

# Law Enforcement Information Portal (LEIP)

by

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## TABLE OF CONTENTS

|   |    |
|---|----|
| Abstract.....   | 1  |
| Introduction.....   | 2  |
| Problem.....  | 2  |
| Solution.....   | 2  |
| Project Goals.....  | 2  |
| Overview.....   | 3  |
| Discussion.....   | 3  |
| Project Concept.....                                      | 3  |
| Design Objectives.....                                    | 4  |
| Methodology.....  | 5  |
| Web Application.....                                      | 5  |
| Database.....   | 5  |
| Work Process.....   | 6  |
| User Profiles.....  | 6  |
| Use Case Diagrams.....                                    | 8  |
| Technical Architecture.....                               | 9  |
| Testing.....  | 10 |
| Budget.....   | 13 |
| Project Timeline.....                                     | 14 |
| Problems Encountered and Analysis of Problems Solved..... | 15 |
| Recommendations for Improvement.....                      | 15 |
| Conclusion.....   | 16 |
| Lessons Learned.....                                      | 16 |
| Skills Developed During the Project.....                  | 16 |
| Back Matter.....  | 18 |
| References.....   | 18 |

## LIST OF ILLUSTRATIONS

|   |    |
|---|----|
| Figure 1. Use Case Diagram.....               | 9  |
| Figure 2. Technical Architecture Diagram..... | 10 |
| Table 1. User Profile Form 1.....             | 6  |
| Table 2. User Profile Form 2.....             | 7  |
| Table 3. User Profile Form 3.....             | 7  |
| Table 4. Final Project Budget.....            | 13 |
| Table 5. Project Timeline.....                | 14 |

## ABSTRACT

Research shows that just over half of the country's law enforcement academies received comprehensive training on cybercrime cases and investigations. Law Enforcement Information Portal is a website that bridges that gap. The home page is a dashboard showing up-to-date statistics of crime in the local area, as well as an interactive map of the local area. Working with a database on the backend, one of the features is a search for information on popular Internet Service Providers (ISPs) that, upon search submission, will detail contact information, a link to the ISP's law enforcement guide, and information on data retention, where to send subpoenas, and more. Other features include an extensive phone directory of local law enforcement and services contacts, a directory of links to each of the 50 states' sex offender registry pages, and a guide full of helpful tips on preserving digital evidence. Law Enforcement Information Portal intends to aid law enforcement in the office or out in the field during investigations.

## 1. INTRODUCTION

### 1.1 Problem

Finding information on cybercrime cases can be a long and tedious task. There are numerous steps involved when solving these types of cases, from gathering data to filing subpoenas. To aid in investigating and solving these cases, law enforcement needs to traverse hundreds, if not thousands, of websites and databases. It can be easy to overlook important details needed to solve cybercrimes when there is not one single point of access for all of this information and data. Because the public feels that local law enforcement cannot keep up with cybercrimes, only 17% of them are reported (Rogers, M.K & Seigfried, K. (2004)). This leaves thousands of victims and survivors without justice.

### 1.2 Solution

Law Enforcement Information Portal (LEIP) is a website that allows law enforcement to access all the data and information they would need to investigate and then solve their cybercrime cases. LEIP provides five fully functioning features: a dashboard with an interactive map of the local area and up-to-date crime statistics for the local area, a local law enforcement and services phone directory, a search for information on popular Internet Service Providers (ISPs), a guide on preserving digital evidence, and a directory containing links to the sex offender registry pages for all 50 states, as well as links for victim and survivor resources.

### 1.3 Project Goals

The main goal to be accomplished with LEIP is to make solving crimes, cyber-related or otherwise, easier for law enforcement. To accomplish this goal, we will develop a website and a database that will work together to retrieve and display relevant data. The website will be available to law enforcement all over the Cincinnati area.

#### **1.4 Overview**

The remainder of this report outlines, in detail how the project was completed. The sections to follow are Project Concept, Design Objectives, Methodology, User Profiles, Use Case Diagrams, Technical Architecture, Testing, Budget, Project Timeline, Problems Encountered and Analysis of Problems Solved, Recommendations for Improvement, Lessons Learned, and Skills Developed During the Project.

