Citizen-Centric Complaint Reporting and Analyzing Mechanism

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Abstract

The "Citizen-Centric Complaint Reporting and Analyzing Mechanism" project is designed to create an online complaint system, called "e-Complaint", to allow citizens to file complaints related to crime and misconduct in a secure and user-friendly way. The proposed system aims to address the challenges of the current complaint system, ensuring transparency and accountability in the police force. The "e-Complaint" system aims to increase police accountability and transparency and has significant benefits for both citizens and police departments.

Keywords

E-Complaint, Entity Relationship Diagram, Use-Case Diagram, Data Flow Diagram

1. Introduction

The "Police" is a crucial component of any society or country, responsible for [1] maintaining law and order, ensuring public safety, and preventing crimes. The state's monopoly on [1] violence gives them legal authority to make arrests and utilize force. A "Complaint" is any expression of dissatisfaction made by or on behalf of a citizen concerning the current "Police Complaint System".

The previous research has featured the difficulties looked at by the citizens in reporting complaints to the Police, particularly in situations where the crime is carried out by influential or powerful, or strong individuals, or where the actual Police might be engaged in crimes. The existing complaints system is often complicated, time-consuming, and hazardous, leading to further dissatisfaction, frustration, and inconvenience for victims. Furthermore, the absence of legitimate

documentation and record-keeping systems in many Police departments can prompt a deferral or even loss of complaints. These issues have added to a lack of confidence in the Police and diminished accountability.

To address these issues, we propose a citizen-centric complaint reporting and analyzing mechanism called the "e-Complaint". Our system is intended to permit individuals to file complaints or objections online from the comfort of their homes, disposing of the need to physically visit the Police Station. It is user-friendly, easy to understand, and open to all, including those with restricted specialized aptitude or expertise. By providing a solid and straightforward platform, our proposed system aims to reestablish public trust in the Police and increment their accountability or responsibility. We believe that this system will provide a more proficient and successful approach to reporting complaints, consequently improving the general quality of law enforcement and public safety.

The proposed project of the "Citizen-Centric Complaint Reporting and Analyzing Mechanism" seeks to address the difficulties faced by citizens in reporting complaints related to crime and misconduct. The existing "Police Complaint System" is often complicated, time-consuming, and hazardous, leading to further dissatisfaction, frustration, and inconvenience for victims. Furthermore, the absence of legitimate documentation and record-keeping systems in many Police departments can prompt a deferral or even loss of complaints, adding to a lack of confidence in the Police and diminished accountability.

The proposed solution to the challenges faced by citizens in reporting complaints related to crime and misconduct is an online platform called the "e-Complaint" system. Our system will provide a more efficient and effective citizen-centric approach that will allow individuals to report multiple complaints related to crime and misconduct online from the comfort of their homes. Moreover, this system will provide a secure, accessible, and user-friendly approach to reporting complaints, with the option to remain anonymous. The objective is to reestablish public trust in the Police and increase their accountability by providing an easy-to-use platform.

The proposed "e-Complaint" system seeks to provide a centralized and secure platform for individuals to report complaints related to crime and misconduct, with the option to remain anonymous. The system will feature centralized coordination and record-keeping to ensure accountability, and transparency, and prevent the loss of complaints. It aims to provide a user-friendly approach and remain independent of the government or influential individuals, to ensure that complaints can be filed and investigated without any influence.

The proposed system seeks to address the challenges faced by victims of crime and misconduct by offering an accessible, secure, and user-friendly platform for individuals to report complaints. This system will be independent of the government and influential individuals, offering protection to complainants and ensuring that complaints can be filed and investigated without any external pressure. Overall, the "e-Complaint" system is intended to increase the quality of law

enforcement and public safety by providing a more proficient and successful approach to reporting complaints, ultimately reestablishing public trust in the Police and increasing their accountability.

2. Literature Review

2.1. Related Works

The "Related Work" for this project aims to address the deficiencies of the existing complaint reporting system in Police departments. Our research found that while some Police departments offer information on their achievements, background history, helpline number, close-by stations, news, administrations or services, and so on; only a few provide information or sources on how to make a complaint by dialing their emergency helpline. In particular, there is no choice for people to file a complaint online, making the process confounded, tedious, and risky.

To conquer these difficulties, our project intends to provide citizens with an easy-to-understand or user-friendly and open web application called "e-Complaint", which empowers individuals to file complaints online from the comfort of their homes. By providing a centralized platform for complaint administration and record-keeping, our system ensures accountability and straightforwardness in the complaint process. Additionally, it permits the Police to provide web-based updates for appropriate action or activity and justice, ultimately improving the quality of law enforcement and public prosperity.

2.1.1. Police as Law Enforcements in Africa

1) Algeria—The Directorate General for National Security (Sûreté Nationale)

Algeria's national civil police force [2] is the "Directorate General for National Security", which is locally known as the "Sûreté Nationale" (Sûreté); it was founded in 1962. The Sûreté, which is part of [2] the Ministry of the Interior, is responsible for keeping order, protecting life and property, looking into crimes, and catching criminals. It also handles [2] traffic control and other routine police duties. It oversees [2] the larger cities and urban areas of Algeria. They don't have any online complaint system on their website. But they have a service named "National Gendarmerie Online Pre-Complaint System" [3], which was introduced to the people in 2015. But many citizens of Algeria still face problems filing complaints to this system, so they utilize the emergency [4] helpline "1548". Their web-based service is not that helpful to file any kind of complaint. In this case, our proposed system will be perfect for this situation.

2) Cameroon—The General Delegation for National Security (Délégation Généraleà la Sûreté Nationale)

As Cameroon's first police force, the "General Delegation for National Security" (GDNS) was established in 1928 by an order of the [5] High Commissioner of the "French Republic" in Cameroon. The Supreme Commander of the police [5] is under the supervision of the Head of State. The police intend to put in a lot

of effort to achieve the goals that have been set for it within the framework [5] of the implementation of the "Ambition" program, which aims to bring Cameroon closer to modernity. One of the fundamental responsibilities assigned to the GDNS [5] is to maintain peace and security. They have their helpline service. By dialing "117" [4] and "1500" [5], the citizens of Cameroon can take the "Police Service". Since they don't have their web-based complaint system, they can easily utilize our proposed complaint system.

3) Egypt—Egyptian National Police

The Arab Republic of Egypt [6] started the "Egyptian National Police" in 1878. It's a division [7] of Egypt's Ministry of Interior. They have their helpline service. By dialing "122", the citizens of Egypt [4] can take the "Police Service". The proposed "e-Complaint" system can be executed for this country, it'll provide the best service to the citizens of this country.

4) Morocco—The General Directorate for National Security (Direction Générale de la Sûreté Nationale)

In 1956, the Kingdom of Morocco established its national [8] police. The "Sûreté Nationale" [8] is its common name. The main Moroccan State Police [8] agency and the Moroccan Ministry of Internal Affairs are in charge of it. It's tasked with [8] maintaining public order and the law. It collaborates with [8] the Forces Auxiliaires, and the Royal Gendarmerie. They have their helpline service. By dialing "19", the citizens of Morocco [4] can take the "Police Service". Since they also don't have their web-based complaint system, they can also utilize our proposed proposed "e-Complaint" system.

5) South Africa—The South African Police Service (SAPS)

The Republic of South Africa's national police force [9] is the South African Police Service, which was established in 1885. It's primarily responsible for preventing, combating, and investigating crime, maintaining public order, safeguarding the Republic's [9] inhabitants and their property, upholding and enforcing the law, creating a safe and secure environment for all South Africans, investigating any crimes that may threaten the safety or security of any community, ensuring that criminals are brought to justice, and participating in efforts to address the causes of crime. They don't have either an emergency number or an online complaint system. But they've provided the contact number of the "SAPS Service Complaints Centre" of each province on their website [9]. The proposed "e-Complaint" system can also be executed for this country to provide the best service.

2.1.2. Police as Law Enforcements in Asia

1) Bangladesh—Bangladesh Police

The People's Republic of Bangladesh's "Bangladesh Police" is a law enforcement agency [10] that is part of the "Ministry of Home Affairs". In 1840, during the British era, it [10] was founded. It's essential to the upkeep of peace and the upkeep of [10] law and order in Bangladesh. Bangladesh Police provide both an emergency helpline "999" [10] and an online general diary "Online GD" [11] to

the citizens. The "Online GD" [11] is a very good way to file a general diary, but it is also a little complex to use. Where our proposed system is very easy to use. Again, in the "Online GD" [11], the person who files a general diary, can't see or get any feedback there; where if anyone files any complaint through our proposed "e-Complaint", they can see the status of the complaint and get the update and feedback from the Police's investigator.

2) Bhutan—Royal Bhutan Police

The Kingdom of Bhutan's national police [12] force is known as the "Royal Bhutan Police". On September 1, 1965; 555 people who had been [12] transferred from the "Royal Bhutan Army" joined it. At that time, it [12] was known as the "Bhutan Frontier Guards". In Bhutan, it's in charge of [12] keeping order and preventing crime. By dialing "113", the citizens of Bhutan [12] can take the services provided by the "Royal Bhutan Police". Since they don't have their web-based complaint system, they can utilize our proposed proposed "e-Complaint" system.

3) Malaysia—Royal Malaysian Police (Polis Diraja Malaysia)

Malaysia has a uniform national [13] and the federal police force is known as the "Royal Malaysia Police". In 1807 [13], it was founded. The organization [13] of the force is centralized. The force is a centralized organization [13] that is in charge of everything from traffic control to gathering intelligence. However, the primary organization tasked [13] with maintaining order in Malaysia is the Royal Malaysia Police. The "Royal Malaysia Police" provides services through both its emergency helpline and its online complaint system. Their emergency helpline is called the "Malaysia Emergency Response Services" (MERS). By dialing 999, Malaysian citizens take the services of the "Royal Malaysia Police" [13]. Again, to provide online convenience for the public to submit police complaints via the Internet is named "e-Reporting" [13]. After looking into this system, we've learned that only the residents of Malaysia can use this system. Although still, they face difficulties in utilizing it. Where our proposed system can be utilized by anyone without any hesitation.

