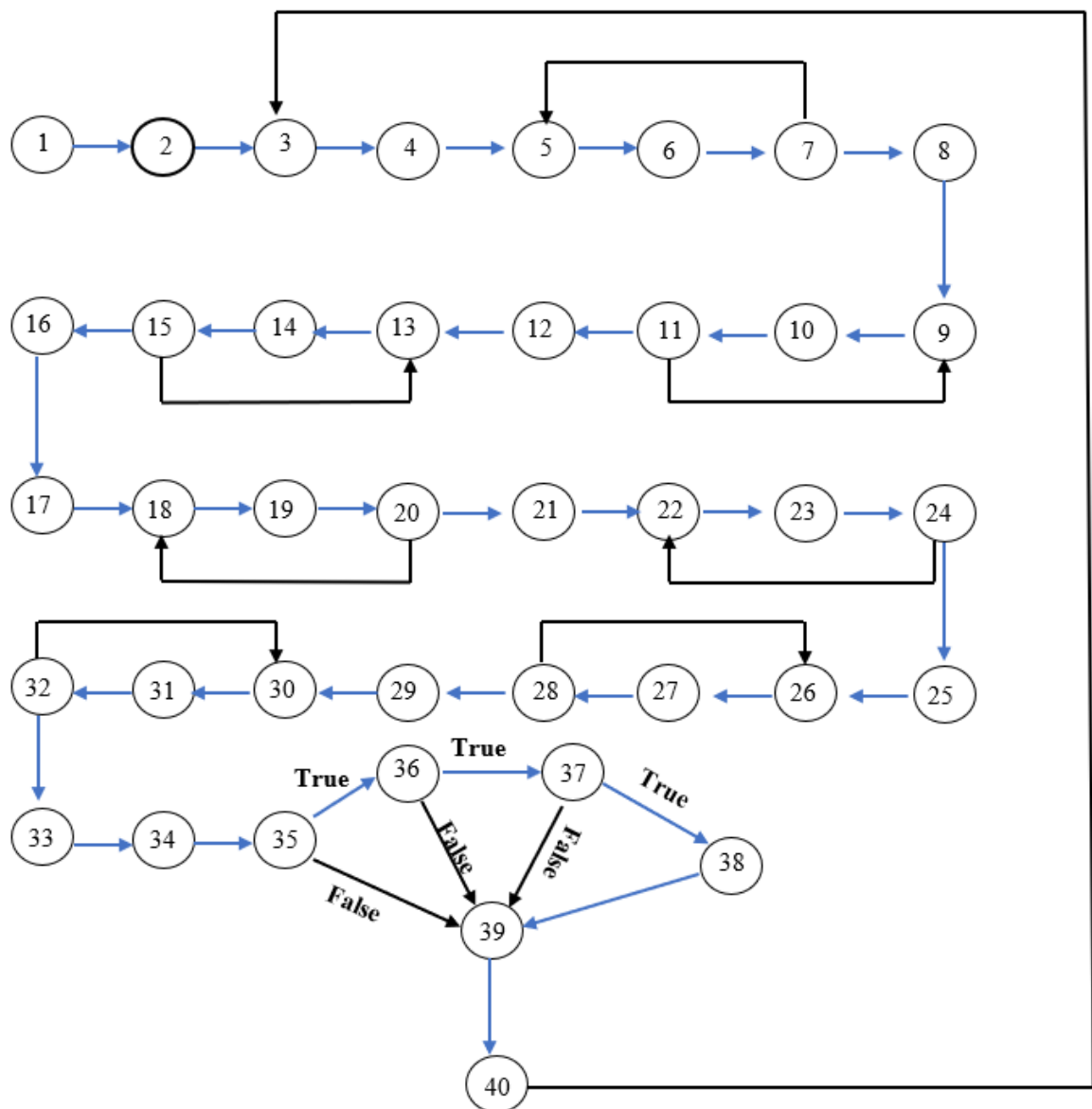
5.11.3 Edge Coverage:

test case 1:

```
NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
total_current_balance_of_bank = 4000 [database]
mobile_banking_account[1]='01745688540'[database]
total_current_balance_of_mobile_banking = 5000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 14000 [database]

bank_transaction[1] = '123214' [database]
total_bank_transaction = 6000 [database]
mobile_bank_transaction[1] = '21211' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
total_credit_card_transaction = 14000 [database]
utility_account[1] = '01211451' [database]
total_utility_bills = 5000[database]
tax_bill = 5000 [database]
total_expense = 40000 [database]

total_balance_of_father = 30000 [database]
total_balance_of_mother = 0 [database]
```



test case 2:

NID_list[1] = '880011111'[database]

bank_account[1] = '123212141'[database]

bank_account[2] = '123212151'[database]

total_current_balance_of_bank = 5000 [database]

mobile_banking_account[1]='01745688540'[database]

mobile_banking_account[2]='01745688570'[database]

total_current_balance_of_mobile_banking = 10000 [database]
credit_card_account[1] = '1215451' [database]
credit_card_account[1] = '1219451' [database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 20000 [database]

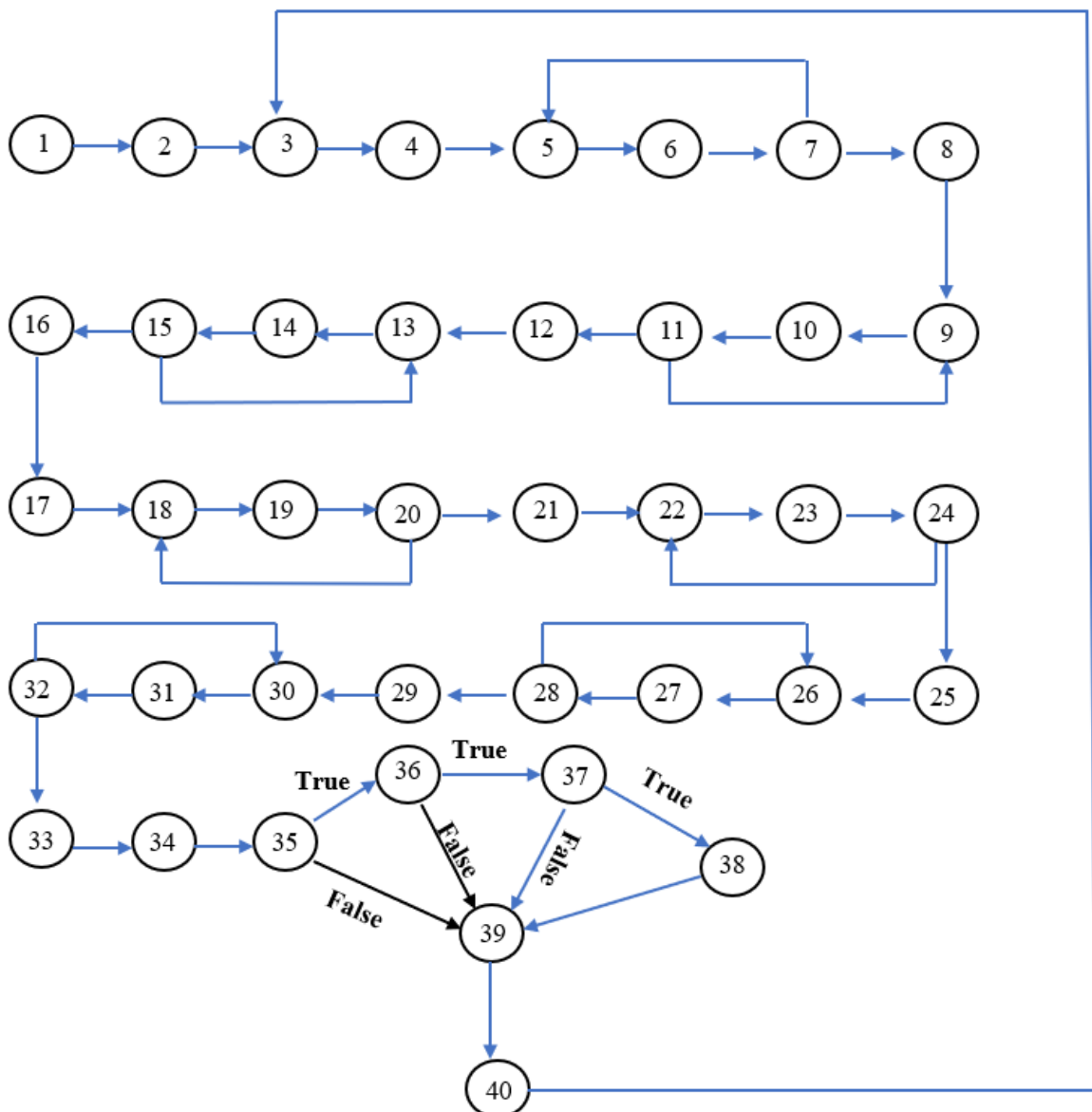
bank_transaction[1] = '123214' [database]
bank_transaction[2] = '123294' [database]
total_bank_transaction = 10000 [database]
mobile_bank_transaction[1] = '21211' [database]
mobile_bank_transaction[2] = '21951' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
credit_card_transaction[2] = '51214' [database]
total_credit_card_transaction = 15000 [database]
utility_account[1] = '01211451' [database]
utility_account[2] = '01211451' [database]
total_utility_bills = 5000 [database]
tax_bill = 5000 [database]
total_expense = 45000 [database]

total_balance_of_father = 30000 [database]
total_balance_of_mother = 70000 [database]

