



Faculty of Computer Science and Information Technology

eVandalism: A Smart Mobile Reporting Application

Tan Chuan Hock

Bachelor of Computer Science with Honours (Multimedia Computing)

2025

eVandalism: A Smart Mobile Reporting Application

TAN CHUAN HOCK

This project is submitted in partial fulfilment of the
requirements for the degree of
Bachelor of Computer Science with Honours
(Network Computing)

Faculty of Computer Science and Information Technology
UNIVERSITI MALAYSIA SARAWAK
2025

eVandalism: Aplikasi Pelaporan Mudah Alih Pintar

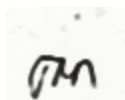
TAN CHUAN HOCK

Projek ini merupakan salah satu keperluan untuk
Ijazah Sarjana Muda Sains Komputer dan Teknologi Maklumat
(Pengkomputeran Rangkaian)

Faculty of Computer Science and Information Technology
UNIVERSITI MALAYSIA SARAWAK
2025

DECLARATION

I hereby declare that this project, eVandalism: A Smart Mobile Reporting Application is my original work in partial fulfilment of the requirements for the degree of Bachelor of Computer Science with Honours (Network Computing) under the guidance of Ts. Dr Mohamad Nazri bin Khairuddin Yap. All information extracted from other resources has been quoted or stated respectively.



.....
TAN CHUAN HOCK (81341)

FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
UNIVERSITI MALAYSIA SARAWAK

ACKNOWLEDGEMENT

First of all, I would like to take this opportunity to express my deepest gratitude to my supervisor, Ts. Dr Mohamad Nazri bin Khairuddin Yap who has continued to give invaluable guidance, support and informative feedback throughout this final year project. Besides that, I would like to thank my examiner for this project, Madam Hamizan binti Sharbini. Madam had given me valuable feedback and advice for improving the quality of this project. Not only that, I also would like to give thanks to Professor Dr. Wang Yin Chai who shared us many important information and tips during the class sessions. Additionally, great thanks to all of the respondents that take part in answering my survey form. Moreover, I would like to thank my friends and coursemates who had, shared me their knowledge and supported me through this long yet short journey. Lastly, I would like to express many thanks to my loving and caring family who had been giving me mental support during my stressful and tired moment throughout the journey

ABSTRACT

Vandalism activity has been a persistent challenge in educational institutions, posing issues to maintaining a safe and conducive learning environment. These issues often happen because the vandal would choose area that is less populated or the blind spot of the security camera to conduct vandalism. Therefore, this project introduces a mobile application, eVandalism: A Smart Mobile Reporting Application is designed to facilitate anonymous reporting of vandalism incidents within educational institution compound. The application enables students to report vandalism while keeping their identity anonymous to protect them from potential retaliation. The application also utilise email notification system that forwards report directly to the person-in-charge to ensure the person-in-charge can take appropriate action. By utilising the eVandalism application, both UNIMAS students and the person-in-charge can work closely to capture the culprit of the vandalism and decrease the chances of vandalism incident from occurring in the future. Other than catching the culprit of the vandalism, the person-in-charge also get to know where and which facilities were being damaged and can take appropriate action like informing the maintenance team about the damaged facilities so that the maintenance team can repair or replace the damaged facilities base on the degree of the damage on the facilities. Therefore, by streamlining the reporting procedures and enabling real-time email notifications, the eVandalism application has the potential to reduce vandalism incidents, foster better communication between UNIMAS students and UNIMAS staff and contribute to a safer educational environment.

ABSTRAK

Aktiviti vandalisme telah menjadi cabaran berterusan di institusi pendidikan, menimbulkan masalah dalam mengekalkan persekitaran pembelajaran yang selamat dan kondusif. Vandalisme sering berlaku di kawasan yang kurang sesak atau di tempat yang tidak dapat dikesan oleh kamera keselamatan. Untuk mengatasi masalah ini, projek ini memperkenalkan aplikasi mudah alih, eVandalism: Aplikasi Pelaporan Mudah Alih Pintar yang direka untuk memudahkan pelaporan vandalisme secara anonim di kawasan institusi pendidikan. Aplikasi ini membolehkan pelajar membuat laporan vandalisme dengan cepat sambil memastikan identiti mereka kekal anonim untuk mengelakkan pembalasan daripada pelaku vandalisme. Aplikasi ini menggunakan ciri notifikasi e-mel yang terus menghantar laporan kepada pihak yang bertanggungjawab, membolehkan mereka mengambil tindakan segera. Dengan menggunakan aplikasi eVandalism, kedua-dua pihak iaitu pelajar UNIMAS dan pihak berkuasa boleh bekerjasama rapat untuk menangkap pelaku vandalisme dan mengurangkan kemungkinan kejadian vandalisme daripada berlaku pada masa hadapan. Selain daripada menangkap pelaku vandalisme, pihak berkuasa juga dapat mengetahui mana dan pada kemudahan yang telah dirosakkan dan dapat mengambil tindakan yang sewajarnya seperti memaklumkan kepada pasukan penyelenggaraan mengenai kerosakan tersebut. Oleh itu, dengan mempermudah proses pelaporan dan membolehkan notifikasi e-mel secara masa nyata, aplikasi eVandalism berpotensi untuk mengurangkan kes vandalisme, memupuk komunikasi yang lebih baik antara pelajar-pelajar UNIMAS dengan staf UNIMAS serta menyumbang kepada persekitaran pendidikan yang lebih selamat.

Table of Contents

DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
ABSTRAK	iv
List of Tables.....	viii
List of Figures	ix
CHAPTER 1: INTRODUCTION	1
1.1. Introduction	1
1.2 Problem Statement	2
1.3 Objectives:.....	3
1.4 Methodology:	4
1.5 Scope	5
1.6 Significance of Project:	6
1.7 Project Schedule	6
1.8 Expected Outcome:	6
1.9 Project Outline.....	7
2.0 Summary	8
CHAPTER 2: LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Review on Existing or Similar Systems or Applications	9
2.2.1 e-Reporting PDRM.....	9
2.2.2 UNIMAS Support.....	15
2.2.3 Van311.....	19
2.3 Comparison of features between 3 existing systems or applications with the proposed application.....	25
2.4 Review on Tools and Technology	27
2.4.1 Software.....	27
2.4.1.1 Flutter	27
2.4.1.2 Firebase	28

2.4.2 Hardware	30
2.4.2.1 Xiaomi 10T Pro.....	30
2.5 Summary	31
CHAPTER 3: REQUIREMENT ANALYSIS AND DESIGN	32
3.1 Introduction	32
3.2 Methodology	32
3.3 Define Requirement	34
3.3.1 Analysis on Similar Existing Applications or Systems.....	34
3.3.2 Analysis on Proposed Application	35
3.3.3 Questionnaire.....	36
3.3.3.1 Demographic Information	36
3.3.3.2 Current Concern About Vandalism	38
3.3.3.3 Preferences for eVandalism Application.....	40
3.3.4 Software Requirements.....	42
3.3.5 Hardware Requirements.....	42
3.4 Design	44
3.4.1 Scenario Illustration.....	44
3.4.2 Overall System Architecture Diagram	45
3.4.3 Flow Chart Diagram	46
3.4.4 Context Diagram	49
3.4.5 Data Flow Diagrams (DFDs)	50
3.4.5.1 Level 1 Data Flow Diagram.....	50
3.4.6 Wireframe Design.....	53
3.5 Summary	58
CHAPTER 4: IMPLEMENTATION	60
4.1 Introduction	60
4.2 Application of Requirement	60
4.2.1 Flutter	60
4.2.2 Android Studio	61
4.2.3 Firebase	63
4.3 Proposed Application's Interfaces	64
4.3.1 Main Page.....	64
4.3.2 Report Submission Page	65
4.3.3 Thank You Page	66

4.3.4 Report Status Page	66
4.3.5 Report Status On Particular Report Page	67
4.3.6 Admin Login Page	68
4.3.7 Dashboard Page	69
4.3.8 Report Details Page	70
4.4 Summary	71
CHAPTER 5: TESTING AND EVALUATION.....	72
5.1 Introduction	72
5.2 Functional Testing.....	72
5.3 Non-Functional Testing	77
5.3.1 User Acceptance Test	77
5.4 Summary	82
CHAPTER 6: CONCLUSION AND FUTURE WORK.....	83
6.1 Introduction	83
6.2 Objective achievement	83
6.3 Project Limitations.....	84
6.4 Future Work	84
6.5 Summary	85
REFERENCES	86
Appendix A: Gnatt Chart.....	89
Appendix B: Sample Questionnaire.....	90
Appendix C: User Acceptance Test (UAT) Survey	95

List of Tables

Table 2. 1 Comparison Of Features Between Three (3) Existing Systems Or Applications With The Proposed Application.....	25
Table 3.1:Functionalities of Proposed Application	35
Table 3.2: Reason for Not Reporting Vandalism	39
Table 3.3: Software Requirements for the Proposed Application.....	42
Table 3.4: Hardware Requirements for the Proposed Application	42
Table 3.5: Data Flow between Application and External Entities	50
Table 4.1: Overview of installation requirements.....	60
Table 5.1: Test Case 1 – Create New Report Button	72
Table 5.2: Test Case 2 – Report Form Validation.....	73
Table 5.3: Test Case 3 – Return To Home Page Function	73
Table 5.4: Test Case 4 – View Report Button.....	74
Table 5.5: Test Case 5 – View On Specific Report	74
Table 5.6: Admin Login	75
Table 5.7: Admin Dashboard	75
Table 5.8: Change Report Status.....	76
Table 5.9: Notification Function For Admin	76
Table 5.10: Admin Log Out	77
Table 6.1: Achievements of eVandalism	83

List of Figures

Figure 1.1: Gantt Chart for Final Year Project of Current Progress.	6
Figure 2.1: Home Page of e-Reporting PDRM.	10
Figure 2.2: Rules and Regulation.....	11
Figure 2.3: Question and Answer.....	11
Figure 2.4: Information About the Reporter (Ali, 2022).....	12
Figure 2.5: Location About the Incident that Happened (Ali, 2022)	12
Figure 2.6: Description About the Report (Ali, 2022)	13
Figure 2.7: Police Report Draft (Ali, 2022)	13
Figure 2.8: Information About the Report (Ali, 2022).....	14
Figure 2.9: Home Screen for UNIMAS Now	16
Figure 2.10: UNIMAS Support Screen	17
Figure 2.11: Add New Ticket Screen.....	17
Figure 2.12: Information About the Ticket(s) Submitted	18
Figure 2.13: Home Page of Van311.....	20
Figure 2.14: Report Form- Step One (1) - (Location).....	21
Figure 2.15: Report Form – Step Two (2) - (Details)	21
Figure 2.16: Report Form – Step Three (3) - (Review)	22
Figure 2.17: Report Form – Step Fourth (4) - (Confirm).....	22
Figure 2.18: History of User’s Request.....	23
Figure 2.19: Search Request.....	23
Figure 2.20: Request Status.....	24
Figure 2.21: A/B test notifications (Firebase, n.d.).....	29
Figure 2.22: Specification of Xiao Mi 10T Pro (Xiaomi Mi 10T pro 5G - Full Phone Specifications, 2020).....	30

Figure 3.1: Phases of Waterfall Model.....	34
Figure 3.2: Age Group	37
Figure 3.3: Gender.....	37
Figure 3.4: State of Residence.....	38
Figure 3.5: Analysis Summary of Section B.....	39
Figure 3.6: How often do you notice signs of vandalism inside the campus?	41
Figure 3.7: Analysis summary for Section C	41
Figure 3.8: eVandalism Report Process	44
Figure 3.9: Overall System Architecture Diagram.....	45
Figure 3.10: FlowChart of the User Report.....	46
Figure 3.11: FlowChart of View Report	47
Figure 3. 12: FlowChart of Handle Report	48
Figure 3.13: Context Diagram for the Proposed Application	49
Figure 3.14: DFD Level 1 for User Report	50
Figure 3. 15: DFD Level 1 For View Report	51
Figure 3. 16: DFD Level 1 For Handle Report	52
Figure 3.17: Wireframe for Main Page	54
Figure 3.18: Wireframe for Report Submission.....	55
Figure 3.19: Wireframe for Thank You Page	55
Figure 3.20: Wireframe for Report Status Page.....	56
Figure 3.21: Wireframe for Report Status On Particular Report Page.....	56
Figure 3. 22: Wireframe for Admin Login Page.....	57
Figure 3.23: Wireframe for Dashboard Page	57
Figure 3.24: Wireframe for Report Details Page	58

Figure 4.1: Flutter Create New Project	61
Figure 4.2: Android Studio SDK Manager	62
Figure 4.3: Setup Virtual Device Manager	62
Figure 4.4: Overall Steps for Firebase Configuration	63
Figure 4.5: Main Page Interface	64
Figure 4.6: Report Submission Page Interface	65
Figure 4.7: Thank You Page Interface	66
Figure 4.8: Report Status Page Interface.....	67
Figure 4.9: Report Status On Particular Report Page Interface	68
Figure 4.10: Admin Login Page Interface.....	69
Figure 4.11: Admin Dashboard Page Interface	70
Figure 4.12: Report Details Page Interface	71
Figure 5.1: The Application Performs All Intended Functions	78
Figure 5.2: The App Uses Mobile Features Correctly	78
Figure 5.3: The Flow Of The Application Is Easy To Understand	79
Figure 5.4: The Interface Was Intuitive And Easy To Understand.....	79
Figure 5.5: Do You Think The Application Is Hard To Use?.....	80
Figure 5.6: Do You Like The Mobile User Interface Of The Application?.....	80
Figure 5.7: Do You Think The Application Provides Helpful Error Messages When Creating A New Report?.....	81
Figure 5.8: Do You Encounter Any Difficulty Or Error While Using The Application?.....	81

CHAPTER 1: INTRODUCTION

1.1. Introduction

Vandalism is an act that destroy or damaging any property that belong to other people (Cambridge Dictionary, 2020). Vandalism has always been a problem for many countries. According to Mohd Rashidi (2024), the number of report from 2020 to early this year is about 14229 incidents being reported. The reasons for teenagers who engage in vandalism diverse from many prospective, some did it out of boredom, some feels excited and happy when they succeed in destroying properties, while there are also some individual, who just wanted to express their anger or frustration (Berita Harian, 2023).

The impact of these acts of vandalism act can affect individual, society and even the entire country. Vandalism on utility facilities and telecommunications infrastructure has incurred significant costs for the government, particularly due to the need to replace damaged equipment to ensure proper functionality (Ten, 2024). This also applies to any education institution. When one does vandalism act, the institutions would need to repair or replace the damaged property to ensure that other students can have a conducive environment for studying. The impact would be more significant if it affects the faculty's facilities, as damaging a single component inside a machine can cause to major problems, such as the making the computer inoperable, especially during a computer lab exam, if personal laptops are not permitted.

Furthermore, there are many reason why vandalism often goes unreported. One of the common reason is the fear of the retaliation from the individual or group they are reporting on (Crimestoppers225, 2023). This also could happen in education institutions where the reporter might get retaliation from the vandal as the vandal only need to search around the campus to look for the reporter. This further indicate that the importance to protect the reporter's identity so they will not easily get retaliation from these vandals.

1.2 Problem Statement

The current vandalism reporting system is normally handled in traditional way which is doing manual file reporting to the person-in-charge or a specific department that will handle these cases. However, it is a time-consuming process as the reporter would need to ask around in order to determine who or how they should file the report to. This often lead to discourage in reporting any vandalism incidents, whether they occur inside the campus or outside of the campus.

Besides, many educational institutions do not provide clear instructions or methods on how to report vandalism incidents. This lack of communication often left the students feeling confused as they do not know that even if they took an effort in making the report, will the report even reach the person-in-charge or not.

Furthermore, there is currently no specific system in place for students to report vandalism incidents at UNIMAS. The absence of a proper reporting system complicates the reporting process, as the only way for students to report a vandalism incident is through the UNIMAS support which is also used for other matters like academic matters, financial matters, hostel management & maintenance and others. Consequently, this issue could lead to that the report of vandalism might be ignored or being delayed since there are going to be so many request and some might be more urgent which need to be tended first. Kaarle (2021) mentioned that one of the reason why incident reporting systems fail in universities is because of too many reporting systems and lack of clear responsibilities. This issue might lead to the same report is being overlap with different departments which might contribute confusion to the person-in-charge.

Additionally, Adrian (2022) highlighted that with mobile technology become more common, real-time incident reporting systems is no longer being restricted by the lack of technology. He also mentioned that if one is using legacy reporting systems which is through a

physical form submission to the system, these incident reports will take time for it to reach the person-in-charge since it would require a someone to deliver these reports to the person-in-charge personally. However, with the help of mobile incident reporting software, one can submit an incident on-the-spot through their mobile phones. Similarly, Lawbirdie (n.d.) also mentioned that with the help of mobile reporting system, one can make evidence collection more efficient as mobile phones are portable which allow one to make an incident report on-the-spot through the mobile application.

Moreover, vandalism can be categorised into few types. Two common types of vandalism that can happen in schools, campus or public spaces are graffiti art and public property destruction. As mentioned by Faiz Zainudin (2017) a vandalism case happen in Universiti Kebangsaan Malaysia (UKM) where the signboard of the UKM at main campus is being vandalised by the graffiti word “MATI” on the signboard. Another type of vandalism is done by a group of students destroying teacher’s property, breaking the school’s toilet’s doors and other public property (Berita Harian,2023).

1.3 Objectives:

The objectives for this project are:

1. To analyse the current challenges faced in vandalism reporting within educational institutions by collecting data through a survey.
2. To develop a mobile application for reporting vandalism incidents.
3. To evaluate the functionality and effectiveness of the developed system through testing and feedback from users.

1.4 Methodology:

The methodology used for this mobile application is the Waterfall Model. This approach is chosen because it is a straightforward, well-defined project management methodology especially when the requirements are clearly defined in the early stages of the project. One of the biggest advantage of this methodology is that the developers can identify and address the design errors during the analysis and design phases. Since these phases are primarily theoretical and involve no coding which make it easier and less disruptive when changes are being made. In contrast, discovering issues related to requirements of the project or design during the implementation phase can be significantly more challenging. This is because during this phase, coding is already underway, which make it harder to incorporate changes without causing disruptions. In the worse-case scenario, the entire codebase might need to be scrapped and started over. To fully utilize Waterfall Model, there are 6 phases need to be followed. Which are define requirements, design, development, testing, deployment, and maintenance.

The initial phase or define requirements phase involves gathering and documenting all necessary requirements from the stakeholder and analyse these requirements to define the scope and the objectives of the projects. Next, in the design phase, the requirements will be translated into a detailed design for the mobile application. This involves creating prototype user interfaces and database design using various tools that is available online such as Canva, draw.io and others. This phase is very important as the subsequence phase, development phase will rely on the designs created during this stage to guide the implementation of the user interface and database structure.

Furthermore, development phase is where the actual coding takes place. The developers will write the application based on the design specification that is written in the design phase. This phase will work closely with the subsequence phase, testing phase. This is because if there are any defects or missing certain required functionalities, this application would need to

undergoes development phase again to ensure the application created meets the requirement of the project.