4) The Maldives—Maldives Police Service

The civilian national police force [14] of the "Republic of the Maldives" is called the "Maldives Police Service", and was founded in 1933. The organization was reestablished in 2004 [14] and is currently managed by the "Ministry of Home Affairs". It enforces [14] traffic and criminal laws, improves public safety, maintains order, and maintains peace throughout the Maldives. They have their online Police service named "Dhvehi Police Service", which allows citizens to file a complaint [14] in any non-emergency situation. For an emergency, the citizens are requested [14] to take service from "119". Since the Maldives is a peaceful country, the number of crimes is very less than the other country. But the online Police service they offer the citizen is only to be utilized in non-emergency situations since it isn't developed for such situations. In this case, our proposed "e-Complaint" system is the best suitable option for them to utilize.

5) Türkiye—The General Directorate of Security (Emniyet Genel Müdürlüğü) or Turkish Police Service (Türk Polis Teşkilatı)

The Republic of Türkiye's national civilian police force [15], known as the "General Directorate of Security" or the "Turkish Police Service", is in charge of law enforcement. It was [15] established in 1845 and is a part of the "Ministry of Interior". They have their emergency helpline "112" [15]; but in Angara and Istanbul, people can get help by dialing "155". Since they don't have any online complaint system; our proposed system can provide the best service for them.

2.1.3. Police as Law Enforcements in Europe

1) Albania—The Albanian State Police (Policia e Shtetit)

In the Republic of Albania, also known as the "Republika e Shqipris" (in Albanian), the national police [16] and law enforcement agency are known as the "Albanian State Police". It was established in 1913 [16] and reorganized in 1991. The Ministry of Internal Affairs [16] oversees it. Their emergency helpline is "126" [16] and "129" [4]. If they provide our proposed system to the Albanian citizens, they'll get the best experience.

2) Holy See—The Corps of Gendarmes of Vatican City State (Corpo della Gendarmeria dello Stato della Città del Vaticano)

The gendarmerie, or police and security forces [17], of the Vatican City and the Holy See's extraterritorial properties, are represented by the "Corps of Gendarmes of Vatican City State". It was established [17] by Pope Pius VII in 1816 as the Corps of Gendarmes, renamed the Central Security Office in 1970, the Security Corps in 1991, and renamed the Security Corps in 2002. By dialing "112", people can contact the Police [4] in an emergency. The proposed "e-Complaint" system can be executed for this country, it'll provide a great service to the citizens of this country.

3) Liechtenstein—The Liechtenstein National Police

The Principality of Liechtenstein's national police force [18] is known as the "Liechtenstein National Police" which was founded in 1933. They maintain a trilateral treaty that enables close [18] cross-border cooperation between the police services of the three states. They're bordered [18] on the west by Switzerland and on the east by Austria. "117" is their emergency [4] helpline number. Since they also don't have their web-based complaint system, they can also utilize our proposed proposed "e-Complaint" system.

4) Monaco—The Public Security of Monaco

The Principality of Monaco's national police force [19] is known as the "Public Security of Monaco". It was established in 1902 [19] and is a branch of the Monegasque Department of Interior. They have two emergency helpline numbers, "17" [4] and "112" [19]. If they utilize our proposed system, they'll get a great experience.

5) San Marino—The Civil Police (Corpo di Polizia Civile)

The Republic of San Marino has a law enforcement organization [20] called the "Civil Police", which was established in 1945. Despite this, the country may

be one of the safest in the world. San Marino had only one inmate in 2011, making it the least-incarcerated nation in the world. The "Civil Police" is under the direction of the Secretary of State for Home Affairs and are in charge of [20] tax collection, domestic security, traffic control, and civil defense. They provide an emergency helpline [4] service by dialing "113". As our proposed system is easy to utilize, the "Civil Police" can offer our proposed system to their citizens to make online complaints from home.

2.1.4. Police as Law Enforcements in North America

1) Anguilla—The Royal Anguilla Police Force

The national police force of Anguilla [21], a British Overseas Territory in the Caribbean, is the "Royal Anguilla Police Force". In 1972, [21] was formed. "911" is their [4] "Police Emergency Helpline" number. They can utilize our proposed system if they want. It'll help the Complainer to file any complaint with evidence and assist the Police to solve the problem.

2) Aruba—The Aruba Police Force (Korps Politie Aruba)

The "Aruba Police Force" is the country's [22] Aruba's law enforcement agency. Established in 1986, the force [22] is supervised by the Minister of Justice and Social Affairs. Citizens of Aruba can get the Police's [4] help by dialing "911". As they don't have any online complaint system, selecting our proposed web-based complaint system will be the best decision for them.

3) Cuba—The National Revolutionary Police Force (Policía Nacional Revolucionaria)

The "National Revolutionary Police Force", which is [23] run by the Cuban Ministry of the Interior, is in charge of law enforcement in the country. In 1959, it [23] was founded. Their emergency helpline is [4] "106". Though they have an emergency helpline, it'll be very good if they have a web-based complaint system. Where the proposed "e-Complaint" will be the best option for them.

4) Haiti—The Haitian National Police (Police Nationale d'Haïti)

Haiti's law enforcement agency [24] is the "Haitian National Police". It was established in 1913 and reorganized in 1995 to bring [24] civilian control of public safety under Haiti's constitution. To address the numerous issues facing Haiti [24], the police force is divided into various divisions. Kidnapping, drugs, and gangs are [24] just a few of the specialized crimes that are dealt with by many of these divisions. Additionally, the force [24] has paramilitary and Coast Guard units. The "Haitian National Police" helpline [4] number is "114". By utilizing our proposed "e-Complaint" system, they'll get the best experience.

5) Panama—The National Police of Panama (Polícia Nacional de Panamá)

The civilian government agency affiliated [25] with the Panamanian Public Forces is the "National Police of Panama", which was founded in 1935 and reorganized in 1990. It's accountable for nationwide order maintenance. The Minister of Public Security has been the [25] National Police's point of contact with the President ever since 2010. "911" is [4] the emergency helpline number. Since they also don't have any web-based complaint system, they can utilize our pro-

posed complaint system.

2.1.5. Police as Law Enforcements in Oceania

1) Australia—The Australian Federal Police (AFP)

The "Australian Federal Police" (AFP) is the primary federal law [26] enforcement agency of the Australian government. Its unique mission is to investigate crimes and [26] safeguard the Commonwealth of Australia's national security. The AFP [26] is an independent department of the Attorney-General's Department that was established in 1979. It reports to the [26] Attorney-General and is accountable to the Australian Parliament. The AFP focuses on preventing, investigating, and disrupting transnational, serious, complex, and organized crime, [26] such as cybercrime, child exploitation, drug smuggling, human trafficking, terrorism, and violent extremism. In addition, it is in charge of [26] providing community policing in the Australian Capital Territory and other dependent territories through ACT Policing, protecting [26] dignitaries like the prime minister of Australia and foreign diplomatic missions nearby at major airports, providing law enforcement training to Asia-Pacific partner agencies, serving as Australia's international law enforcement and policing representative, and contributing to UN peacekeeping efforts around the world. "000" is their [4] "Police Emergency Helpline" number. Being a modern and developed country without having a digital complaint system for its country's citizens seems very wrong. In this situation, the "e-Complaint" system is the best option for them to file complaints online. It'll give the best experience to the complainer.

2) Fiji—The Fiji Police

The Republic of Fiji [27] is served by the "Fiji Police". In 1874, they [27] were established. The Fiji Police's roles and responsibilities [27] include maintaining law and order, preserving peace, protecting life and property, preventing and detecting crime, and enforcing all applicable laws and regulations in the Fiji Islands and elsewhere. Citizens of Fiji can get help [4] from the Police by dialing "911". As they don't have any online complaint system, selecting our proposed web-based complaint system will be a great decision for them.

3) New Zealand—The New Zealand Police

Established in 1886, the "New Zealand Police" [28] is the nation's primary law enforcement agency and serves as the country's national police force. They're in charge of [28] preventing crime, improving public safety, bringing criminals to justice, maintaining public order, enforcing traffic laws and commercial vehicle regulations, protecting dignitaries, licensing firearms, and handling issues about national security. By dialing "105", the citizens can make a non-emergency [28] report. And by dialing "111", the citizens can make an emergency response [28] from the Police. By utilizing our proposed "e-Complaint" system, they'll get the best experience.

4) Papua New Guinea—The Royal Papua New Guinea Constabulary (RPNGC)

A national police force [29] with jurisdiction over the entirety of Papua New

Guinea is the "Royal Papua New Guinea Constabulary" (RPNGC). They were established in 1950 [29] and are tasked with enforcing the law, maintaining order, safeguarding property, detecting and preventing crimes, and bringing perpetrators to justice. "112" is the [4] emergency Police helpline number. The proposed "e-Complaint" system can be executed for this country, it'll provide the best service to the citizens of this country.

5) Solomon Islands—The Royal Solomon Islands Police Force

The Solomon Islands national police [30] force is the "Royal Solomon Islands Police Force" (RSIPF). They were established in 1954 [30] to provide the Solomon Islands with peace, security, and safety. The RSIPF strives to [30] provide a policing service that is effective, competent, and responsive. The Police Field Force, a paramilitary wing [30] of the RSIPF that was later disbanded, was the only military organization in the Solomon Islands. The RSIPF [4] provide services to the citizens through both "911" and "999". As our proposed system is easy to utilize, they can offer our proposed system to their citizens to make online complaints from home.

2.1.6. Police as Law Enforcements in South America

1) Argentina—The Argentine Federal Police (Policía Federal Argentina)

The national civil police force [31] of the Argentine federal government is the "Argentine Federal Police". Since their inception in 1943 [31], they have been in charge of preserving public safety and order, enforcing the law, and preventing, detecting, and evaluating criminal activity. These include [31] terrorism, organized crime, drug trafficking, fugitive investigations, and human trafficking. "911" [4] is the Police's emergency helpline number. The proposed "e-Complaint" system can be executed for this country to provide the best service.