NID_list[2] = '985081111' [database]
bank_account[1] = '123212141' [database]
bank_account[2] = '123212151' [database]
total_current_balance_of_bank = 5000 [database]
mobile_banking_account[1] = '01745688540' [database]
mobile_banking_account[2] = '01745688570' [database]
total_current_balance_of_mobile_banking = 10000 [database]
credit_card_account[1] = '1215451' [database]
credit_card_account[1] = '1219451' [database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 20000 [database]

bank_transaction[1] = '123214' [database]
bank_transaction[2] = '123294' [database]
total_bank_transaction = 10000 [database]

mobile_bank_transaction[1] = '21211' [database]
mobile_bank_transaction[2] = '21951' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
credit_card_transaction[2] = '51214' [database]
total_credit_card_transaction = 15000 [database]
utility_account[1] = '01211451' [database]
utility_account[2] = '01211451' [database]
total_utility_bills = 5000[database]
tax_bill = 5000 [database]
total_expense = 45000 [database]
total_balance_of_father = 30000 [database]
total_balance_of_mother = 70000 [database]



test case 3:

NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
bank_account[2] = '123212151'[database]
total_current_balance_of_bank = 5000 [database]

mobile_banking_account[1] = '01745688540'[database]
mobile_banking_account[2] = '01745688570'[database]
total_current_balance_of_mobile_banking = 10000 [database]

credit_card_account[1] = '1215451'[database]
credit_card_account[1] = '1219451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 20000 [database]

bank_transaction[1] = '123214' [database]
bank_transaction[2] = '123294' [database]
total_bank_transaction = 10000 [database]

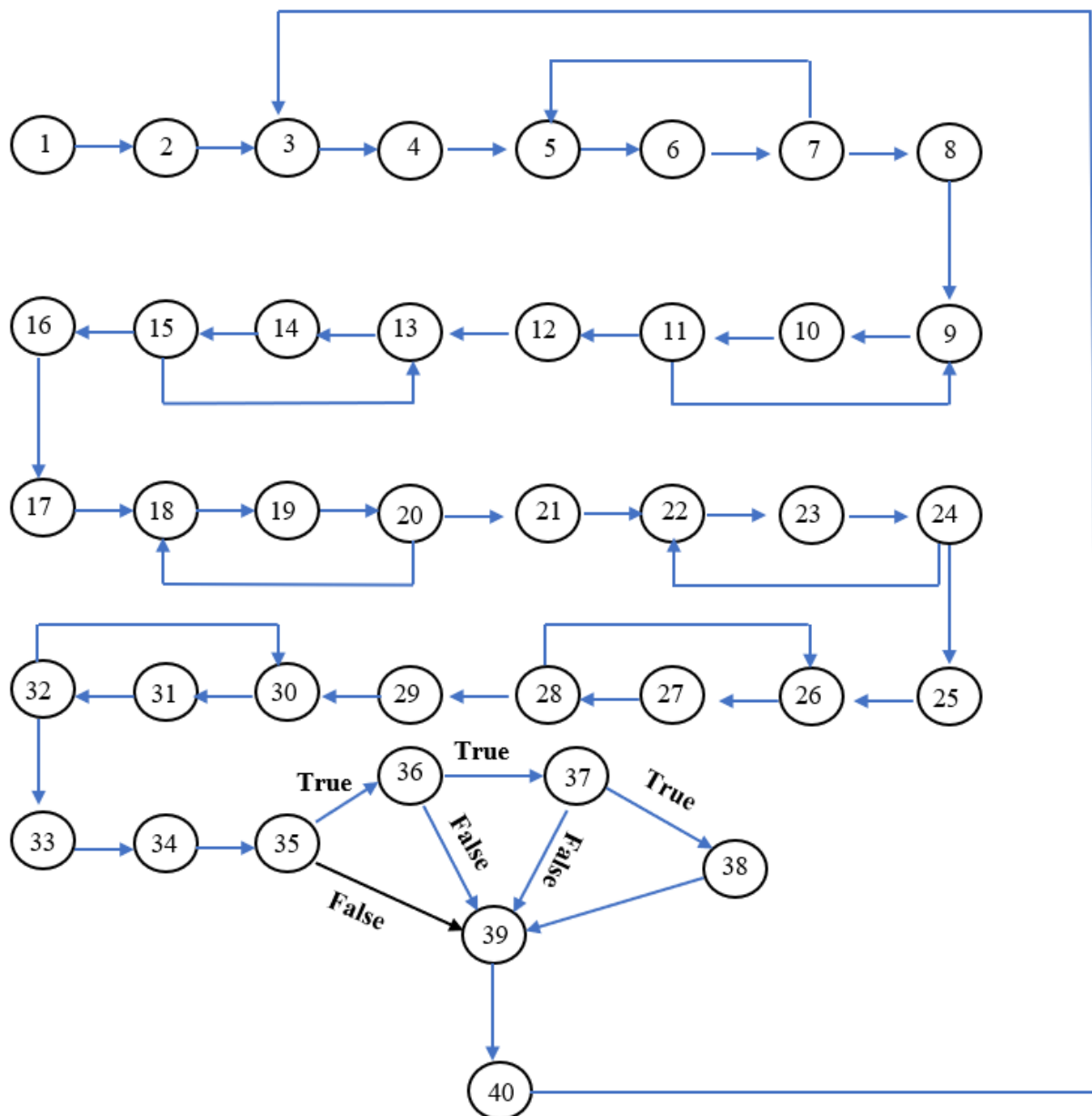
mobile_bank_transaction[1] = '21211' [database]
mobile_bank_transaction[2] = '21951' [database]
total_mobile_bank_transaction = 10000 [database]

credit_card_transaction[1] = '21214' [database]
credit_card_transaction[2] = '51214' [database]
total_credit_card_transaction = 15000 [database]

utility_account[1] = '01211451' [database]
utility_account[2] = '01211451' [database]
total_utility_bills = 5000[database]
tax_bill = 5000 [database]

total_expense = 45000 [database]

total_balance_of_father = 700000 [database]
total_balance_of_mother = 0 [database]



test case 4:

NID_list[1] = '880011111'[database]

bank_account[1] = '123212141'[database]

bank_account[2] = '123212151'[database]

total_current_balance_of_bank = 50000 [database]

mobile_banking_account[1]='01745688540'[database]

mobile_banking_account[2]='01745688570'[database]

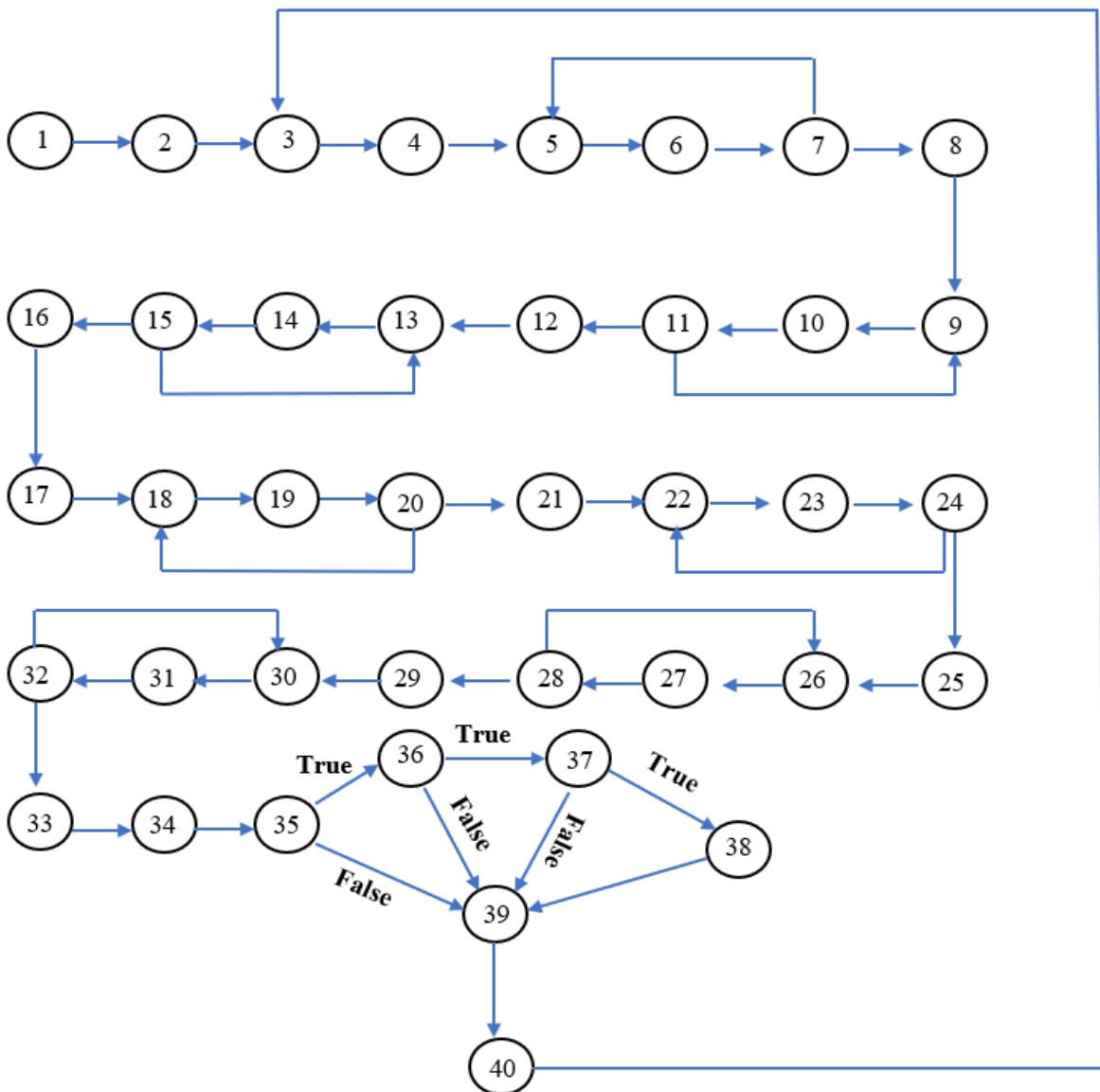
total_current_balance_of_mobile_banking = 30000 [database]