After that, deployment phase is the stage that application will be deployed online and is ready for the intended user to install and use the application. Finally, the maintenance phase involves ongoing support and monitoring of the application after deployment. This phase is crucial for the long-term success of the application as no system can be perfect. Therefore, a continuous maintenance can help to improve user satisfaction and enhance functionality.

1.5 Scope

The project scope covers one main user that is the UNIMAS student. The mobile application will provide UNIMAS student a mean for them to report any vandalism cases. This allow them to file a report quickly and efficiently compare to traditional method, where one would need go to the department in charge to make a report.

Despite that, there are also few limitations of this mobile application. The application is mainly focus on providing a mobile platform for student to make the report providing the whole reporting process simplified. Therefore, the application may not provide a tracking system about the report being reported, a dashboard for administrator, only available for Android system for the moment.

1.6 Significance of Project:

This project aims to address the persistent issue of vandalism on campus by providing an efficient reporting application for students. Vandalism always pose both financial and safety risks which will affect both students and the university. High repair costs is always a problem for university since the budget being allocated is always been limited. While the safety risk will be more significance since a single faulty component could cause quite a big problem especially in the mechanical field. Therefore, by enabling a faster incident reporting, the application could minimise these risks to ensure university would have a well-maintained environment where students can study safely.

1.7 Project Schedule

The project is expected to be finished within two semesters, Semester 1 and Semester 2 of 2024/2025. The Figure 1.1 will only show the current progress and the complete version Gantt chart will be shown in **Appendix A** of the report.

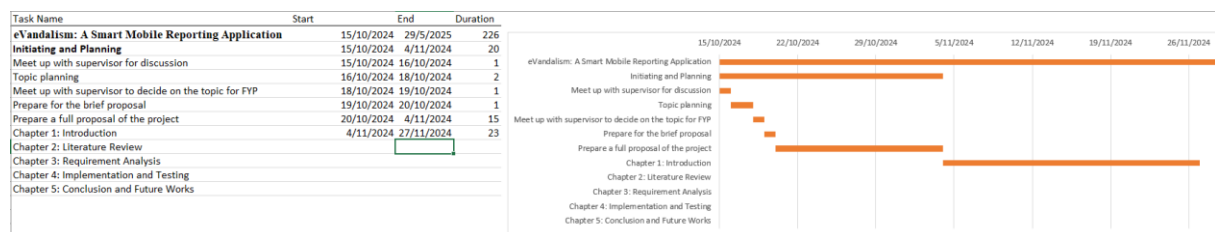


Figure 1.1: Gantt Chart for Final Year Project of Current Progress.

1.8 Expected Outcome:

The expected outcome of this project is a fully functional mobile app that can provide a mean for students to make a report on vandalism incident. The dream outcome is that the vandalism activity can be completely vanished from the campus in order to protect the university's property. This application will serve as a bridge for communication between students and

university to demonstrate that the university is also taking these vandalism incidents seriously. This also could result in increasing the sense of responsibility among the students in preventing vandalism for continue to happen inside the campus as students know that university stands beside them to tackle the problem together.

1.9 Project Outline

There are five (5) chapters in this paper to explain the development of the eVandalism: A Smart Mobile Reporting Application which are Chapter 1: Introduction, Chapter 2: Literature Review, Chapter 3: Requirement Analysis and Design, Chapter 4: Implementation, Chapter 5: Testing and Evaluation, and Chapter 6: Conclusion and Future Work.

Chapter 1: Introduction provide a detailed overview about the project, eVandalism: A Smart Mobile Reporting Application in order to let the readers to have a clear overview about the proposed eVandalism application to be developed. This chapter consists of eight (8) sections to give a detailed explanation about this project. The eight (8) sections are background, problem statement, aims and objectives, methodology, project scope, significance of the project, project schedule and project schedule.

Chapter 2: Literature Review discusses and evaluate the existing or similar vandalism reporting applications to identify the limitations and scope of the application. The functionalities of the proposed application will also be discussed in this chapter. Comparison between the proposed eVandalism application and existing application will be done in this chapter as well.

Chapter 3: Requirement Analysis and Design focus on analysing user requirements and design for the eVandalism application. After that, visual representations like system architecture, Data Flow Diagram (DFD), Unified Modeling Language (UML) Diagram, flowchart, Data Dictionary, and proposed system wireframe will be created.

Chapter 4: Implementation will be focusing on implementing the proposed eVandalism application which include the prototype, screenshots of the interface layout of the application. The steps of installing the application of requirement will also be discussed in this chapter.

Chapter 5: Testing and Evaluation emphasize on the detail of testing the application to ensure there is no bug or the application is running as expected by conducting test cases. The test case result will be documented for bug fix or as a proof that this is the expected outcome.

Chapter 6: Conclusion and Future Work provides a summary about the proposed eVandalism application. This chapter will also discuss about the objectives and user requirements accomplished.

2.0 Summary

In summary, this chapter discusses about introduction of the eVandalism: A Smart Mobile Reporting Application, problem statement, objectives, methodology, scope, significance of project, project schedule, expected outcome and project outline. All of these are discussed in order to provide readers a comprehensive picture of the suggested eVandalism application that will be developed.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this chapter, three (3) existing systems or applications with similar features as the proposed system will be studied and reviewed. The reviews are mainly based on the functionalities, feature available and disadvantages of the system or application. After that, the software tools and hardware that are going to use in the development phase will be reviewed in this chapter as well. The system here refers to the website that anyone can access through browser by entering the website link while the application refers to the application that user can download through Google Play Store or Apple Apps Store. The system(s) or application(s) that can be only used in certain region or it is unavailable for the user from Malaysia will not be included in this review section.

2.2 Review on Existing or Similar Systems or Applications

2.2.1 e-Reporting PDRM

System e-Reporting PDRM is a system that is prepared by PDRM for public to make a police reports through the internet. However, only cases that is not related to crime can be reported through this system (Zaki, 2024). To use this e-Reporting PDRM system, users can access it through any browser with the link as followed “<https://ereporting.rmp.gov.my/index.aspx>” or just search for e-Reporting PDRM. After enter the link, the user will be redirected to the page as shown in Figure 2.1. After that, user must register their account first before they can use this e-Reporting system. After providing the identification card number, a pop-up reminder will be shown like Figure 2.2 and a form of question will show up just like Figure 2.3. To complete the e-Reporting process involves five (5) steps as shown in Figure 2.4 to Figure 2.8.

The first step of the process is filling up the reporter's personal information according to the form requirements as shown in Figure 2.4. After that, pin the location or type the location into the form manually to indicate where the incident happened as shown in Figure 2.5. The reporter would also need to include the time and date when did that incident happen. Next, the reporter will be required to fill in the description about the report base on which option that the reporter had chosen in Figure 2.3. The form is shown like in Figure 2.6. The fourth step is for reporter to double-check the police report draft before submission as shown in Figure 2.7. After submit, the user or reporter will get to the page like in Figure 2.8 where the user can know which polis station they should go to if they want acquire more information about the police report matters.

There is some drawback on the e-Reporting system which is that, the system cannot take photo directly through the phone cameras or laptop's camera. Secondly, there are many rules and regulation which will make users or reporters to refuse using the system and they would prefer just report physically to the closest police station as it is not easy to descript one incident with words unless there are pictures to support the stand. Third drawback is that whenever the user wanted to make a new report through this e-Reporting system, they are required to fill in their personal information every time.

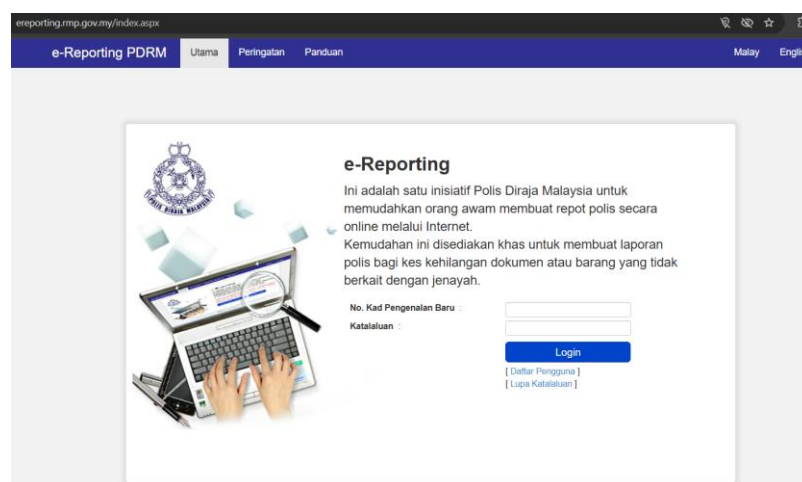


Figure 2.1: Home Page of e-Reporting PDRM.

ereporting.mrp.gov.my/index.aspx?lang=english

e-Reporting PDRM Main Reminder Guide Malay English

Reminder

For incident that requires immediate police action, please contact Royal Malaysia Police Control Center at +60 (3) 2266 3333 or +60 (3) 2031 9999 or dial 999 or refer to the nearest police station.

It is advisable in the following case of emergencies:

1. Require immediate police response;
2. Case that is still ongoing;
3. Suspect is still at the scene or nearby;
4. Life threatening case;
5. Missing person case;
6. Physical evidence (including blood, fingerprints or any article) is still left at crime scene; or
7. If the relevant party needs authorization of the police report, you need to get the signature of the officer/Chief of Police of the Station at the station.

Warning

- Section 182 of Penal Code (Act 574). Providing false information. Carries a maximum penalty of 6 months imprisonment, or with fine which may extend to two thousand ringgit (RM2,000), or with both.
- Section 233 of Communications and Multimedia Act 1998. Improper use of network facilities or network service, etc. Carries a maximum penalty of 1 year imprisonment, or with fine which may extend to fifty thousand ringgit (RM50,000), or with both, and a further fine of one thousand ringgit (RM1,000) for each day the offense continues after conviction.

☐ I am 18 years old and above and a Malaysian citizen.

☐ I hereby confirm the police report that I am lodging does not involve any crime matter.

Cancel Next

[Forgot Password]

Figure 2.2: Rules and Regulation

ereporting.mrp.gov.my/index.aspx?lang=english

e-Reporting PDRM Main Reminder Guide Malay English

Please answer the following question before lodging a police report :

1. How do you suspect the incident happened?

☐ Dropped ☐ Misplaced ☐ Disappeared ☐ Cancellation Of Maid Work Permit ☐ Natural Disaster

2. How many times the incident happened?

☐ 1st time ☐ 2nd time ☐ More than twice

3. What is the purpose of the report is made?

☐ Replacement ☐ Demand ☐ Court ☐ Personal

Cancel OK

Figure 2.3: Question and Answer

ereporting.rmp.gov.my/r

e-Reporting PDRM

1. 2. 3. 4. 5.

Butiran Peribadi :

Nama Pengadu * :

No. Kad Pengenalan Baru * :

Tarikh Lahir * :
 Tahun

Jantina * :

Warganegara * :

Keturunan * :

Agama * :

No. Telefon Bimbit *

No. Telefon Rumah :

No. Telefon Pejabat :

Figure 2.4: Information About the Reporter (Ali, 2022)

ereporting.rmp.gov.my/r

e-Reporting PDRM

1. 2. 3. 4. 5.

Butiran Kejadian:

Tempat Kejadian * :

No.Lot / Bilik / Pejabat / Rumah / Bangunan :

Nama Jalan * :

Nama Taman / Tempat * :

Poskod * :

Bandar * :

Figure 2.5: Location About the Incident that Happened (Ali, 2022)

ereporting.rmp.gov.my/r

e-Reporting PDRM

1. 2. 3. 4. 5.

Keterangan Kejadian :

Tarikh :
30/08/2022 Hingga 31/08/2022

Masa :
0000hrs Hingga 0000hrs

Tempat :
Kediaman

Alamat :

Daftar Barang Hilang

PADA 30/08/2022, LEBIH KURANG JAM 0000HRS HINGGA 0000HRS, SAYA MENDAPATI BARANG-

* Mandatori

« Kembali Seterusnya »

Figure 2.6: Description About the Report (Ali, 2022)

ereporting.rmp.gov.my/r

e-Reporting PDRM

1. 2. 3. 4. 5.

Perakuan :

Deraf Repot Polis

Butir Peribadi Pengadu

Nama :

No. KP (Baru) :

Jantina :
Lelaki

Tarikh Lahir :

Umur :

Keturunan :
Melayu

Warganegara :
Malaysia

Alamat Tempat Tinggal:

No. Telefon (Rumah) :

No. Telefon (Pejabat) :

No. Telefon (Bimbit) :

Figure 2.7: Police Report Draft (Ali, 2022)



Figure 2.8: Information About the Report (Ali, 2022)

2.2.2 UNIMAS Support

UNIMAS support was created for UNIMAS students or staff members to file a request or report problem in term of simplicity and efficiency. To access UNIMAS support, the user will need to download UNIMAS Now which is free to download at Google Play Store or Apple App Store that is accessible by everyone. After login to our UNIMAS Now, it will be as shown in the Figure 2.9 (Home Screen for UNIMAS Now). UNIMAS Now has many features included but the focus will be on the Support feature as that feature is also known as UNIMAS support.

After clicking into the Support feature in UNIMAS Now, the user will be redirected to the screen as shown in Figure 2.10 (UNIMAS Support Screen). In this page, the users can see their tickets tracking progress, how many ticket the user open, in progress and closed. To add a new ticket, just click on the 'Add Ticket' button to make a new ticket. The application will open a new screen as shown in Figure 2.11 (Add New Ticket Screen). After that, the user can select a category they wanted request or complaint on. There are 8 categories that is available to be chosen, which are general matters, ICT, facilities, financial matters, hostel management & maintenance, security and academic matters. The user can include the title for request or complaint subject, add description, location, images or documents to support this particular ticket they currently making. After including all the necessary information, the user can simply press the submit button to submit their ticket to the system. The user can track their submitted ticket(s) by swiping-up in the screen as shown in Figure 2.10 (UNIMAS Support Screen), the user will be able to see the information about their submitted ticket's status as shown in Figure 2.12 (Status About the Ticket(s) Submitted).

However, there are some disadvantages for this application. First and foremost, there are too many category option can be chosen when creating a new ticket for report which will increase the time for one's ticket to be verified by the staff or agent who will later redirect these ticket to the person-in-charge according to different category of the ticket. This problem will

not be significantly noticeable if there are too less tickets coming in at the same time. However, if there are many tickets that coming in regarding the academic matters which is a particular big problem for new intake students as they would need to fill in bunch of documents and how they pay for their tuition fees or login to their UNIMAS account using the two factor authentication (2FA). During this time, there will be a bunch of tickets coming in for the UNIMAS support as these new intake students will need to acquire all the information required to be submitted during the opening week. This matter will result in that most of the UNIMAS support team will focus on the academic matters as it is more urgent and should be prioritised which will lead to other category's ticket get neglected or delayed.

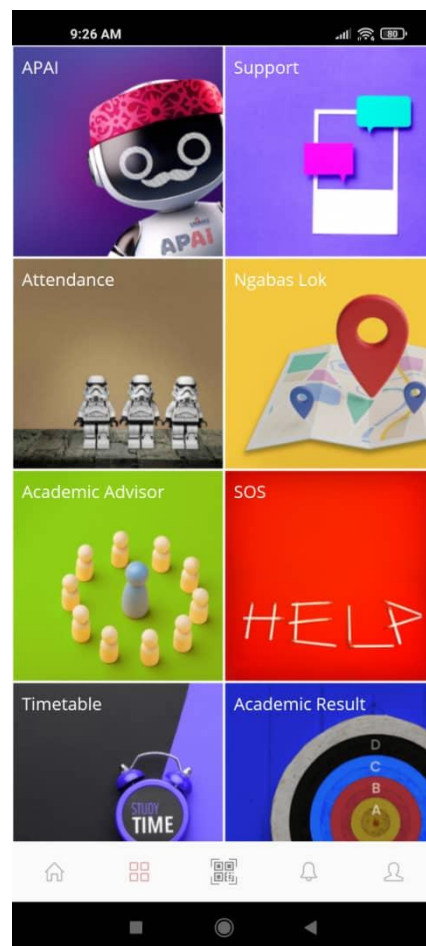


Figure 2.9: Home Screen for UNIMAS Now

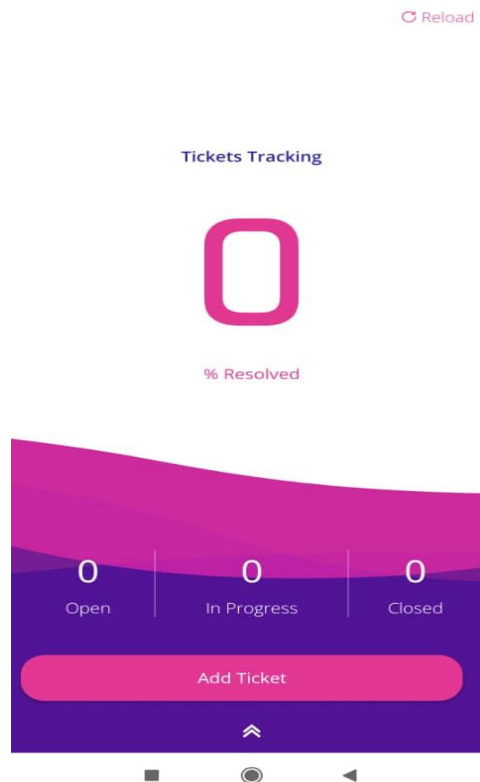


Figure 2.10: UNIMAS Support Screen

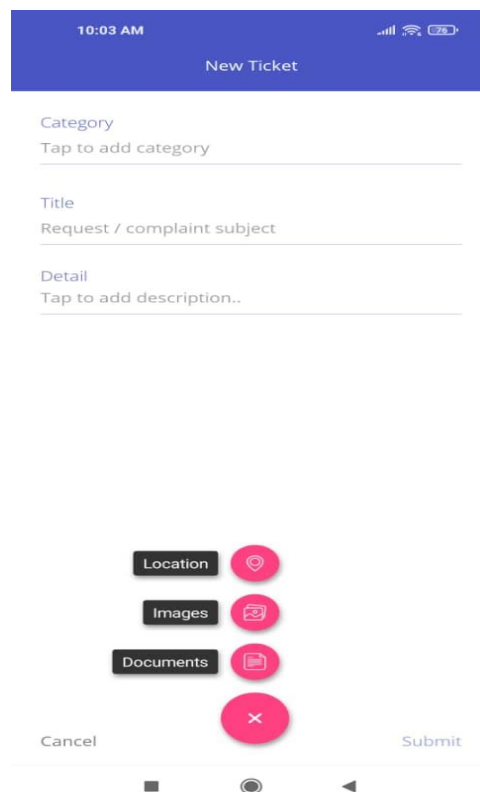


Figure 2.11: Add New Ticket Screen

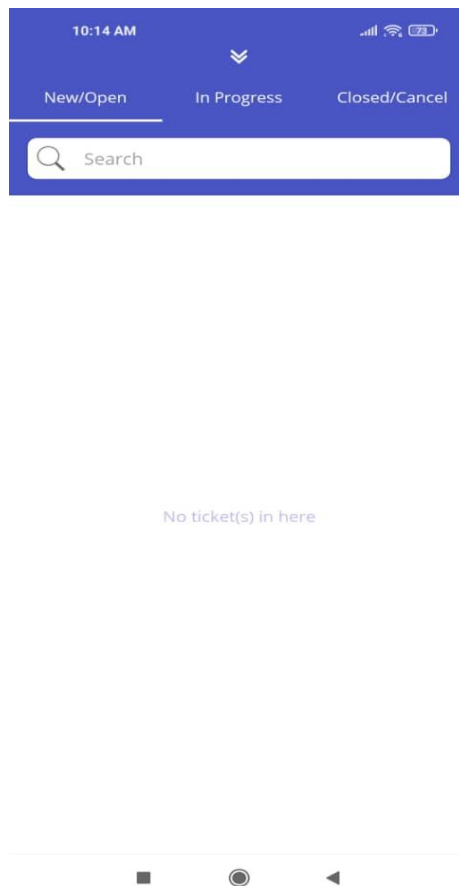


Figure 2.12: Information About the Ticket(s) Submitted

2.2.3 Van311

Van311 was developed by the City of Vancouver. The purpose of Van311 is to enable citizens for submitting service requests for issues like abandoned garbage, abandoned vehicle or dinghy, manage my existing bins, pothole, street lightning and lamps or storm. To use Van311 app, the user can download it for free from Google Play Store or Apple App Store which is accessible for everyone. To submit a new request, the user simply just choose one (1) of the six (6) requests as shown in Figure 2.13. After choosing the request category, user will go through process as shown in Figure 2.14 to Figure 2.17 to complete the request submission.

