**CRIME DATA MANAGEMENT SYSTEM FOR THE OFFICE OF THE VICE-MAYOR**

**A Capstone Presented**

**To the Faculty of the College of Business**

**Administration, Silliman University, Dumaguete City, Philippines**

**In Partial Fulfillment of the Requirements of the Course**

[**BA-AN 34P (2018)-A (LEC) Thesis/Capstone**](https://soul.su.edu.ph/course/view.php?id=19605)

**By**

**Amil, Derrick Thomas**

**Andres, Shekinah T.**

**Felisilda, Josemaria Archel G.**

**Geslani, Daniela U.**

**Lituañas, Eunice Mel G.**

**Serilo, Nikka Marae Leonore V.**

**June 9, 2022**

# ACKNOWLEDGEMENT

The following individuals deserve special thanks for their contributions to the completion of this capstone project:

First and foremost, the students want to thank the Almighty Father, who continues to give them protection and wisdom in these trying times. The students are amazed by His love because it strengthens them to finish tasks.

Second, they want to convey their gratitude to Mr. Larry Vincent C. Regencia, the adviser of BA-AN 34P – Thesis/Capstone, because this initiative would not have been possible without him. We also want to extend our appreciation to the rest of the faculty of Business Analytics, Mrs. Myla Jean P. Sardan, and Ms. Precious Mae Avanzado. They have conveyed their ideas well to increase the progress of the system.

Third, they want to convey our gratitude to our friends and parents for their unwavering love and support throughout the process.

Lastly, the students would like to thank Atty. Karissa Faye Tolentino-Maxino and the Office of the Vice Mayor for offering their time and effort in communicating with us regarding the project. They inspired the students to complete the system for their use.

# EXECUTIVE SUMMARY

Data visualization is increasingly important for operations for police and other agencies of the criminal justice system. It is also an important tool for teaching and explaining data analysis to our target audience (which are the Dumaguete City barangays/police stations). It provides them with security since we are showing the current state of their barangay, regarding the intensity of crime experienced.

The purpose of the crime data management system is to provide the office of the vice mayor with a centralized data visualization system which they can use and suited for their system’s structure. Among others, this system has components such as types of crimes, time and date, locations, which are based on police records and plotting them dynamically. Mainly, the insights taken out of the data help to improve the performance of the police and are used as an input for decision-making processes within the community. The advantage of using visualizations becomes apparent when communicating the information to the office.

The more officers who can view the larger picture, the more likely it is that a crime will be solved quickly. The concept is starting to gain traction and the community is becoming more accustomed to this type of approach. The shift in focus inside agencies from solving crimes to preventing them is contributing to this trend. This is for the police practice for investigation, crime prediction, and planning of police forces. This would not only benefit the police but also the people in the community.

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# Chapter I: Introduction

## Project Abstract

Criminal cases are now handled not just by the police station or law enforcement officers but also by the government leaders. Identifying the locations with the most crimes, most occurred type of crime, and their time and day are necessary to track the safeness of the city. The Dumaguete City Police Station is continually monitoring the criminal cases in the town by updating its system. Although the office of the vice mayor has the list of criminal cases in the city given by the police station, they do not have the actual system or program to monitor them. Therefore, our team intends to make an interactive website to assist the vice mayor's office and people through a centralized data system ready for immediate use. Big data and analytics come into the picture when building a system because analytics can provide valuable insights that would benefit the decision-making process. According to Daniel Ruiz and Alisha Sawant (2019), “Crime is an ever-pervasive part of society and while our police forces work tirelessly to reduce the crime rate, there is only so much they can do when working solely off their intuition and training. This is where big data comes in. Crime is rarely random, and there are vast crime archives that can provide insight into the patterns in which crimes are committed.” (Page 3). The crime data management system will be a big help for the vice mayor and her people to identify helpful information that would eradicate or solve the crime rates in each city location and make meaningful recommendations and conclusions.

The crime interactive website or management system will consist mainly of data and records that Dumaguete City Police Station has provided; the data will be placed in a database. This website will also be customized based on the office's suggestions. For security purposes, the employees or people of the vice mayor can access the website after registering their name and password. Data visualization outputs will also be shown in the system, such as heat maps, bar charts, and line graphs since these are convenient to view and understand the trends or patterns of information.