credit_card_account[1] = '1215451'[database]

credit_card_account[1] = '1219451'[database]

total_current_balance_of_credit_card = 10000 [database]

total_balance = 90000 [database]
 bank_transaction[1] = '123214' [database]
 bank_transaction[2] = '123294' [database]
 total_bank_transaction = 10000 [database]
 mobile_bank_transaction[1] = '21211' [database]
 mobile_bank_transaction[2] = '21951' [database]
 total_mobile_bank_transaction = 10000 [database]
 credit_card_transaction[1] = '21214' [database]
 credit_card_transaction[2] = '51214' [database]
 total_credit_card_transaction = 15000 [database]
 utility_account[1] = '01211451' [database]
 utility_account[2] = '01211451' [database]
 total_utility_bills = 5000 [database]
 tax_bill = 5000 [database]
 total_expense = 45000 [database]
 total_balance_of_father = 700000 [database]
 total_balance_of_mother = 0 [database]

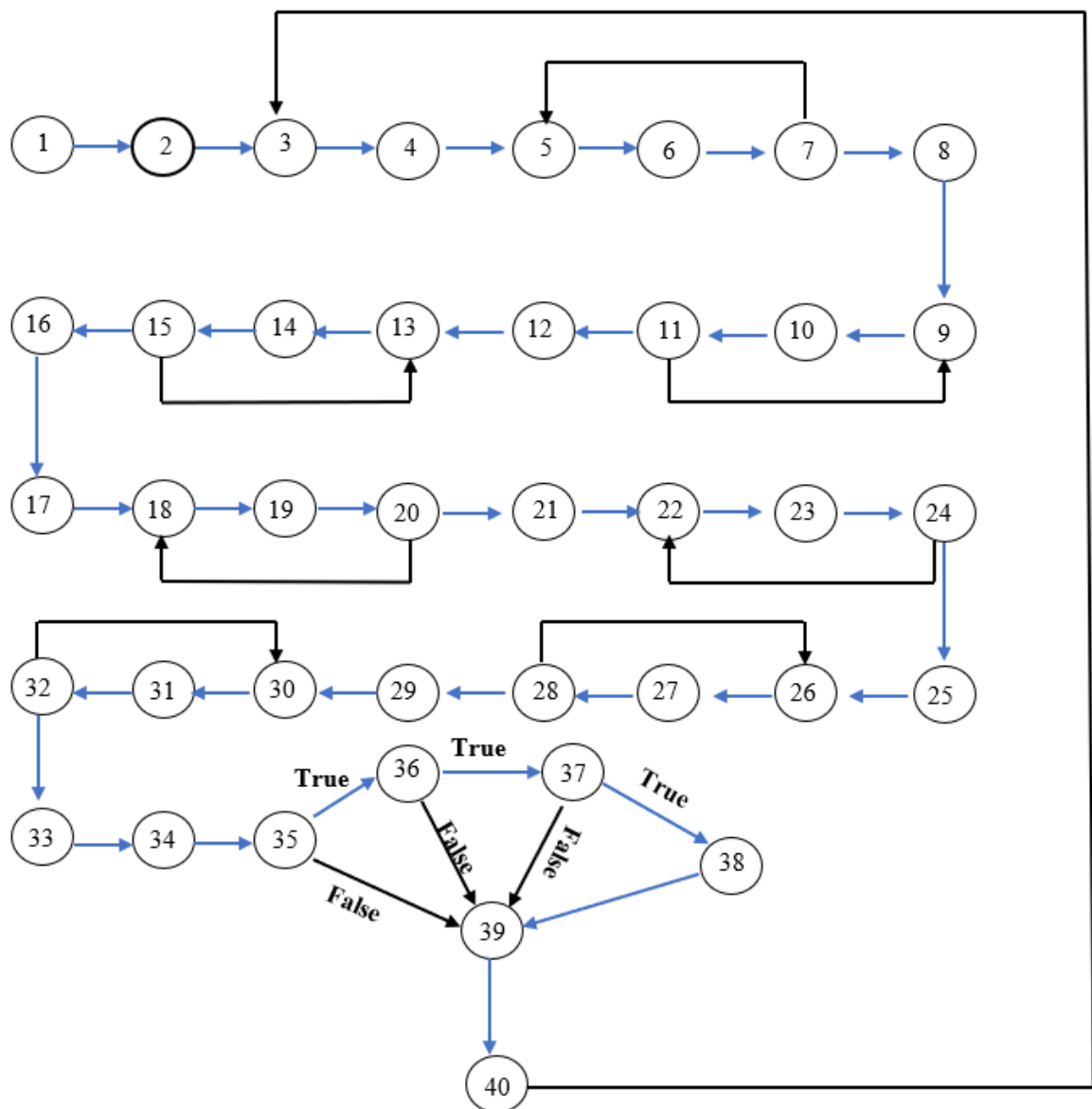


5.11.4 Condition Coverage:

test case 1: if the first condition true, second condition true, third condition true

```
NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
total_current_balance_of_bank = 4000 [database]
mobile_banking_account[1] = '01745688540'[database]
total_current_balance_of_mobile_banking = 5000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 14000 [database]
```

```
bank_transaction[1] = '123214' [database]
total_bank_transaction = 6000 [database]
mobile_bank_transaction[1] = '21211' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
total_credit_card_transaction = 14000 [database]
utility_account[1] = '01211451' [database]
total_utility_bills = 5000 [database]
tax_bill = 5000 [database]
total_expense = 40000 [database]
total_balance_of_father = 30000 [database]
total_balance_of_mother = 0 [database]
```



test case 2: if first condition true, second condition true, third condition false

NID_list[1] = '880011111'[database]

bank_account[1] = '123212141'[database]

total_current_balance_of_bank = 4000 [database]

mobile_banking_account[1] = '01745688540'[database]

total_current_balance_of_mobile_banking = 5000 [database]

credit_card_account[1] = '1215451'[database]