2) Brazil—The Federal Police of Brazil (Polícia Federal)

One of Brazil's three national police forces [32] is the "Federal Police of Brazil", a federal law enforcement agency. It was established in 1944 and is in charge of [32] combating crimes against federal institutions, international drug trafficking, terrorism, organized crime, public corruption, white-collar crime, money laundering, immigration, border control, airport security, and maritime policing. It is also in charge of combating cybercrime and other forms of cybercrime. The Ministry of [32] Justice and Public Security is in charge of it. Citizens of Brazil dial "190" [4] to get the Police's help. The proposed "e-Complaint" system can also be executed for this country to provide the best service.

3) Colombia—National Police of Colombia (Policía Nacional de Colombia)

The Republic of Colombia's national police [33] force is known as the "National Police of Colombia". In 1891 [33], it was founded. The Ministry of Defense [33] also has control over the National Police, which is considered the "Public Force" despite not being a part of the Colombian military. In Colombia, the only [33] civilian police force is the "National Police". The official responsibilities [33] of the force are to safeguard the nation of Colombia, uphold the law

following constitutional mandate, safeguard public freedoms and rights, and ensure peaceful cohabitation among the populace. Their emergency helpline [4] number is "123". The proposed "e-Complaint" system can be executed for this country, it'll provide the best service to the citizens of this country.

4) Paraguay—The National Police of Paraguay (Policía Nacional del Paraguay)

The main law enforcement agency in Paraguay is the "National Police of Paraguay" [34], which is run by the Ministry of Internal Affairs. In 1943, [34] was founded and is in charge of ensuring the nation's internal security. By dialing "911" [4], the Paraguayans can get the Police's help. Since they also don't have their web-based complaint system, they can also utilize our proposed proposed "e-Complaint" system.

5) Peru—The Peruvian National Police (Policía Nacional del Perú)

The "Peruvian National Police" [35] is Peru's national police. The nation's land, sea, and air territories are all [35] under its jurisdiction. It's one of Latin America's largest police forces, having been established in 1988 through [35] the merger of the Investigative Police, the Civil Guard, and the Republican Guard. Its goal is to maintain domestic order, public order, and national security, as well as to uphold the law and safeguard Peru's citizens. A Peruanos can dial "911" [4] to reach the Police from home. The proposed "e-Complaint" system can also be executed for this country, it'll provide a great service to the citizens of this country.

3. Methodology

The "Methodology" is predominantly the arrangement of strategies, rules, and procedures for acquiring a specific proposed model's objectives.

3.1. Proposed Methodology

The "Waterfall Process Model" is chosen as the appropriate process model to develop the "e-Complaint" system, because it's a sequential approach where the entire development process is divided into sequential stages, and each stage is completed before moving on to the next. This model is suitable for this project because the requirements are well-defined and changes are unlikely to occur during the development process. Additionally, it's a universal model and some logical sequential phases will be taken to develop the entire process. The result of one stage goes about as the input for the following stage consecutively, such as Figure 1.

3.2. Description of the Proposed Methodology

The proposed methodology for this project involves utilizing the "Waterfall Process Model" for developing the "e-Complaint" system. This model is chosen because it is a sequential approach that is suitable for well-defined projects where changes are unlikely to occur during development. The objective of the
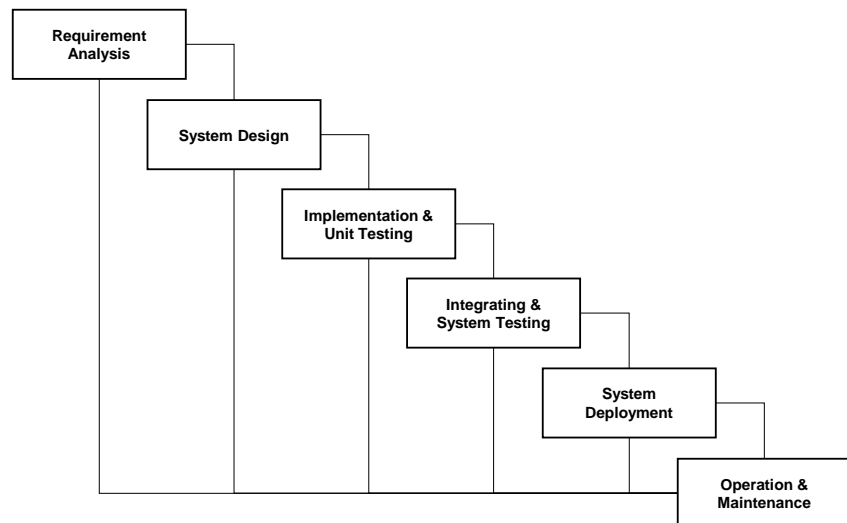
Figure 1. The basic "Sequence Diagram" [36] of the "Waterfall Process Model".

project is to design and develop a citizen-centric complaint reporting and analyzing mechanism that allows complainants or victims to submit data online and have it compiled in the "e-Complaint" system. The methodology will follow certain elements or features and strategies, with the work being completed by following those means. The successive means or steps are.

3.2.1. Requirement Analysis

In this phase, the project team accumulates and documents all the requirements for the project, including client needs, utilitarian requirements, technical determinations, and constraints. The essential goal of this phase is to ensure that all partners have an unmistakable comprehension of the project's objectives and extension.

3.2.2. System Design

The necessary determinations from the main stage were focused on in this stage. The goal was to make a genuine framework system architecture that incorporated the requirements to complete this project as a "Web Application" for both Computer and Mobile. The system design's configuration helps in deciding hardware equipment and system requirements and helps in characterizing the general system architecture.

3.2.3. Implementation & Unit Testing

After arranging the steps of the design, the team carried out the design according to the system design's "Software Requirement Specification" (SRS). The system was first developed into units, which were tried for their usefulness, alluded to as "Unit Testing". The unit-tested codes were coordinated into a complete system in the following stage.

3.2.4. Integration & System Testing

In this phase, every one of the units created in the execution stage was coordi-

nated into a system after testing each unit. The whole system was tested for any defects or flaws and disappointments by integrating the unit-tested codes into a complete system. Functional and non-functional testing ensured that the system meets the requirements, and testing progress was followed through apparatuses to address any abnormalities or irregularities.

3.2.5. Deployment of the System (System Deployment)

After the "e-Complaint" system was developed, it was tested to check how it performs. When the functional and non-functional testing was finished, it was conveyed into the specific client environment on the market. Another look was performed in the environment after software deployment to ensure it functions well.

3.2.6. System Maintenance

The last phase includes delivering patches to fix any issues that surface in the client environment and overhauling the system to better renditions. Maintenance or support is essential to keep all the modifications and convey these progressions in the client's environment. The system is invigorated with the furthest-down-the-line highlights to guarantee it performs well.

3.3. Justification of the Methodology

This justification exists to explain the choice of methodology for the development of an "e-Complaint" system, which aims to provide a citizen-centric approach to reporting crimes while helping the police analyze and track reported complaints. The appropriate methodology is crucial for the success of the project, and after careful consideration, the "Waterfall Process Model" has been chosen. This methodology is best suited for projects with clear and definitive requirements, which is the case for the "e-Complaint" system. By choosing this methodology, the project's requirements will be well-defined, reducing the risk of changes during the project's lifecycle, which could result in delays and additional costs.

The justification for the "Waterfall Process Model" will be executed by following a structured and sequential process that ensures each phase is completed before moving on to the next. The project will be divided into smaller, manageable phases, allowing each team to have control over its level, and ensuring that each phase's roles are executed efficiently. The "Laravel" framework will be utilized due to its usability, security, and built-in libraries. The "Blade" templating engine will allow for the creation of clean, reusable templates, simplifying the development process. The integrated testing feature will ensure the web application is bug-free. By following this methodology, the "e-Complaint" system will be delivered on time and within budget.

Other process models, such as the "Agile Process Model", the "Rapid Application Development Model" (RAD Model), and the "Spiral Process Model" isn't suitable for the "e-Complaint" system, because they require frequent changes,

and continuous development, and a more flexible approach. These methodologies are more appropriate for larger and more complex projects, where the requirements are not well-defined, or the project's scope may change during the development process. The Waterfall Process Model's justification works better because it follows a structured approach that ensures each phase is completed before moving on to the next, providing a clear understanding of the overall objective and helping maintain focus on achieving this project's goals. By breaking down the project into smaller, manageable phases, this project's roles can be executed efficiently, ensuring that the system meets all requirements and is delivered on time and within budget.

4. Requirement Analysis, Design and Development

4.1. Requirement Analysis for Designing "E-Complaint"

The "Requirement Analysis" is the method involved with characterizing user assumptions for a system being built or changed. This includes archiving all parts of the project advancement process from start to finish to decide explicit component assumptions with users of the system, and to determine ambiguities or conflicts depending on the situation by various users with the goal that later on, the system is straightforward to modify.

4.1.1. Hardware Requirements
To execute this work, the underneath requirements were utilized as the "Hardware":
➢ **Disk:** 256 GB "Solid State Drive" (SSD).
➢ **Memory:** 4 GB "Random Access Memory" (RAM).
➢ **Processor:** Intel Core i5.

4.1.2. Software Requirements
To execute this work, the underneath requirements were utilized as the "Software":
➢ **Operating System:** Linux Mint 20.3, and Windows 10.
➢ **Host (Local Server):** xampp.
➢ **Storage (Database):** My Structured Query Language (MySQL).
➢ **Programming Tool:** Visual Studio Code.
➢ **Design (Front-End):** Cascading Style Sheet (CSS), Content Delivery Network or Content Distribution Network (Bootstrap CDN), Hypertext Markup Language (HTML), and JavaScript.
➢ **Language (Back-End):** Hypertext Preprocessor (PHP) with Laravel.

4.2. System Design and Development

In this phase, the focus is on designing the system architecture of the "e-Complaint" and developing the necessary modules to create a functional system. The motivations behind this phase are:
➢ To design explicit issues by requirements.

➢ To introduce a system that can be utilized later to make that system.

➢ To recognize the modules contained in the system, the details of those modules, and how they associate with one another to make results.