First of all, the user will have to fill in the location or give some details about that location if the user does not know their current location as shown in Figure 2.14. After that, step two (2) involves providing details which will be different for each form base on the request category that the user had chosen in Figure 2.13 when making a new request. The user will have the option to add files and write details to support their request as shown in Figure 2.15. In step three (3)-review, the user can check all the details that had been saved in the request form before submitting as shown in Figure 2.16. After submitting the request form, the page will tell the user the submission is successful and will give a case number for user when they want to check the request status as shown in Figure 2.17. The case number can be used to search the request status as shown in Figure 2.18 by clicking the “Search by case number” which will redirect the user to a search request page as shown in Figure 2.19. User can key in their case number in the page where the case number is the same as shown in Figure 2.17 to view their request status like the Figure 2.20 which shows the details about the request detail.

However, there are some disadvantages for this application. The first disadvantage of this application is that the user has to fill in personal information every time they make a new request. Another disadvantage is that the application only support uploading files for supporting

the request. It does not have the feature that allow user to take photo and upload it directly to the request form.

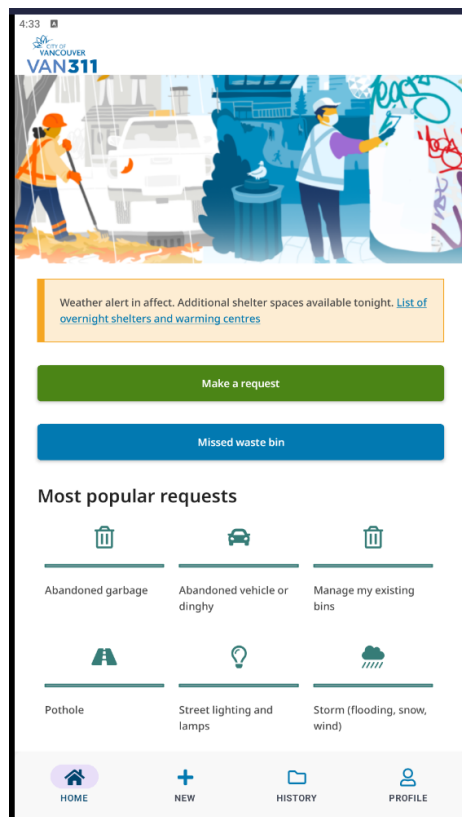


Figure 2.13: Home Page of Van311

9:35

VAN311

Abandoned vehicle or dinghy

1 Location 2 Details 3 Review 4 Confirm

Tell us about the location

Enter or search the map for an address to pin the location on the map.

666 KINGSWAY

[Locate me](#)

Map showing the location of 666 Kingsway in Vancouver.

Address selected **666 KINGSWAY**

Nearby address suggestions

Additional location details (optional)

Give us more details to help identify your location

HOME NEW HISTORY PROFILE

Figure 2.14: Report Form- Step One (1) - (Location)

9:35

VAN311

Abandoned vehicle or dinghy

1 Location 2 Details 3 Review 4 Confirm

Report abandoned vehicles on City property that have no valid insurance or no license plates.

Type of request: *

☒ Abandoned dinghy

☐ Abandoned or uninsured vehicle

Provide details: *

File Upload

(Optional) Help us identify the problem by uploading photos. [View guidelines](#)

Drag and drop Add files

About you (optional)

HOME NEW HISTORY PROFILE

Figure 2.15: Report Form – Step Two (2) - (Details)

5:43

VAN311

Abandoned vehicle or dinghy

Location Details Review Confirm

Review your request

Location and request details:	
Location:	602 KINGSWAY
Type of request:	Abandoned dinghy
Provide details:	nothing

File upload:

Contact information:

Name: dd dd

Email address: 69@gmail.com

Phone number: 888-539-5536

Submit

HOME NEW HISTORY PROFILE

Figure 2.16: Report Form – Step Three (3) - (Review)

5:46

VAN311

Abandoned vehicle or dinghy

Location Details Review Confirm

Thank you for your submission.

Case number: 201002053424

Abandoned vehicle: Parking Enforcement will check the vehicle within 7 business days for insurance details and registered ownership. If the vehicle meets the criteria as abandoned, further steps will be taken for the removal of the vehicle. If the vehicle does not meet the criteria as abandoned, it will be reviewed for other Parking Enforcement action.

Abandoned dinghy: Parking Enforcement will review and take appropriate action as required.

An e-mail confirmation has been sent to 69@gmail.com

HOME NEW HISTORY PROFILE

Figure 2.17: Report Form – Step Fourth (4) - (Confirm)

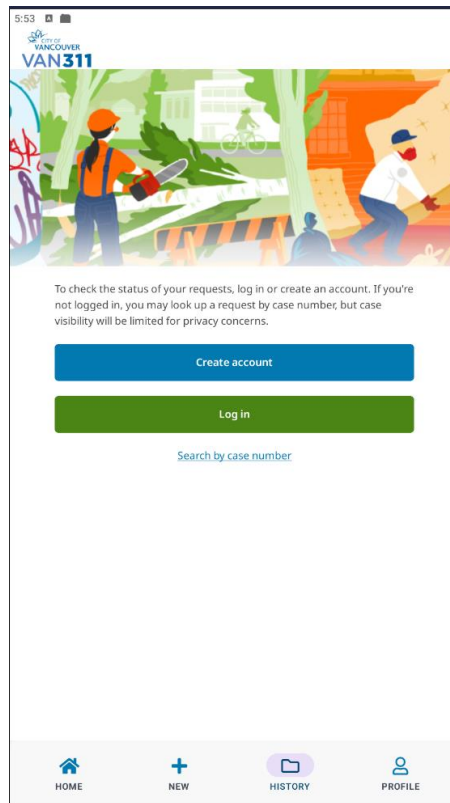


Figure 2.18: History of User's Request

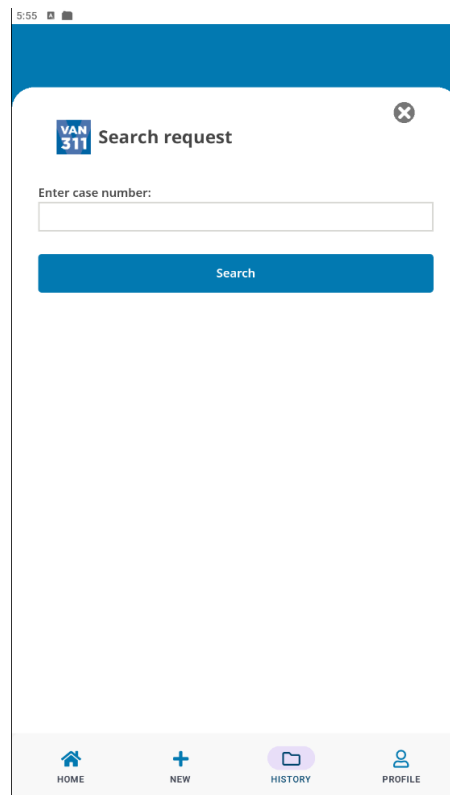


Figure 2.19: Search Request

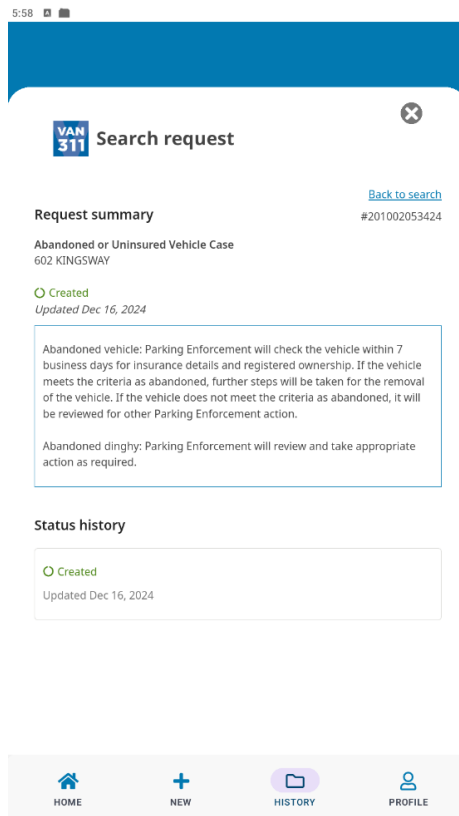


Figure 2.20: Request Status

2.3 Comparison of features between 3 existing systems or applications with the proposed application

Table 2. 1 Comparison Of Features Between Three (3) Existing Systems Or Applications With The Proposed Application.

Features	Existing Systems or Applications			Proposed Application
	e-Reporting PDRM	UNIMAS Support	Van311	
Have multiple category for report/request form	✓	✓	✓	X
Send report/request directly to person-in-charge	X	X	X	✓
Able to upload file as evidence	X	✓	✓	✓
Able to take photo and upload directly	X	✓	X	✓
Require user to enter personal information on every report	✓	X	✓	X
Single step report/request submission	X	✓	X	✓

Based on the Table 2.1, we can know that all three (3) existing application or system have multiple category for report or request form for submission. With so many different type of report or request going through one channel or medium will overburden the support team that handle all of these requests and might lead to low efficiency of handling each request. While the proposed application only focus on one type of report which is vandalism. Furthermore, the three (3) existing application or system does not have the feature of sending the report or request directly to the person-in-charge. For the e-Reporting PDRM, the report is only for non-crime cases like missing Identity Card, passport, credit/ATM card, handphone, laptop, road tax and housemaid who ran away from employer. Most of the case is required one to report to the closest police station to make a police report in case of misuse of their personal information or credit card. This case does not really involve a person-in-charge to handle their report or request while UNIMAS Support and Van311 would only inform the person-in-charge

after the support team or staff approved the report or request form. It might not be a good practice to have a ‘middleman’ to verify the request or report before sending to the person-in-charge as if the ‘middleman’ knows that certain request or report is related to themselves or their close relative, they can just simply disapprove the request or report. Since they had the power to decide which request or report form should let the person-in-charge know. While the proposed application does not have this issue as all the report will be directly send to the person-in-charge without a ‘middleman’ to filter the report. Next is the feature to upload file as evidence, UNIMAS Support and Van311 both can upload file as an evidence to support their report. While, e-Reporting PDRM does not have this feature for uploading file as an evidence to support their report. As for the proposed application, it is going to have this feature where users can upload file to support their report. Additionally, among the existing application or system, only UNIMAS Support have the feature that allow user to take photo and upload the photo directly as evidence. This feature will be implemented in the proposed application to allow user to take real-time evidence and upload it to the form. Moving on, e-Reporting PDRM and Van311 requires user to fill in their personal information every time they wanted to make a new report. While the proposed application is same with UNIMAS Support where user will not need to fill up any personal information when they wanted to make a report. Lastly, UNIMAS Support follow the single step report/request submission where the user only need to fill up everything in a single page or step and can proceed with the submission. While e-Reporting PDRM and Van311 need go through several steps before user can submit the form. As the proposed application aims to simplify the reporting process so it will also have this feature where the user will fill in required information within one page or step. In conclusion, the proposed application is developed to help in handling the vandalism activity with simplified reporting process.

2.4 Review on Tools and Technology

This section review and discuss the tools and technology requirements in term of software and hardware for the development of the proposed system, eVandalism: A Smart Mobile Reporting Application.

2.4.1 Software

This section review on the software that would be used in the development of the proposed application.

2.4.1.1 Flutter

Flutter is an open-source framework developed by Google which allow developers to build an application's user interface(UI) for different platforms like Android, IOS, Windows, MacOS, Linux and the web by using a single codebase (Amazon, n.d.). Flutter was first introduced in 2015. However, flutter was only officially launch in 2017 by Google when they release the first commercial Flutter App. Flutter quickly gained significant popularity due to it fast development cycle, flexible UI and high performance cross-platforms (Vikas, 2023). Flutter has one key feature why it become popular among the developers which is the “hot reload” feature. Flutter “hot reload” feature allows developers to almost instantly see the changes they made to the code without restarting the application. This feature leads to a highly efficient development process and could have a smooth debugging experience without repetitively restarting the application.

The programming language used by Flutter is Dart which is also being developed by Google. Flutter offers three (3) type of design pattern architecture which can be used in the Dart programming. The three (3) design pattern architecture are Model-View-Controller (MVC), Model-View-Presenter (MVP) and Model-View-ViewModel (MVVM) (Sparkleo, 2023). Dart

programming language achieved the “hot reload” feature by having their unique features, which are Ahead-of-Time (AOT) and Just-in-Time (JIT) compilation methods (Michał & Inez, 2024). Therefore, Flutter is chosen to be used in developing the proposed system.

2.4.1.2 Firebase

Firebase is a comprehensive platform that was developed by Google in 2014. It is a powerful tool designed to simplify the development process and help achieve faster time-to-market for mobile and web applications (Sophia, 2024). Some of the tools and features provided by Firebase are realtime databases to analytics, app hosting, authentication and cloud storage (Firebase, n.d.).

One of the feature that make Firebase a popular is realtime database functionality. Realtime database allow data to be synced across all client in realtime, ensuring that changes are almost immediately reflected to all connected devices. Additionally, the Realtime Database SDKs utilise local caching on the device to serve and store changes whenever the user goes offline. When the user’s device regains an internet connection, the data cache will automatically be synchronised with the cloud database to ensure all changes are updated across all clients (Firebase, n.d.).

Another key feature is Firebase Authentication, which provides a simple and secure way to authenticate users using a variety of methods like email with password, social logins, phone auth, GitHub login and more. This reduces the complexity of implementing one’s authentication system or handling complex cases like account merging (Firebase, n.d.).

Furthermore, Firebase also provide Firebase Cloud Messaging (FCM). The FCM allows developer to send notifications and messages to the users on IOS, Android and the web at no cost. The notification messages are seamlessly integrated with Google Analytics for Firebase

which allow developer to track engagement and conversion in detail. The FCM also provide A/B test notifications which is particularly when the developer wanted to evaluate which version of the notification message perform best in achieving specific goals. This is done by sending different version of notification message to two (2) groups of user. The Figure 2.23 shows the example of A/B test notification (Firebase, n.d.).

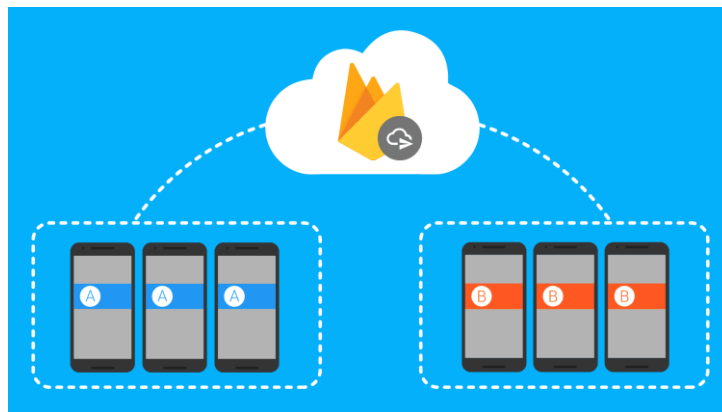


Figure 2.21: A/B test notifications (Firebase, n.d.)

2.4.2 Hardware

This section review on the hardware that would be used in the development of the proposed application.

2.4.2.1 Xiaomi 10T Pro

According to Marie Black, Mi 10T Pro is a powerful mid-range phone with some outstanding specs (Marie, 2020). Mi 10T Pro are using Octa-core Max 2.85GHz CPU (Central Processing Unit) and Adreno 650 GPU (Graphic Processing Unit). Mi 10T Pro has a triple-camera setup on the back and one front camera. The rear cameras at the back are 108 MP (wide), 13 MP (ultrawide) and 5 MP(macro). While the front camera is 20 MP (wide). These features from Mi 10T Pro helps in taking better quality of the picture and faster image processing. Figure 2.24 shows the specification of the Xiaomi 10T Pro.

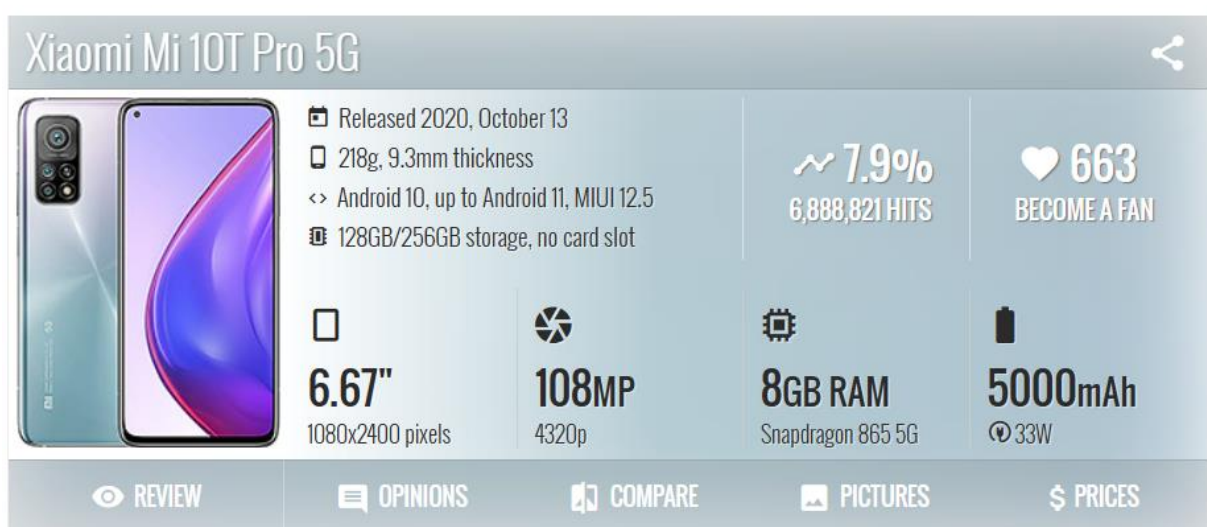


Figure 2.22: Specification of Xiao Mi 10T Pro (Xiaomi Mi 10T pro 5G - Full Phone Specifications, 2020)

2.5 Summary

In summary, this chapter review on three (3) existing or similar applications/systems. The features of the existing system are being compared and reviewed to generate new ideas which can be the unique sell point for the proposed application. Besides that, the tools and technology that is going to be used in the developing phase to develop the proposed application is being studied and reviewed.