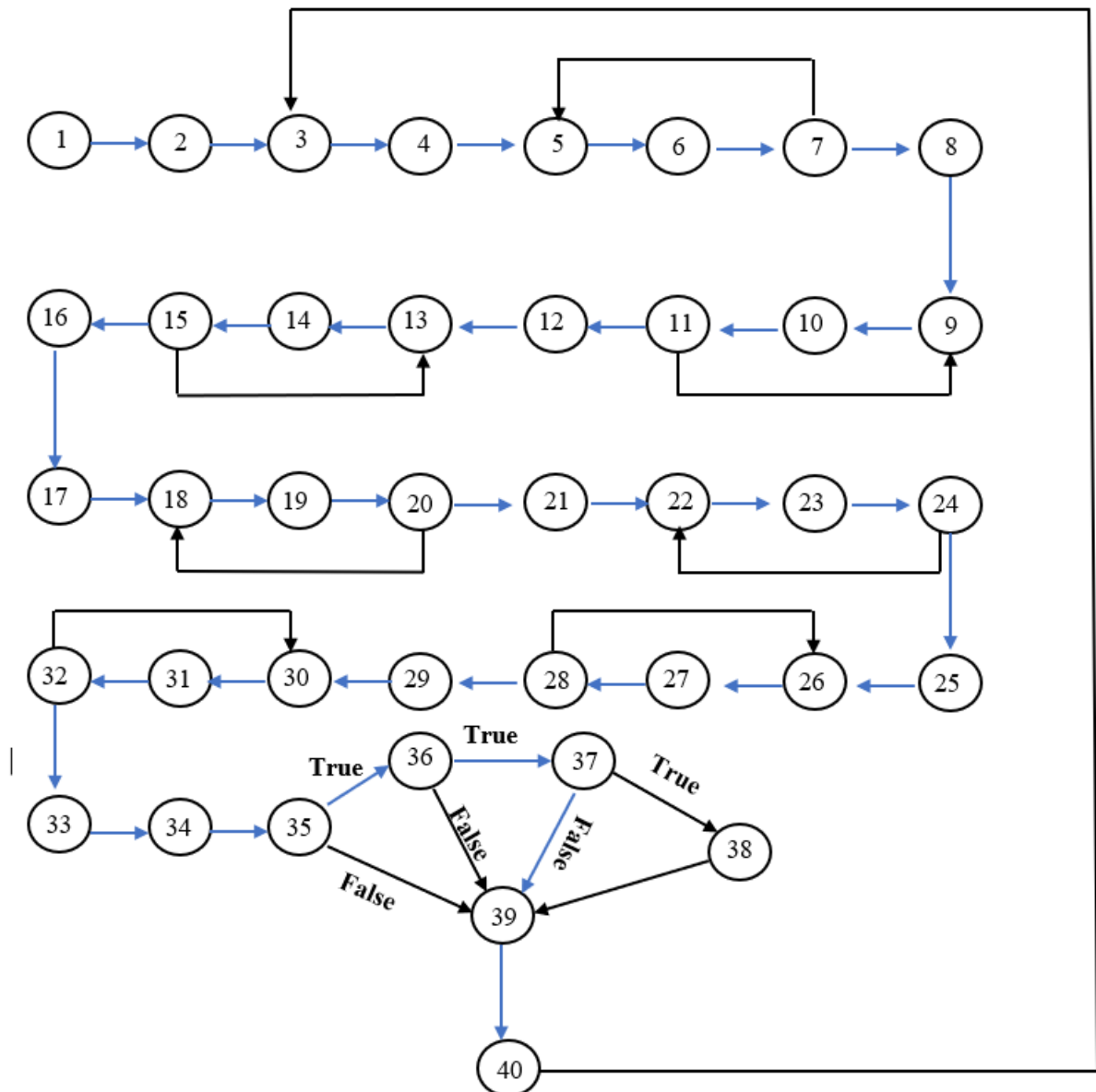
total_current_balance_of_credit_card = 5000 [database]

total_balance = 14000 [database]

bank_transaction[1] = '123214' [database]

total_bank_transaction = 6000 [database]
 mobile_bank_transaction[1] = '21211' [database]
 total_mobile_bank_transaction = 10000 [database]
 credit_card_transaction[1] = '21214' [database]
 total_credit_card_transaction = 14000 [database]
 utility_account[1] = '01211451' [database]
 total_utility_bills = 5000 [database]
 tax_bill = 5000 [database]

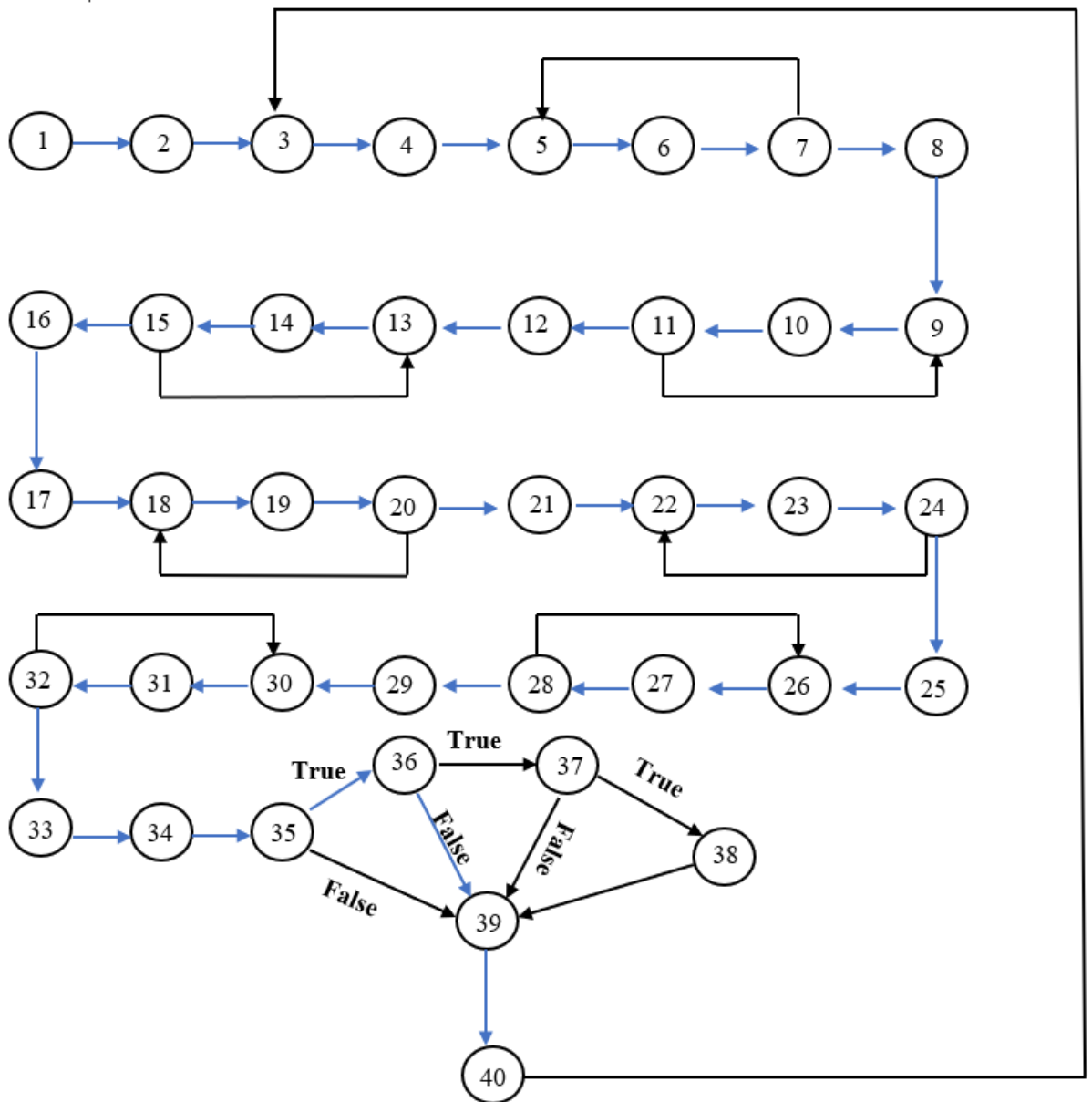
 total_expense = 40000 [database]
 total_balance_of_father = 30000 [database]
 total_balance_of_mother = 50000 [database]



test case 2: if first condition true, second condition false

```
NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
total_current_balance_of_bank = 4000 [database]

mobile_banking_account[1]='01745688540'[database]
total_current_balance_of_mobile_banking = 5000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 14000 [database]
bank_transaction[1] = '123214' [database]
total_bank_transaction = 6000 [database]
mobile_bank_transaction[1] = '21211' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
total_credit_card_transaction = 14000 [database]
utility_account[1] = '01211451' [database]
total_utility_bills = 5000[database]
tax_bill = 5000 [database]
total_expense = 40000 [database]
total_balance_of_father = 50000 [database]
total_balance_of_mother = 0 [database]
```

