

Digital Forensics Report Management System for MCMC (DFRMS-MCMC)

Nordiana Zulkifli^{1,*}, Siti Rohaidah Ahmad², Wan Yusmawati Wan Yusoff³, Arniyati Ahmad⁴, and Mohd Fahmi Mohamad Amran⁵

- ¹ National Defense University Malaysia; 2200237@alfateh.upnm.edu.my;  ORCID ID: 0009-0003-7683-9902
- ² National Defense University Malaysia; sitiroidah@upnm.edu.my;  ORCID ID: 0000-0001-5045-9803
- ³ National Defense University Malaysia; yusmawati@upnm.edu.my;  ORCID ID: 0000-0003-0407-3031
- ⁴ National Defense University Malaysia; arniyati@upnm.edu.my;  ORCID ID: 0000-0001-8073-7966
- ⁵ National Defense University Malaysia; fahmiamran@upnm.edu.my;  ORCID ID: 0000-0003-4378-5971
- * Correspondence: 2200237@alfateh.upnm.edu.my; +60146562998.

Abstract: Malaysian Communication and Multimedia Commission (MCMC) uses a physical report storage system and a stand-alone management system. Both systems have a flaw because workers must come to the office to use it. Therefore, this Digital Forensics Report Case Management System is proposed to help solving those problems. The main objective of this system is to make management system's process easier such as add, update, and delete cases, upload or download case reports, generate reports, and approve case according to the user's need. The next objective is to assist the retrieval process if the documents are to be used as reference. This management system is an online report management system proposed for MCMC. This developed system employs the concept of an online report management system which allows the user access if the device is connected to the internet network. This system is developed using the spiral methodology that have four phase which are planning, risk analysis, development, and testing. This method is important to ensure that the development process runs as expected. This system also has a security feature which is user need to input their password to get in the system and only users that being registered in the system's database are allowed to use it. With this system, MCMC's digital forensic officers can manage relevant reports more secure, efficient, and productive.

Keywords: computer forensics; report management system; spiral methodology.



Copyright: © 2023 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. INTRODUCTION

DFRMS-MCMC is a system designed to make all the reports kept by MCMC more organised and systematic. MCMC is one of Malaysia's law enforcement agencies responsible for enforcing Section 233 of the Communications and Multimedia Act 1998. It has many departments that handle cases in the most intelligent way. One of them is digital forensics. Digital forensics is a branch of forensic science that focuses on data recovery research, processing, examination, and investigation. This department will investigate the digital evidence in the cases. Hard discs, smartphones, and thumb drives are examples of digital evidence. The MCMC officers will create reports that include all procedures while conducting the investigation. The reports are crucial for future use. Furthermore, different types of evidence are usually present in a case, which is why it is important to ensure that the reports are handled properly and to avoid confusion. MCMC currently uses a physical report storage system in their vault as well as a separate management system known as the Digital Forensic Case Management

System (DFCMS). Both systems have a flaw in that employees must come to the office to use them. Digital Forensic Report Management System for MCMC is created to overcome those problems and to ensure the reports are stored safely and can be accessed at any time and from any location.

This system was developed after conducting research with comparable systems such as the Human Resource Management Information System (HRMIS), the Public Complaints Management System (SISPAA), and the Measles Investigation Information System (SM2). This research assists developers in gaining an understanding of what a system should have in order to create a better-quality system.

2. METHOD & MATERIAL

This section will discuss the methods and materials used in the development of this project to provide a better understanding. It is critical to have the proper method and materials to avoid any difficulties during the working process.

2.1 Method

The spiral methodology is used to create DFRMS-MCMC. Spiral is a model of the Software Development Life Cycle (SDLC) (Gurendo, 2015). Barry Boehm, an American software engineer, created this model in 1986. The system development phase is represented by a circular spiral in this model. This model has no fixed number and can be used according to the system's requirements. The primary goal of this model is to produce a high-quality product in a short amount of time and at a low cost. The spiral model has four phases, which are as follows:

1. Planning

This is the beginning stage before developing the product. This phase will examine all factors to ensure that this system is developed successfully.

2. Risk analysis

At this stage, all risks that will or may occur during the development phase will be considered. It is to ensure that if any problems arise during the development process, solutions will be available to continue development. This is significant because without solutions, the project will not be completed on time.

3. Design

During this phase, various types of diagrams are used to support project flow. The diagrams will guide developers in having a clear understanding of the project. For this project, context diagrams, entity-relationship diagrams (ERDs), hierarchy charts, and flow charts were used.