CHAPTER 3: REQUIREMENT ANALYSIS AND DESIGN

3.1 Introduction

This chapter is to discuss the chosen methodology used in the development of the proposed application. Methodology is also defined as a framework that is used to guide the programmer on planning, executing and delivering a project. The proposed methodology for this project is Waterfall Model which will be used in the development phase. According to Herawati et al. (2021), “the Waterfall Model is suitable for making systems that have a clear flow”. The proposed application also has a clear flow for application which make Waterfall Model a suitable methodology to be used for the proposed application.

3.2 Methodology

According to Figure 3.1, Waterfall Model consists of six (6) phases which are define requirements, design, development, testing, deployment, and maintenance. Waterfall Model is being chosen for this project is because the requirements of the project are clearly defined in the early stages. This is a big advantage of using this methodology because developer can identify and address the design errors during the analysis and design phases. These phases are mostly theoretical and coding is not involved yet, which allowing changes to be made much easier and with minimal disruption. In contrast, discovering issues with project requirements or design during the implementation phase is much harder. Since coding is already underway during this phase, incorporating changes becomes more complex and disruptive. In the worst-case scenario, it could require scrapping the entire codebase and starting over.

The first stage, known as the define requirements phase, involves collecting and documenting all relevant stakeholder needs, then analysing them to determine the project's goals and scope. Next, the requirements will then be converted into a comprehensive mobile

application design during the design phase. This phase involves utilising a variety of web tools, including Canva, Draw.io and others to create prototype user interfaces and database designs. This phase is very crucial because the ideas made in this phase will be utilised to guide the implementation of the database structure and user interface in the subsequent development phase. The survey questionnaire will also be distributed to UNIMAS students to collect feedback on the requirement for the proposed application.

Additionally, the real coding begins during the development phase. According to the design specification created during the design phase, the developers will create the application to fulfil the specification. This phase will collaborate closely with the fourth phase, testing phase. This is because the program would need to go through the development phase again to make sure it satisfies the project's requirements if it had any flaws or lacked of any necessary functionality.

The application will then be made available online for the intended user to install and use during the deployment phase. Lastly, after the application is deployed, it must be continuously supported and monitored during the maintenance phase. Since no system can be error-free, this stage is essential to the application's long-term success. As a result, regular maintenance can boost functioning and increase satisfaction among the clients.

However, only 2 phases which are define requirements and design will be discussed in this chapter while other phases like development, testing, deployment and maintenance will be discussed in the next chapter.

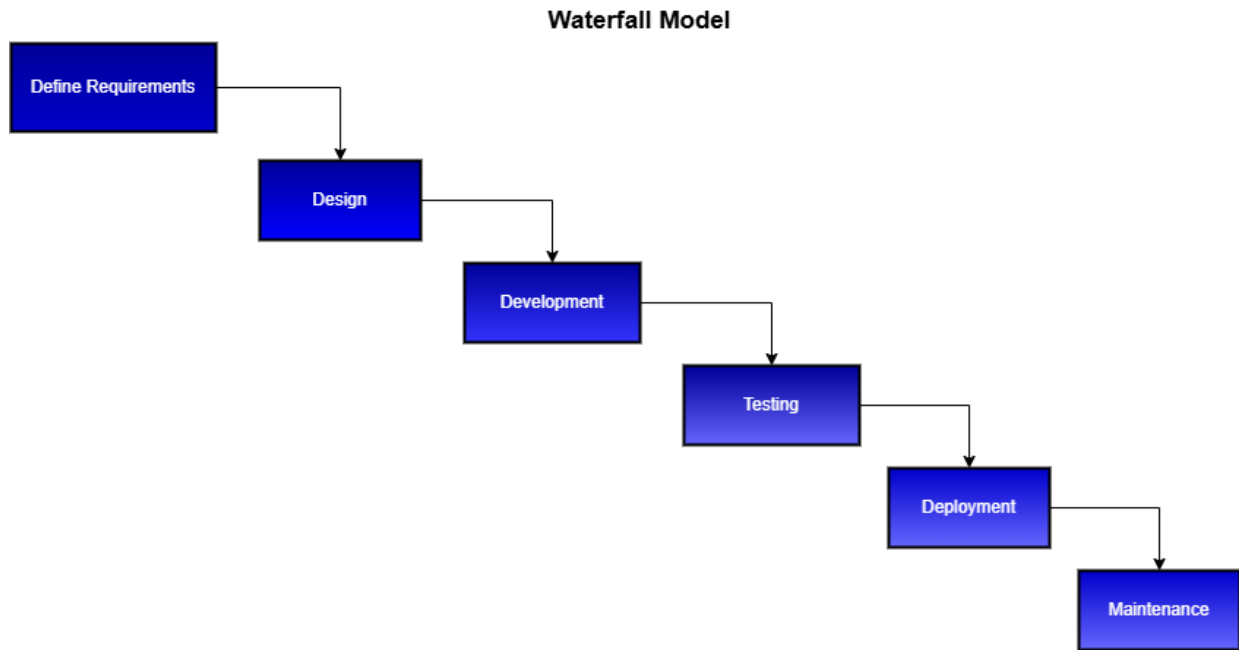


Figure 3.1: Phases of Waterfall Model

3.3 Define Requirement

Define Requirement is one of the phase in Waterfall Model where the proposed application, the eVandalism: A Smart Mobile Reporting Application will be defined and how it will be delivered. The requirements are identified and broken down into manageable tasks to ensure a clear understanding of the proposed application's objective. A survey is conducted to determine the awareness of vandalism among the UNIMAS students as well as the demand of the proposed application. Furthermore, this phase also will discuss about the software and hardware requirements.

3.3.1 Analysis on Similar Existing Applications or Systems

Based on the review on similar existing applications or systems in the previous chapter, there are few key features that need to take in consideration. First of all, the ability to take photo and upload directly should be included as it allows user to take the evidence(s) on spot directly instead of taking a photo through phone camera app and upload the file to the application or

system as evidence. Other than that, the ability to submit report without entering personal information or so called anonymous report which will encourage more reporter to utilise the application or system provided as they do not need to give their personal information whenever they wanted to file a report.

Moreover, single step report or request submission is highly beneficial for the users especially in this fast-paced modern lifestyle where most of the people have packed schedule. For most of them is like why bother to go through a complicated report filing when I had so many things on my hand already. Therefore, if the application or system support single step report or request submission feature, most likely these people will be more willingly to spare few seconds to make a report.

3.3.2 Analysis on Proposed Application

The proposed mobile application is designed and developed to address the drawback of the existing systems or applications. First of all, the main purpose of developing the proposed mobile application is to simplify the reporting process for the users. Besides, it is a direct report to the person-in-charge which make the report cannot be altered by anyone after it is being submitted. One of the basic requirement to use the proposed mobile application is the user's smartphone is able to take photos or upload photos as the user would be required to include evidence to support their report. Table 3.1 shows all of the functionalities of the proposed application.

Table 3.1: Functionalities of Proposed Application

User	Person-in-charge (Administrator)
• Upload Photo • Submit vandalism incident	• Receive report • Gives feedback on the application

3.3.3 Questionnaire

A survey was distributed randomly to a total of 25 UNIMAS students with the aim to gather feedback for the requirement analysis of the proposed application. The survey aimed to assess the respondents' awareness on vandalism and if they know where or who to report the vandalism incident. The survey was conducted through online platform, Google Form. This is to ensure the respondent can easily access to the survey. For the survey, there are three (3) sections which are Section A: Demographic Information, Section B: Current Concern About Vandalism and Section C: Preferences for eVandalism Application. A sample of the survey questions are included in Appendix B for reference. For the follow sub-sections, the analysis based on the respondents' responses will be conducted. The questions type for the survey is a combination of open-ended and closed questions

3.3.3.1 Demographic Information

Section A, demographic information is used to collect basic information of the respondent such as age group, gender and state of residence. This helps to ensure the survey can get from different perspective and is not solely from a group of targeted respondent.

First of all, the respondents were categorised into six (6) age groups as shown in Figure 3.2. However, all of the respondents are from the age group of 22-27 as the primary target respondents for this project is UNIMAS students. Therefore, gender and state of residence were also collected to ensure the data could be captured from diverse perspectives. According to the Figure 3.3, 64% of the respondents are male while 36% are female which clearly shown that the responses do not favour one gender only.

Besides that, all of the respondents answered the survey came from various states across Malaysia with the majority from Sarawak which is 68% of the total respondents as shown in

Figure 3.4. The second majority respondent are from Sabah with 12% while both Perak and Selangor each contributed 8% of the total responses. The smallest percentage of respondents came from Negeri Sembilan which is 4%.

Age Group
25 responses

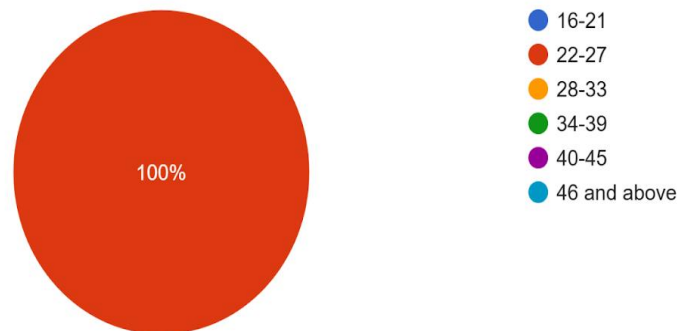


Figure 3.2: Age Group

Gender
25 responses

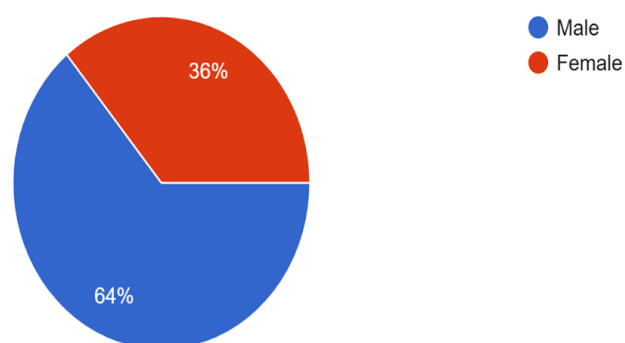


Figure 3.3: Gender

State of Residence

25 responses

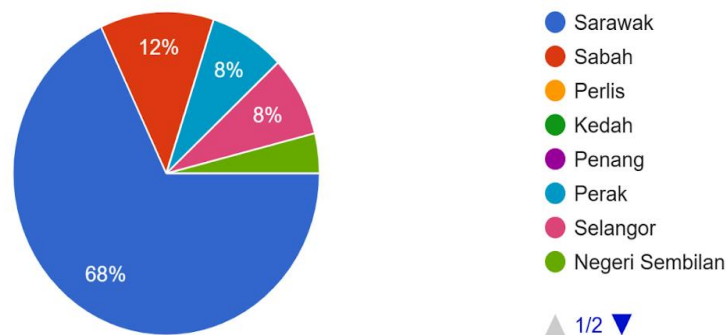


Figure 3.4: State of Residence

3.3.3.2 Current Concern About Vandalism

Section B evaluates the respondents' current concern about vandalism. 25 respondents agreed that vandalism is a crime that need to be punished. However, only 8% respondent witnessed someone conduct vandalism in the UNIMAS campus while 92% respondent has never witnessed the vandalism incident. Even though they never witnessed someone conduct vandalism in action, most of them still feel frustrated whenever they wanted to use the facility inside the faculty but they are being damaged. Among 25 respondents, only 8% respondent ever reported a vandalism incident while 92% of the respondent never reported an incident of vandalism. The Table 3.2 shows some of the reason why the 92% of the respondent do not make a vandalism report. Based on Table 3.2, most of the respondent stated that they do not know how to report, who or where they should report to and some even said there is no platform or channel for them to report the vandalism incident. While there are few thinks that even if they reported the vandalism incident, it is just wasting their time since there is no clear instruction on how they should make the report. Based on the respondent's answer, it is clearly that UNIMAS students would wanted to report vandalism incident if they witnessed it but currently,

there is no existing platform or medium for them to use and report the vandalism incident. Therefore, the proposed application would be significantly important since the main purpose of the proposed application is to provide a mobile platform for students to make report.

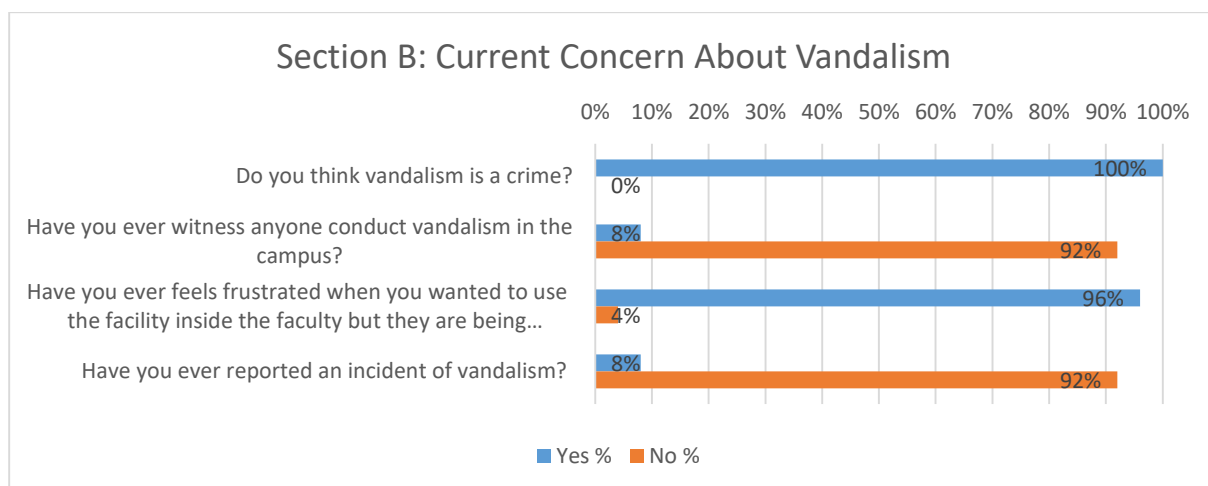


Figure 3.5: Analysis Summary of Section B

Table 3.2: Reason for Not Reporting Vandalism

Respondents	Reason for Not Reporting Vandalism
1	Lazy
2	Do not know where to report.
3	Do not know who to report and no platform to report
4	Do not know how to report
5	Do not know how to report
6	don't know who do the vandalism
7	Never saw someone doing it in front of me
8	No idea on how to report
9	Don't know how to report
10	No easy access medium to report it

11	Feel useless if reported
12	Do not know where to report
13	Do not know how to report
14	Not sure where or who I should report to
15	Does not have clear instruction on how to report or channel for report
16	Do not know how to report
17	No idea who to report
18	No idea who or where to report
19	Not sure where to report
20	Do not know who I can report to and no medium for me to report
21	Unsure where I should report to
22	No idea how the report should be done
23	No idea how to make a report

3.3.3.3 Preferences for eVandalism Application

Section C is to evaluate the respondents' preferences of the application and willingness to use the proposed application. Based Figure 3.6, 36% of the respondent answered that they are not often noticing the signs of vandalism inside the campus while 16% respondent answered slightly not often on noticing the sign of vandalism. 24% of the respondent stayed neutral while another 24% respondent answered slightly often on noticing the signs of vandalism inside the campus while there is no respondent answered that they very often notice the sign of vandalism inside the campus. It is a good sign that no one notices the sign of vandalism inside the campus very often as it means there might be some cases of vandalism but not happening in a large scale.

According to Figure 3.7, all of the respondent do not know where or who they should report the vandalism incident to and they all are willing to use an application to report the incident if the reporting process is simplified. Lastly, only 4% of the respondent preferred to report using real identification information provided while 96% of the respondent preferred anonymous reporting when using the proposed application.

How often do you notice signs of vandalism inside the campus?

25 responses

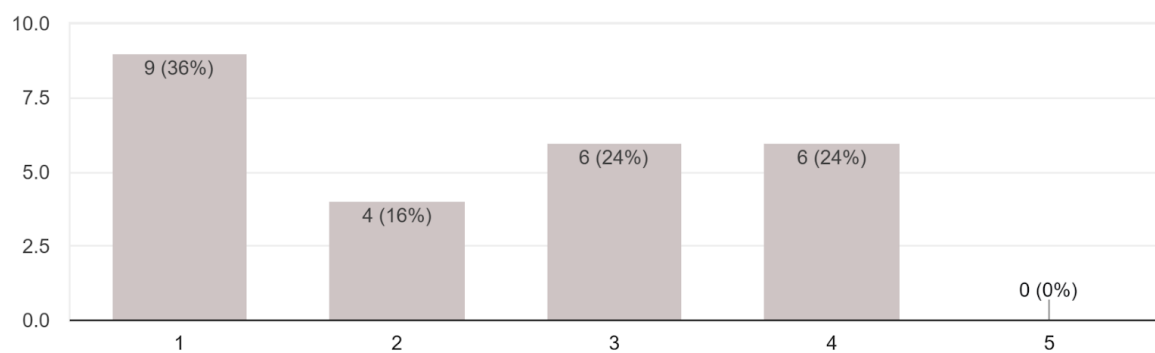


Figure 3.6: How often do you notice signs of vandalism inside the campus?