## **2. DISCUSSION**

### **2.1 Project Concept**

A project team member's work with Hamilton County's local law enforcement department is the main source of inspiration behind LEIP. She had been thinking about various ideas in the Summer of 2020 having to do with cybercrimes but talking to her co-workers and "higher-ups" helped her decide on LEIP. Through her daily interactions with the investigation team, she saw that detectives and officers were not properly prepared or equipped to investigate and solve cybercrimes. They received little to no cybercrime investigations training in the academy. Further, the resources they were made to use to aid in these investigations were overwhelming and many conflicted with information

from other similar resources. This is where LEIP comes in. LEIP acts as a “one-stop-shop,” condensing the functionality of all these resources to one website.

## 2.2 Design Objectives

The aspects of the key design objectives and constraints are specified below.

- Design, build, and implement a database of ISPs with information such as:
  - Contact information
  - Link to law enforcement guide on ISPs website
  - Detailed information on where to send subpoenas, data retention, etc.
- Design, build, and implement a database of local law enforcement and services.
  - Phone Directory
- Design, build, and implement a website to be used by law enforcement during cybercrime investigations.
  - Features to be included:
    - Dashboard with interactive map and up-to-date crime statistics for the local area
    - ISP search and results page
    - Phone directory page
    - Page with links to the sex offender registry pages for all 50 states
      - Also included will be links to victim and survivor resources.
    - Page with a guide on preserving digital evidence

- Also included will be links to other websites with detailed information on this topic.

Unfortunately, not all of our initial ideas made it to the final product. This includes the use of personal user accounts, as well as a notetaking feature. The latter would have been specific to the user account. The user would have been able to log back in and refer back to their notes.

### **2.3 Methodology**

In this section, listed will be the major components of the project, what they include, and how and with what they were developed. There will also be discussion on how the LEIP team worked together during the Fall semester of 2020 and Spring semester of 2021.

#### **Web Application**

Initially used was Bootstrap Studio to get a template for the website. Visual Studio Code was then used as the IDE for further web development. For the backend of the website, controlling interaction with the database and how HTML templates loaded, Python was used as the programming language. HTML, CSS, and JavaScript were used to design and develop the templates. GitHub was used for remote source control, Sourcetree being used to facilitate.

#### **Database**

To start, two of the LEIP team members created two Excel spreadsheets to store information for the ISPs and phone directory. The sheets were then imported as tables

into an autonomous database hosted on Oracle Cloud. MySQL was the structured query language used.

### **Work Process**

Starting in the Fall semester of 2020, the LEIP team met every Monday, after the synchronous class session for Senior Design I, to work on project management assignments and to meet with our faculty advisor, Tony Iacobelli. There, the team would also decide on tasks for the week, be that work for other project management assignments or work on the product. Outside of Monday nights, the team would work on their assigned tasks and then meet up again on Fridays to complete the Weekly Retrospective and Weekly Team Evaluations.

Spring semester 2021 was a bit less structured for the team. Two out of the three of the team members attended the Monday night synchronous class sessions, while the other team member was in the Asynchronous section of the class. Because of this, the team met with our advisor on Wednesday's at 2:30 PM to discuss progress and tasks for the upcoming week. The team would meet outside of these advisor meetings, when necessary, to work on project management assignments or development of the product.

## **2.4 User Profiles**

This section will introduce potential users and administrators of LEIP, what their related experience with web applications is, how they may use LEIP, and what they may want included.

|  |
|--|
| <b>User Profile Form 1</b>                                       |
| <b>Application:</b><br>LEIP (Law Enforcement Information Portal) |
| <b>Potential Users:</b>  |

|   |
|---|
| Law Enforcement officials that can include officers, sheriffs, patrolman, and others  |
| <b>Software and Interface Experience:</b><br>Users do not have to have any prior software or interface experience besides navigating a website. |
| <b>Experience with Similar Applications:</b><br>SEARCH.org, Google Chrome, Safari, Edge, etc  |
| <b>Task Experience:</b><br>Being able to navigate a website that includes drop downs and clicking different features                            |
| <b>Frequency of Use:</b><br>Whenever the users need to access the portal; 24/7  |
| <b>Key Interface Design Requirements that the Profile Suggests:</b><br>User-friendly, easily accessible, and secure                             |