In this part, to achieve the above objectives, three sorts of diagrams are included to design the "e-Complaint" system. Following are various types of diagrams design that will be described to run the proposed system:

➢ Entity Relationship Diagram (ERD).

➢ Use-Case Diagram.

➢ Data Flow Diagram (DFD).

Each of these diagrams serves a specific purpose in designing and developing the proposed "e-Complaint" system.

4.2.1. Entity Relationship Diagram (ERD)

The "Entity Relationship Diagram" (ERD) is an exceptionally realistic image that depicts the connection between elements in a database. It frequently utilizes symbols to address various types of information. Boxes are usually utilized to address entities and variables are utilized to address characteristics. So, for the "e-Complaint", the "ERD" will be Figure 2.

The "Entity Relationship Diagram" (ERD) is a visual representation of the relationship between different elements in a database. For the proposed "e-Complaint", the ERD will help identify the relationships between different entities. The ERD will be used to create a database schema that can store and retrieve the necessary data for the proposed "e-Complaint". Figure 2 shows the ERD for the proposed "e-Complaint".

Here, in Figure 2, it's been seen that any user either a Complainer or any Police member has to go through the "Registration" by providing the necessary details. A Complainer has to register herself/himself in the proposed "e-Complaint" system, but the "Police" member's account will be registered by the Admin of the "Police HQ" after that person becomes a member of the "Police". After the "Registration" is complete, the users can "Login" to their account in the "e-Complaint" by submitting an "e-Mail" and "Password". After successfully Loggin into their respective profile, all the users will be taken to their "Dashboard". From there, a Complainer will be able to file a new Complaint and see the status of their submitted Complaint. On the other hand, there are multiple Police dashboards; such as "Cyber Police", "Police Headquarters", "Police Station", and "Investigator". After a Complaint is successfully solved, the Complaint will be automatically transferred to the "Archive".

4.2.2. Use-Case Diagram

The "Use-Case Diagram" is a realistic depiction of the connections among the components of any system. It's a strategy utilized in system analysis to distinguish, coordinate, and explain system requirements. So, for the "e-Complaint", the "Use-Case Diagram" will be Figure 3.

The "Use-Case Diagram" is a visual representation of the interactions between the different components of a system. For the proposed "e-Complaint", the
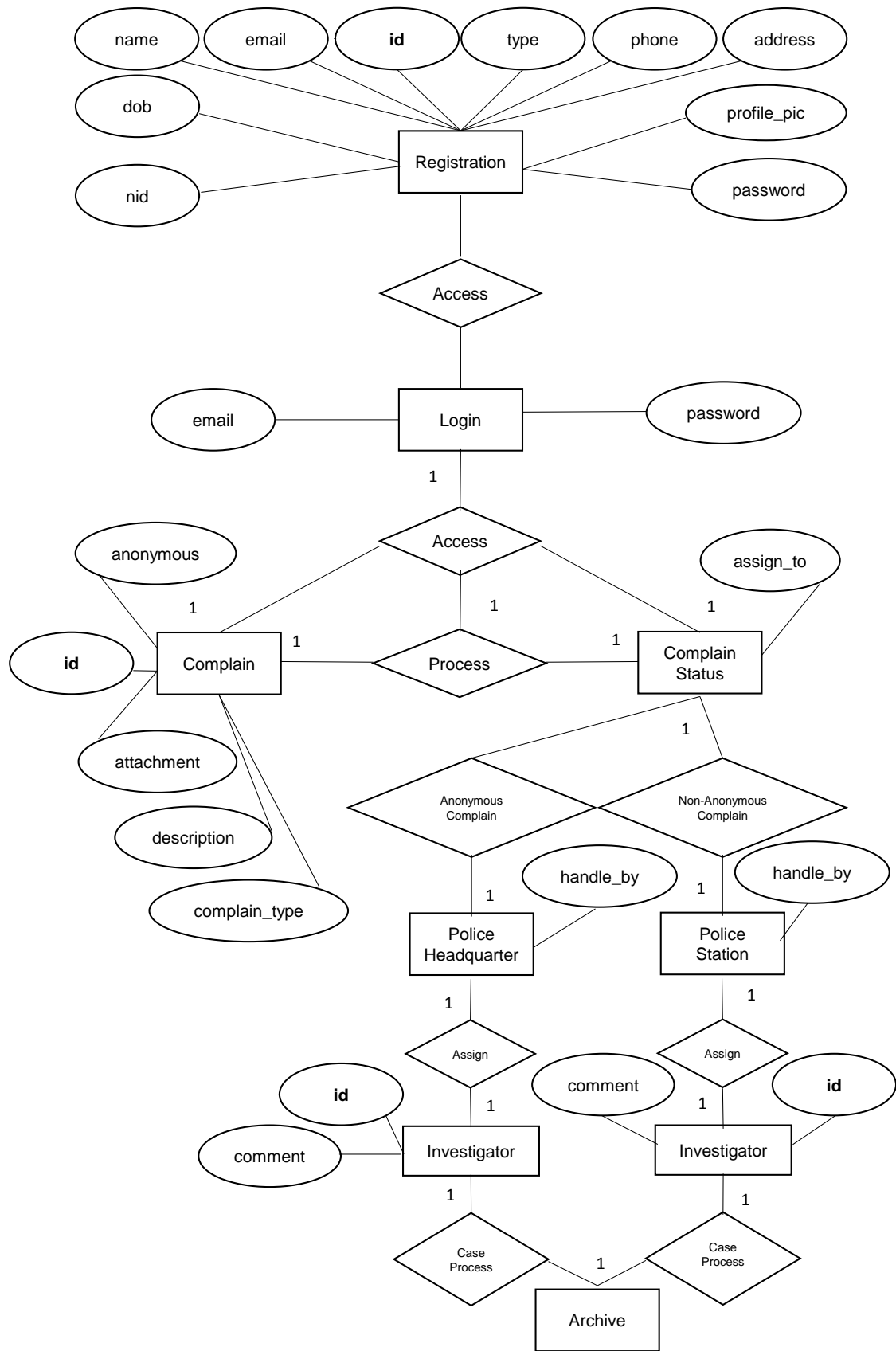
Figure 2. The "Entity Relationship Diagram" (ERD) of the "e-Complaint".
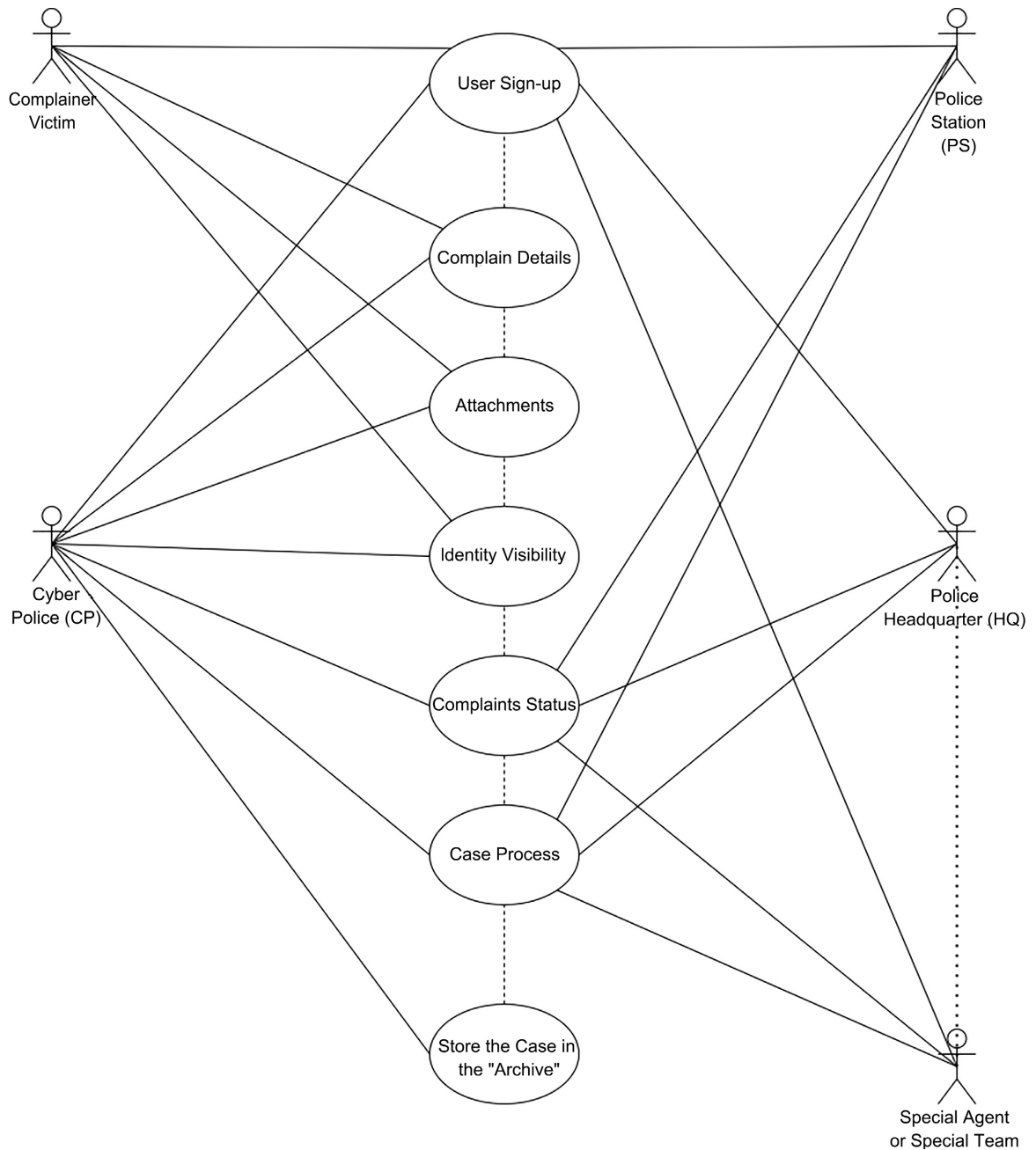
Figure 3. The "Use-Case Diagram" for the "e-Complaint".