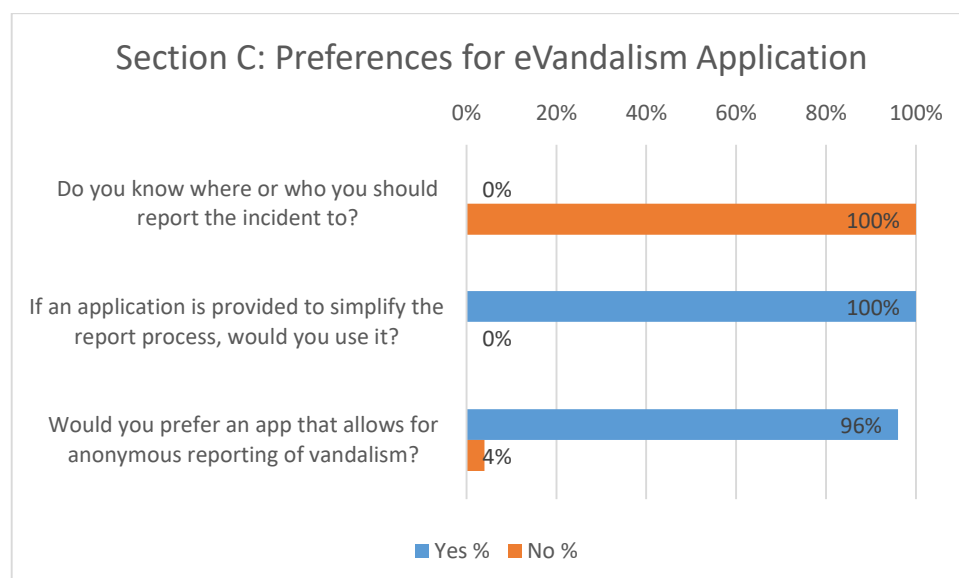


Figure 3.7: Analysis summary for Section C

3.3.4 Software Requirements

The software requirements for the proposed application have been discussed in Chapter 2.5.1 Software Analysis. An overview of the software requirements is as shown in the Table 3.3 below.

Table 3.3: Software Requirements for the Proposed Application

Software	Description
Flutter	To develop cross-platform applications with a single codebase for Android, iOS, web, desktop, and more.
Firebase	To provide backend services like real-time database, authentication, cloud messaging, and hosting.

3.3.5 Hardware Requirements

The hardware requirements for the proposed application have been discussed in Chapter 2.5.2 Hardware Analysis. An overview of the hardware requirements is as shown in the Table 3.4 below.

Table 3.4: Hardware Requirements for the Proposed Application

Component	Specification
Processor (CPU)	Octa-core Max 2.85GHz CPU for high performance and smooth multitasking.
Graphics (GPU)	Adreno 650 GPU for enhanced graphics and efficient media processing.
Rear Cameras	Triple-camera setup: • 108 MP (wide): High-resolution images.

	• 5 MP (macro): Detailed close-up photography. • Front Camera 20 MP (wide) for high-quality selfies and video calls.
--	--

3.4 Design

For the next phase after the requirement phase is the design phase in Waterfall Model. It is an important phase as most of the detailed design for the development phase will be designed in this phase. The designs such as Scenario Illustration, Overall System Architecture Diagram, Flow Chart Diagram, Context Diagram, Data Flow Diagrams (DFDs) and Wireframe Design are designed in this phase.

3.4.1 Scenario Illustration

This section illustrates the scenario for the eVandalism: A Smart Mobile Reporting Application on how the proposed system function. Based on Figure 3.8, whenever a vandalism incident occur, the user or reporter can directly use the eVandalism or the proposed application to make a report by taking photo of the incident and submit the form. The form will be directly sent to the person-in-charge without directing to a middleman for approve before sending to the person-in-charge. This is to ensure the person-in-charge can receive the latest report from the reporter and can take appropriate action immediately. After that, the person-in-charge can give feedback to the application to update the status of the report.



Figure 3.8: eVandalism Report Process

3.4.2 Overall System Architecture Diagram

System architecture is the conceptual model that defines the fundamental structure of a software system, providing programmers with a clearer understanding of the system under development. Figure 3.9 shows the general architecture on how the proposed application function. The system architecture of the proposed application contains two main components which are frontend and backend. In term of frontend component, it consists of four components which are user interface, submit report, view report and update report

For the backend, the proposed application utilises Firebase Firestore as the primary database. When the user submits the form from frontend, the data will be sent to the Firestore and stored at the Firestore.

The architecture is designed to facilitate seamless data submission and notification, providing simplified report mobile platform for the users to report incidents and for the responsible party to receive real-time notifications.

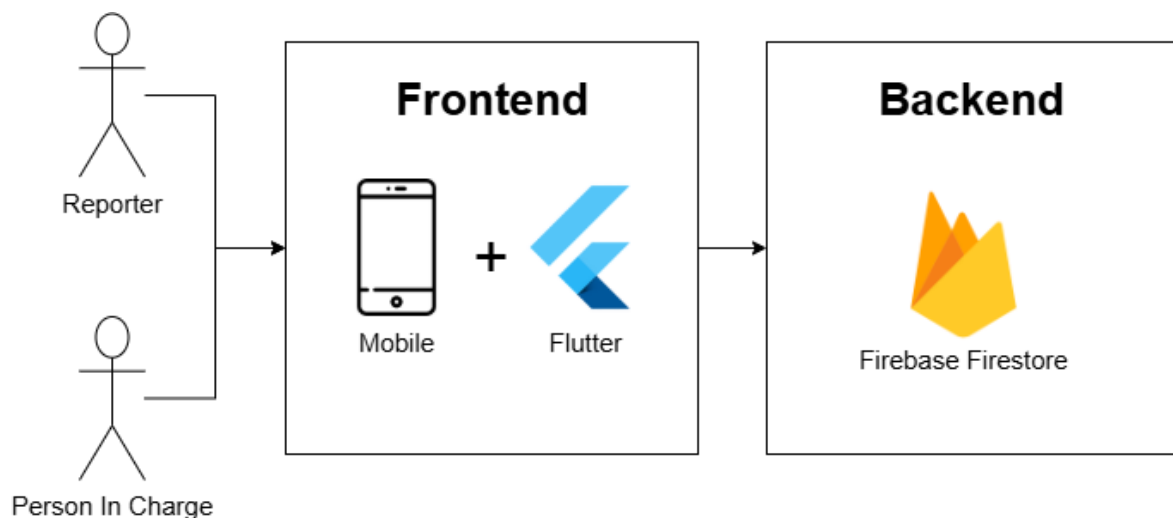


Figure 3.9: Overall System Architecture Diagram

3.4.3 Flow Chart Diagram

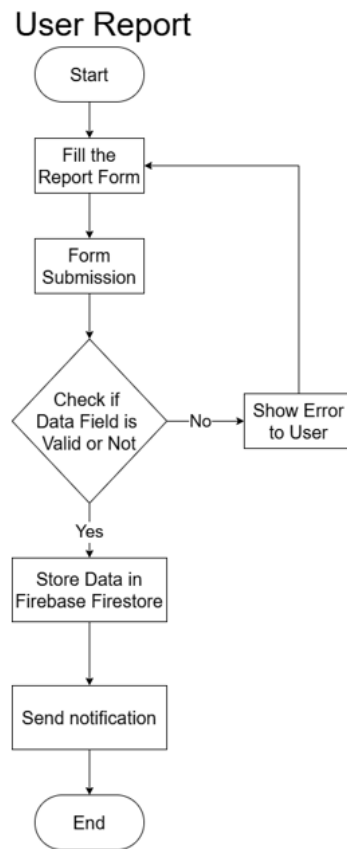


Figure 3.10: FlowChart of the User Report

Figure 3.10 shows the general flow of the proposed application from filling the report form to send email to the person-in-charge. The detailed explanation of the process in the flowchart in Figure 3.10 will be explained as follow:

1. Fill the report form

For the user, they can just fill in the form that is provided by the proposed application.

2. Form submission

After user fill all the required field on the form, user can submit the form.

3. Check if data field is valid or not

The form will be checked by the application to determine if the data field is valid or not.

If data is not valid, the application will show error message to the user and require the

user to fill-up the form again. If the data is valid, the application will send the data to the Firebase Firestore for storage.

4. Send notification to person-in-charge

The application will send notification to the person-in-charge to inform them there is new report coming-in.

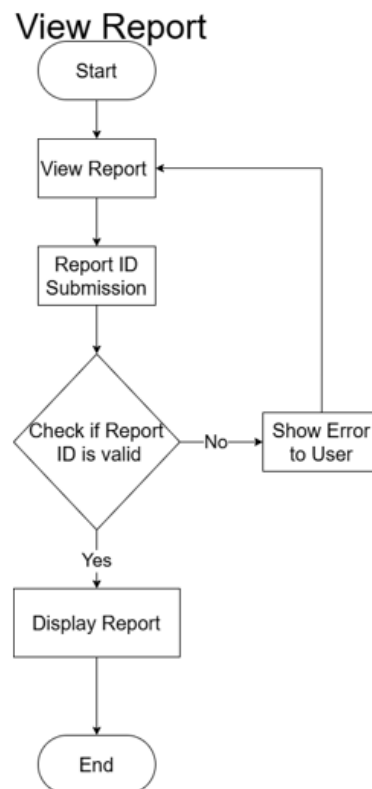


Figure 3.11: FlowChart of View Report

Figure 3.11 shows the general flow of the proposed application for viewing the report status that is being reported. The detailed explanation of the process in the flowchart in Figure 3.11 will be explained as follow:

1. Submit report ID

For the user to view their report status, they can submit the report ID that is being given to them when they finished the report.

2. Check if report ID valid or not

The Report ID will be validated, if the Report ID is not found in the database, then the application will show error message to the user. If the Report ID is found, the report status will be displayed to the user.

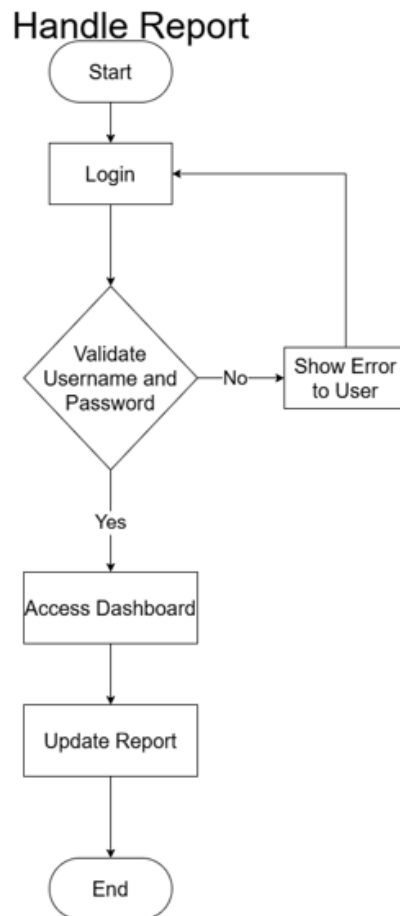


Figure 3. 12: FlowChart of Handle Report

Figure 3.12 shows the general flow of the proposed application for person-in-charge to handle the report. The detailed explanation of the process in the flowchart in Figure 3.12 will be explained as follow:

1. Login to the application

Person-in-charge can login to the application to access the dashboard that contain all the reports.

2. Validate username and password

The application will check if the username and password is valid or not. If not valid, show error message to the user. If valid, login as administrator.

3. Access dashboard

The dashboard will display all of the report from user along the details of the report.

4. Update Report

The administrator has the authority to update the report at the dashboard.

3.4.4 Context Diagram

Context diagram also known as Level 0 Data Flow Diagram (DFD) which is also the highest level in data flow diagram. Context diagram shows the interactions between the eVandalism: A Smart Mobile Reporting Application and the external entities. According to Figure 3.13, there are two external entities which are, user and Person-in-Charge. Table 3.5 below shows the data flow between the application and multiple external entities.

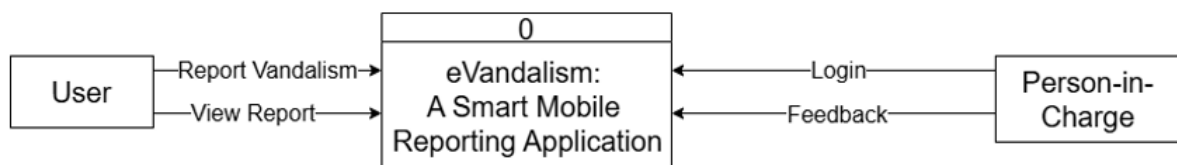


Figure 3.13: Context Diagram for the Proposed Application

Table 3.5: Data Flow between Application and External Entities

Data Flow Between eVandalism: A Smart Mobile Reporting Application and User	Data Flow Between eVandalism: A Smart Mobile Reporting Application and Person-in-Charge
• Report Vandalism • View Report	• Feedback • Login

3.4.5 Data Flow Diagrams (DFDs)

The Data Flow Diagram (DFD) provides illustration of the incoming data flow, outgoing data flow and store data. Through the data flow diagram, programmer can get a clearer understanding about the data flows within the proposed application. This section will discuss Level 1 DFD to highlight the data flow of the application.

3.4.5.1 Level 1 Data Flow Diagram

For the Level 1 Data Flow Diagram, there will be 3 main components which are user report, view report and handle report component. The 3 components will be discussed as follow:

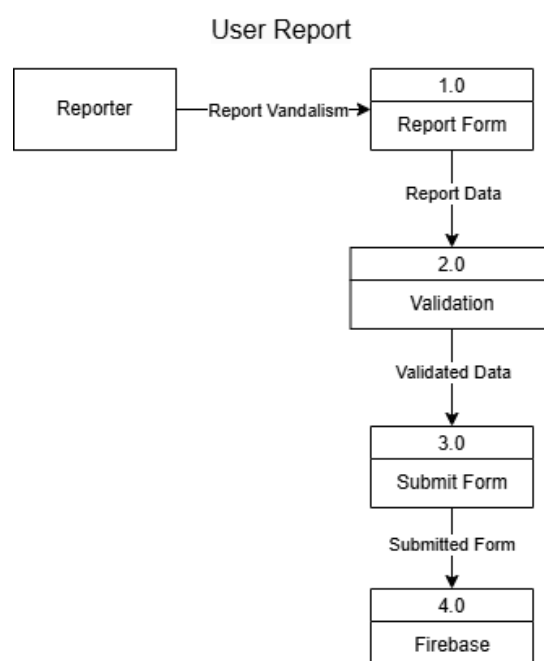


Figure 3.14: DFD Level 1 for User Report

1. User Report

Based on Figure 3.14, there are four (4) processes associated with the proposed application.

The 4 processes are as follow:

- Process 1.0: Report Form

User can report vandalism through the report form by filling all the required field in the report form.

- Process 2.0: Validation

The report form will be validated before the submission if user does not provide all the required data, the form will not be able to submit.

- Process 3.0: Submit Form

The form will be submitted after the validation is passed.

- Process 4.0: Firebase

The details of the submitted form will be stored to the Firebase.

2. View Report

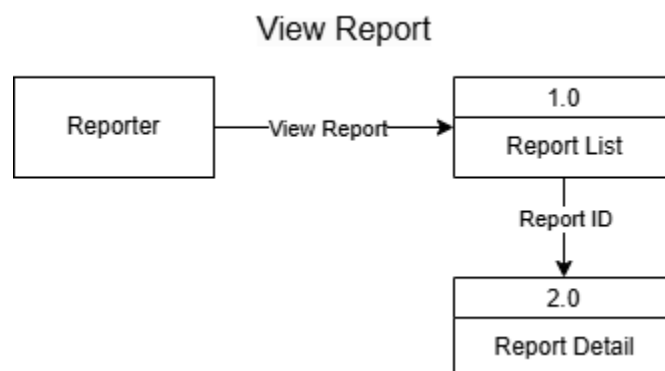


Figure 3. 15: DFD Level 1 For View Report

Based on Figure 3.15, there are two (2) processes associated with the proposed application. The 2 processes are as follow:

- Process 1.0: Report List

User can view the report list through the view report button available on the application.

However, the user can only view the report that they had made.

- Process 2.0: Report Detail

The user then can select the report to view the report details.

3. Handle Report

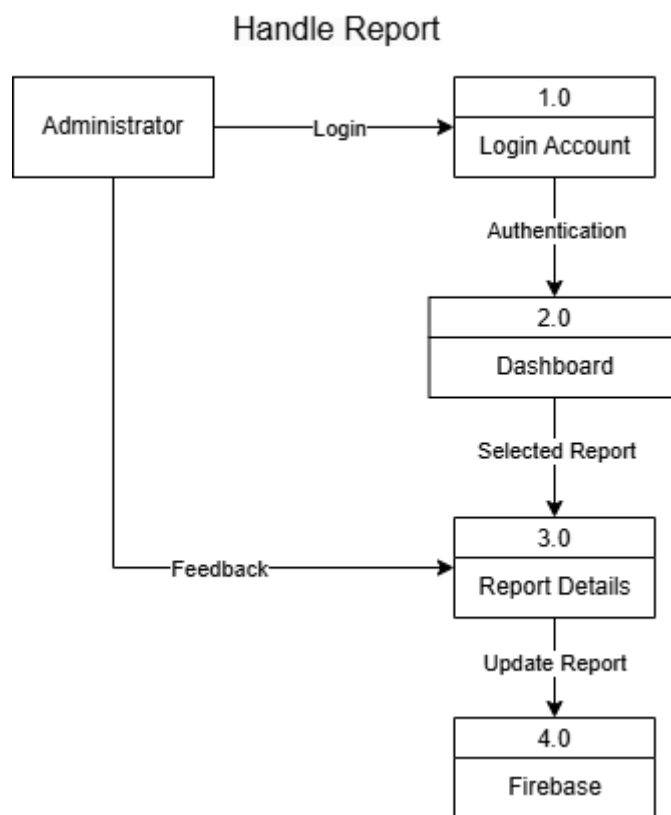


Figure 3. 16: DFD Level 1 For Handle Report

Based on Figure 3.16, there are four (4) processes associated with the proposed application.

The 4 processes are as follow:

- Process 1.0: Login Account

Person-in-charge can login their account by giving the correct username and password.

- Process 2.0: Dashboard

After being authenticated, the person-in-charge or administrator will be redirected to the dashboard where all of the report from user along the details of the report.

- **Process 3.0: Report Details**

The person-in-charge can select the report and give feedback to the selected report.

- **Process 4.0: Firebase**

The details of the updated report will then be updated in the Firebase.

3.4.6 Wireframe Design

Wireframes are basic blueprints that gives general view of the structure of the page layout which also include screen layouts, components of UX and UI design and interactive elements. The Figure 3.17 shows the main page which will be shown to the user when they entered the application. There will be four (4) button to press which are 'New Report', 'View Report Status', 'Admin' and 'Exit' button. If the user tapped the 'Exit' button, the application will be exited. On the other hand, the 'New Report' button will navigate the user to the next page as shown in Figure 3.18 to make a new report submission. The user will be able to upload images or take photo directly through their mobile phone's camera, update location, date and the user can also choose to add more detailed description for the report which is optional. After filling in necessary information for the report, the user can submit their form and will get redirected to the 'Thank You Page' as shown in Figure 3.19. The user can choose to press the 'Return' button to navigate back to the main page or the user will be redirected back to the main page after few seconds when the submission is completed. For the 'View Report' button, it will navigate the user to 'Report Status Page' as shown in Figure 3.20. The user can press view to know the status about the report they had selected as shown in Figure 3.21. For the 'Admin' button in Figure 3.17, it will navigate the user to 'Admin Login Page' as shown in Figure 3.22. The user can enter username and password in this page. After login, the authenticated user will

be redirect to the ‘Dashboard Page’ as shown in Figure 3.23. A graph and report list will be shown in the dashboard page. The authenticated user or person-in-charge can press the view button in the report list to see the report details on the selected report as shown in Figure 3.24. In the ‘Report Detail Page’, the person-in-charge can change the status of the report to ‘Under Investigation’ or ‘Close Case’.