test case 3: if first condition false

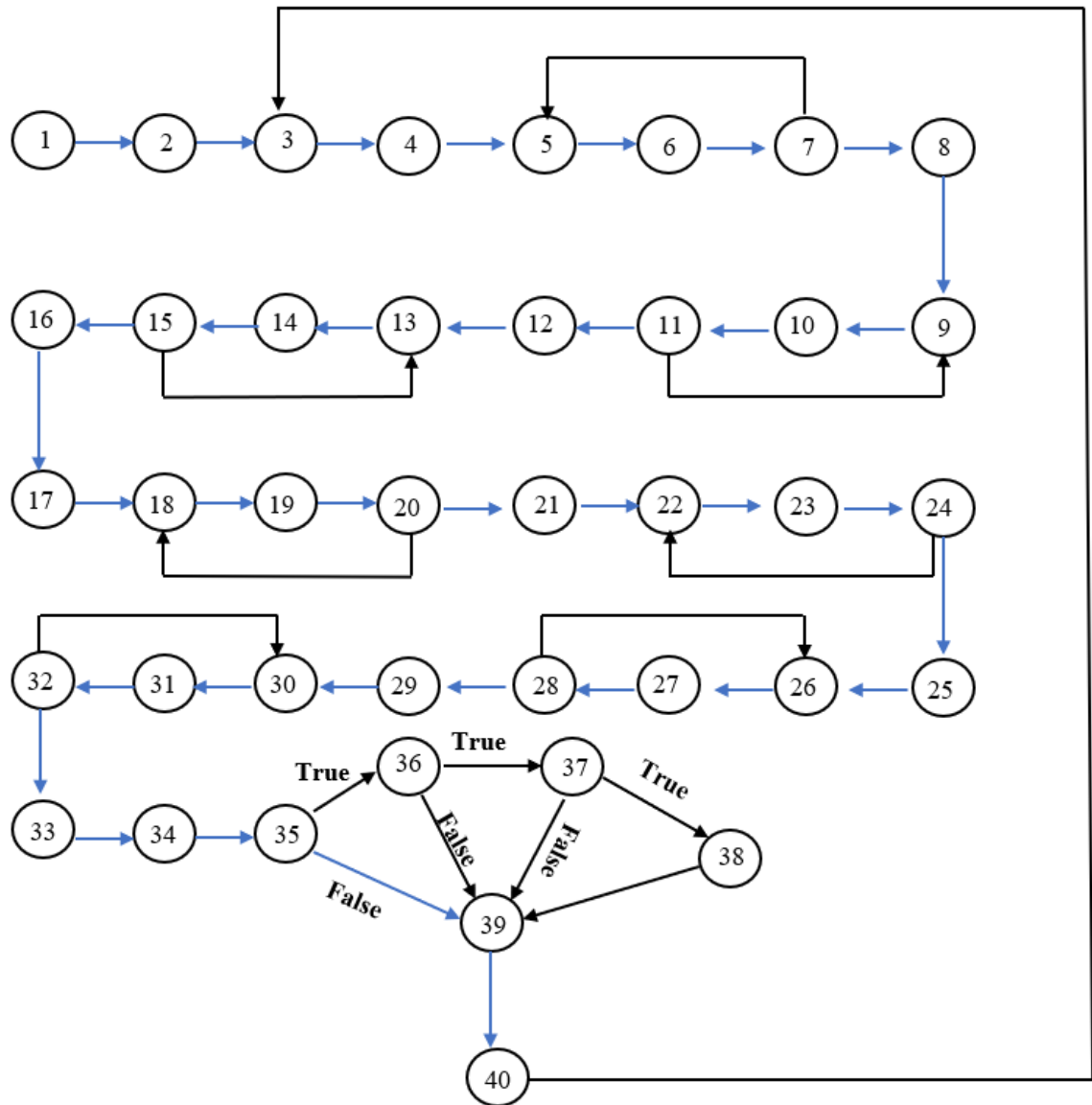
```

NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
total_current_balance_of_bank = 40000 [database]

mobile_banking_account[1]='01745688540'[database]
total_current_balance_of_mobile_banking = 10000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 55000 [database]
bank_transaction[1] = '123214' [database]
total_bank_transaction = 6000 [database]
mobile_bank_transaction[1] = '21211' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
total_credit_card_transaction = 14000 [database]

```

utility_account[1] = '01211451' [database]
 total_utility_bills = 5000[database]
 tax_bill = 5000 [database]
 total_expense = 40000 [database]
 total_balance_of_father = 20000 [database]
 total_balance_of_mother = 0 [database]



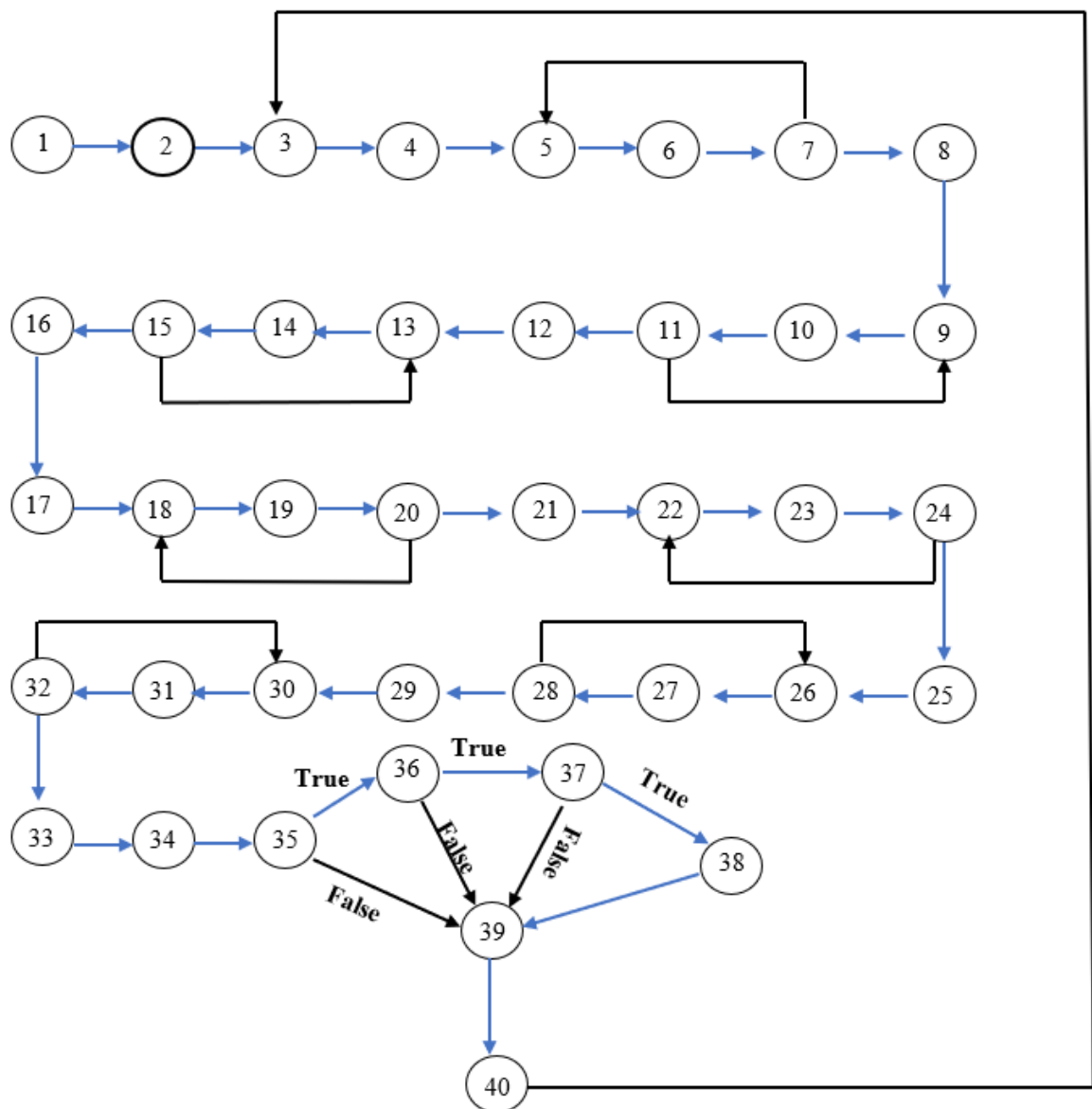
5.11.5 Path Coverage:

test case 1: if the first condition true, second condition true, third condition true

```
NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
total_current_balance_of_bank = 4000 [database]
mobile_banking_account[1]='01745688540'[database]
total_current_balance_of_mobile_banking = 5000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 14000 [database]
bank_transaction[1] = '123214' [database]
total_bank_transaction = 6000 [database]
mobile_bank_transaction[1] = '21211' [database]
total_mobile_bank_transaction = 10000 [database]

credit_card_transaction[1] = '21214' [database]
total_credit_card_transaction = 14000 [database]
utility_account[1] = '01211451' [database]
total_utility_bills = 5000[database]
tax_bill = 5000 [database]

total_expense = 40000 [database]
total_balance_of_father = 30000 [database]
total_balance_of_mother = 0 [database]
```



test case 2: if first condition true, second condition true, third condition false

NID_list[1] = '880011111'[database]

bank_account[1] = '123212141'[database]

total_current_balance_of_bank = 4000 [database]

mobile_banking_account[1] = '01745688540'[database]

total_current_balance_of_mobile_banking = 5000 [database]

credit_card_account[1] = '1215451'[database]