Table 1: User Profile Form 1

|  |
|--|
| <b>User Profile Form 2</b>   |
| <b>Application:</b><br>Law Enforcement Information Portal (LEIP)   |
| <b>Potential Users:</b><br>Private Investigators   |
| <b>Software and Interface Experience:</b><br>Experience with using common web applications and websites                      |
| <b>Experience with Similar Applications:</b><br>Search.org, Google Chrome, Firefox, Microsoft Edge                           |
| <b>Task Experience:</b><br>Basic knowledge of interacting with websites – clicking links, using search list, download button |
| <b>Frequency of Use:</b><br>Whenever they need to look up information for investigative cases, or general knowledge          |
| <b>Key Interface Design Requirements that the Profile Suggests:</b><br>Easily accessible, easy navigation, and secure.       |

Table 2: User Profile Form 2

|  |
|--|
| <b>User Profile Form 3</b>   |
| <b>Application:</b><br>GitHub, SourceTree, Python, MySQL Server Database, CSS, HTML5   |
| <b>Potential Users:</b><br>Web Developers/Administrators   |
| <b>Software and Interface Experience</b><br>User should be familiar with python and the coding used to create the dashboard, GitHub and SourceTree |
| <b>Experience with Similar Applications:</b><br>Needs to be familiar with coding languages and GitHub  |
| <b>Task Experience:</b><br>Experience with coding/developing websites and databases.   |

|  |
|--|
| <b>Frequency of Use:</b><br>Once the website is created, this user will only interact with the application when needing to update information such as adding/removing ISPs and adding up-to-date information. They will also interact when needing to improve security requirements and correct bugs in the application. |
| <b>Key Interface Design Requirements that the Profile Suggests:</b><br>Work with programming languages, be able to maintain the dashboard, be current with new ISPs, and new technology trends   |

*Table 3: User Profile Form 3*

## 2.5 Use Case Diagram

This section provides a figure showing the potential users of LEIP and what their interactions would be with the front and back ends of the application.