## Project Objectives

The Crime Data Management System will enhance the crime recording operations and will be the basis for all actions in the system and can be easily updated and used to aid in all the system’s processes, that is, all the required information is stored. This will also assist our government leaders and law enforcement officers, especially in Dumaguete City in identifying patterns of criminal cases and raising awareness on the given types of criminal acts that most frequently occur in typologically similar parts of the community and to identifying the number of criminal cases in each community of Dumaguete City using an interactive webpage that contains data visualizations and crime analysis. Another objective of the project is to establish a baseline analysis and formulate models that are suited to the system’s structure. Furthermore, the correctness of the centralized database will allow functions such as crime report generation and statistical analysis of crime data.

## Scope and Limitations of the Project

The main scope of the project is to develop a web-based crime data system that is easily accessible to users. The scope of the project also includes crime data records for the last 3 years up to the recent. Through the system, proper safekeeping of data is provided and ensures data accuracy to generate crime data reports through the form of data visualization.

Even though this project focuses on a crime data system, it doesn’t include confidential information such as the name, age, and gender of the perpetrators and victims. It also doesn’t include real-time data but near real-time data due to the main source being secondary. As a web-based system, it cannot be accessed without an internet connection.

## Significance of the Project

The crime data management system is significant for developing the decisions of the people involved in the environmental or safety committee of the city’s government since it provides them with the current state of the communities regarding the intensity of crime experienced.

The more officers who can view the larger picture, the more likely a crime will be solved quickly. The concept is starting to gain traction, and the community is becoming more accustomed to this type of approach. The shift in focus inside agencies from solving crimes to preventing them contributes to this trend. This project is for the community leaders and law enforcement leaders for investigation, crime prediction, and planning police forces and city officials. In addition, the crime data management system will offer cost reduction, operational efficiency, and reduced time consumption.

Through this project, the government leaders and local law enforcement officers would use the appropriate strategy to identify the number of criminal cases in each community of Dumaguete City using data visualizations, specifically heat maps and charts. The output of this project will be utilized to assist them in identifying patterns of criminal cases. In addition, it is hoped that this project will help raise awareness of the given types of criminal acts that most frequently occur in similar parts of the community.

# Chapter II: Review of Related Literature

## Theoretical Background

### John Tukey’s Theory of Exploratory Data Analysis (EDA)

This research tradition was founded by John Tukey, who often relates EDA to detective work. In EDA, the role of the researcher is to explore the data in as many ways as possible until a plausible “story” emerges. You would evaluate your data as a whole and look for clues and patterns, much like a detective would look at all the evidence available to her and try to make sense of it.  You may establish questions to ask, how you`re going to frame them, and determine the best way to manipulate the information to draw out important insights. What you find during this phase of EDA will help you establish the right questions to ask and, more importantly, what areas of data deserve further exploration.

Considering the volume, variety, and frequency of data, it is difficult to manually analyze and make patterns out of it. Having data collected from the police station of Dumaguete City, the researchers will offer a crime data management system to help the Office of the Vice Mayor see patterns in a bigger picture with data visualization and will be able to have a further understanding of appropriate decisions to bring down the crime rate. This will also give an absence of difficulty for them since they will no longer manually input data and we can provide a more sophisticated environment to store crime case data.

### Crime Pattern Theory

This theory by Paul and Patricia Brathingham integrates crime within a geographical context, thus demonstrating how the environment people live in and pass-through influence criminality. It focuses on places and the lack of social control or other measures of guardship that are informally needed to control crime.

Researchers will then create a data visualization specifically Map mapping where we place coordinates of where crimes are committed to form patterns that will help The Office of the Vice Mayor to carefully examine possible reasons why most crimes are committed in the same area/location.

### Crime Causation: Economic Theories

This research of Crime Causation: Economic Theories is conducted by Ann Dryden Witte and Robert Witt. It focuses on the analysis of crime regarding economic awareness, thus providing an entry to surveys and provides an opening to this basic theory. According to Richard, the study investigated the effect of incentives on criminal conduct, how decisions interact in a market setting, and the use of cost-benefit analysis to product range by offering crime-reduction policies.

This theory can help explain how criminal behavior affects the specific location in Dumaguete City with respect to Economics and provide information, with the use of data visualization, and mitigate crime overtime. The researcher can consider with the data gathered as to how the results impacted the people living in that area.

### Assessing Macro-Level Predictors and Theories of Crime: A Meta-Analysis

This paper by Travis Pratt and Francis Cullen incorporates neighborhoods, census tracts, cities, counties, state, or nations on how crime rate results to the “macro-level” or “ecological” analysis. This provides further insight and ideas to the Office of the Vice Mayor on where and how to focus on crime prone areas and mitigate crime in a specific area.

