



# **BACHELOR OF SCIENCE WITH HONOURS IN CYBERSECURITY**

Final Year Project Report

## **“Bookworm” A Secure Bookstore Web Application**

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Due Date: 19 April 2024

## DECLARATION STATEMENT

I certify that all the information given in this curriculum vitae is in accordance with my knowledge and experience. I take full responsibility for the truthfulness of the provided information below. Moreover, I understand that if I have deliberately given any false information, I am liable for prosecution for fraud and/or perjury.

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## **ABSTRACT**

This paper aims to provide a proposal of developing a secure web application for the final year project. Bookworm is a secure website application in which users can trust and intends to maintain their data securely. This proposal encompasses into three parts. The first part will briefly give an overview of this proposal, and the latter one will discuss mainly on background study of the literature review. The last part with outline the methodology of this project.

## **ACKNOWLEDGEMENTS**

In this section, I want to express my sincere gratitude towards my professor for helping me throughout this project.

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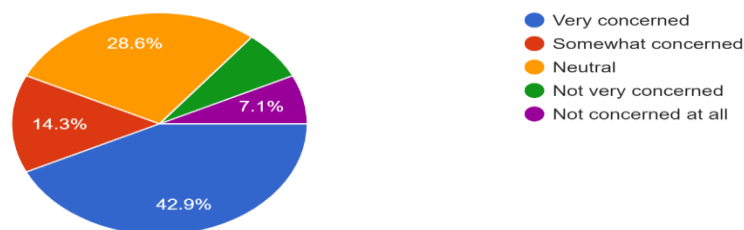
# 1. PROJECT PROPOSAL

## 1.1 Project Background

Since most consumers prefer online platforms to buy their needs and wants, many retailers have been digitalizing their selling strategies in recent years. As for the book industry, the structure has significantly transformed due to the rapid development of e-commerce and digital technology. To adapt with these changes, the development of Bookstores Web Application emerges as a strategic solution to tackle the gap between physical stores and the online marketplace. However, the concerns about keeping customers' personal information safe are significant which means it is important to put strong web-security protections in place when creating a complete Bookstores Web Application. Moreover, it is crucial to implement the strong encryption and hashing algorithms along with utilizing the secure programming while developing the website.

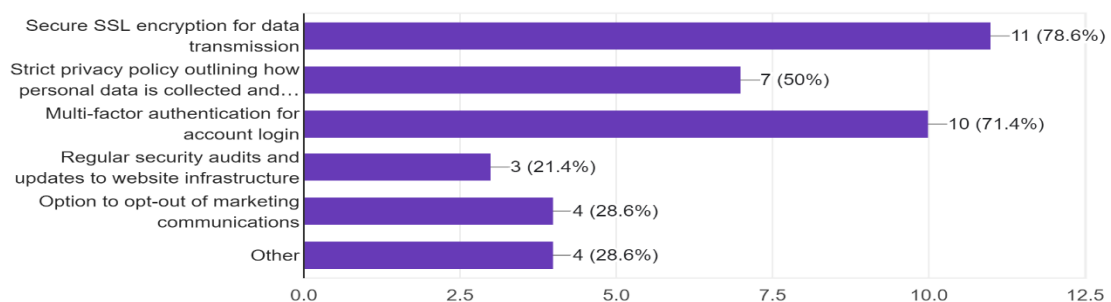
According to my conducted survey, 8 out of 14 people are concerned with their privacy when giving their personal information during account creations. Over one-third of audiences expect the bookstore website to implement secure SSL encryption for data transmissions and multifactor authentications for account login. Almost all the participants in my survey want to see the secure sign for bookstore website.

How concerned are you about the security of your personal information when making purchases on online bookstore websites?  
14 responses



**Figure 1 People concerns on giving their personal information.**

What measures do you expect an online bookstore to implement to protect your personal information? (Select all that apply)  
14 responses



**Figure 2 Preferences on security measures.**

## ***1.2 Project Aims & Objectives***

### **1.2.1 Project Aims**

The purpose of this project is to design and integrate a secure web application of bookstores which ensures the protection of customers' personal data and implementing strong security measures.

### **1.2.2 Project Objectives**

Objectives are:

- Utilize secure programming, such as sanitization of codes.
- Integrate secure authentication mechanisms, such as password hashing and salting, to prevent unauthorized access to user accounts.
- Implement Transport Layer Security (TLS) protocols to encrypt data transmitted between the web application and users' device.
- Implement Secure Socket Layer (SSL) certificate to make a website into https.
- Implement encryption techniques, such as Advanced Encryption Standard (AES), to encrypt sensitive data stored in the database.



### 1.3 Market Research

In this section, I have carried out market research based on several factors mainly focusing on security aspects.

Aspects	Bookmate	Scribd	Kobo	Booktopia
<b>Main contents</b>	E-books, audiobooks	E-books, audiobooks, documents	E-books	Books, e-books, DVDs, media
<b>Subscription Model</b>	Yes	Yes	No	No
<b>User Interface</b>	Personalized	User-friendly interface	Reader-friendly interface	Easy navigation
<b>Target Audience</b>	General readers	General readers	E-book readers	General readers
<b>Data Encryption</b>	Strong encryption standards	Secure encryption protocols	Secure transmission protocols	Secure data transmission
<b>User Authentication</b>	Multifactor authentication	Secure login mechanisms	Secure login mechanisms	Secure login mechanisms
<b>Data Protection</b>	Regular data security audits	Data protection measures	Data protection measures	Data protection measures
<b>Anti-piracy Measures</b>	DRM protection	Anti-piracy measures	Anti-piracy measures	Anti-piracy measures
<b>Account Security</b>	Account recovery options	Account security features	Account security features	Account security features
<b>Secure Transactions</b>	Secure payment gateways	Secure payment processing	Secure payment processing	Secure payment processing