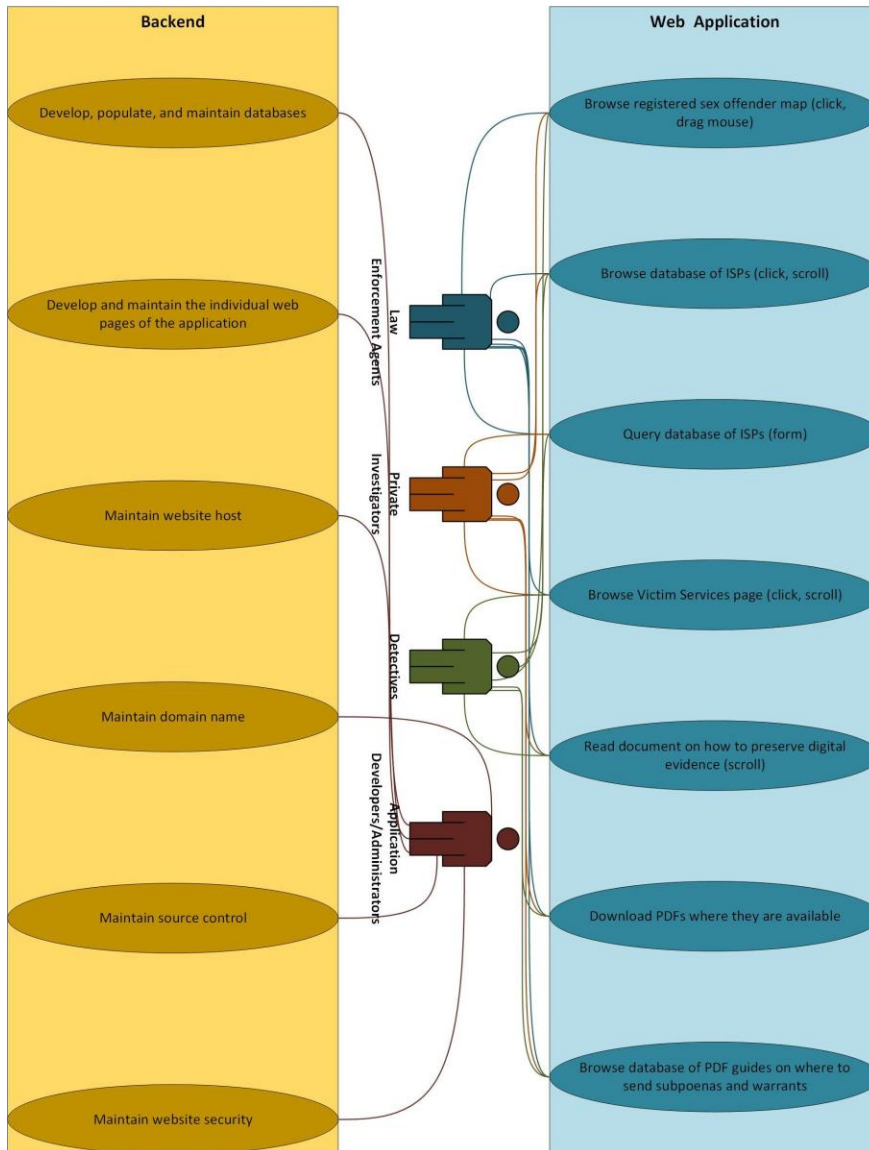


Figure 1: Use Case Diagram

## 2.6 Technical Architecture

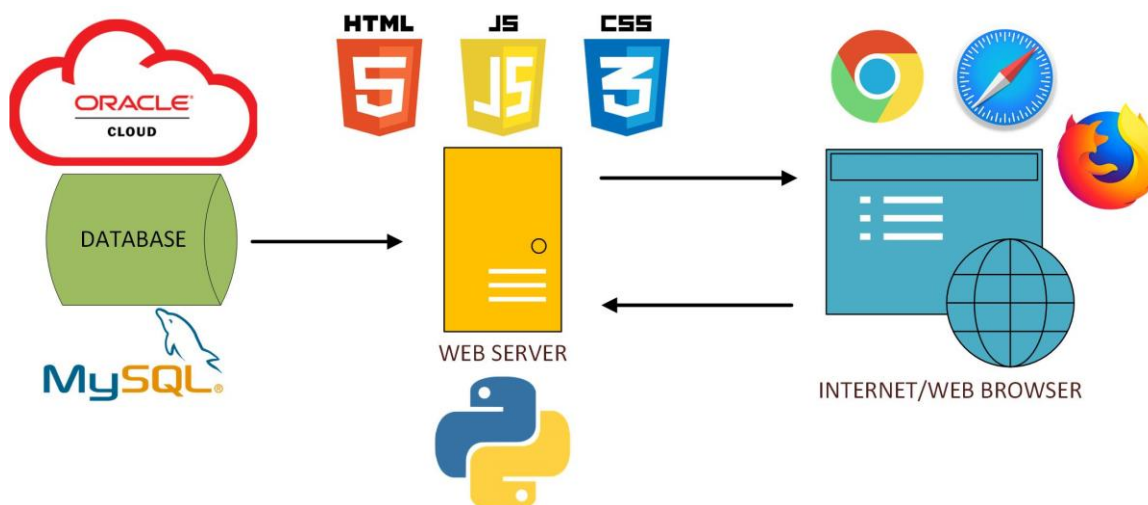


Figure 2: Technical Architecture Diagram

## 2.7 Testing

In this section, we will detail our testing plan and procedures. We will present our approach to testing and explain our reasoning behind choosing the approach we did. We will list our use cases and features to be tested, along with explaining why those are the use cases and features that need to be tested. We will define our testing strategy and what our end goal is by specifying our objectives. We will present our testing results and, finally, conclude with a review of what we learned during testing, any parts of our project that we reworked as a result, and what we would change going forward.

### Testing Methodology

Our approach to testing was to scale the usability of LEIP. We want the portal to be user friendly for non-IT professionals, with focusing specifically on law enforcement officials. The goal for our project is to make a reliable, one stop shop for law enforcement to get information for cyber cases, so focusing on the actual serviceability is our top priority for testing.

### Scope of Testing

#### Test Users:

- Law Enforcement Officials, current detective or patrolman, or retired.
- IT Professional – Software Engineer

#### Features to Be Tested:

- Home Page/Dashboard
  - Cybercrime Court Items List
  - Interactive Map
  - Statistics
- State Sex Offender Registry Directory
- Phone Directory
  - Page-by-Page Navigation
- ISP Information Search and Results
- Preserving Digital Evidence Task List

#### Use Cases:

- Test users navigating the homepage
- Test users navigating the State Sex Offender Registry Directory
- Test users navigating the Phone Directory
- Test users interacting with the ISP Information Search and viewing of the results
- Test users navigating the Preserving Digital Evidence Task List

### **Objectives**

Our testing strategy is to have real law enforcement officials use our web application as it is right now. We specifically want that group of users to lead our testing period because they are who we expect to use our web application “in the real world.”