(Variables: Data Mining, Managing Crime Data, Crime Analysis, Crime Pattern Detection, and Prediction)

## Related Literature

### Crime Analysis with Crime Mapping

The discipline of crime analysis with crime mapping is recognized today as important by government, policing, and academic communities; however, it is still being developed. Although these findings may not be surprising, given that short-term pattern analysis and real-time data analysis support a core function of police agencies, they indicate that most police agencies are not using crime analysis to their full potential. Crime analysts and police leaders alike are focusing crime analysis efforts on short-term pattern and long-term hot spot identification and have not yet expanded the focus to long-term, in-depth analysis of crime and disorder problems to seek solutions for these problems. These may be due partly to a lack of communication and knowledge of the capabilities and usefulness of crime analysis (Santos, 2017).

### Big Data

The term "Big Data" has become increasingly popular; crime and intelligence analysts have been working with massive datasets for a year. Citizen Calls for Service (CFS), SIGINT, and geospatial data sources frequently fall into the "Big Data" realm, particularly when they are linked to other sources in relational databases or combined to form derived products. Perhaps the one noteworthy benefit associated with analytic capabilities has advanced to the point where these big data resources are increasingly accessible to the analyst. With the development of cloud computing, in-memory appliances, and other capabilities, the analyst can now effectively explore and exploit these resources in a meaningful way in support of real-time or near real-time analysis and actionable insight (McCue, 2015).

### Crime Data Mapping

According to Benjamin Matias (2017) crime data mapping is not a new concept, but rather a new approach to crime analysis. In the past, the police forces would use a big map on a wall, they would use pins on the location(s). This is, however, as new crimes were committed the old pins were replaced. The old or past data would be replaced. Crime mapping is a tool that can be used to mark the locations of victims as well as offenders in order to locate localized crime and prevent it. Armed with this information, the police departments are able to determine not only where the victims are located but also where the areas with the highest concentration of criminal activity can be found. With this information, it would be possible to determine which areas of town are the most dangerous. Because of this information, the department is able to trace the movements of criminals as they go from one location to another. This is accomplished by classifying the criminal activity according to the time of day, the day of the week, and the day of the month.

*Crime Mapping and the Crime stat Program*

This book is used for Crime Mapping and Crime stat Programs. Crime mapping heavily involves technology, forensics, profiling, database analysis, and other required and supplementary tools to succeed in generating the needed data to achieve the objectives of these procedures.

## Related Studies

### Crime Data Management

Managing crime data is considered as an indicator of effectiveness for police use. It will be easy to give precise crime reduction targets when information is organized accordingly. Crime figures can be, and are, used to demonstrate police efficiency in terms of clearance rates or lack of investment when crime figures are high, and clearance rates are low. The ability of the police to manipulate recorded crime is now recognized and identified in the literature. (Reiner 1992; Maguire 1997; Loveday 1999).

### Data Mining

Data mining is defined as identifying interesting structures in data, where structure designates patterns, statistical or predictive models of the data, and relationships among parts of the data (Fayyad & Uthurusamy, 2002). Data mining in the context of crime and intelligence analysis for security is the process of detecting patterns and relationships among data by using artificial intelligence methods (Mohammad, R.K. et al., 2011). Valuable criminal-justice data in free texts such as police narrative reports are currently challenging to access and use by intelligence investigators in crime analyses. The large volume of crime datasets and the complexity of relationships between these kinds of data have made criminology an appropriate field for applying data mining techniques. Identifying crime characteristics is the first step for developing further analysis. The knowledge and information gained from data mining techniques are a handy tool to help and support law enforcers.

### Crime Analysis

According to the Police Foundation’s (2001) Introduction to Crime Analysis Mapping and Problem-Solving course, “crime analysis is the qualitative and quantitative study of crime and law enforcement information in combination with socio-demographic and spatial factors to apprehend criminals, prevent crime, reduce disorder, and evaluate organizational procedures” (p. 9). This refers to identifying patterns and studying relationships of crime and law enforcement data with other types of information. Crime analysis has been used to improve the operations and administration of police departments, to improve the job satisfaction of police officers, to permit the patrol deployment system to correspond with service demand, and to augment patrol activities in crime prevention. (S R Stiles, 1981).