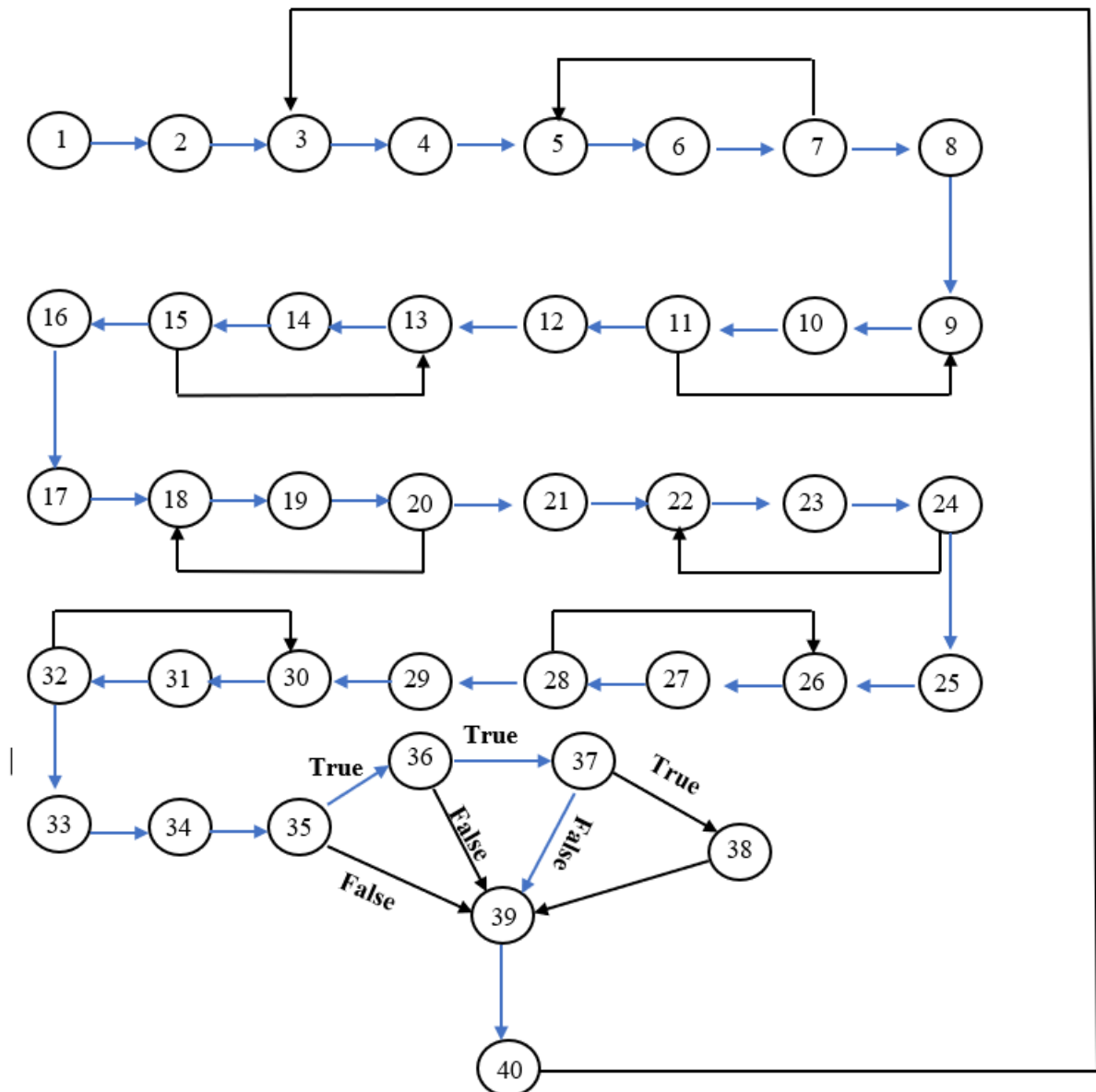
total_current_balance_of_credit_card = 5000 [database]

total_balance = 14000 [database]

bank_transaction[1] = '123214' [database]

total_bank_transaction = 6000 [database]
 mobile_bank_transaction[1] = '21211' [database]
 total_mobile_bank_transaction = 10000 [database]
 credit_card_transaction[1] = '21214' [database]
 total_credit_card_transaction = 14000 [database]
 utility_account[1] = '01211451' [database]
 total_utility_bills = 5000 [database]
 tax_bill = 5000 [database]

 total_expense = 40000 [database]
 total_balance_of_father = 30000 [database]
 total_balance_of_mother = 50000 [database]

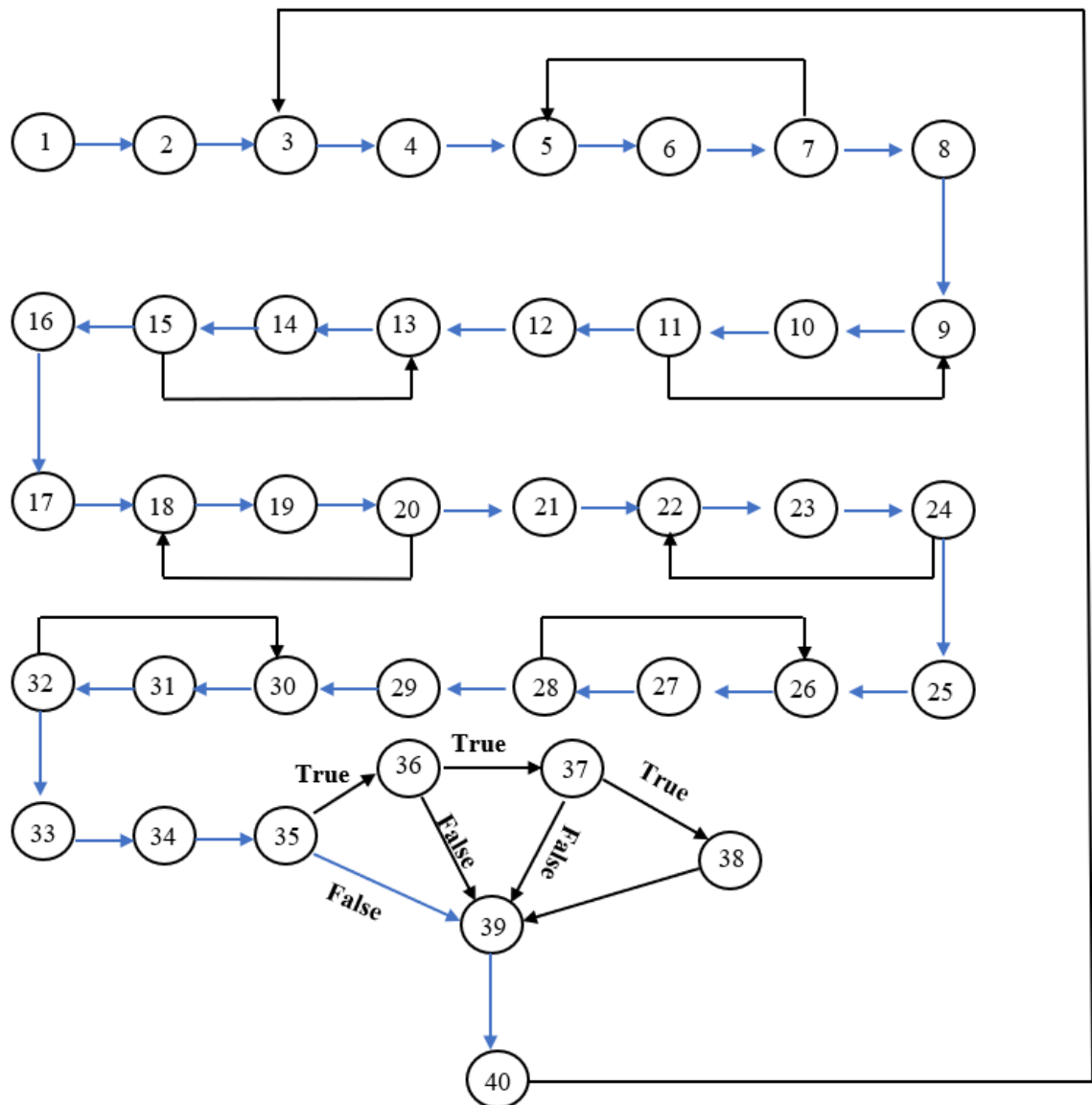


test case 2: if first condition true, second condition false

```
NID_list[1] = '880011111'[database]
bank_account[1] = '123212141'[database]
total_current_balance_of_bank = 4000 [database]

mobile_banking_account[1]='01745688540'[database]
total_current_balance_of_mobile_banking = 5000 [database]
credit_card_account[1] = '1215451'[database]
total_current_balance_of_credit_card = 5000 [database]
total_balance = 14000 [database]
bank_transaction[1] = '123214' [database]
total_bank_transaction = 6000 [database]
mobile_bank_transaction[1] = '21211' [database]
total_mobile_bank_transaction = 10000 [database]
credit_card_transaction[1] = '21214' [database]
total_credit_card_transaction = 14000 [database]
utility_account[1] = '01211451' [database]
total_utility_bills = 5000[database]
tax_bill = 5000 [database]
total_expense = 40000 [database]
total_balance_of_father = 50000 [database]
total_balance_of_mother = 0 [database]
```


utility_account[1] = '01211451' [database]
 total_utility_bills = 5000[database]
 tax_bill = 5000 [database]
 total_expense = 40000 [database]
 total_balance_of_father = 20000 [database]
 total_balance_of_mother = 0 [database]



5.11.6 Possible paths are for the following conditions:

T-T-T

T-T-F

T-F-X

F-X-X

Therefore, there are 4 possible paths.

Chapter 6

System Design

In the previous chapter we discussed about the functional and non-functional requirements of the system and produced analysis model. In this chapter we discussed about the design goals, system architecture, deployment and database design.

6.1 Design Goals

Design goal describes the qualities of the system. The feature what developer should look in to specifically and optimize. This goals normally comes from non-functional requirements of the system.

This design goals are grouped in to four categories.

1. Performance
2. Dependability
3. Maintenance
4. End user criteria

6.1.1 Performance Criteria

The part of this system to be used for analyse all the information linked with NID. So, as fast as this system is connected to the provided databased more fast this system will work. If there is any delay or maintenance problem then the system will take too much extra time which this system should not take. This connection need very fast response. And on the other hand, this system won't take too much memory space. Because this system not creating new data. It just analysing existing data.