Our end goal is to identify areas of weakness, bugs that need to be fixed, and possibly new features to be developed, whether that is before the IT Expo and after graduation, based on what our test users’ feedback is.

Defined Objectives:

- All major features and use cases need to be accounted for.
- Data should display correctly when queried.
- Portal should be relatively easy to navigate for the users.
- Any bugs will need to be resolved before we start preparing for the IT Expo.

### **Test Logs and Procedures**

This section will be completed for the final report at the end of the semester. Our testing is still in progress.

### **Testing Cases**

1- Navigate the Home and Sex Offender Page

Step 1: Navigate to each feature page

Step 2: Select the Sex Offender page

What happened: detective was able to successfully click the SO page and open drop downs that connected to multiple states.

2- Navigate to the IPS Page

Step 1: Select the drop down and click on an IPS to view

What happened: the tables too a little long to load so the detective thought that he broke it and went back with interrupted the table.

### 3- Navigate the Phone Directory

Step 1: Find a phone number for the Chief of Police at Green Township

What happened: at first had a little trouble realizing the organization of the phone book, but found the number after a few minutes. Recommended that we add a number for the Mayerson Clinic.

### 4- Read over the Digital Evidence Guide

Step 1: Find out what to do when finding a phone at a crime scene

What happened: found what to do with a phone that was on at a crime scene within a few moments.

## 2.8 Budget

This section provides a table visualizing our final budget for this project. It is separated by what software we used and how we would charge labor for the major tasks of the project.

| <b>Law Enforcement Information Portal Budget</b> |                    |                    |                   |              |
|--|--------------------|--------------------|-------------------|--------------|
| <b>NO.</b>                                       | <b>ITEM</b>        | <b>UNIT, HOURS</b> | <b>UNIT PRICE</b> | <b>TOTAL</b> |
| <b>SOFTWARE</b>                                  |                    |                    |                   |              |
| <b>1</b>   | Visual Studio Code | 1                  | \$0               | \$0.00       |
| <b>2</b>   | Sourcetree         | 1                  | \$0               | \$0.00       |
| <b>3</b>   | Bootstrap Studio   | 1                  | \$0               | \$0.00       |
| <b>4</b>   | Microsoft Office   | 1                  | \$0               | \$0.00       |
| <b>5</b>   | Canva              | 1                  | \$0               | \$0.00       |

|              |   |        |                  |                  |
|--------------|---|--------|------------------|------------------|
| <b>6</b>     | Oracle MySQL Database Service (Free Tier) | 1      | \$0              | \$0.00           |
|              | Subtotal                                  |        |                  | \$0.00           |
| <b>LABOR</b> |   |        |                  |                  |
| <b>4</b>     | Logo Design                               | 1, 0.5 | \$100 (flat fee) | \$100.00         |
| <b>5</b>     | Website Build                             | 1, 100 | \$20 (hourly)    | \$2000.00        |
| <b>6</b>     | Database Build                            | 1, 30  | \$20 (flat fee)  | \$600.00         |
|              | Subtotal                                  |        |                  | \$2700.00        |
|              | <b>Total</b>                              |        |                  | <b>\$2700.00</b> |