### Crime Pattern Detection and Prediction

Crime analysis, detection, and prediction have become essential these days. For this, we need to go through previous crime records, analyze them, then classification algorithms can be applied based on the requirements to predict the next occurrence of crime (Das, D., & Nayak, M., 2011). Crimes are neither systematic nor random, otherwise crime cannot be analyzed. Predictive policing means using analytical and predictive techniques to identify criminals and it is pretty much effective in doing the same (Nagaraj, P. et al., 2021). This leads the law enforcers to more objective decision-making, preventing them from making random decisions that might be biased rather than factual. In addition, detecting crime patterns aids in reducing crime risk or solving past crimes.

# Chapter III: Technical Background

## Technicality of the Project

**MySQL**. MySQL is an open-source relational database management system that supports different back ends, several client programs, libraries, and tools. The data being used are cases collected from the Dumaguete City Police Station (note: for confidentiality, data of the persons involved of the crime are not given as per Republic Act No. 10173, otherwise known as the Data Privacy Act) will be stored in the database server which is the MySQL database. Information stored in the database is imported data that will be used to create data visualizations for decision making for the Office of the Vice Mayor.

**PHP, jQuery, JavaScript**. PHP programming language is most widely used for website and web application development because of its ability to support database management systems and other open-source databases. Furthermore, it is used for creating simple functions, methods and other special features or components. This will be the primary language that will be used throughout the development of the proposed web page data visualization and account lo alongside other scripting languages like jQuery and JavaScript.

**HTML, CSS, Bootstrap**. These frameworks will be used to structure the web pages and its content. These languages will be used for the design and presentation of the web pages, including colors, size, layout, fonts, etc.

**Chart.js, AnyChart.** This free open – source JavaScript library will be utilized for data visualization in order to generate charts that will be used to compare charts with filtering year. We used line chart, pie chart, horizontal and vertical bar chart, and heatmap that are all responsive.

[**www.crimedata.mydatamarker.com**](http://www.crimedata.mydatamarker.com)**.** The platform will be a website application. User may create an account and log in to use the application.

*Software Specification*

To develop the benchmarking platform the following framework and application will be utilized:

MySQL, PHP, JQuery, JavaScript, HTML, CSS, Bootstrap, Chart.js, Anychart, [www.crimedata.mydatamarker.come](http://www.crimedata.mydatamarker.come), and any internet browser.

*Hardware Specification*

The website can be accessed through a Personal Computer either a Desktop or a Laptop to achieve compatibility on the web design.

## How the project will work

The system was created and designed for the Dumaguete City Office of the Vice Mayor. This could be applied to different localities as well. The vice mayor or whoever has the authority will be the one who will accept and select the people who can register an account. Once the user has logged in, they have the power to import data collected from the Dumaguete City Police Station. Adjustments are necessary to confide with the format of the crime data strictly. The interactive webpage displays data visualization and lists that will help the user gather insights and form conclusions and recommendations that may lessen the crime rates in each barangay.

# Chapter IV: Methodology

Environment

### Local

The study focuses on Dumaguete City Negros Oriental. The Office of the Vice Mayor and Police Station will be interviewed and offered a project proposal that may utilize analytical applications and tools. The user can be anyone from the office as long as the manager or Vice Mayor approves them.

### Population of the Study

The population will be focused on the Office of the Vice Mayor and those people who work for them. Their office resides on the third floor of the City Health Office near the Fire Station of Dumaguete City.

### Organizational Chart/Profile

This is composed of the Office of the Vice Mayor:

|  |  |  |  |
| --- | --- | --- | --- |
| **POSITION** | **IMPORT DATA** | **APPROVAL** | **TRACKER** |
| **MANAGER** | ALLOWED | ALLOWED | ALLOWED |
| **SUPERVISOR** | ALLOWED | ALLOWED |  |
| **MEMBER** | ALLOWED |  |  |

## Requirements Specifications

### Operational Feasibility

Functional Decomposition DiagramDiagram

Description automatically generated*Figure 1. Functional Decomposition Diagram*

### Technical Feasibility

#### Compatibility checking

The interactive webpage/platform is expected to work in any given browser. There will be no issues of compatibility because the platform is accessible online, it could be via desktop or mobile.

### Schedule Feasibility

#### Gantt Chart

A picture containing chart

Description automatically generated*Figure 2. Gantt Chart*

### Requirements Modeling

Input

Data imported comes from the Dumaguete City Police Station. They input their criminal records in excel and word files. The excel file is proven more valuable as each cell contains the essential information depending on the given category, which could be formatted and tracked efficiently. The people of the office can access the records, or anyone has been permitted to collect them. The data for the past three years can be imported before the final submission. The user can view those who imported the records together with the date and time when they performed the import.