4. Evaluation

This phase will determine whether the development phase will continue, or end based on the quality. Before being delivered to the end user, this system will be tested by the developer to ensure that all the system's functions work properly. This is necessary to assist in tracking for and repairing any problems to produce more high-quality products.

It has only one spiral circle for the development of DFRMS-MCMC. This is because this project was created in a short period of time. Figure 1 shows the DFRMS-MCMC spiral model.



Figure 1. Spiral model for DFRMS-MCMC

2.2 Material

The scopes and materials that being used for developing the DFRMS-MCMC are as follows:

1. User

There are three user type for this system which are officer, head of department and admin.

- Officer - This system is only accessible to MCMC officers who have registered with admin. The officer will use the system to upload data and a report for the digital forensic case.
- Head of Department (HoD) - The HoD can use the system to update information uploaded by officers. The HoD can approve and change the status of the reports.
- Admin - Admins can register and update users' information. Admin manages the list of users who are permitted to use the system.

2. Data

This system will be used to store reports for cases under Section 233, Communications and Multimedia Act 1998 which is the use of a network for immoral purposes or activities.

3. Software, language, and database

Notepad++ is being used as a source code typing platform, and Figma is being used to design the interface or prototype. Hypertext Pre-processor (PHP), Hypertext Markup Language (HTML), and Cascading Style Sheets are the programming language formats (CSS). XAMPP with MySQL as the system database.

3. FINDINGS

This system was planned to ensure that it is appropriate for all user types and that users can easily adapt to it. A good design will shorten the time it takes users to complete their objectives while not confusing them. As a result, elements such as colour, fonts, images, buttons, and content are critical to the development of a website (Greenlane, 2019). This system has two designs which are the interface, and the algorithm.

3.1 The Interface

This system has different functions depending on the type of user. This is done to improve system security by implementing user access control. To login the system, user need to fill in the staff ID and password correctly. Figure 2 shows the login interface for this system.



Figure 2. Login interface for DFRMS-MCMC

3.1.1 Admin

Figure 3 shows the admin main page, which includes two buttons for registering users as well as updating and deleting users. The buttons will take the administrator to the page that being select.



Figure 3. Main page DFRMS-MCMC for admin

The image in Figure 4 shows the user registration form that admin must fill if admin click the register user button on the main page. All information is required to successfully register the user.

Figure 4. User registration form for admin

If the administrator clicks the update and delete user button, the interface shown in Figure 5 will appear. All users who have registered with the database will be displayed here. Admin can update or remove users from the list.

Index	User Type	Staff ID	First Name	Last Name	Phone Number	Email Address	Update	Delete
1	1	1234567	John	Doe	081234567	john.doe@digitalforensics.com	✓	✗
2	1	2345678	Jane	Doe	081234568	jane.doe@digitalforensics.com	✓	✗
3	2	3456789	John	Doe	081234569	john.doe@digitalforensics.com	✓	✗
4	2	4567890	Jane	Doe	081234570	jane.doe@digitalforensics.com	✓	✗
5	2	5678901	John	Doe	081234571	john.doe@digitalforensics.com	✓	✗
6	2	6789012	Jane	Doe	081234572	jane.doe@digitalforensics.com	✓	✗
7	2	7890123	John	Doe	081234573	john.doe@digitalforensics.com	✓	✗
8	2	8901234	Jane	Doe	081234574	jane.doe@digitalforensics.com	✓	✗
9	2	9012345	John	Doe	081234575	john.doe@digitalforensics.com	✓	✗
10	2	0123456	Jane	Doe	081234576	jane.doe@digitalforensics.com	✓	✗

Figure 5. List of users

Figure 6 shows the form on which administrators can update user information if necessary. If administrators want to make changes, they must also confirm their password. This is done to increase the system's security.

Figure 6. Update user information

3.1.2 Officer and Head of Department

Officer and department head have some functions that are similar but also differ.

1. Main page

The main difference between the officer and head of department main page interfaces is that the head of department has an additional button, which is the approve report button. Figure 7 is the main page for officer and Figure 8 is the main page for head of department.