"Use-Case Diagram" will help identify the different roles and their interactions with the system. It will also help identify the different use cases that the system must support, such as registering a complaint, assigning it to the police, and providing updates to the complainant. **Figure 3** shows the "Use-Case Diagram" for the "e-Complaint".

Here, in **Figure 3**, it's understandable that a Complainer has to "Sign-Up" to the "e-Complaint". Here, they have to register and log in to this process. Then, they can file a Complaint by providing the "Complain Details", "Attachment", and "Identity Visibility". Here, in the "Complain Details", the Complainer has to

brief the entire complaint in detail. Then, in the "Attachment", the Complainer can add Audio, Image, and Video if they want. As this project was piloted, only the Image was taken as an "Attachment". Lastly, in the "Identity Visibility", the Complainer can file the Complaint by selecting their privacy as "Anonymous" or not.

Then again, from the users of Police, there is "Cyber Police", "Police Station", "Police Headquarters", and "Special Agent" or "Special Team". Here, all of the users will Log-in in to their respective profiles. Then, the "Cyber Police" will see the entire complaint. If the "Cyber Police" sees that the Complainer has selected her/his privacy as "Non-Anonymous", then the "Cyber Police" will send the Complaint to the "Police Station". But if the "Cyber Police" sees that the Complainer has selected her/his privacy as "Anonymous", then the "Cyber Police" will send the Complaint to the "Police Headquarters". After that, whoever gets the Complaint, both the "Police Headquarters" and "Police Station" will read the entire Complaint and hand it over to their selected "Investigator". The "Investigator" will investigate the Complaint and provide an update in the "e-Complaint". Once the Complainer's case is solved, the "Investigator" will select the Complaint as complete. Then the entire summary of the Complaint will be stored in the "Archive".

4.2.3. Data Flow Diagram (DFD)

The "Data Flow Diagram" (DFD) addresses the progression of data in the system. It additionally gives data about every entity's bits of feedback, as well as the actual process itself. So, for the "e-Complaint", the "DFD" will be Figure 4.

The "Data Flow Diagram" (DFD) is a visual representation of the flow of data through a system. For the proposed "e-Complaint", the DFD will help identify the different processes involved in handling a complaint, such as receiving a complaint, assigning it to the police, and updating the complainant. It will also help identify the different data inputs and outputs of each process. Figure 4 shows the DFD for the "e-Complaint".

Here, in Figure 4, it's seen that as same as in Figure 2 and Figure 3, after registering and logging into the user's respective account, all the users will be taken to their "Dashboard". Here is a Complainer's Dashboard, the "Dashboard" will be blank in the first place. The Complainer has to file a Complaint first. While filing a Complaint, the Complainer has to select "Create A Complaint". There, the Complainer has to select the "Complain Type" first. Then, the Complainer has to briefly describe the complaint. After that, the Complainer can attach any image to the Complaint they are filing. Lastly, the Complainer has to select whether he/she wants to keep the Complainer's privacy as "Anonymous" or not. After all of these processes are completed, the Complainer will submit the Complaint.

Afterward, when a Complainer submits her/his Complaint, the "e-Complaint" system will send the Complaint to the Cyber Police's Dashboard. Here, the receiver of the Cyber Police's Dashboard will read the Complaint and check the
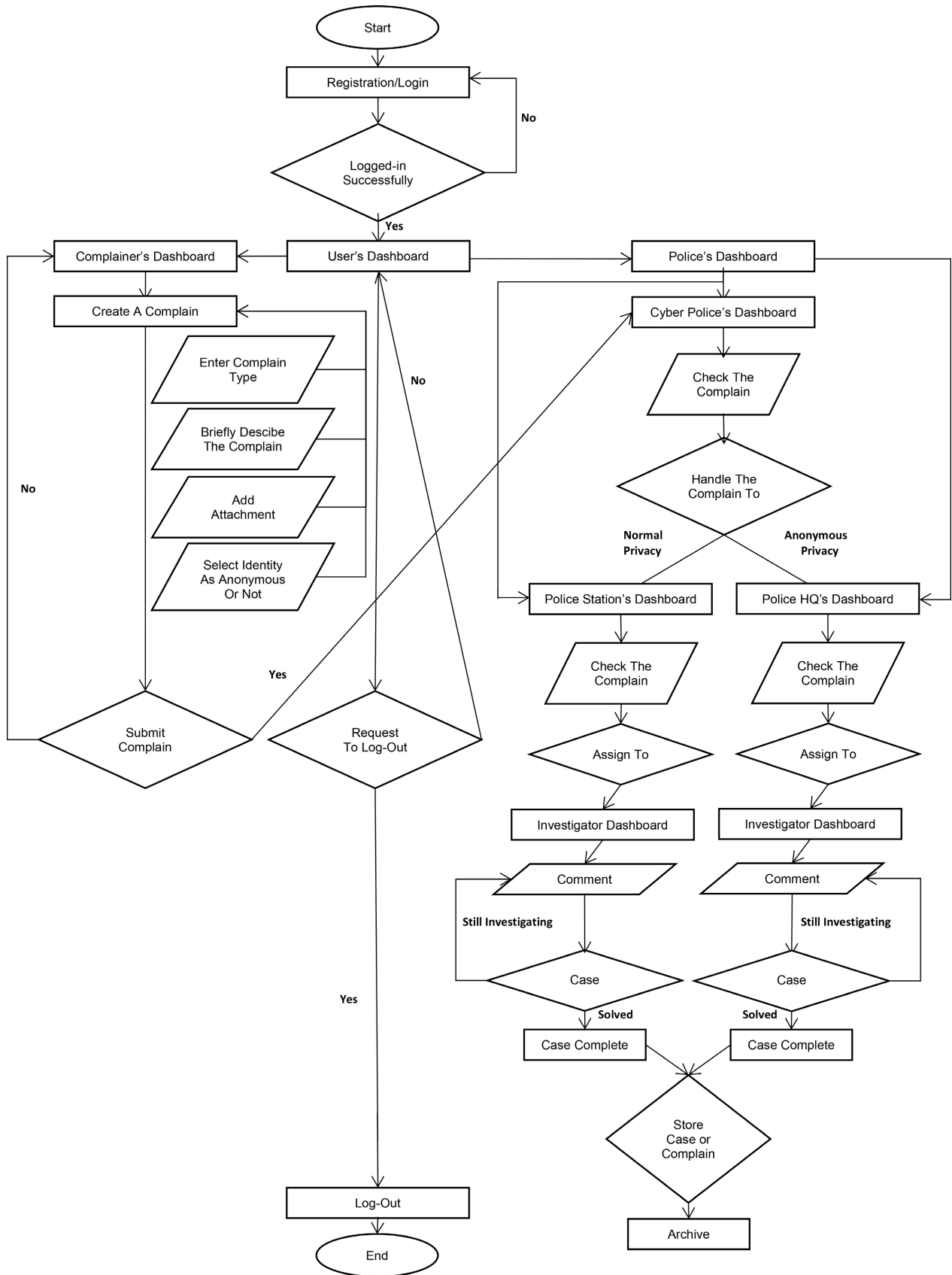
Figure 4. The "Data Flow Diagram" (DFD) of the "e-Complaint".

Complainer's selected privacy. If the Complainer's privacy is not selected as "Anonymous", then the privacy will be seen as "Normal". So, seeing this, from the Cyber Police's Dashboard, the Complaint will be handled on the Complainer's local Police Station's Dashboard. But in case, the Complainer's privacy is selected as "Anonymous", then the privacy will be also seen as "Anonymous". After seeing this, from the Cyber Police's Dashboard, the Complaint will be handled on the Police Headquarters Dashboard. Then, whoever receives the Complaint, the receiver will read and check the submitted Complaint. Then the receiver will assign the Complaint to their selected Investigator. The Investigator will see the Complaint in their e-Complaint's Dashboard. After receiving the Complaint, the Investigator will start to investigate the Complaint and provide updates of that Complaint in the "e-Complaint". The "Police Station", "Police Headquarters", and "Complainer" will be able to see the updates of the Complaint in the "e-Complaint". After the case of the "Complaint" is solved, the "Investigator" will select the "Case Complete" option. And with this, the Complaint will be automatically stored in the "Archive".

5. Project Description

5.1. About This Project

"Citizen-Centric Complaint Reporting and Analyzing Mechanism" is an online platform that enables citizens to easily file and track complaints from the comfort of their homes. Through the "e-Complaint" system, complaints are swiftly delivered to the police who promptly take action, providing updates to the complainer online. This efficient and user-friendly system streamlines the complaint process, putting citizens at the forefront of the reporting and analyzing mechanism.

5.2. Piloting This Project

By keeping respect to "Police Regulations, Bengal" [37], "The Code of Criminal Procedure, 1898 (Act No. V of 1898) Part-V Chapter-XIV Information to The Police and Their Powers to Investigate" Clause-154 [38] and Clause-155 [39], "The Penal Code, 1860 (Act No. XLV of 1860) Chapter-XVI of Offences Affecting The Human Body" Clause-377 [40], and "The Police Act, 1861 (Act No. V of 1861)" Clause-44 [41] this project is being piloted underneath. Here, all the details, such as "Name", "E-mail", "Phone", "Date of Birth", "Address", "National ID", and "Image" are not authentic due to this is a piloted project. If the details were real, this may go as an illegal act, and "Bangladesh Police" might take action further in the future.

5.2.1. Registration
After entering the "e-Complaint" website, a "Complainer" has to go through the registration process. The "Complainer" will see the underneath blank registration page (Figure 5).

Figure 5. Image of a blank registration page of a Complainer.

A "Complainer" has to fill up this page by providing all the necessary information as same as underneath (Figure 6(a), Figure 6(b)).

As same as the Complainer's registration, any member of the Police also has to register her/his account in the "e-Complaint". But the difference between a Complainer and a Police member's registration is a Complainer has to register her/his account by herself/himself, whereas a Police member's account will be registered by the Admin of the "Police Headquarters" (Police HQ) after the Police member joins the Police department. Now before this, the Admin's account will be registered from the "Police HQ". Here, the Admin's registration page will look as same as the Complainer's registration page. The change will be that when a Complainer will go to the "e-Complaint" website, he/she will directly enter the website. For this project, the website is 127.0.0.1:8000/register. But when the Admin's account will be registered from the "Police HQ", the route will be changed. For this project, the route was 127.0.0.1:8000/admin. So, when the Admin of the "e-Complaint" will register a new account for the Police member, he/she will see the underneath blank registration page (Figure 7)

Again, here the admin has to select the "User Type" of every Police member, such as Figure 8.