Figure 3.17: Wireframe for Main Page

←

New Report Submission

Images

Upload Image

Take Photo

Location

Update Location

Date

MM/DD/YYYY

Descriptions(Optional)

Tap to add description

Submit

Figure 3.18: Wireframe for Report Submission

✓

Thank you for your
valuable report.

You will be redirect back in
5 seconds

Return

Figure 3.19: Wireframe for Thank You Page

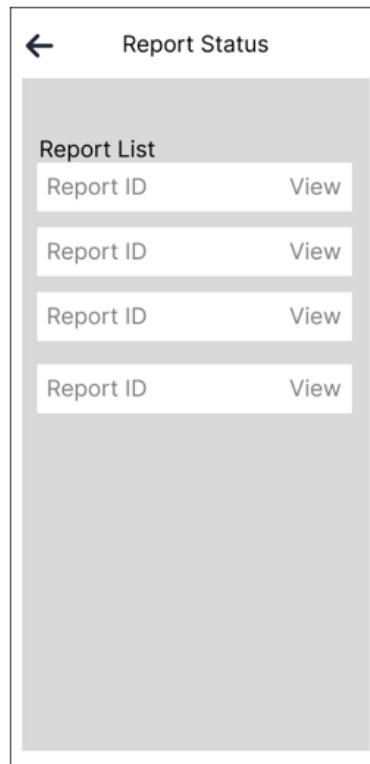


Figure 3.20: Wireframe for Report Status Page

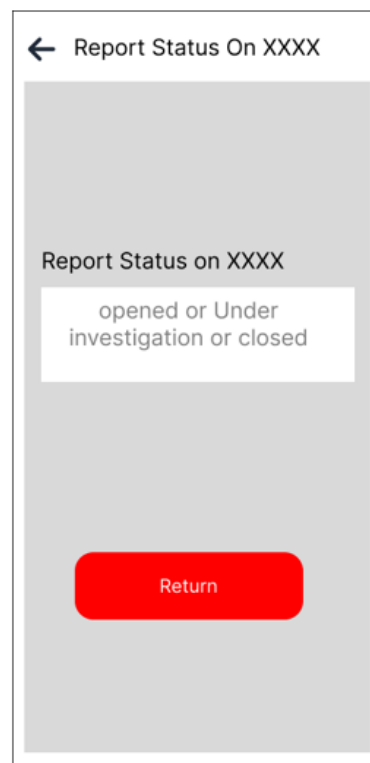


Figure 3.21: Wireframe for Report Status On Particular Report Page

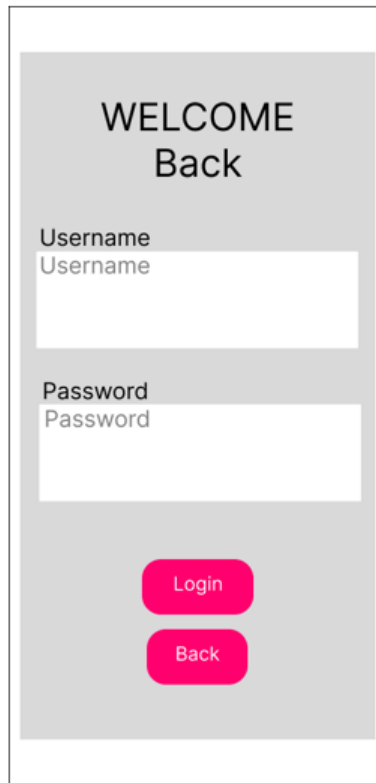


Figure 3. 22: Wireframe for Admin Login Page

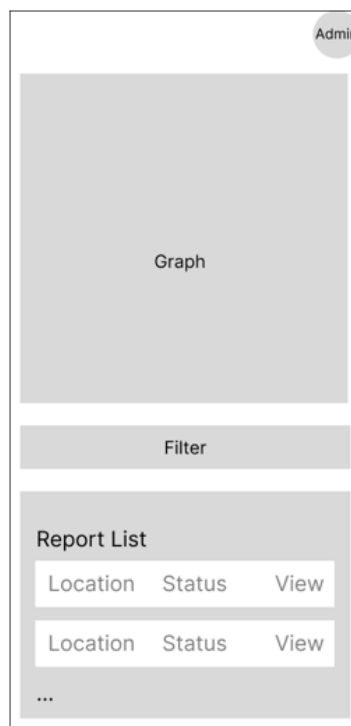
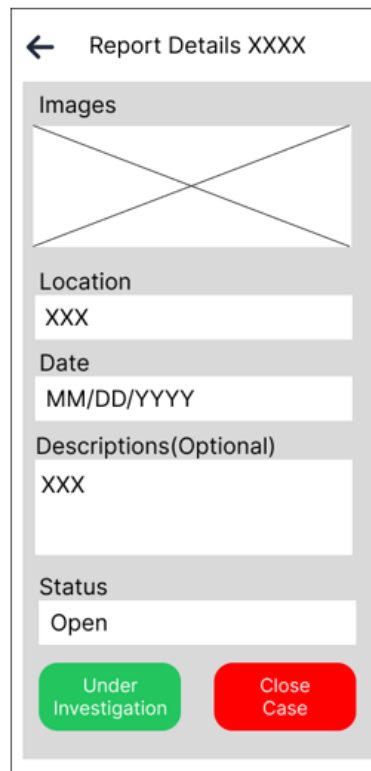


Figure 3.23: Wireframe for Dashboard Page



The wireframe shows a mobile application screen titled "Report Details XXXX" with a back arrow on the left. The layout includes several sections: an "Images" section with a placeholder box crossed out by a large 'X'; a "Location" section with a text input field containing "XXX"; a "Date" section with a text input field containing "MM/DD/YYYY"; a "Descriptions(Optional)" section with a text input field containing "XXX"; a "Status" section with a text input field containing "Open"; and two action buttons at the bottom: a green "Under Investigation" button and a red "Close Case" button.

Figure 3.24: Wireframe for Report Details Page

3.5 Summary

In summary, this chapter discussed the methodology used for the proposed application, Waterfall Model. For the requirement phase, the similar existing applications or systems and the proposed application were being analysed to ensure the proposed application will be implemented with some of the great feature from the similar existing applications or systems and to have a clearer understanding of the proposed application's unique sales point. After that, a survey is distributed among the UNIMAS students to collect the users' opinion and the preference the feature of the proposed application. The survey is then being analysed to take in the consideration of users' opinion. Next, the design phase involves creating scenario illustrations, designing overall system architecture diagram, design a flow chart of the proposed application. The context diagram and data flow diagrams are developed to have a clearer understanding of the data flow within the application. Lastly, the wireframes of the proposed application are being developed. In this chapter, the Waterfall Model will emphasises on two

(2) phases which are define requirements and design. For the remaining phases which are development, testing, deployment and maintenance will be discussed in the next chapter.

CHAPTER 4: IMPLEMENTATION

4.1 Introduction

This chapter is to discuss and explain about the implementation of eVandalism: A Smart Mobile Reporting Application based on the requirement analysis and design in Chapter 3. The application of requirement that were used in the implementation phase will be discussed. After that, all of the application interface will be explained to show the flow of the proposed application.

4.2 Application of Requirement

Before the implementation begin, certain software needed to be installed or setup before-hand. Proper steps of installation and configuration of the required software to implement the proposed application is very important to ensure smooth implementation process. The software that are required to be used in the implementation phase are Flutter, Android Studio and Firebase.

The Table 4.1 shows the software that are required to be installed or setup.

Table 4.1: Overview of installation requirements

Configuration	Links
Flutter	https://docs.flutter.dev/get-started/install/windows/mobile
Android Studio	https://developer.android.com/studio/install#windows
Firebase	https://firebase.google.com/

4.2.1 Flutter

Flutter is the main software that is going to be used for coding, developing and debugging the proposed application. The Flutter's official documentation has provided very

detailed steps that are required to install Flutter successfully. The overall steps are install the Flutter SDK, update the windows PATH variable, configure the Android toolchain in Android Studio and agree to Android licenses by running the command line of ‘flutter doctor --android-licenses’. To create a new Flutter project, it can be done by using the command line of ‘flutter create project_name’.

```
C:\Users\ACER\Desktop\Flutter\Testing>flutter create fyp_testing
Creating project fyp_testing...
Resolving dependencies in `fyp_testing`... (1.2s)
Downloading packages...
Got dependencies in `fyp_testing`.
Wrote 130 files.

All done!
You can find general documentation for Flutter at: https://docs.flutter.dev/
Detailed API documentation is available at: https://api.flutter.dev/
If you prefer video documentation, consider: https://www.youtube.com/c/flutterdev

In order to run your application, type:

$ cd fyp_testing
$ flutter run

Your application code is in fyp_testing\lib\main.dart.
```

Figure 4.1: Flutter Create New Project

4.2.2 Android Studio

Android Studio is required because it provides virtual Android device that can run the proposed application during the coding, development and debugging phase. The overall steps for installing the Android Studio is go to the official Android Studio website as shown in Table 4.1 and download the latest version of Android Studio. Next, after finish downloading the Android Studio, launch the Android Studio and follow the Android Studio Setup Wizard. Lastly, ensure that Android SDK Platform, API 35, Android SDK Command-line Tools, Android SDK Build-Tools, Android SDK Platform-Tools and Android Emulator are installed. These can be found as shown in Figure 4.2. After that, go to the Virtual Device Manager as shown in Figure 4.3 to set up the Android emulator. Lastly, run the command ‘flutter doctor --android-licenses’ to agree to Android licenses at Command Prompt(CMD).

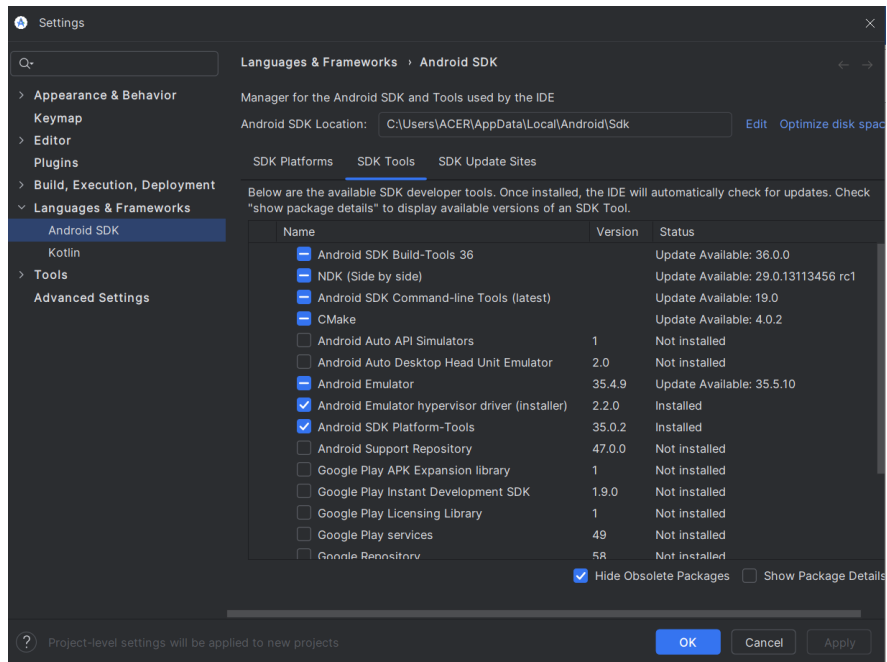


Figure 4.2: Android Studio SDK Manager

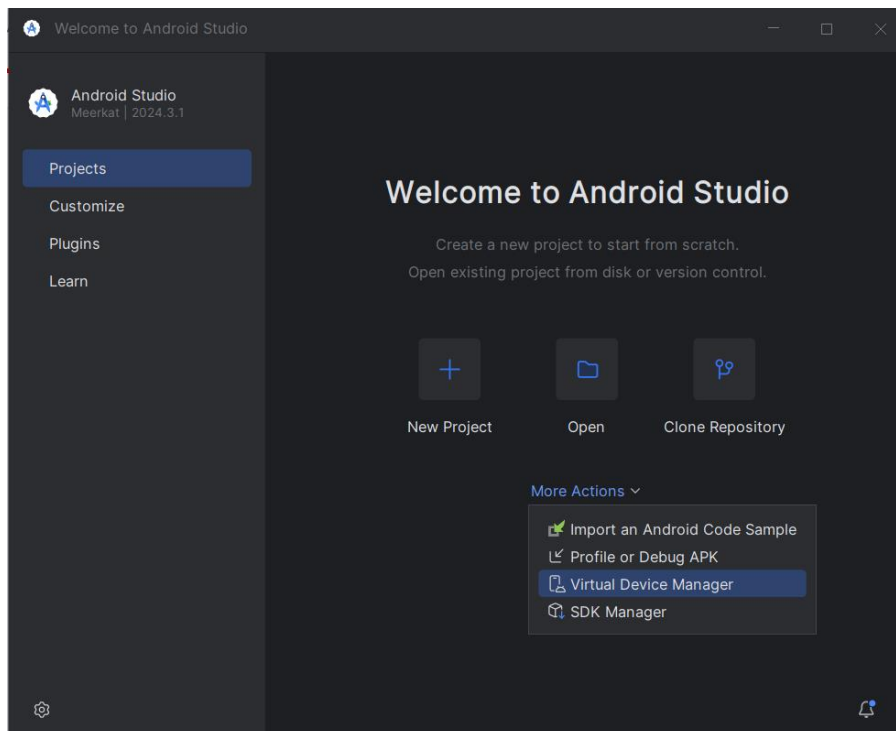


Figure 4.3: Setup Virtual Device Manager

4.2.3 Firebase

Firebase is a proprietary Backend-as-a-Service(BaaS) platform developed by Google that offers various backend services which include scalable NoSQL databases and file or image storage that are the Firebase Database and Firebase Storage respectively. Firebase also provide Cloud functions that is mainly used to handle Gmail notification and app notification for the proposed application. Based on the Figure 4.4, there will be 7 steps for the Firebase configuration. First of all, go to the firebase google and go to the console. After that, create a new Firebase project by following the instruction given like giving a project name. Right after creating a Firebase project, press the Android icon at the add an app to get started. Furthermore, input the Android package name base on the applicationId that can be found in the flutter project's app-level build.gradle file. Next, download the configuration file (google-services.json) and put the configuration file to the path of your_flutter_project\android\app. Finally, add Firebase SDK which includes 2 instruction steps before complete the Firebase configuration. The first instruction step is adding the plugin as a dependency to our project-level build.gradle.kts file, the example of the path to the correct file will be something like your_flutter_project\android\build.gradle.kts. Lastly, go to the module(app-level) build.gradle.kts file (your_flutter_project\android\app\build.gradle.kts) to add both the google-services plugin and any Firebase SDKs that needed to be used in the application.

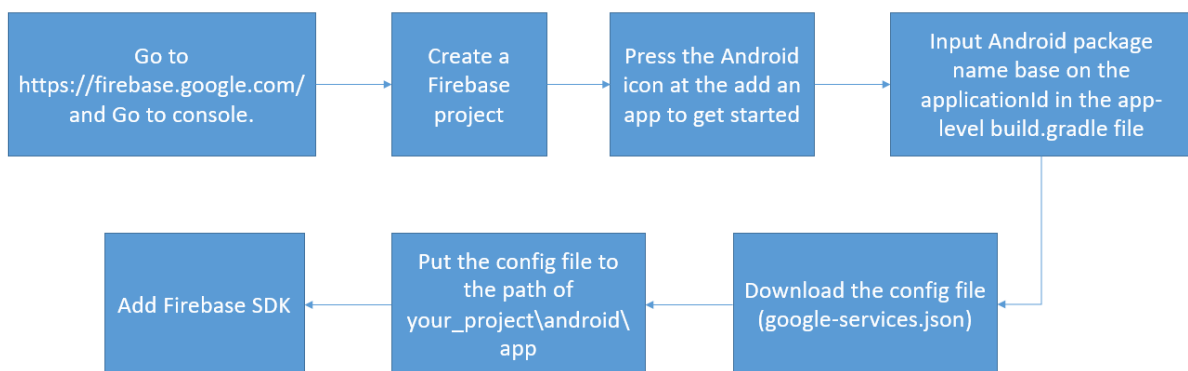


Figure 4.4: Overall Steps for Firebase Configuration

4.3 Proposed Application's Interfaces

4.3.1 Main Page

To access the proposed application, the users would be required to download the Android Package Kit(APK) file and install the proposed application to their phone. When the user started the proposed application which is the e-vandalism app, the first interface that user will see is the main page interface as shown in Figure 4.5. In the main page, there will be 4 buttons that can be pressed by the user which are 'Create New Report', 'View Report', 'Admin' and 'Exit' button. If the user tapped the 'Exit' button, the application will be exited. On the other hand, the 'Create New Report' button will navigate the user to the 'Report Submission Page' interface as shown in Figure 4.3.2 to make a new report submission. While the 'View Report' button will navigate the user to 'Report Status Page' interface as shown in Figure 4.8. Lastly, the 'Admin' button will navigate the user to 'Admin Login Page' as shown in Figure 4.10.

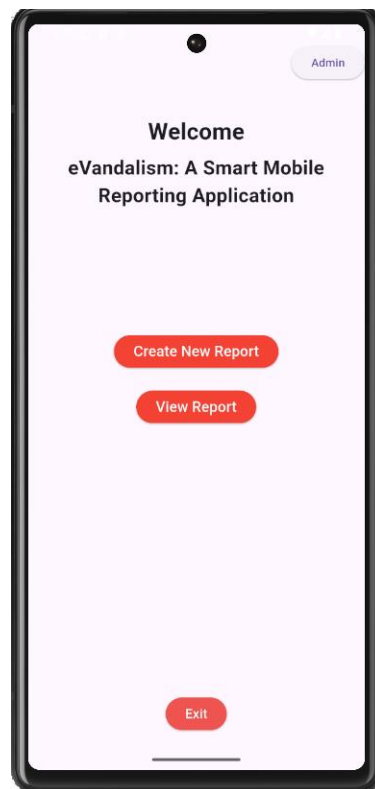


Figure 4.5: Main Page Interface

4.3.2 Report Submission Page

At the ‘Report Submission Page’ interface, the user would be required to fill in all of the necessary information if the user wanted to submit a new report through the proposed application. For the images part, the user can use the ‘Upload Image’ button to directly upload image that is saved in their phone or press the ‘Take Photo’ button take a new photo and upload it directly. For the location part, if the user does not know where their current location is, the user can enable their phone’s location access to use the ‘Use Current Location’ button which will help the user to fill in their location automatically after the user tapped on the ‘Use Current Location’ button. After the user fill in all of the necessary information, the user can then submit the form and will get redirected to the ‘Thank You Page’ as shown in Figure 4.7.