Process

The system will generate data visualization outputs and an understanding of the results of the criminal records. The charts and graphs will be automatically generated after the user imports the data.

Output

The imported data will be displayed on the screen in the data tab, and the charts, graphs, and heatmap are in the data visualization tab. The listing tab shows a summary of the records based on their category.

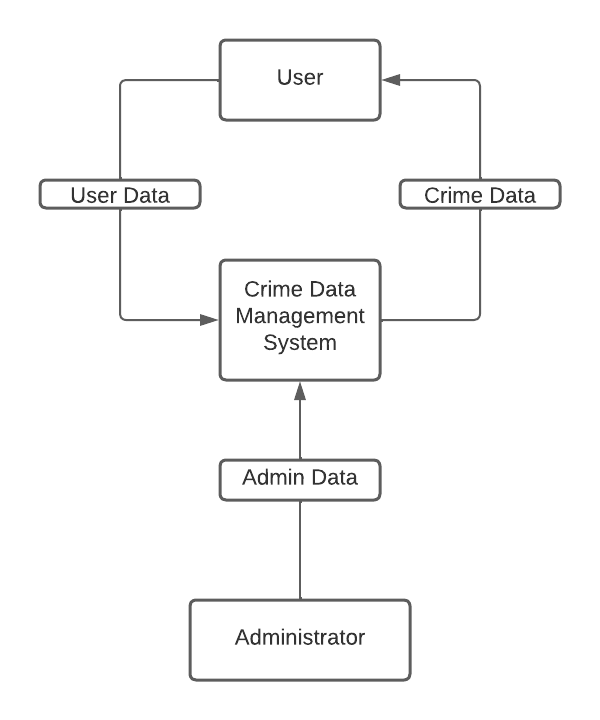
Performance

Regarding speed, the data visualization and lists will automatically process and generate their outputs as soon as the user imports and submits the data.

Control

Users must first register to have an account on the platform and will be redirected into the waiting page since the system requires approval from the higher position (Manager or Supervisor). They then receive an email containing their user ID from the crime data system confirming approval before having access to the system. The log in module will require a user ID and a password with checks to ensure that the information matches the user account data stored within the database. The administrators have full control and access of the baseline data. For existing users who forgot their password, they can input, and press forgot password from the login page and will be asked for their email. It will be checked from the system if email input exists and will be given a code confirmation from their email before creating a new password. The users can only change the information they input from the registration page aside from the position page. The users cannot edit or delete data of the cases imported in the system since the data are coming from Dumaguete City Police Station with correctness and accurate information of data.

#### Data and Process Modelling



*Figure 3. Data Flow Diagram*

Diagram

Description automatically generated

*Figure 4. Program Flowchart*

Diagram

Description automatically generated

*Figure 5. User Case Diagram*

### Design

### Output and User-Interface Design

Reports

Once the data is submitted, results are presented in the form of graphical charts to visually illustrate the comparison between the user data and the baseline data. Recommendations will also be drawn from the results of the benchmark. The user has an option to view the data history to keep track of its previous inputs and historical data.

#### Entity Relationship Diagram Diagram Description automatically generated

*Figure 6. Entity Relationship Diagram*

#### Data Dictionary

*Table 1. Approval Table*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| approval\_id (Primary) | int | No |  |  |
| approval\_name | varchar(10) | No |  |  |

*Table 1.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | approval\_id | 3 | A | No |  |

*Table 2. Barangay*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| barangay\_id (Primary) | int | No |  |  |
| barangay\_name | varchar(100) | No |  |  |

*Table 3. Cases*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| case\_id (Primary) | int | No |  |  |
| date | date | No |  |  |
| day | varchar(100) | No |  |  |
| time | varchar(100) | No |  |  |
| barangay\_name | varchar(100) | No |  |  |
| coordinate\_x | decimal(15,10) | No |  |  |
| coordinate\_y | decimal(15,10) | No |  |  |
| crime\_type\_name | varchar(100) | Yes | Null |  |
| category\_name | varchar(100) | No |  |  |
| classification\_name | varchar(200) | No |  |  |
| status\_name | varchar(100) | No |  |  |
| solve | varchar(100) | No |  |  |
| clear | varchar(100) | No |  |  |
| occurence\_name | varchar(200) | No |  |  |
| user\_id | varchar(100) | No |  |  |
| create\_timestamp | timestamp | No | CURRENT\_TIMESTAMP |  |