After the Admin fill-up this page by providing all the necessary information about that Police member, it'll look like as same as underneath (Figures 9(a)-(d)).

(a)

(b)

Figure 6. (a) Images of the fill-up registration page of the Complainers; (b) Images of the fill-up registration page of the Complainers.

Figure 7. Image of a blank registration page of a Police Member.

Figure 8. Image of the "User Type" selection Drop-Down for Police Member registration.

5.2.2. Login

After the registration is complete, all the users of "e-Complaint" will go through the same login process. They will see the underneath blank page, here they will only provide their e-Mail and password to Login their account (**Figure 10**).

(a)

(b)

(c)

(d)

Figure 9. (a) Images of the fill-up registration page of "Cyber Police"; (b) Images of the fill-up registration page of "Police"; (c) Images of the fill-up registration page of "Quick Reaction Agent"; (d) Images of the fill-up registration page of "Special Agent".

5.2.3. Dashboard

After logging into the user account, all the users will be able to see their Dashboard. Moreover, they can edit their profile here (**Figures 11(a)-(f)**).

5.2.4. Filing Complaints

After logged-in to the dashboard, a Complainer will go to the top of her/his dashboard page and select the "File Complaint" option. After selecting that option, the Complainer will be taken to a new page where he/she can file a new Complaint. Here, the Complainer can see a Blank page by default (**Figures 12(a)-(c)**).

5.2.5. Receiving Complaints

After the Complainers submit their complaints, the "Cyber Police" will receive the complaint first (**Figure 13**).
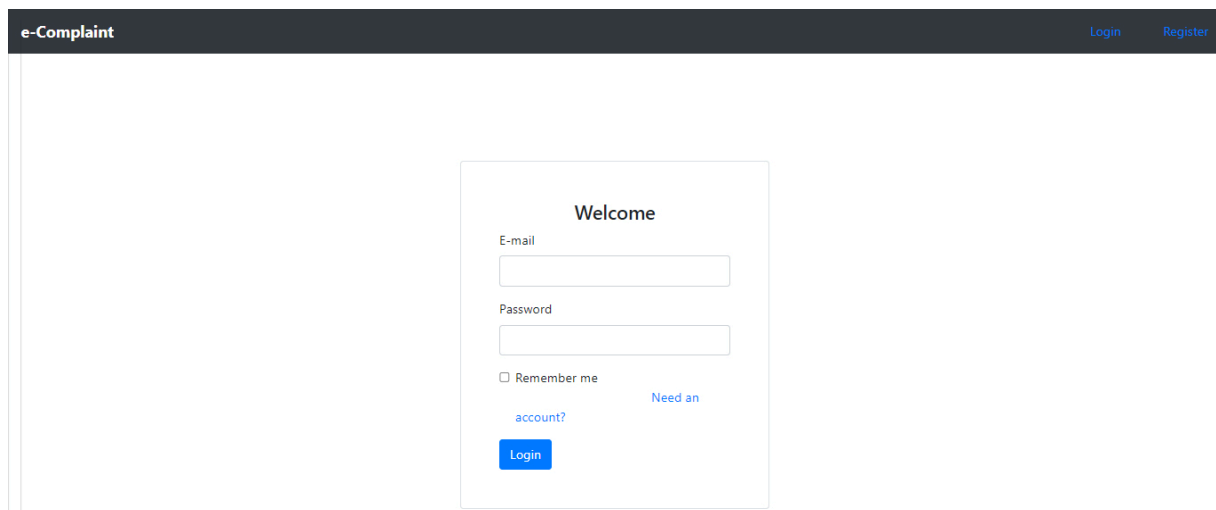
Figure 10. Image of a blank Login page of all users in the "e-Complaint".

(a)

(b)

(c)

(d)

(e)

(f)

Figure 11. (a) Image of the Dashboard of the "Complainer"; (b) Image of the Dashboard of the "Cyber Police"; (c) Image of the Dashboard of the "Police"; (d) Image of the Dashboard of the "Police Headquarter"; (e) Image of the Dashboard of the "Quick Reaction Agent"; (f) Image of the Dashboard of the "Special Agent".

After that, the "Cyber Police" will check the entire case and the Complainers privacy manually. If the Complainer files a complaint with normal privacy, then the case will be submitted to the local Police Station. But if the Complainer files a complaint with anonymous privacy, then the complaint will be submitted to the "Police Headquarters" (**Figure 14(a)**, **Figure 14(b)**).

5.2.6. Providing Case Status Update
After receiving the complaints from the "Cyber Police", both the "Police Station" and "Police Headquarters" will check the complaints and will assign the Cases to their selected Investigator Agent/Team (**Figure 15(a)**, **Figure 15(b)**).

(a)

(b)

(c)

Figure 12. (a) Image of "Blank Complaint Page" of the "Filing Complaint" by the Complainers in the "e-Complaint"; (b) Image of "Filing Normal Privacy Complaint" of the "Filing Complaint" by the Complainers in the "e-Complaint"; (c) Image of "Anonymous Privacy Complaint" of the "Filing Complaint" by the Complainers in the "e-Complaint".

Figure 13. Image of the Cyber Police's Dashboard after receiving Complaints in the "e-Complaint".

(a)

(b)

Figure 14. (a) Image of the "Cyber Police" viewing "Normal" privacy Complaint in the "e-Complaint"; (b) Image of the "Cyber Police" viewing "Anonymous" privacy Complaint in the "e-Complaint".
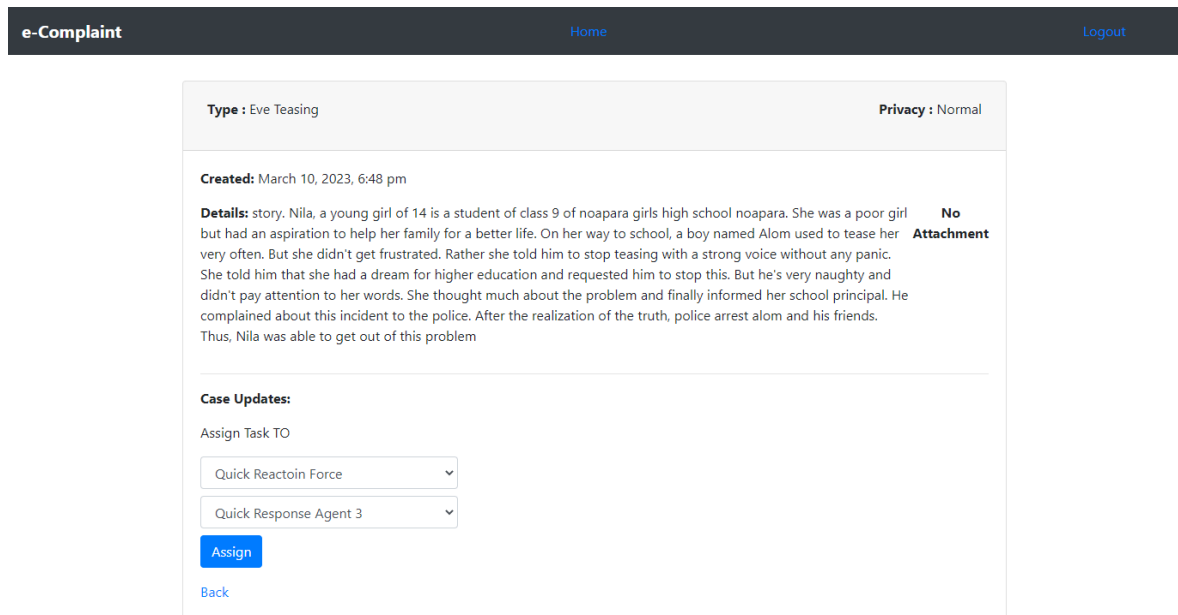
(a)
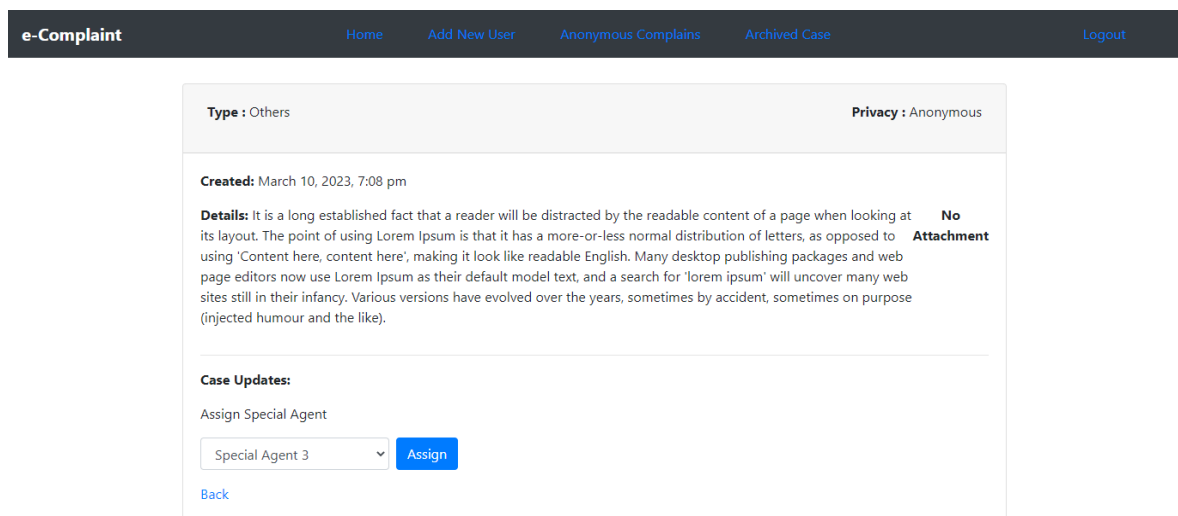
(b)

Figure 15. (a) Image of the "Police Station" checking and assigning the Complaints to the selected "Quick Reaction Agent" in the "e-Complaint"; (b) Image of the "Police Headquarter" checking and assigning the Complaints to the selected "Special Agent" in the "e-Complaint".