6.1.2 Dependability

This system is built for government use only. All the classified data will be stored in the database so, the system must have proper security. And this system will be operated by non-IT professional so this has to be as much as user-friendly as possible.

6.1.3 Maintenance

The system should be easily improvable. To add new feature and functionalities at later if needed. It should be also easily modified to make changes the functionalities and features.

6.1.4 End User Criteria

Usability: Usability is the area which a product can be used by a specific user to achieve specific goals. From the user end perspective, the system must design in a way that it is very easy to learn to use and efficient with very few errors if there is any.

Some time it's normal to lose one thing in order to achieve another functionality. The best example is the issue of security over the response time. Checking user ID, a password before the user can access the system creates response time problem.

6.2 Architecture of the System

This system is expected to find out the corrupted person. It's an automated system. It can do its work without any user help. After starting the system, it will do its part without any outside commands.

The architecture for the system is simple where the user just starts the system and the system analyse all the database linked with the system to find out the suspected person. The data tier maintains the applications data never stores in any kind of system.

It just read all the Data was provided for this system to analyse and generate a suspected list. The middle tier (web/application server) implements the controller logic and presentation logic to control the interaction between the application and user. The controller logic processes the data and shows the result to the user.

The client tier is the applications user interface. Here the system doesn't take any input from the user. This system has only one start button. After the user starts the analyse, the system will generate the list automatically.

6.3 Persistent Data Management

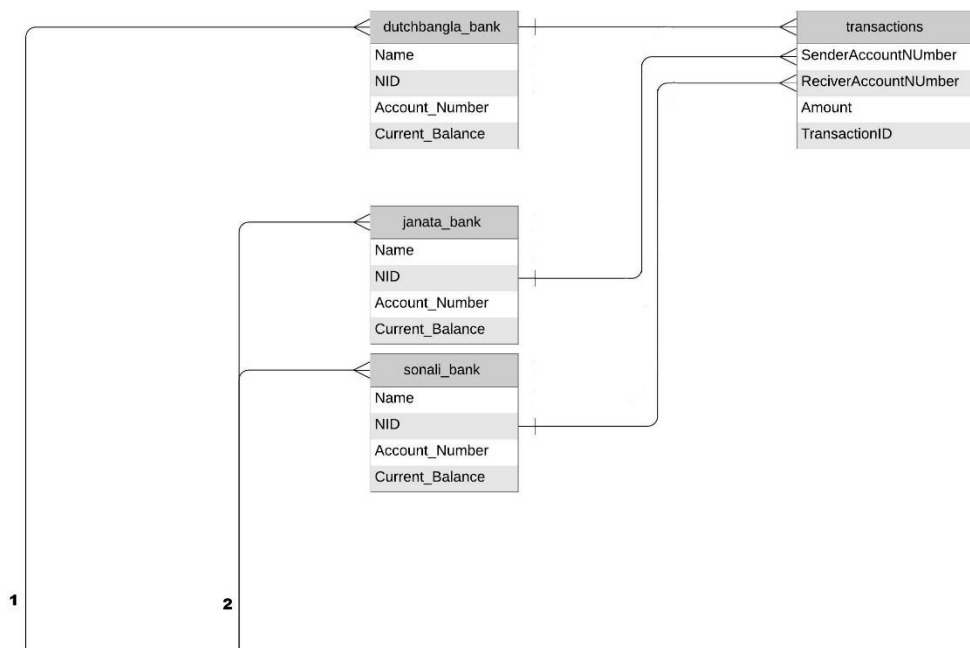
Persistent data management deals with how the data are stored and managed. All the information used to analyse for the system is outsourced. The system doesn't store those data it's just read the data for the server's database.

The system analyses all the data connected to NID to find out the suspected person. It does a lot of queries over all the connected database which is relational database management system.

6.3.1 Relationships among Tables

This part describes and shows the necessary relationship among the tables which are connected to the system. There are three types of relationship in a relationship database system. These are one-to-one, one-to-many and many-to-many. The system consideration has one-to-one and one-to-many relationship.

NID table and all the bank table have one-to-one relationship. On the other hand, all the bank and transactions have one-to-many relationship.



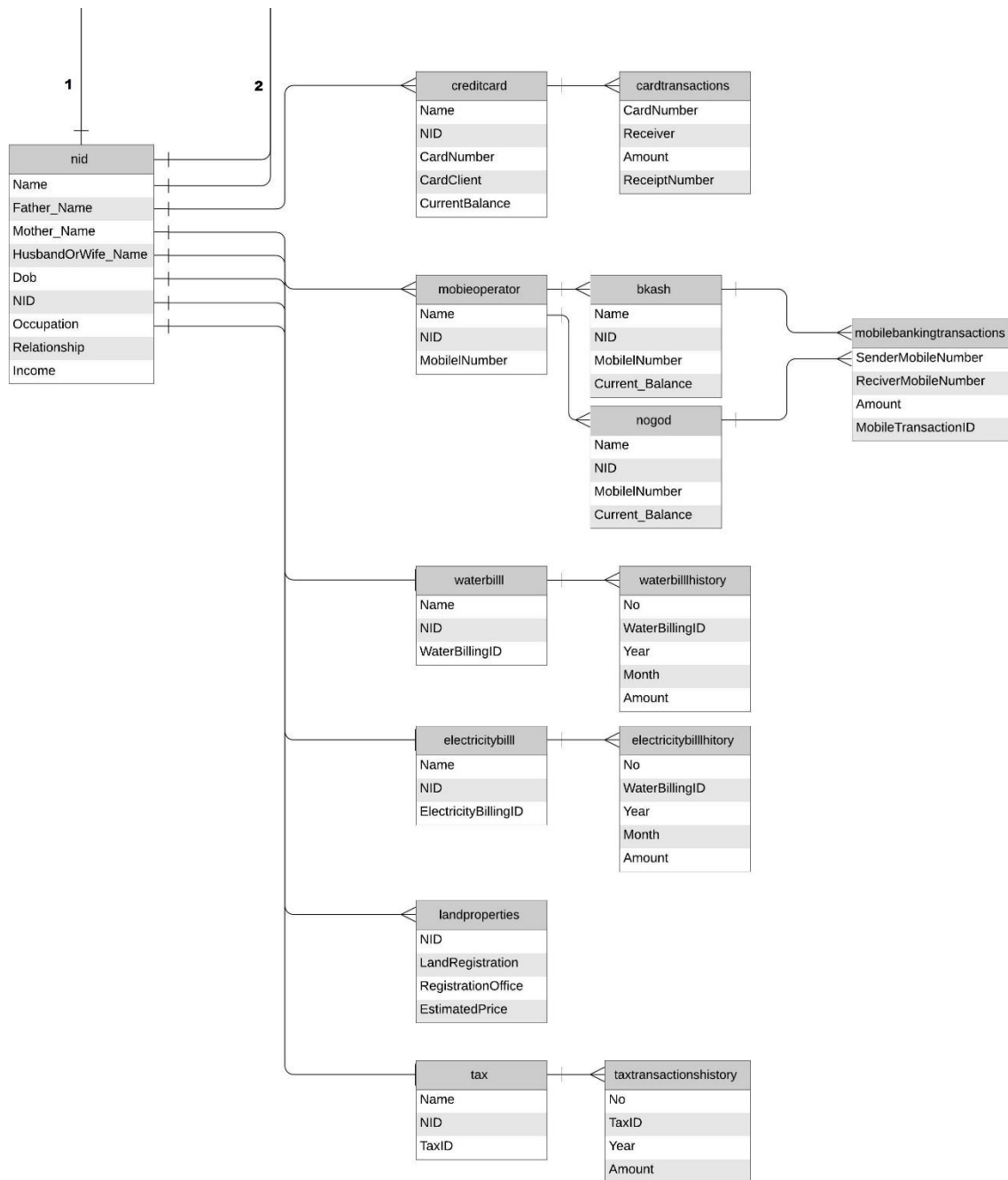


Figure 6.1: Relationship Diagram of the Tables

Chapter 7

Implementation

In this chapter, we described all the tools used to develop this system and how it works.

7.1 System Interface

All System interfaces in this chapter were created in HTML/CSS coder while creating PHP, MySQL Integrated Development Environment (IDE) interfaces.

7.1.1 Login System

Here only authorized person of the government will have the specific Username and Password to login to the system. Without the specific Username and Password no one can access the system. The screenshot is given below for Login System.