*Table 3.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | case\_id | 10137 | A | No |  |
|  |  |  |  | barangay\_name | 1689 | A | No |  |
|  |  |  |  | category\_name | 3379 | A | No |  |
| barangay\_id | BTREE | No | No | classification\_name | 5068 | A | No |  |
|  |  |  |  | status\_name | 5068 | A | No |  |
|  |  |  |  | occurrence\_name | 5068 | A | No |  |
|  |  |  |  | user\_id | 5068 | A | No |  |

*Table 4. Case Status*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| status\_id (Primary) | int | No |  |  |
| status\_name | varchar(100) | No |  |  |

*Table 4.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | status\_id | 10 | A | No |  |

*Table 5. Classification*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| classfication\_id (Primary) | int | No |  |  |
| classfication\_name | varchar(100) | No |  |  |
| category\_id | int | No |  |  |

*Table 5.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | classfication\_id | 123 | A | No |  |

*Table 6. Crime Category*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| category\_id (Primary) | int | No |  |  |
| category\_name | varchar(100) | Yes | NULL |  |
| crime\_type\_id | int | Yes | NULL |  |

*Table 6.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | classfication\_id | 123 | A | No |  |

*Table 7. Crime Type*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| crime\_type\_id (Primary) | int | No |  |  |
| crime\_type\_name | varchar(100) | No |  |  |

*Table 7.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | crime\_type\_id | 2 | A | No |  |

*Table 8. Place of Occurrence*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| occurence\_id (Primary) | int | No |  |  |
| occurence\_name | varchar(100) | No |  |  |

*Table 8.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | occurence\_id | 2 | A | No |  |

*Table 9. User*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column | Type | Null | Default | Comments |
| user\_id (Primary) | int | No |  |  |
| email | varchar(100) | No |  |  |
| password | varchar(100) | Yes | NULL |  |
| first\_name | varchar(100) | No |  |  |
| last\_name | varchar(100) | No |  |  |
| position | varchar(100) | No |  |  |
| create\_timestamp | timestamp | Yes | CURRENT\_TIMESTOP |  |
| update\_timestamp | timestamp | Yes | NULL |  |
| approve\_reject\_timestamp | timestamp | Yes | NULL |  |
| supervisor\_accept\_reject | int | Yes | NULL |  |
| approval | int | Yes | 0 |  |
| image\_name | varchar(100) | Yes | profile.png |  |

*Table 9.1 Indexes*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Keyname | Type | Unique | Packed | Column | Cardinality | Collation | Null | Comment |
| PRIMARY | BTREE | Yes | No | user\_id | 7 | A | No |  |

Development

Software Specification

To develop the benchmarking platform the following framework and application will be utilized:

MySQL, PHP, JQuery, JavaScript, HTML, CSS, Bootstrap, Chart.js, AnyChart, www.crimedata.mydatamarker.com, and any internet browser.

Hardware Specification

The website can be accessed through a Personal Computer, either a Desktop or a Laptop to achieve compatibility on web design.

Program Specification

The programs used are VSCode and WAMPServer64.

Programming Environment

##### Front End

Front-end development ended up deciding on using Bootstrap, an HTML and CSS framework to build the user interface, and JavaScript.

*Back End*

PHP and MySQL software were used as back-end development.

### Verification, Validation, Testing

To assure quality, the team acknowledges the value of thorough testing. Appropriate test techniques will be developed for all sections of the system, based on the system's requirements, and will be incorporated into the project plan.

## Conclusions

This study proves that not only law enforcement officers analyze the patterns and information of crime data. Government leaders and their staff also improve the city's well-being and safety. The Crime Data Management will help the Vice Mayor and her office detect the reasons for the number of criminal cases happening in a location and time and what influences them. Technologies emphasize the innovation of Big Data and Analytics as they develop the needed solutions to eradicate the problems in each data and improve business operations. With the use of the system developed, insights will flourish after understanding the usage and content of the data visualization and lists of criminal records in Dumaguete City.

## Recommendations

After presenting the Crime Data Management System to the faculty of the Business Analytics department and Dumaguete City Vice Mayor, recommendations for improving the interactive webpage are included in this portion of the study. It is recommended to explore the web design rules more to make users comfortable using the website without noticing lapses and difficulties. A map of Dumaguete City could also be added to the webpage as this showcases the exact location of each barangay; this can help identify patterns and create more valuable information to solve those places with the most crimes.