Then, the agents will check the complaints and provide an update. Finally, after completing the case, they will select "Complete Case" and close the case (Figure 16(a), Figure 16(b)).

5.2.7. Completed Case

After the case is completed, all of the user's Dashboard will show the case status as "Completed" (Figures 17(a)-(i)).

5.2.8. Archive

After any complaint is filed and solved, it will automatically store in the archive.

(a)

(b)

Figure 16. (a) Image of the "Quick Reaction Agent" checking and providing an update on the Complaints to the selected cases in the "e-Complaint"; (b) Image of the "Special Agent" checking and providing an update on the Complaints to the selected cases in the "e-Complaint".

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)

(i)

Figure 17. (a) Image of the Special Agent's Dashboard after completing the case in the "e-Complaint"; (b) Image of the Quick Reaction Agent's Dashboard after completing the case in the "e-Complaint"; (c) Image of the Police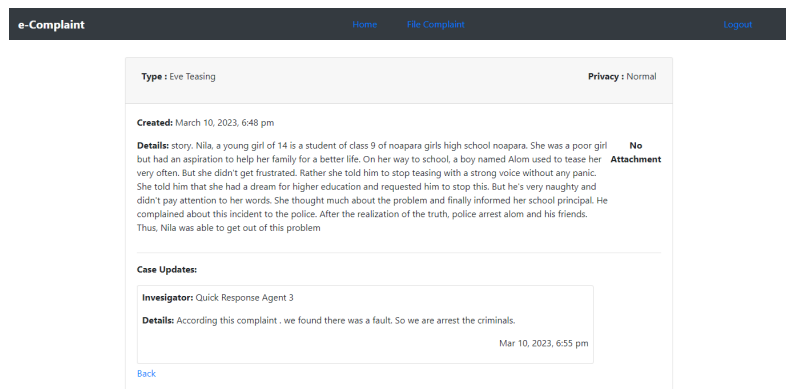 Headquarter's Dashboard after completing the case in the "e-Complaint"; (d) Image of the Police Station's Dashboard after completing the case in the "e-Complaint"; (e) Image of the Cyber Police's Dashboard after the case is solved in the "e-Complaint"; (f) Image of the Anonymous Complainer's Dashboard after the case is solved in the "e-Complaint"; (g) Image of the Anonymous Complainer's Complaint after the case is solved in the "e-Complaint"; (h) Image of the Normal Complainer's Dashboard after the case is solved in the "e-Complaint"; (i) Image of the Normal Complainer's Complaint after the case is solved in the "e-Complaint".
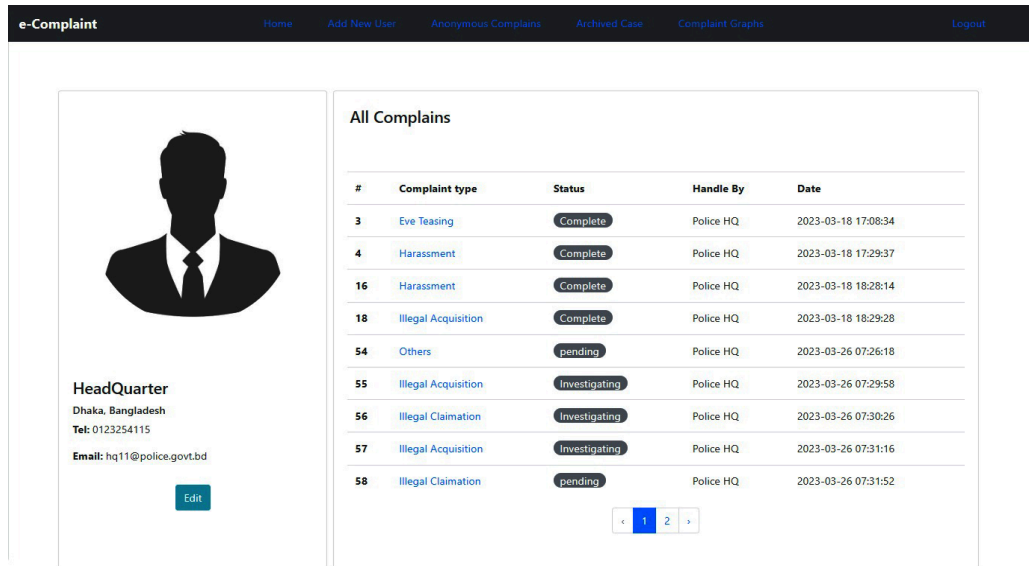
Figure 18. Image of the "Archive" in the "e-Complaint".

(a)