Figure 7.1: Login System

7.1.2 Home Page

In the home page the user has ten options. Four of them is hidden which will activate upon some certain condition is met. “Connect NID Database” button is for connect the Bangladesh Election Commission database. “Connect Bank Data” button is for connect Bangladesh Bank database. “Connect Bank Transaction Database” button is for connect the Bangladesh Election Commission. This button is hidden which will appear when our system will be connected to the Bangladesh Election Commission. “Connect Utility Database” button is for connect Utility Service Provider database. “Connect Utility Bill Database” button is for connect Utility Service Provider database. This button is hidden which will appear when our system will be connected to the Utility Service Provider data. “Connect Land Properties Database” button is for connect Bangladesh Land Properties Authority database. “Connect Tax Database” button is for connect National Board of Revenue (NBR) database. “Connect Tax History Database” button is for connect National Board of Revenue (NBR) database. This button is hidden which will appear when our system will be connected to the National Board of Revenue (NBR) database. “Start Analysis” button is also hidden. This will appear when all the required database is connected to the system. This button is for the start the analysis. “Exit” button is for exiting the system.



Figure 7.2: Home Page

7.1.3 Analyze Result

After the analyze is complete here will show the list of all the suspected person's list. And from the bottom search bar we can search their profile through NID. And with the back button we can go back to the home screen. Here is another alternative result will be shown if there is no suspected person found. Then the screen will show no list but a message "No Suspected Person Found!" and the search bar will be gone as there is no person to search. The screenshot is given below for Analyze page. There is also a "Notify All" button which will lead to notify all the suspected person in the list that they are suspected for anti-corruption.

Suspected List		
No	Name	NID
1	Faysal Ahmed	8000000001
2	Shahana Begum	8000000003

Notify All

Back

Figure 7.3: Suspected List

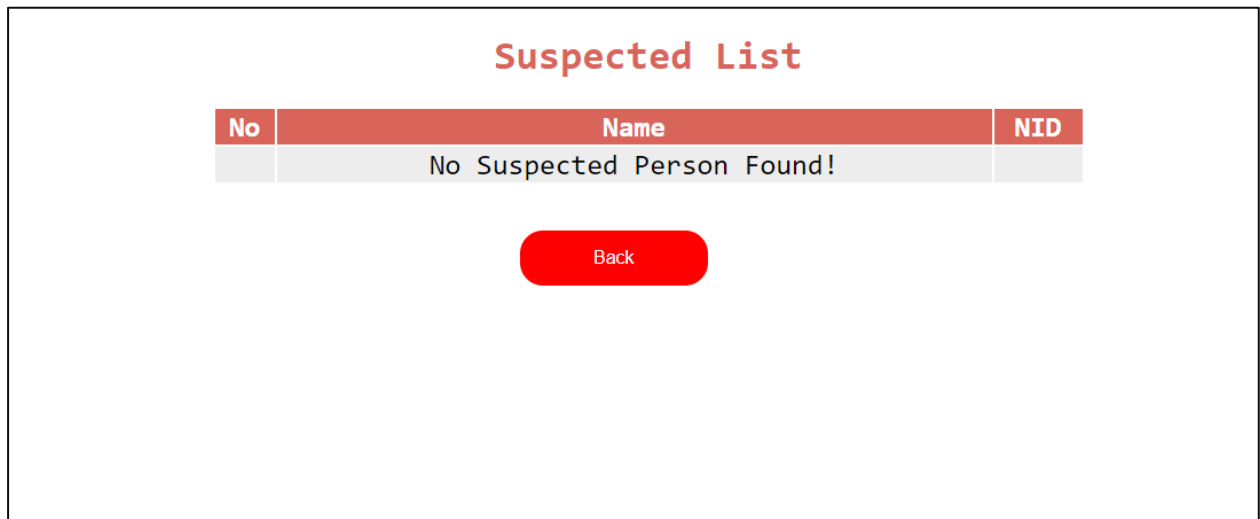


Figure 7.4: Suspected List with no person.

7.1.4 Profiling Page

After searching with the NID in the search bar this profile will be generated where user will be able to see all the information regarding that person. His all information like bank balance, transaction,

Utility bills, Tax history, Land properties and his family members information too. This will help the user to determine if this suspected person is truly corrupted or not. The screenshot is given below for profiling page.

There is also a search bar to search the suspected person family member's profile. We can search any of the family member of the suspected person with the NID of suspected persons family members provided in the suspected person profile.

As for the "Back" button we can go back to the suspected list page to search another person or exit the system.

Suspected Person's Profile

Name	NID	Date of Birth	Occupation	Relationship	Address	Income
Faysal Ahmed	8000000001	1985-04-23	Government Employee	Married	address	550

Bank Balance

Account Holder	Account Number	Balance
Dutch Bangla Bank	1000000002	6000
Sonali Bank	2000000001	5000
bKash	01710000001	5000
Credit Card	987654001	5000

Transaction

Account Holder	Transaction ID	Amount
Dutch Bangla Bank	ABCDEFGHI001	6000
Sonali Bank	ABCDEFGHI002	9000
Janata Bank	10001	3500
bKash	654001	6000

Utility Bill

Billing Client	Billing ID	Amount
Water	456001	600
Electricity	987001	1200

Tax History

TaxID	Amount
321001	6000

Land Properties

Land Registration	Registration Office	Estimated Price
987456001	Mirpur	12000000

Family Members

Relationship	Name	NID
Siblings	Anika Tabassum	8000000008
Father	Md. Imran Hossain	8000000005
Mother	Afsana Shirin	8000000006
Husband/Wife	Shahana Begum	8000000003
Children	Raghib Bhuiyan	8000000007

[Back](#)

Figure 7.5: Profiling page

Chapter 8

Conclusion & Future Work

8.1 Conclusion

Here our main goal is to monitor every person's annually income and expense. The main theme of our system to calculate all the income source and expense and compare them. If we can such person who's annually income is less than his annually expense the is our primary suspicious guy. Then we will try to find out his extra money source. We will analyze all his transactions to find from which source he/she got the extra money. We will monitor his every income source and also his family members and close relatives to find that if he got any help from them or if he got any lone from the bank to expense that extra money. If he got that extra money from bank loan or he sold his property then he is clear. If he got those extra money from his family members or close relatives then we will analyze that family member or close relatives if he has that option to give that money without exceeding his annually income. If we don't find any kind of trace of that extra money then he will be ta Suspect for black money. If we can't find any clue of extra money transactions from long distance relatives or some unknown person, we will give a chance to verify himself why he got those money to from that person or organization.

8.2 Future Work

In our work we are able to calculate almost all the digital transaction. We are totally depended on the provided database we are getting from all the source like bank, mobile operator company, utilities service providers etc. We simply reading their data to analyze and calculate to find out suspicious person. We can't identify the direct hand cash money and bit-coin [14].

So, there is some room for improvements. In future maybe we will be able to find some ways to analyze those things what we can't do right now.

Bibliography

- [1] A. A. M. Nurunnabi, Klazi, and T. Ullah, "E-Governance as an Anti-Corruption Tool for Government in Bangladesh," *AIUB J. Bus. Econ.*, vol. 8, no. 2, pp. 143–164, 2009.
- [2] A. A. Ameen and K. Ahmad, "Information Systems Strategies to Reduce Financial Corruption," no. July, pp. 731–740, 2017, doi: 10.1007/978-3-319-43434-6_65.
- [3] U. Nations, "Corruption Toolkit."
- [4] N. Hasani and B. Beleraj, "E-Government as an Anti-Corruption Tool. The Case of Albania," *Acad. J. Interdiscip. Stud.*, vol. 2, no. 8, pp. 712–716, 2013, doi: 10.5901/ajis.2013.v2n8p712.
- [5] A. A. Ameen and K. Ahmad, "Towards harnessing financial information systems in reducing corruption: A review of strategies," *Aust. J. Basic Appl. Sci.*, vol. 6, no. 8, pp. 500–509, 2012.
- [6] "Bangladesh: Overview of corruption and anti-corruption efforts," <https://www.u4.no/publications/overview-of-corruption-and-anti-corruption-in-bangladesh-2019>.
- [7] A. Halai, V. Halai, R. Hrechaniuk, and K. Datsko, "Digital Anti-Corruption Tools and Their Implementation in Various Legal Systems Around the World," *SHS Web Conf.*, vol. 100, p. 03005, 2021, doi: 10.1051/shsconf/202110003005.
- [8] "Tradingeconomics," <https://tradingeconomics.com/bangladesh/corruption-index>.
- [9] "SDLC - Agile Model - Tutorialspoint." https://www.tutorialspoint.com/sdlc/sdlc_agile_model.htm (accessed May 10, 2021).
- [10] "(PDF) Software Quality Assurance." https://www.researchgate.net/publication/230636169_Software_Quality_Assurance (accessed May 10, 2021).
- [11] "(PDF) Entity-relationship modeling."

https://www.researchgate.net/publication/3227223_Entity-relationship_modeling (accessed May 10, 2021).

- [12] “(PDF) Formal Analysis Of Use Case Diagrams.”

https://www.researchgate.net/publication/50365823_Forma_Analysis_Of_Use_Case_Diagrams (accessed May 10, 2021).

- [13] “(PDF) Developing Sequence Diagrams in UML.”

https://www.researchgate.net/publication/2370102_Developing_Sequence_Diagrams_in_UML (accessed May 10, 2021).

- [14] “Bitcoin Definition: How Does Bitcoin Work?”

<https://www.investopedia.com/terms/b/bitcoin.asp> (accessed May 10, 2021).