## Implementation Plan

### Project Implementation Checklist

|  |  |
| --- | --- |
| **NAME OF TASK** | **STATUS** |
| **Topic Identification, Structural Planning and Database Making** |  |
| Narrative Report/Proposal | Finished |
| Crime Data System ERD Making (draft) | Finished |
| ERD V1 Submission & Consultation with Sir Larry | Finished |
| Chapter 1 & 2 Making (Submission) | Finished |
| Creation of table in the Database & Consultation w/ Sir Larry | Finished |
| Edited ERD V2 | Finished |
| **DESIGN** |  |
| DATABASE STRUCTURE | Finished |
| Plan a layout for the user interface of the website. | Finished |
| Review design | Finished |
| Finalize interactive webpage design | Finished |
| **Data Pre-processing** |  |
| Consultation with Ma’am Tiffany regarding the data about the crime system | Finished |
| Data cleaning were made to the crime data | Finished |
| provide up-to-date crime statistics, map crime hot locations, and manage dynamic databases. | Finished |
| **IMPORTING OF DATA** | Finished |
| **DEVELOPMENT** |  |
| Landing page (log in/out, Registration) | Finished |
| Home page (HOME BUTTON, DATA VISUALIZATION, DATA, LIST, ABOUT) | Finished |
| DATA COLLECTION / EXPLORER (crime data: input data, import data; data visualization) & List tab | Finished |
| DATA VISUALIZATION (MAPPING, LINE CHART, PIE CHART, BAR GRAPH) using JS | Finished |
| ABOUT (INFO AND FAQS) w/ Mail Function | Finished |
| USER PROFILE (Update Profile, password, and picture) | Finished |
| CONNECT ALL PAGES | Finished |
| **FINALIZATION OF MODULES** | Finished |
| **ADDITIONAL FEATURES OF MODULES** | Finished |
| **TESTING AND IMPLEMENTATION** | Finished |
| Finish capstone paper | Finished |
| Module Implementation | Finished |
| Website Test-run | Finished |
| Bug Fixes | Finished |
| Final Test-run | Finished |
| **Defense w/ Sir Larry & Office of the Vice Mayor** | Finished |

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APPENDICES

## Users Guide

Video Link

<https://drive.google.com/file/d/1H8xExzyWy0pMpW3aAYBssn_QWQ1C7_x7/view?usp=sharing>

Other Relevant Documents

<https://drive.google.com/drive/folders/1D14JQC2qixkOOJLNnsg_sJ-HBFV2LsMz?usp=sharing>

## Curriculum Vitae

## Name : Derrick Thomas Amil

Address : Banilad, Dumaguete City

Cellphone No. : (0909) 166 3957

E-mail : [derrickamil@su.edu.ph](mailto:derrickamil@su.edu.ph)

**PERSONAL DATA**

Nationality : Filipino

Sex : Male

Marital Status : Single

Place of Birth : Dumaguete City

Date of Birth :

**EDUCATION**

2018-Present : Bachelor of Science in Business Administration Major in Business

Analytics at Silliman University

2016-2018 : Accountancy, and Business Management (**ABM**) at Negros Oriental State University (Senior High School)

2016-2012 : Studied at Dumaguete City High School (Junior High School)

2006-2012 : South City Elementary School

## Curriculum Vitae

## Name : Shekinah T. Andres

Address : Escalante City, Negros Occidental

Cellphone No. : (0977) 197 9644

E-mail : shekinahtandres@su.edu.ph

**PERSONAL DATA**

Nationality : Filipino

Sex : Female

Marital Status : Single

Place of Birth : Escalante City, Negros Occidental

Date of Birth : October 20, 1999

**EDUCATION**

2018-Present : Bachelor of Science in Business Administration Major in Business

Analytics at Silliman University

2016-2018 : Accountancy, and Business Management (**ABM**) at

Silliman University Senior High School

2012-2016 : Negros Occidental National Science High School

2006-2012 : A. E. M. S. E. S – School of the Future

## Curriculum Vitae

## Name : Josemaria Archel G. Felisilda

Address : Judyville Subd., Boloc Boloc Sibulan, Negros Oriental

Cellphone No. : (0916) 636 8292

E-mail : [josemariagfelisilda@su.edu.ph](mailto:josemariagfelisilda@su.edu.ph)