Barishal Division

Mymensingh Division

Chattogram Division

Khulna Division
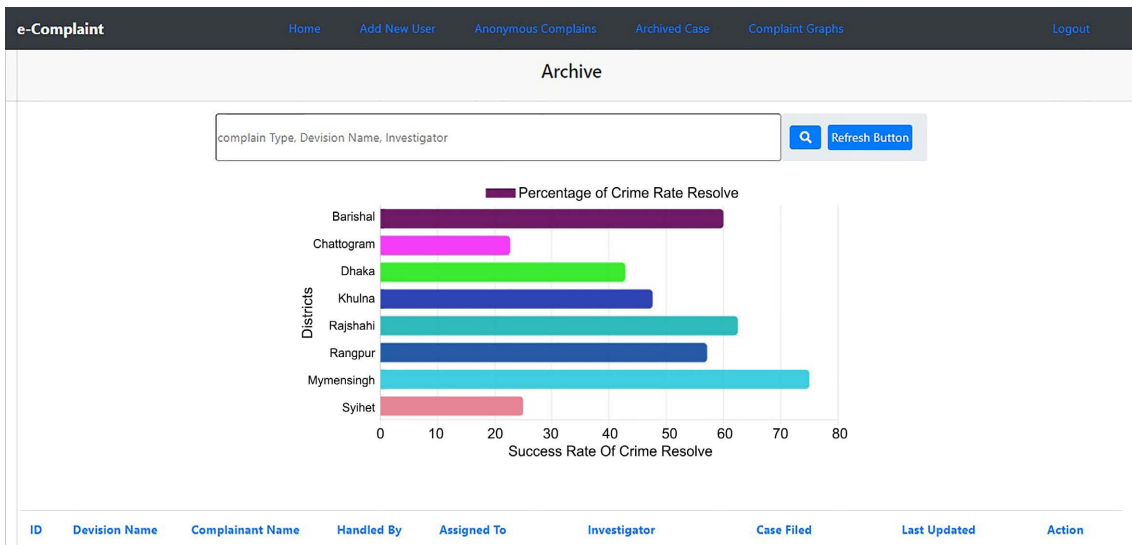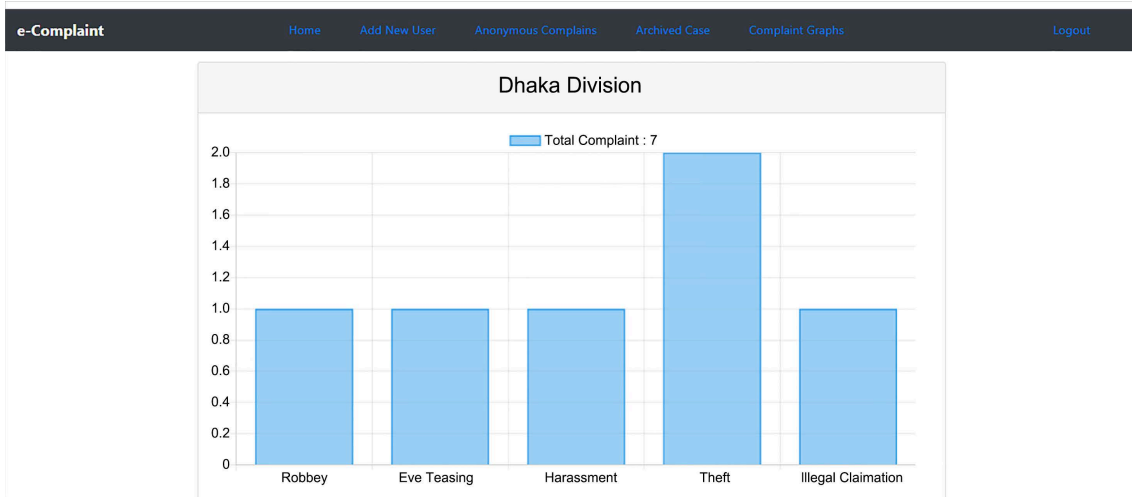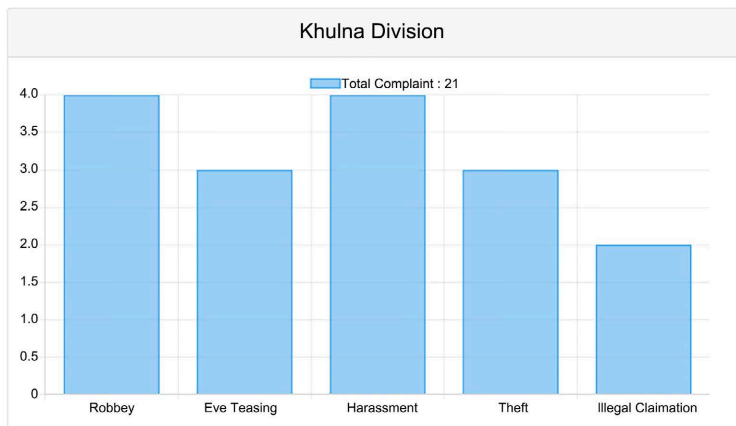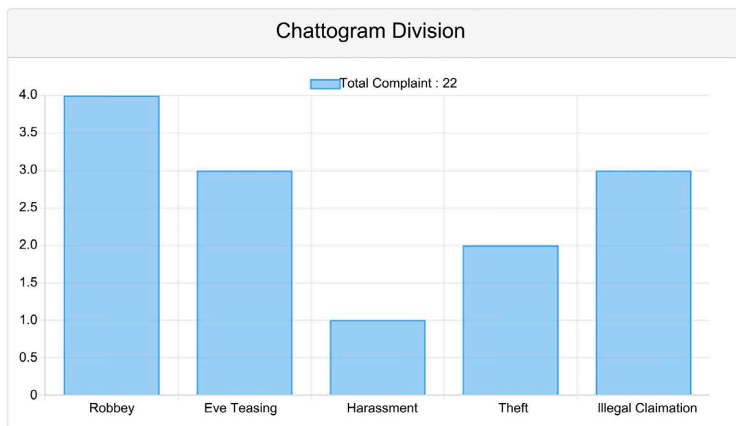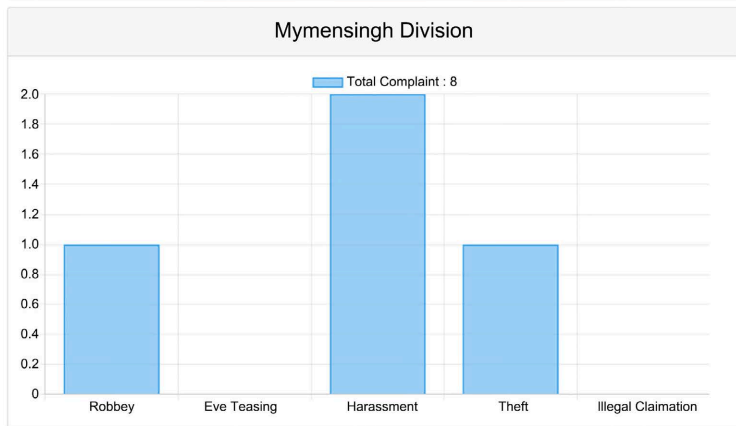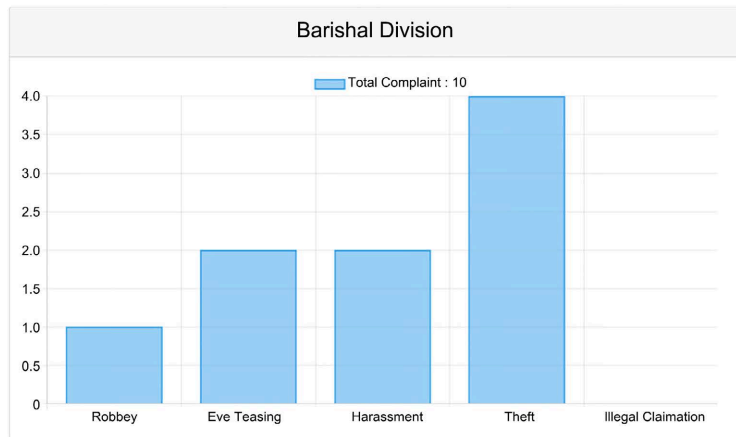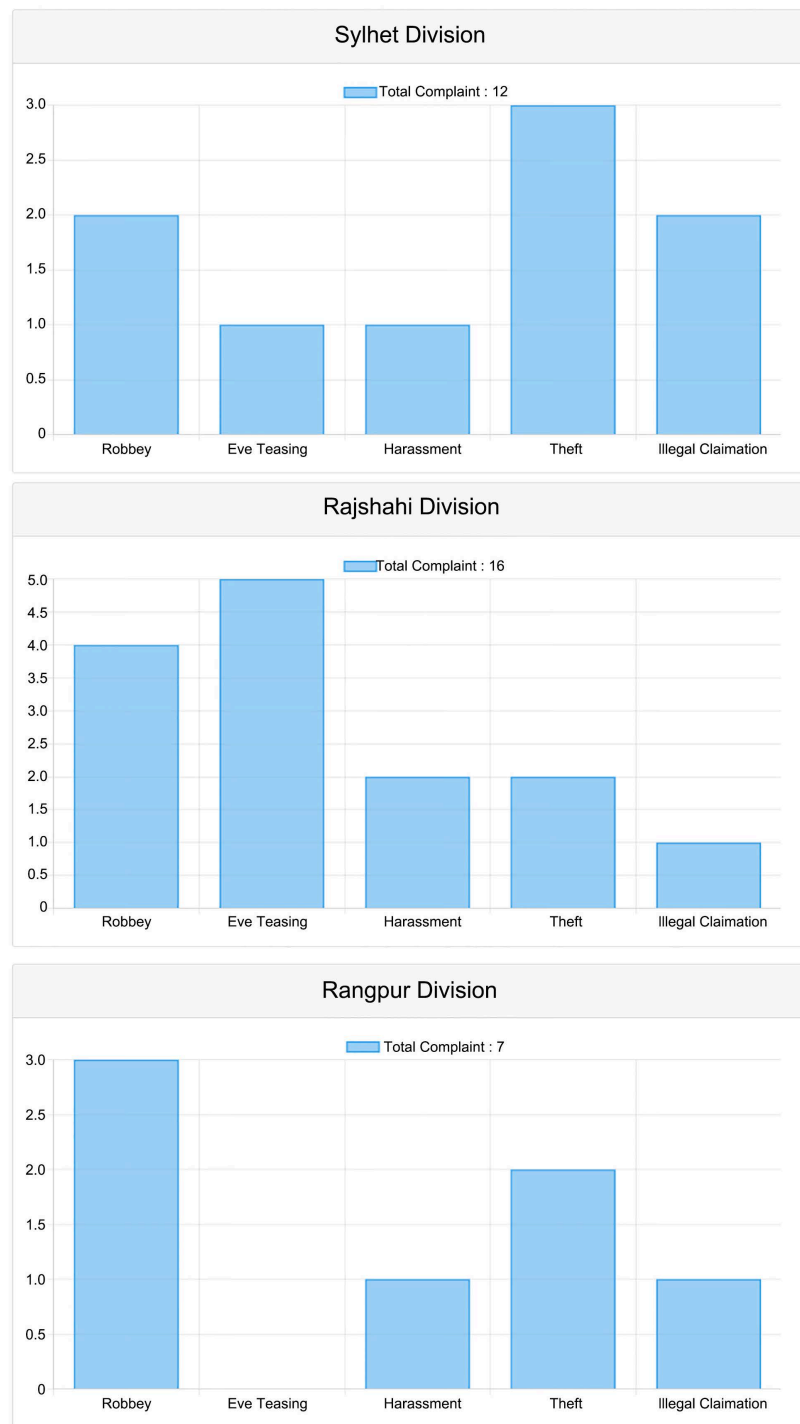
(b)

Figure 19. (a) Image of the "Graph" in the "Archive" in the "e-Complaint"; (b) Image of the "Division-wise Graph" in the "Archive" in the "e-Complaint".

Here, a graph will be visible to the Admin, where the Admin can see how many cases are filed from any district and how many of them are solved. Moreover, the Admin can search any case by entering the "Case Type" or "District Name" in the "Search Bar" (**Figure 18**).

Here, in the "Archive", a "Graph" (Bar Chart) will be shown. Where it can be seen how many Complaints are solved in each division. Again, if that "Graph" is selected, then another "Graph" will be seen where it'll give a clear view of which type of Complaint is solved in each division (Figure 19(a), Figure 19(b)).

6. Conclusions

The "Citizen-Centric Complaint Reporting and Analyzing Mechanism" presented in this project has created a reliable and efficient system that allows citizens to report crimes and misconduct through the online complaint system called "e-Complaint". The proposed system provides a user-friendly platform for complainants to file complaints without fear of retaliation, increasing transparency and police accountability in the complaint process. The "Laravel" framework was utilized for developing the system, providing benefits such as high performance, built-in functionality, and ease of development.

The implementation of the system will bring significant benefits to both citizens and police departments worldwide. Citizens can report complaints online, saving time and effort, while police departments can respond quickly and effectively, aided by increased accountability and transparency. The centralized platform will also help to ensure that complaints are managed and stored in one place, preventing loss or forgetting of complaints.

The "e-Complaint" system is expected to be especially useful for Bangladeshi citizens and the "Bangladesh Police". Bangladesh's large population makes filing complaints challenging due to various factors, such as fear of retaliation and lack of trust in authorities. However, the proposed system will make it easier for complainants to report complaints, and the Police will be able to respond promptly and efficiently.

In conclusion, the "Citizen-Centric Complaint Reporting and Analyzing Mechanism" will significantly improve the complaint filing process, increasing police accountability and transparency. Its implementation will bring substantial benefits to both citizens and Police departments worldwide, including Bangladesh.

6.1. Limitations

Although the "e-Complaint" system provides a reliable and efficient platform for citizens to report crimes and misconduct, there are some limitations that need to be addressed; such as:

➢ Complainants may have no control over the investigation process.
➢ Decisions based on the "e-Complaint" system may not be binding, affecting accountability and transparency in the complaint resolution process.
➢ Investigation teams may not represent the complainant, and specific issues may not be addressed.
➢ Limitations in resolving complex issues promptly through the "e-Complaint" system.

6.2. Future Works

The proposed "e-Complaint" system can be further developed and enhanced in several areas, including the integration of "Artificial Intelligence" (AI) and "Machine Learning" (ML) technologies to automate the complaint filing and processing process. Additionally, the proposed system can be integrated with other government systems, such as the "Judicial System", "Emergency Response" systems, and other law enforcement agencies. This will help to streamline the complaint resolution process and provide more efficient and effective services to citizens. Further developments in the "e-Complaint" system will increase its usability and effectiveness, providing more benefits to citizens and police departments.

Again, to enhance the effectiveness of the "e-Complaint" system, the main focus should be on improving the system by developing a comprehensive training program for investigation teams, ensuring that the proposed system is accessible to marginalized groups, providing alternative complaint resolution mechanisms, and providing more control to complainants. This will ensure that their issues are addressed comprehensively and in a more specific manner.

Overall, the proposed "e-Complaint" system is a significant step towards improving the complaint filing process and increasing the Police's accountability and transparency. With continued development and improvement, this system will be a valuable tool for citizens and law enforcement agencies alike.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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