Table 4: Final Project Budget

## 2.9 Project Timeline

| <b>Task #</b> | <b>Task</b>                   | <b>Duration</b> | <b>Start Date</b> | <b>End Date</b> |
|---------------|-------------------------------|-----------------|-------------------|-----------------|
| 1             | Project Contract              | 8 Days          | 8/24/2020         | 9/1/2020        |
| 2             | Project Abstract              | 14 days         | 9/1/2020          | 9/14/2020       |
| 3             | User Profile                  | 14 days         | 9/1/2020          | 9/14/2020       |
| 4             | Use Case Diagram              | 14 days         | 9/1/2020          | 9/14/2020       |
| 5             | Budget                        | 14 days         | 9/1/2020          | 9/14/2020       |
| 6             | Testing Plan/Report           | 7 days          | 9/15/2020         | 9/21/2020       |
| 7             | Meet with advisor             | 7 days          | 9/22/2020         | 9/28/2020       |
| 8             | Project Abstract              | 7 days          | 9/29/2020         | 10/12/2020      |
| 9             | Team Contract Resubmission    | 7 days          | 9/29/2020         | 10/12/2020      |
| 10            | Elevator Pitch                | 7 days          | 10/13/2020        | 10/19/2020      |
| 11            | User Profile                  | 7 days          | 10/13/2020        | 10/19/2020      |
| 12            | Use Case Diagram              | 7 days          | 10/13/2020        | 10/19/2020      |
| 13            | Prepare for Fall Presentation | 14 days         | 10/20/2020        | 11/02/2020      |
| 14            | Draft Report                  | 7 days          | 11/03/2020        | 11/09/2020      |
| 15            | Oral Presentations            | 14 days         | 11/03/2020        | 11/16/2020      |
| 16            | Final Fall Report             | 7 days          | 11/17/2020        | 11/30/2020      |
| 17            | Copy of Formal Presentation   | 14 days         | 11/16/2020        | 11/30/2020      |
| 18            | Testing Plan/Report           | 7 days          | 2/1/2021          | 2/8/2021        |
| 19            | Final IT Expo Abstract        | 7 days          | 2/8/2021          | 2/15/2021       |

|    |  |         |           |           |
|----|--|---------|-----------|-----------|
| 20 | Draft IT Expo Poster                               | 7 days  | 2/22/2021 | 3/1/2021  |
| 21 | Final IT Expo Poster                               | 7 days  | 3/8/2021  | 3/15/2021 |
| 22 | Course Final Presentation & Visual Aids            | 7 days  | 3/29/2021 | 4/5/2021  |
| 22 | IT Expo Recorded Presentation                      | 1 day   | 4/4/2021  | 4/5/2021  |
| 23 | Plagiarism (Turn it In) Review for the Final Paper | 7 days  | 4/5/2021  | 4/12/2021 |
| 24 | Final Report                                       | 7 days  | 4/5/2021  | 4/12/2021 |
| 25 | IT Expo  | 1 day   | 4/13/2021 | 4/13/2021 |
| 26 | Final Library Copy of Report                       | 12 days | 4/14/2021 | 4/26/2021 |

*Table 5: Project Timeline*

## **2.10 Problems Encountered and Analysis of Problems Solved**

Throughout the semester, we have worked together to design the project and every project comes with problems. We have faced challenges with technical implementation while working. One of the problems we faced was time constraints when trying to see if we could put in user accounts. Since we had a limited time with this project, we decided to forego the user accounts and stick with a website that was free to use for all.

## **2.11 Recommendations for Improvement**

The LEIP team wanted to include more features than we had time for. As mentioned in the Methodology section, there were plans to include user accounts and a note taking feature, personal to each user account.

If we had to do it all over again, we would take less time researching during the Fall semester on the technologies needed to design, develop, and build the website and database. That research took up a lot of extra time that we could have spent developing the other scrapped features mentioned.

### 3. CONCLUSION

#### 3.1 Lessons Learned

We learned quite a few lessons while working on this project this semester. We learned the background basics of what it takes to put a website together from scratch. Researching different technologies helped us learn more about the kinds of companies there are in the market and what they offer in terms of specifics. One of the biggest lessons we learned was team communication and organization with managing a big project like LEIP.

We also learned about all the different platforms and applications that law enforcement has to use to solve one crime and how there really isn't any dashboard like ours that combines all of them together.

#### 3.2 Skills Developed During the Project

While working on our project, we learned a lot of important skills that we will be able to take into the "real world." One skill we learned is project management. Designing this project, between Fall semester and Spring semester required a lot of organization, time, and effort. These are the main skills needed for successful project management. Another skill we developed is working together with people from different technical

backgrounds. Our team comprised of members from different tracks. Madison is in Software Development, Novyle is in Cybersecurity, and Katie is Cybersecurity while also getting her Master's in Criminal Justice. This project would not have been able to be successful without each member's expertise. A third skill we developed was web development. Madison, specifically, was able to learn more about Python and JavaScript, while we all learned about HTML and CSS through developing the pages for the website.

## REFERENCES

Rogers, M. K., & Seigfried, K. (2004). The future of computer forensics: a needs analysis survey. *Computers & Security*, 23(1), 12-16.