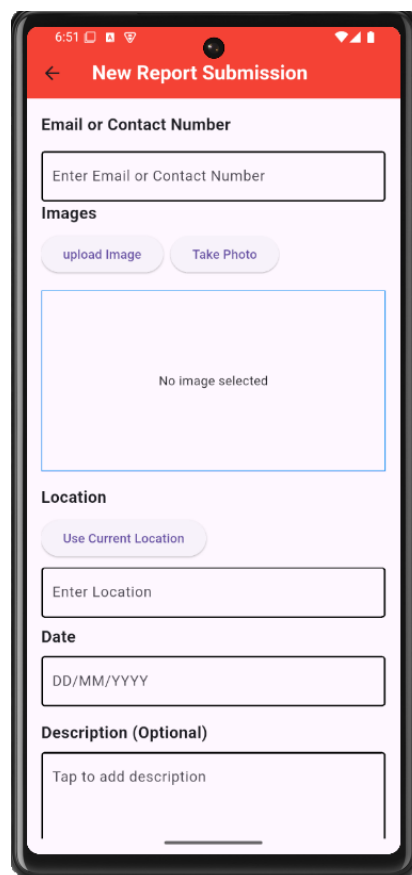
The image shows a mobile application interface for submitting a new report. The screen has a red header bar with a back arrow and the title "New Report Submission". Below the header, the form is organized into sections: "Email or Contact Number" with a text input field; "Images" with two buttons, "upload Image" and "Take Photo", and a large placeholder box stating "No image selected"; "Location" with a "Use Current Location" button and a text input field; "Date" with a text input field showing the format "DD/MM/YYYY"; and "Description (Optional)" with a text input field containing the placeholder "Tap to add description". The bottom of the screen shows a home indicator bar.

Figure 4.6: Report Submission Page Interface

4.3.3 Thank You Page

For the ‘Thank You Page’ interface as shown in Figure 4.7, there will be only one ‘Return’ button that can be pressed by the user. The ‘Return’ button will redirect the user back to the ‘Main Page’ interface as shown in Figure 4.5. Not only that, the user will also be automatically redirected back to the ‘Main Page’ after 10 seconds interval after the submission.

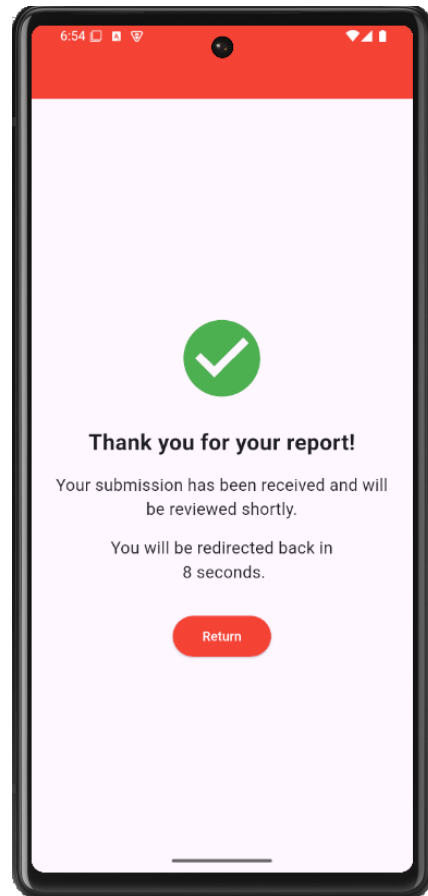


Figure 4.7: Thank You Page Interface

4.3.4 Report Status Page

At the ‘Report Status Page’ interface as shown in Figure 4.8, all of the users is able to view all of the report that is being submitted through the proposed application. The user can tap on the ‘View’ button to view more details about the report which will redirect the user to the ‘Report Status On Particular Report Page’ as shown in Figure 4.9.

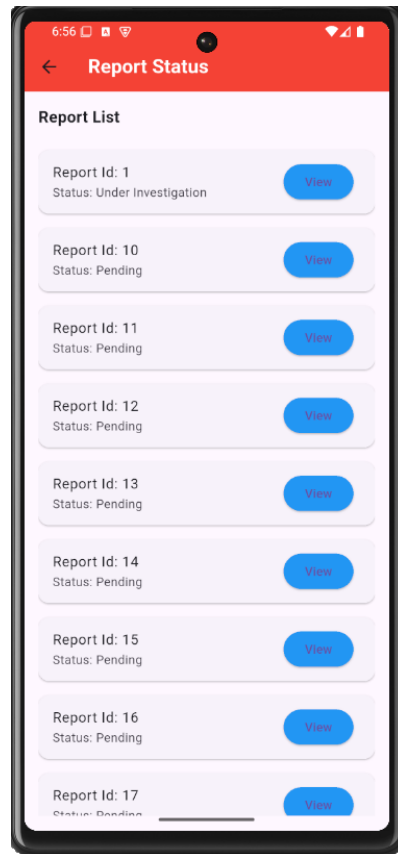


Figure 4.8: Report Status Page Interface

4.3.5 Report Status On Particular Report Page

Figure 4.9 shows all of the details about the report on a specific report. The user will only be able to view the report details and does not have the ability to modify or change the submitted report's details.



Figure 4.9: Report Status On Particular Report Page Interface

4.3.6 Admin Login Page

For the 'Admin Login Page' interface as shown in Figure 4.10, the user can enter email and password in this page. If it is authenticated user, the user will be redirect to the 'Dashboard Page' interface as shown in Figure 4.11.

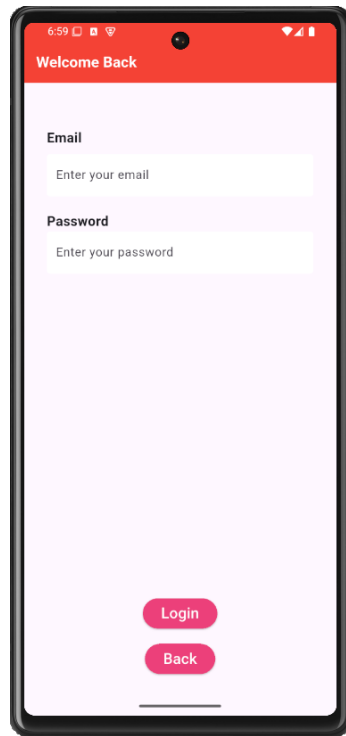


Figure 4.10: Admin Login Page Interface

4.3.7 Dashboard Page

Figure 4.11 shows the 'Admin Dashboard' after the authenticated user gets logged in. The 'Report Graph' shows how many reports are being reported and can be filtered to be either 'Weekly' or 'Monthly'. For the 'Report List' section, the authenticated user or person-in-charge will have the option to filter the report list using the dropdown option that is next to the 'Filter'. The dropdown option for the filter will have four (4) options that can be chosen which are 'All', 'Pending', 'Under Investigation' and 'Case Closed'. After choosing one of the filter options, the 'Report List' section will filter the report data based on the filter option that is being chosen by the authenticated user. Lastly, the authenticated user can press the 'View' button on each of the reports to view more detailed report details which is as shown in Figure 4.12.

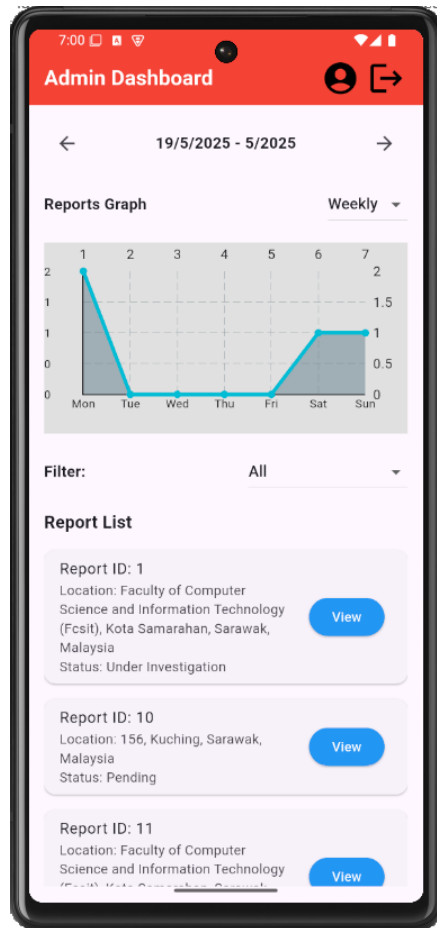


Figure 4.11: Admin Dashboard Page Interface

4.3.8 Report Details Page

Lastly, the Figure 4.12 shows the authenticated user all of the report details. However, the authenticated user can only press either 'Under Investigation' or 'Case Closed' button to change the report's status and cannot change or modify other details like 'Email or Contact Number', 'Images', 'Date' and 'Description (Optional)'. After updating the status of the report, the authenticated user will be redirected back to the 'Admin Dashboard Page'.



Figure 4.12: Report Details Page Interface

4.4 Summary

In the nutshell, this chapter discuss the process of installation and configuration of the required software to implement the proposed application as well as the proposed application's interfaces, features and functions to give a clear understanding of how the actual application looks like and the flow of the application.

CHAPTER 5: TESTING AND EVALUATION

5.1 Introduction

Testing and evaluation of an application is crucial to determine if the final product is both functional and reliable. Therefore, this chapter will discuss on two type of testing which are functional testing and non-functional testing. Functional testing is a type of software testing that is used to test if the features or functionality of the system or application works as expected according to the requirements or specifications stated by the stakeholders. For the non-functional testing, it is used to test non-functional requirements of the application such as performance testing, usability testing, reliability testing and others.

5.2 Functional Testing

Functional testing is used to verify that each of the functions work as expected according to the requirements or specifications stated by the stakeholders. However, this testing does not involve the source code of the application and would only focus on the function that is provided by the prototype of the application. Test cases to test each of the functionality of the software application will be conducted to ensure the application can be operated as expected and will not have major error or bug that prevent users from using the application's function. The test cases used to test the application and the results of each test will be as shown in below:

Table 5.1: Test Case 1 – Create New Report Button

Test Title:	Create New Report Button		Pre-condition:	Users install and run the application successfully.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
1	Verify that the create new report button will navigate the user to the 'Report Submission Page'.	Whenever the user pressed the create new report button, the user should be navigated to the 'Report Submission Page'.	The button works as expected without any issue.	Y	
Post-condition		User will be navigated to the 'Report Submission Page'.			

Table 5.2: Test Case 2 – Report Form Validation

Test Title:	Report Form Validation		Pre-condition:	Users install, run the application successfully and navigate to 'Report Submission Page'	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
2	Fill in the form with necessary information to test the validation of the form.	The form can be submitted if all necessary information is filled in with correct format. If incorrect format is being filled, hints will show up to inform the user how the correct format need to be followed.	The form can be submitted after user fill in the necessary information with correct format. The hints work as expected when user input wrong format of information or trying to submit a form without filling up all the necessary information required.	Y	
Post-condition		The report form will be submitted and the user will be navigated to the 'Thank You Page' before navigate back to the 'Main Page'.			

Table 5.3: Test Case 3 – Return To Home Page Function

Test Title:	Return To Home Page Function		Pre-condition:	Users submit the form successfully.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
3	Verify if the 'Return' button and the auto countdown timer work as expected.	The user should be able to navigate back to the 'Main Page' after pressing the 'Return' button or will be automatically navigate back after 10 seconds.	The button and the auto navigation work as expected without any issue.	Y	
Post-condition		User will be navigated to the 'Main Page' either by pressing the 'Return' button or wait 10 seconds after submitting the form.			

Table 5.4: Test Case 4 – View Report Button

Test Title:	View Report Button		Pre-condition:	Users install and run the application successfully.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
4	Verify if the 'View Report' button works as expected and to determine if the report list will be shown.	The user should be able to navigate to the 'Report Status Page' and view a report list if some of the user did submit the report already. Else a line of text 'No reports available.' Will be shown.	The button and report list works as expected. If there is no report being submitted once through the app, the line of text 'No reports available.' will be shown.	Y	
Post-condition		User will be navigated to the 'Report Status Page' to view all submitted report by any user.			

Table 5.5: Test Case 5 – View On Specific Report

Test Title:	View Report On Specific Report Button		Pre-condition:	Users install, run the application successfully and navigate to the 'Report Status Page'	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
5	Verify if the 'View' button works as expected as well as the information showed.	The user should be able to navigate to the 'Report Status On Particular Report Page' with the details of that report being shown.	The button works as expect and the detail of that particular report is being shown as expected.	Y	
Post-condition		User will be navigated to the 'Report Status On Particular Report Page' to view all the detail about that specific report.			

Table 5.6: Admin Login

Test Title:	Admin Login		Pre-condition:	Users install, run the application successfully and navigate to the 'Admin Login Page'.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
6	Verify if the user can login as admin using correct credentials.	The user should be able to login if he/she uses the correct credentials.	The user is able to login when using correct credentials and will show errors if incorrect credentials is entered.	Y	
Post-condition		User will be navigated to the 'Dashboard Page'.			

Table 5.7: Admin Dashboard

Test Title:	Admin Dashboard		Pre-condition:	Users successfully login as admin using correct admin credentials.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
7	Verify if the details showed up properly in the dashboard as user submit the report through the app.	The admin should be able to see a graph which indicate when the report is submitted and a report list that can be filtered. Admin should also be able to view a particular report's details by clicking on the 'View' button that is next to each of the report.	The graph and report lists shows as expected. The admin also able to view more detailed information of the report by clicking on the 'View' button next to that report.	Y	
Post-condition		User will be navigate to the 'Report Details Page' when they pressed the 'View' button			

Table 5.8: Change Report Status

Test Title:	Change Report Status		Pre-condition:	Users successfully login as admin using correct admin credentials and navigate to the 'Report Details Page'	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
8	Verify if the report status of a particular report can be changed by the admin by clicking on the status button field.	The status of that report would be changed based on which type of status that is chosen by the admin.	The status of the report update as expected and will navigate the admin back to the 'Dashboard Page' after updating the status of that particular report.	Y	
Post-condition		User will be navigate back to the 'Dashboard Page'			

Table 5.9: Notification Function For Admin

Test Title:	Notification Function For Admin		Pre-condition:	Users successfully login as admin using correct admin credentials and does not logged out either on this device or other devices as a specific token assigned to the admin will be removed whenever the admin logged out.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
9	Verify if the notification function works whenever the user submit a report through the application.	A mail notification through Gmail will be sent to the admin's Gmail account and the application will also sent a notification to the device that is logged in as admin.	The Gmail notification and the app notification works as expected.	Y	
Post-condition		The app will show a notification Gmail and app notification on the admin device.			

Table 5.10: Admin Log Out

Test Title:	Admin Log Out		Pre-condition:	Users successfully login as admin using correct admin credentials.	
No	Test Procedure	Expected Result	Actual Result	Pass (Y/N)	Remarks
10	Verify if the log out function works by clicking on the log out icon button.	The user should be able to log out and redirected to the 'Admin Login Page'.	The user is able to log out and will be redirected to the 'Admin Login Page'.	Y	
Post-condition		The admin token that is stored in the database will be deleted.			

5.3 Non-Functional Testing

According to Ganji (2024), he stated that non-functional testing plays an important role in the software testing phase as non-functional testing is more focused on the characteristics of a software application that assess its readiness and suitability. Ganji (2024) also stated that non-functional testing has direct impact on the user experience and satisfaction with the software as non-functional testing would include some questions like 'How quickly does the application load?', 'Is it easy to use?' and others. Therefore, the goal of conducting this testing for the proposed application is to determine if the proposed application is readily to be released into the public. The test is conducted by giving 10 randomised students to use the proposed application as a beta tester and a survey of User Acceptance Test (UAT) will be conducted to get the review from the users.

5.3.1 User Acceptance Test

According to Alimi (2018), User Acceptance Test(UAT) is the final phase of any software development to determine if the software or application does what it was designed to do in real-world situation before going 'live'. As stated above, the UAT survey will be

completed by 10 randomised students after they used the proposed application. The UAT form will be elaborated in the figure in below.

The application performs all intended functions.

10 responses

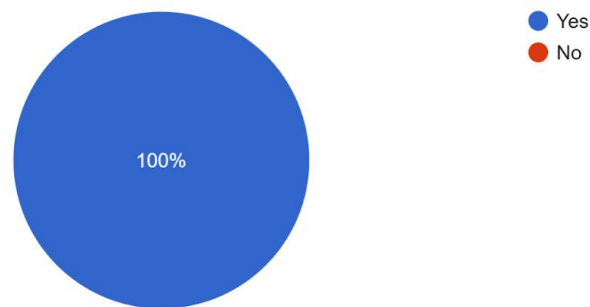


Figure 5.1: The Application Performs All Intended Functions

Based on Figure 5.1, all the respondent find that the proposed application did performs all of the intended functions.

The app uses mobile features correctly (e.g., camera, GPS).

10 responses

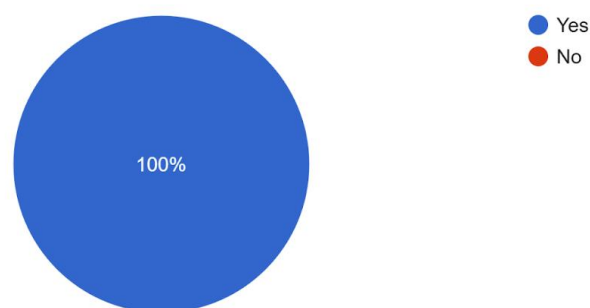


Figure 5.2: The App Uses Mobile Features Correctly

Figure 5.2 shows that all users can use the mobile features that is implemented in the application like taking photo using their device's camera or using the Global Positioning System (GPS) to locate their current location.

The flow of the application is easy to understand.

10 responses

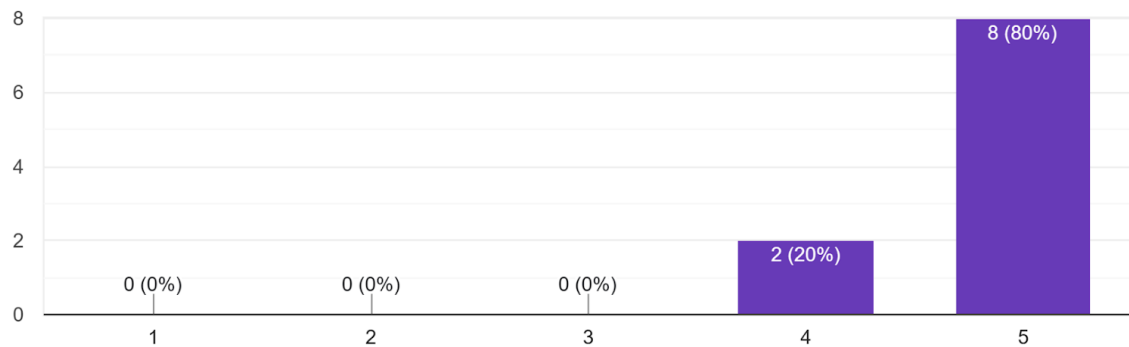


Figure 5.3: The Flow Of The Application Is Easy To Understand

Additionally, Figure 5.3 shows that most of the respondent agree that is it easy to understand the flow of the proposed application.

The interface was intuitive and easy to understand.