**PERSONAL DATA**

Nationality : Filipino

Sex : Male

Marital Status : Single

Place of Birth : Dumaguete City

Date of Birth : September 9, 1999

**EDUCATION**

2018-Present : Bachelor of Science in Business Administration Major in Business

Analytics at Silliman University

2016-2018 : Accountancy, and Business Management (**ABM**) at St. Paul University Dumaguete

2012-2016 : Studied at St. Paul University Dumaguete

2006-2012 : ABC Learning Center Dumaguete City

## Curriculum Vitae

## Name : Daniela U. Geslani

Address : Purok Mapahiyumon, Brgy. Cantil-E, Dumaguete City

Cellphone No. : (0906) 269 9474

E-mail : [danielaugeslani@su.edu.ph](mailto:danielaugeslani@su.edu.ph)

**PERSONAL DATA**

Nationality : Filipino

Sex : Female

Marital Status : Single

Place of Birth : Quezon City

Date of Birth : September 22, 2000

**EDUCATION**

2018-Present : Bachelor of Science in Business Administration Major in Business

Analytics at Silliman University

2016-2018 : Accountancy, and Business Management (**ABM**) at St. Paul University Dumaguete

2014-2016 : Studied at St. Paul University Dumaguete

2007-2014 : Colegio de Sta Rosa, Makati City

## Curriculum Vitae

## Name : Eunice Mel G. Lituañas

Address : Judyville Subdivision, Bolocboloc, Sibulan, Negros Oriental

Cellphone No. : (0906) 063 0357

E-mail : euniceglituanas@su.edu.ph

**PERSONAL DATA**

Nationality : Filipino

Sex : Female

Marital Status : Single

Place of Birth : Dumaguete City, Negros Oriental

Date of Birth : October 11, 1999

**EDUCATION**

2018-Present : Bachelor of Science in Business Administration Major in Business

Analytics at Silliman University

2016-2018 : Accountancy, and Business Management (**ABM**) at

Silliman University Senior High School

2012-2016 : St. Paul University Dumaguete City

2006-2012 : St. Paul University Dumaguete City

## Curriculum Vitae

## Name : Nikka Marae Leonore V. Serilo

Address : Larena Drive, Taclobo, Dumaguete City

Cellphone No. : (0915) 5035 418

E-mail : [nikkavserilo@su.edu.ph](mailto:nikkavserilo@su.edu.ph)

**PERSONAL DATA**

Nationality : Filipino

Sex : Female

Marital Status : Single

Place of Birth : Dumaguete City

Date of Birth : October 08, 1999

**EDUCATION**

2018-Present : Bachelor of Science in Business Administration Major in Business

Analytics at Silliman University

2016-2018 : Accountancy, and Business Management (**ABM**) at St. Paul University Dumaguete

2012-2016 : Studied at St. Paul University Dumaguete

2006-2012 : ABC Learning Center Dumaguete City

# **GLOSSARY**

* BAR GRAPH, chart or graph that presents categorical data with rectangular bars with heights or lengths proportional to the values that they represent.
* CONDITIONAL FORMATTING, feature that allows the user to apply specific formatting to cells that meet certain criteria. It is most often used as color-based formatting to highlight, emphasize, or differentiate among data and information stored in a spreadsheet
* DATA ANALYSIS, a process of cleaning, transforming, and modeling data to discover useful information for business decision-making.
* DATA CLEANSING, the process of fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset.
* DATA VISUALIZATION, the process of translating large data sets and metrics into charts, graphs and other visuals.
* HEAT MAP, a two-dimensional representation of data in which values are represented by colors. It provides an immediate visual summary of information to understand complex data. Red - Most Cases; Yellow - Mid Range; Green - Least Cases
* INDEX CRIME, a crime is an act committed or omitted in violation of a law forbidding or commanding it and for which a punishment is imposed upon conviction.
* LINE GRAPH, a type of chart which displays information as a series of data points called 'markers' connected by straight line segments.
* NON-INDEX CRIME, on the other hand, are violations of special laws such as illegal logging or local ordinances.
* PIE CHART, a circular statistical graphic, which is divided into slices to illustrate numerical proportion.
* PIVOT TABLE, a powerful tool to calculate, summarize, and analyze data that lets you see comparisons, patterns, and trends in your data.
* SLICER, visual filter or interactive button that allow you to see what items have been chosen within a Pivot Table.