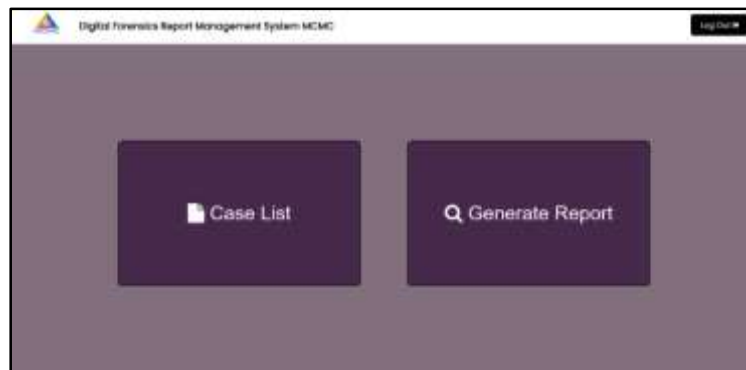


Figure 7. Main page for MCMC officer



Figure 8. Main page for head of department

2. Case list

When the officer clicks on the case list button, the interface shown in Figure 9 appears. Officers can choose from this list to download or view the report in PDF format that has been uploaded to the database. Officers can also choose to edit or remove a case from the list.

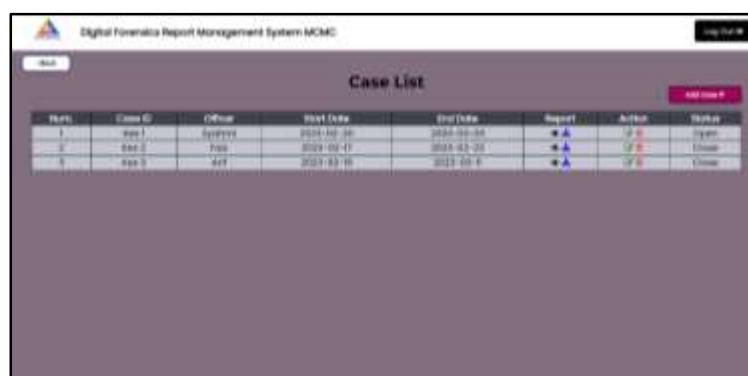


Figure 9. Case list for officer

3. Add/Register case

The purpose of the add and register form is to upload and store information in the system database. The form must be filled out completely or the case will not be registered. When an officer clicks the add case button on the case list interface, the interface shown in Figure 10 appears. If the department head clicks the register case button, the interface shown in Figure 11 will show up.

Figure 10. Add case for MCMC officer

Figure 11. Register case for head of department

4. Update case

Officers and department heads can update the case like in Figure 12 as needed in the circumstance that information changes in the future; this function is also required.

Figure 12. Update form for officer and head of department

5. Generate report

If the officer and head of department click the generate report button, the interface shown in Figure 13 will appear. To allow the system to generate a report, officers and heads of departments must enter the case ID or officer name. This function will make it easier for both types of users to search for specific cases.

The screenshot shows the 'Generate Report' page. At the top, there's a header with the system name and a 'Log Out' button. Below the header, there's a 'Generate Report' section with a search bar containing 'Case ID or Officer Name' and a 'Generate Report' button. Below this, there's a 'Search Result' section displaying details for Case ID 1.

Case ID	Officer Name	Start Date	End Date	Status
Case 1	SP12345	2023-01-01	2023-01-05	Open

Figure 13. Generate report for officer and head of department

6. Approve report

The extra button for the head of department will display the interface shown in Figure 14. There is an action column with a button in it. If the report is approved by the department's head, the status will be changed to closed. Otherwise, the case will remain open.

The screenshot shows the 'Case List' page. At the top, there's a header with the system name and a 'Log Out' button. Below the header, there's a 'Case List' section displaying a table with the following data:

Name	Case ID	Officer	Start Date	End Date	Report	Action	Status	Action
Case 1	Case 1	SP12345	2023-01-01	2023-01-05	Report	Open	Open	Approve
Case 2	Case 2	SP12345	2023-01-01	2023-01-05	Report	Open	Open	Approve
Case 3	Case 3	SP12345	2023-01-01	2023-01-05	Report	Open	Open	Approve

Figure 14. List of cases for head of department

Figure 15 shows the change in the status of the case when the head of department clicks the action button.



Case ID	Case ID	Officer	Start Date	End Date	Report	Status	Action
1	Case 1	Syafiq	2021-01-01	2021-01-01	Report	Report	Approve
2	Case 2	IHL	2021-01-01	2021-01-01	Report	Report	Approve
3	Case 3	AHL	2021-01-01	2021-01-01	Report	Report	Approve

Figure 15. Change on status after click on approve button

3.2 The Algorithm

Algorithms are one method by which developers implement decision making in their systems. The algorithm for this system's process is shown below in Figure 16.

```

Process 1: Login
Input: staff ID and password
If    staff ID and password correct
    display message successfully logged in;
Else  display error message login is unsuccessful;
    repeat process 1;

Process 2: Register User
Input: user information
If    all user information filled in and no such information in the database
    display message successfully register new user;
Else  display error message user registration is unsuccessful;
    repeat process 2;

Process 3: Register Case
Input: case information
If    case information filled in an no such information in the database
    display message successfully register new case;
Else  display error message case registration is unsuccessful;
    repeat process 3;

Process 4: Generate Report
Input: case ID or staff name
If    case ID or staff name available in the database
    display case report;
Else  display error message input not available in the database;
    repeat process 4;

Process 5: Approve Report
Input: report approval status
If    click on approve button
    display approve on status;
Else  display error message report unsuccessfully approved;
    repeat process 5;
    
```