10 responses

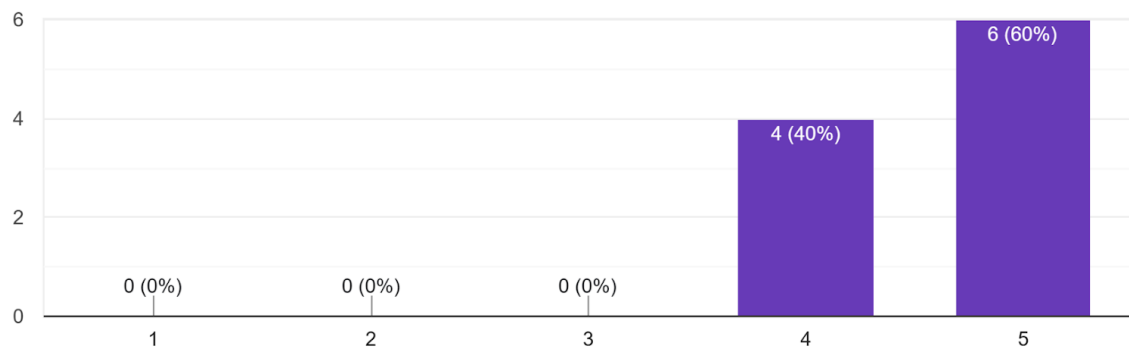


Figure 5.4: The Interface Was Intuitive And Easy To Understand

While Figure 5.4 also show most of the respondent think the interface was intuitive and easy to understand.

Do you think the application is hard to use?

10 responses

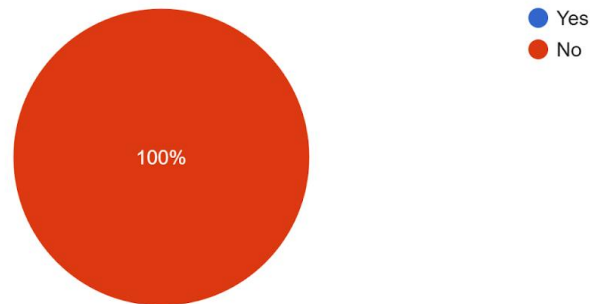


Figure 5.5: Do You Think The Application Is Hard To Use?

Furthermore, Figure 5.5 shows all respondents find that it is not hard to use the proposed application for reporting.

Do you like the mobile user interface of the application?

10 responses

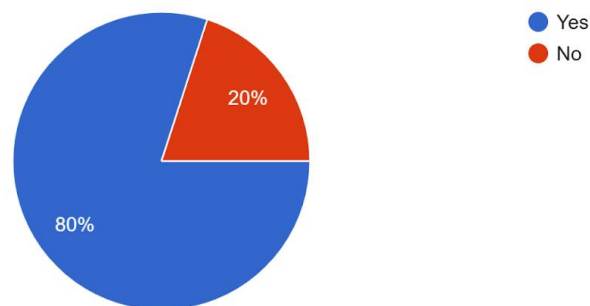


Figure 5.6: Do You Like The Mobile User Interface Of The Application?

Besides that, Figure 5.6 shows that eight (8) respondents like the application's interface while two (2) respondents dislike the user interface of the application. This might because the

respondents find the interface of the application too plain as the development is more focused on the functionality of the proposed application.

Do you think the application provides helpful error messages when creating a new report?

10 responses

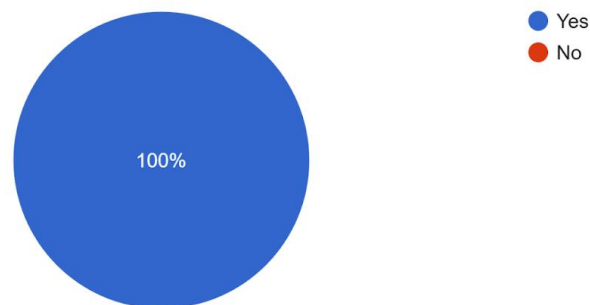


Figure 5.7: Do You Think The Application Provides Helpful Error Messages When Creating A New Report?

On the other hand, Figure 5.7 shows that all respondents find the error messages very helpful when creating new report.

Do you encounter any difficulty or error while using the application?

10 responses

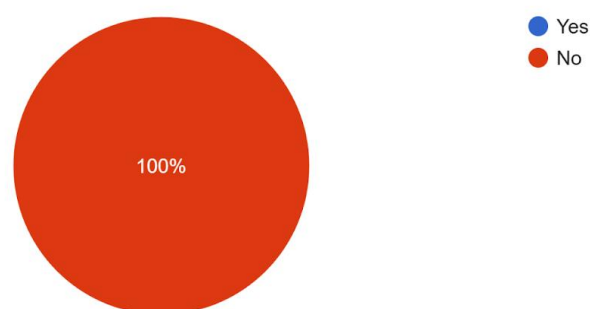


Figure 5.8: Do You Encounter Any Difficulty Or Error While Using The Application?

Based on Figure 5.8, there is currently no difficulty or error encountered by all of the respondents.

5.4 Summary

In conclusion, testing phase is a crucial stage in the Waterfall Model as this phase ensure all the features and functionality proposed will be work as intended. In this chapter, functional testing and non-functional testing were being conducted to ensure the application could achieve the features or functionality that were being proposed. The non-functional testing was more to user's acceptance on the proposed application as everyone has their own preferences which is why UAT is important to meet most of the user's expectation.

CHAPTER 6: CONCLUSION AND FUTURE WORK

6.1 Introduction

The final chapter gives a conclusion to the proposed application by discussing the objectives that had been achieved as well as potential future work that can be done to improve the application. Lastly, the project limitations will also be discussed.

6.2 Objective achievement

The objectives of this project as stated in Chapter 1 has all been achieved. The objectives and achievements are listed in the table below:

Table 6.1: Achievements of eVandalism

Objectives	Achievements
To analyse the current challenges faced in vandalism reporting within educational institutions by collecting data through a survey.	Based on the finding in Chapter 3's questionnaire, most of the UNIMAS students does not know where or who they should report the vandalism incident to. This clearly shows that there is currently no official system or application for students to report the vandalisms.
To develop a mobile application for reporting vandalism incidents.	The proposed mobile application, so called eVandalism had been successfully implemented and is able for users to report vandalism incidents. More detailed User Interface (UI) design can be found in Chapter 4 and the functional testing or non-functional testing can be found in Chapter 5.
To evaluate the functionality and effectiveness of the developed system through testing and feedback from users.	Based on the User Acceptance Test (UAT) conducted in Chapter 5, it is clearly shown that the users find the proposed application's functionality fulfil what it intended to serve for and it is easy to report using the proposed application.

6.3 Project Limitations

Despite the proposed application meets all the objective requirements but there are several project limitations like as mentioned before, the current application only support Android user and does not have a tracking system for user to track the report he/she had submitted as most of the users would prefer anonymous report. Besides that, the time given to complete the application was too short as developing while learning a new programming language is too time constraint. As a result, some features like showing a Google Map for user to pick their location and some admin settings like changing admin's icon, name and others are not being implemented. Therefore, the next section will be discussing on what feature can be included in the future work.

6.4 Future Work

For the future improvement, the proposed application can be improved by implementing the features as stated above which are an interactive Google Map for user to choose their location during filling in the report form, and create settings for the admin so the admin can customise his/her icon, names and others. Apart from that, the proposed application can also be extended to support iOS devices by developing a compatible version for the iOS platform. This cross-platform integration would allow iOS users to report vandalism incidents just like Android users, improving accessibility and ensuring wider user usage across different mobile platforms. Furthermore, implement a Chatbot that can answer related questions to the proposed application like how to use the application, how to view the report or questions like how to determine if it is a vandalism incident. Last but not least, a feature that can convert the graph report data that show in the 'Dashboard Page' to Portable Document Format (PDF) can also be implemented as these will give convenient to the admin who would need to do report to proof what incidents they had resolved in monthly or weekly.

6.5 Summary

In a nutshell, this chapter concluded that this project has achieved its' objectives. Furthermore, the project limitations for this project are listed down and the future work that can be done to improve the proposed application are also being discussed. This project's contribution is that an application that serve as a communication channel between UNIMAS students and the UNIMAS staffs that focus in handling vandalism incident was being created.

REFERENCES

- Adrian A. (2022, March 24). *4 Reasons to Adopt Mobile Incident Reporting Systems*. Vatrix.
<https://vatix.com/blog/reasons-mobile-incident-reporting-systems>
- Ali, G. (2022, October 1). *Cara Buat Laporan Polis Secara Online Di e-Reporting PDRM Guna Telefon | Police Reports*. YouTube.
https://www.youtube.com/watch?v=Gd36o6Xh8_U
- Alimi, B. (2018, April 23). *What is User Acceptance Testing (UAT) - The Full Process Explained*. Panaya. <https://www.panaya.com/blog/testing/what-is-uat-testing/>
- Amazon. (n.d.). *What is Flutter? Flutter Explained - AWS*. Amazon Web Services, Inc.
<https://aws.amazon.com/what-is/flutter/>
- Berita Harian. (2023, March 3). *Selami punca vandalisme remaja, didik tingkah laku positif*.
<https://www.bharian.com.my/rencana/minda-pembaca/2023/03/1071621/selami-punca-vandalisme-remaja-didik-tingkah-laku-positif>
- Brand. (n.d.). Flutter.dev. <https://flutter.dev/brand>
- Crimestoppers225 (2023, May 31). *Breaking the Silence: Understanding the Barriers to Reporting Crimes – Capital Region Crime Stoppers – Louisiana*.
<https://crimestoppers225.com/breaking-the-silence-understanding-the-barriers-to-reporting-crimes/>
- Cambridge Dictionary. (2020, January 8). *VANDALISM | meaning in the Cambridge English Dictionary*. Cambridge.org.
<https://dictionary.cambridge.org/dictionary/english/vandalism>
- Faiz Zainudin. (2017, September 21). *UKM: Hukuman berat menanti pelaku vandalisme “MATI.”* Free Malaysia Today | FMT.
<https://www.freemalaysiatoday.com/category/bahasa/2017/09/21/ukm-hukuman-berat-menanti-pelaku-vandalisme-mati/>
- Firebase. (n.d.). Firebase. <https://firebase.google.com/products-build>

- Ganji, S. (2024, February 18). *What is Non Functional Testing? Types & Example*. ACCELQ Inc. <https://www.accelq.com/blog/non-functional-testing/>
- Herawati, S., Negara, Y. D. P., Febriansyah, H. F., & Fatah, D. A. (2021). Application of the Waterfall Method on a Web-Based Job Training Management Information System at Trunojoyo University Madura. *E3S Web of Conferences*, 328, 04026. <https://doi.org/10.1051/e3sconf/202132804026>
- Kaarle, P. (2021, February 22). *Why Most Incident Reporting Systems Fail In Universities?* Blog.falcony.io. <https://blog.falcony.io/en/university-incident-reporting-fails>
- LawBirdie. (n.d.). *Advantages of a Mobile-Based Platform for Crime Investigation*. <https://lawbirdie.com/advantages-of-a-mobile-based-platform-for-crime-investigation/>
- Marie, B. (2020, November 6). *Xiaomi Mi 10T Pro*. Tech Advisor. <https://www.techadvisor.com/article/721713/xiaomi-mi-10t-pro-review.html>
- Michał, D., & Inez, B. (2024, May 15). *What is Flutter and is it The Best Solution to Build Your App?* Droids on Roids. <https://www.thedroidsonroids.com/blog/what-is-flutter-app-development>
- Qirana Nabilla Mohd Rashidi. (2024, June 18). *Growing vandalism problem must be addressed: Lawyer*. Thesun.my. <https://thesun.my/malaysia-news/growing-vandalism-problem-must-be-addressed-lawyer-CO12587858>
- Sophia, E. (2024, November 16). *What is Firebase? A Complete Overview of the Platform*. theknowledgeacademy. <https://www.theknowledgeacademy.com/blog/what-is-firebase/>
- Sparkleo. (2023, November 7). *Design Patterns in Flutter: Implementing MVC, MVP, and MVVM*. Medium. <https://medium.com/@sparkleo/design-patterns-in-flutter-implementing-mvc-mvp-and-mvvm-2b2ff24ec077>

Ten, M. (2024, July 3). *Amendments to vandalism law need to be tightened, impose heavier punishments, says S'wak minister*. Borneo Post Online.

<https://www.theborneopost.com/2024/07/03/amendments-to-vandalism-law-need-to-be-tightened-impose-heavier-punishments-says-swak-minister/>

Vikas, K. (2023, November 16). *The History Of Flutter: A Comprehensive Overview Of The Development Framework*. TechAhead. <https://www.techaheadcorp.com/knowledge-center/history-of-flutter/>

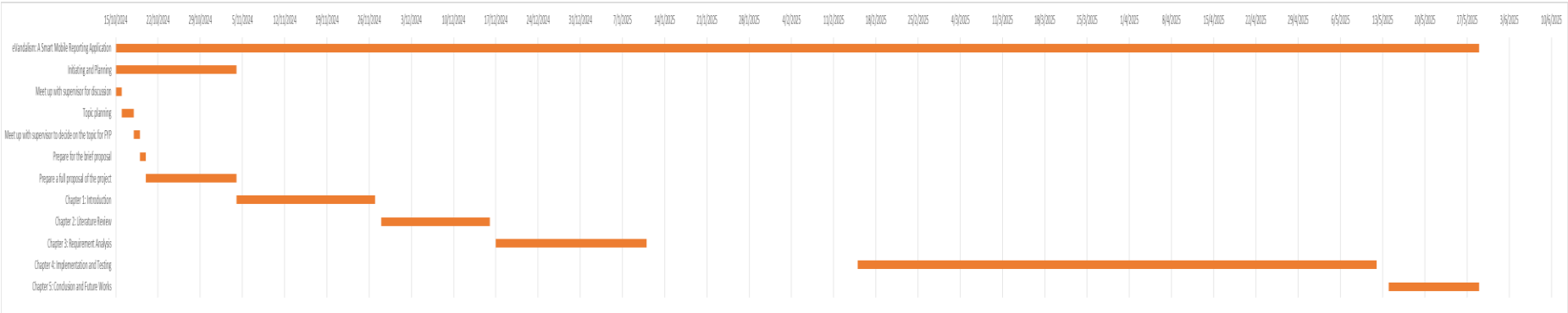
Xiaomi Mi 10T Pro 5G - Full phone specifications. (2020). Gsmarena.com.

https://www.gsmarena.com/xiaomi_mi_10t_pro_5g-10437.php

Zaki, S. (2024, October 14). *Use the PDRM e-Reporting System to Report Non-Criminal Cases Without Going to the Police Station*. Ipoh Echo.

<https://www.ipohecho.com.my/2024/10/14/use-the-pdrm-e-reporting-system-to-report-non-criminal-cases-without-going-to-the-police-station/>

Appendix A: Gantt Chart



Appendix B: Sample Questionnaire



Final Year Project : Survey on eVandalism: A Smart Mobile Reporting Application

Dear Respondents,

My name is Tan Chuan Hock from Faculty of Computer Science and Information Technology (FCSIT), Universiti Malaysia Sarawak (UNIMAS). Currently, I am a final year student. Therefore, this survey is conducted for my Final Year Project which is "**eVandalism: A Smart Mobile Reporting Application**". The purpose of this project are:

1. To analyse the current challenges faced in vandalism reporting within educational institutions by collecting data through a survey.
2. To develop a mobile application for reporting vandalism incidents.
3. To evaluate the functionality and effectiveness of the developed system through testing and feedback from users.

The survey take approximately 5 - 10 minutes to complete. All information information provided will only be used for academic purpose and no data will be shared to any third party. If you have any question(s) about the the survey, feel free to contact me through my WhatsApp via 011-16028480 or through my email at 81341@siswa.unimas.my

Your participant in this survey means a lot for me. By taking part in this survey, you are indirectly helping to make my project more successful and meaningful.

sincerely,
Tan Chuan Hock

tanchuanhock0103@gmail.com [Switch account](#)



Not shared



VANDALISM

Final Year Project : Survey on eVandalism: A Smart Mobile Reporting Application

tanchuanhock0103@gmail.com [Switch account](#)



Not shared

* Indicates required question

Section A: Demographic Information

Age Group *

- ☐ 16-21
- ☐ 22-27
- ☐ 28-33
- ☐ 34-39
- ☐ 40-45
- ☐ 46 and above

Gender *

- ☐ Male
- ☐ Female

State of Residence *

Choose

Back

Next



Page 2 of 5

Clear form

VANDALISM

Final Year Project : Survey on eVandalism: A Smart Mobile Reporting Application

tanchuanhock0103@gmail.com [Switch account](#)



Not shared

* Indicates required question

Section B: Current Concern About Vandalism

Do you think vandalism is a serious crime?

- ☐ Yes
- ☐ No

Have you ever witness anyone conduct vandalism in the campus? *

- ☐ Yes
- ☐ No

Have you ever feels frustrated when you wanted to use the facility inside the faculty but they are being damaged? *

- ☐ Yes
- ☐ No

Have you ever reported an incident of vandalism? *

- ☐ Yes
- ☐ No

[Back](#)

[Next](#)



Page 3 of 5

[Clear form](#)

VANDALISM

Final Year Project : Survey on eVandalism: A Smart Mobile Reporting Application

tanchuanhock0103@gmail.com [Switch account](#)



Not shared

* Indicates required question

Section B: Current Concern About Vandalism

If you have not reported vandalism, what are some factor(s) that prevent you from *
doing so? (Eg: do not know who to report or scare of retaliation or other)

Your answer

Back

Next



Page 4 of 5

Clear form

Final Year Project : Survey on eVandalism: A Smart Mobile Reporting Application

tanchuanhock0103@gmail.com [Switch account](#)



Not shared

* Indicates required question

Section C: Preferences for eVandalism Application

How often do you notice signs of vandalism inside the campus? *

1 2 3 4 5
Not often ☐ ☐ ☐ ☐ ☐ Very often

Do you know where or who you should report the incident to? *

☐ Yes
☐ No

If an application is provided to simplify the report process, would you use it? *

☐ Yes
☐ No

Would you prefer an app that allows for anonymous reporting of vandalism? *

☐ Yes
☐ No

That is all for the survey. Thank you!



[Back](#)

[Submit](#)

Page 5 of 5

[Clear form](#)

Appendix C: User Acceptance Test (UAT) Survey

Final Year Project : User Acceptance Test (UAT) on eVandalism: A Smart Mobile Reporting Application

* Indicates required question

User Acceptance Test (UAT)

The application performs all intended functions. *

- ☐ Yes
- ☐ No

The app uses mobile features correctly (e.g., camera, GPS). *

- ☐ Yes
- ☐ No

The flow of the application is easy to understand. *

- | | | | | | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ☐ | ☐ | ☐ | ☐ | ☐ | Strongly Agree |

The interface was intuitive and easy to understand. *

- | | | | | | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ☐ | ☐ | ☐ | ☐ | ☐ | Strongly Agree |

Do you think the application is hard to use? *

- ☐ Yes
- ☐ No

Do you like the mobile user interface of the application? *

☐ Yes

☐ No

Do you think the application provides helpful error messages when creating a new *
report?

☐ Yes

☐ No

Do you encounter any difficulty or error while using the application? *

☐ Yes

☐ No

[Back](#)

[Submit](#)

[Clear form](#)