Figure 16. The algorithm for DFRMS-MCMC

4. DISCUSSION

This DFRMS-MCMC web-based system achieves its goals. The following goals have been met:

- a. Gathering information on what features are appropriate for developing this system.
- b. Create a database that allows users to update and store evidence information and reports.
- c. Developed a system to help solving the issues faced by MCMC.
- d. Generate reports for case status in the database.
- e. Ensure the system is functioning well no error.

This system also has advantages that make it more suitable to being developed by MCMC which are:

- a. Ensure that reports are managed properly and in a systematic manner.
- b. It simplifies the work of officers and department heads because it can be accessed via an Internet connection.
- c. The interface is simple, adaptable, minimalist, and user-friendly.
- d. A database is used to store all the information that is registered on the system.
- e. Only administrators can register users. Because only registered users can access the system, it becomes more secure.

Although this system is well delivered to its end user and usable, it does have limitations that can be resolved in the future. Time constraints and other factors contributed to the limitations. The constraints are as follows:

- a. To use this system, the user must have Internet access.
- b. Officers and department heads are unable to manage their own personal information.
- c. There is no password reset options.
- d. Admin is unable to manage case information.
- e. The system does not recommend a better password to users.
- f. The system only supports one language, which is English.

5. CONCLUSION

Overall, this Digital Forensic Report Management System met its user's objectives and needs. This system is also secure because it has a security feature that requires users to enter their password to access the system, and it is only accessible to users who are registered in the system's database. This system is appropriate and can be implemented by the MCMC to help them solve the problems discovered in their current system.

Acknowledgments: Special thanks to the Faculty of Defense Science and Technology, National Defense University of Malaysia for supporting this project and also the Student Affairs Department for the sponsorship to participate i3DC 2023.

References

- Dennis, A., Wixom, B. H., & Roth, R. (2012). *System analysis and design*. In B. L. Golub & J. Poh (Eds.), Inc. United States of America (5th ed.). John Wiley & Sons, Inc.
- Greenlane (2019). *Mempelajari asas reka bentuk web*. Retrieved 28 November 2022 from: <https://www.greelane.com/ms/sains-teknikal-matematik/sains-komputer/web-design-basics-4140405/>
- Gurendo, D. (2015). *Spiral model in software development life cycle (SDLC): Phases, explanations, methodology*. Retrieved 19 October 2022 from: <https://xbsoftware.com/blog/software-development-life-cycle-spiral-model/>
- Kean Hua, A. (2016). Pengenalan rangkakerja metodologi dalam kajian penyelidikan: Satu kajian literatur. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 1(2), 18.
- Kendall, K. E., & Kendall, J. E. (2011). *Systems analysis and design*. 8th ed. Pearson Prentice Hall.
- Malaysian Communications and Multimedia Commission (MCMC). (2022). *Akta Komunikasi dan Multimedia 1998 [Akta 588]*. Retrieved 13 October 2022 from: <https://www.mcmc.gov.my/ms/legal/acts/communications-and-multimedia-act-1998-reprint-200>
- Malaysian Communications and Multimedia Commission (MCMC). (2022). *5,802 aduan penipuan diterima MCMC sejak 2020*. Retrieved 13 October 2022 from: <https://www.mcmc.gov.my/ms/media/press-clippings/5-802-aduan-penipuan-diterima-mcmc-sejak-2020>
- Mohamad, N. S. (2019). Facial Recognition Based Student Attendance Monitoring System: Sistem Data Architecture Studies on Disability Insurance Claims Handling at SOCSO
- Rosenblatt, H. J. (2014). *Systems analysis and design* (M. Lee, Ed.; 10th ed.). Course Technology.
- Wahid, F. (2004). Metodologi penelitian sistem informasi: Sebuah gambaran umum. *Media Informatika*, 2(1), 69–81.
- Watrianthos, R., Jamaludin, Sulaiman, O. K., Simarmata, J., Wagiu, E. B., Pakpahan, A. F., & Iskandar, A. (2021). *Forensik digital* (A. Rikki, Ed.; 1st ed., Vol. 1). Yayasan Kita Menulis.