Figure 3 Overview of Market Research

## ***1.4 Problem Statement & Solutions***

### **1.4.1 Problem Statement**

After thoroughly analysing on the current market, even though their securities are mostly advanced, they often face security challenges. They often encounter with attack vectors such as data breaches, unauthorized access to user credentials, and piracy concerns. Problems can be detailed as follows:

1. **Data Breaches:** In bookstore platforms, users' personal and credit card information can be breached by the malicious users. They gained unauthorized access by targeting less technology literate and elderly people.
2. **Weak Authentication:** It is not sufficient to only deploy the single factor authentication in the login system. Using only one authentication such as password cannot prevent unauthorized access to user accounts.
3. **Account Security:** Utilizing account security and account recovery options cannot alone prevent from unauthorized access.
4. **Piracy Concerns:** Anti-piracy measures are not enough to outsmart a sophisticated attacker.

### **1.4.2 Solutions**

Regarding to the problems that I have stated above, these are the possible solutions to mitigate the above problems. The solutions are as follows:

1. **Implement Strong Encryption and Hashing:** To protect user information, I must use strong encryption systems like AES and RSA. For storing password securely in database, secure hashing algorithms must apply.
2. **Utilize Multifactor Authentication:** To enhance user account security, I must implement MFA mechanisms in my web application, such as one-time passwords, SMS verification and email verification. It will also prevent from unauthorized logins. If a user has forgot his password, several verifications must also be taken place for re-logins.
3. **Secure Payment Process:** For safeguarding customers' information, the web application should also be implemented with CSRF tokenization and SSL encryption. Another option is to work with trusted payment gateways to ensure secure transactions.
4. **Implement Digital Rights Management (DRM):** To mitigate piracy, incorporating with DRM technology can prevent copying and sharing of copyrighted contents. DRM includes access controls, strong encryptions, and license management systems. These features enable to limit the duration of access on each device which a user is logged in. So, it is difficult for piracy.

### 1.4.3 Use Case

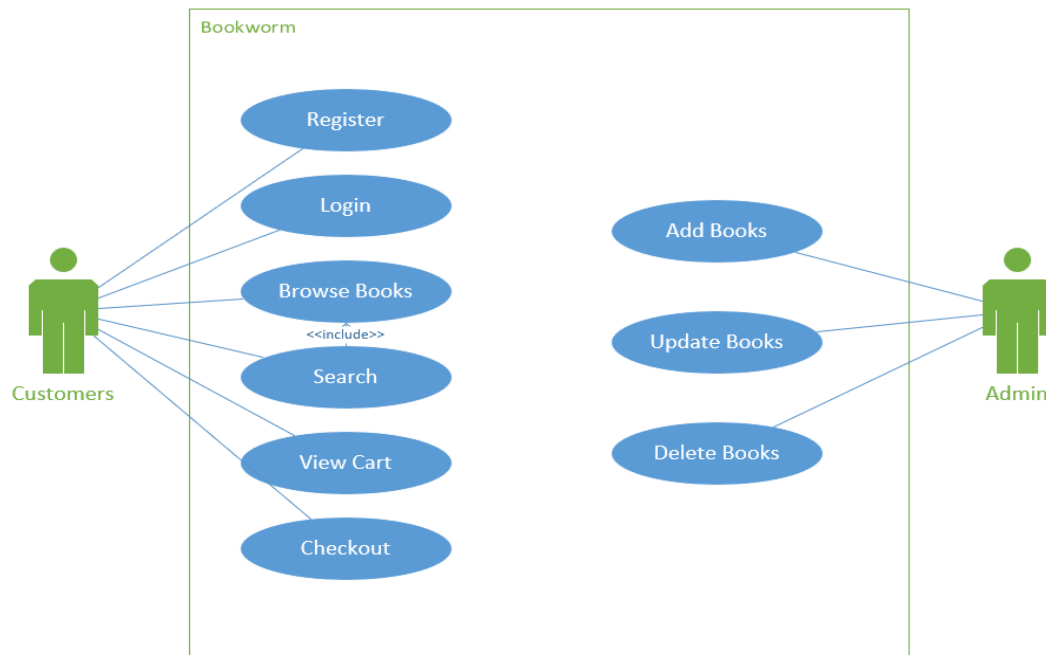


Figure 4 Use Case Diagram

### 1.5 Project Deliverables

Title	Description
<b>Project Criteria</b>	Bookworm is an e-commerce application where a user can buy a wide variety of books online. Secure programming and security protocols are mainly used in building this web application as a necessity of this project
<b>Project Type</b>	Web application
<b>Programming Language</b>	PHP, HTML, and CSS
<b>Development Environment</b>	Xampp
<b>IDE</b>	Notepad, Visual Studio
<b>Testing Environment</b>	Kali Linux
<b>Testing Application</b>	Kali terminal, Burpsuite, OWASP ZAP, OWASP DirBuster
<b>Proposal</b>	Covered the detailed of project criteria and literature review, including methodology used for the working project.
<b>Final Report</b>	Final report will cover with the overview of this project, it's design, implementation, testing.

Figure 5 Project Delivery in Details

## ***1.6 Project Scope***

The following are the scope of the project in summary.

1. **Planning:** This is the initial stage where I conducted surveys and market research. In addition, I have gathered necessary materials and information to develop a full workable prototype.
2. **Proposal Writing:** To persuade project assessors, I am writing a proposal which gives a brief introduction of the overall project.
3. **Design:** I will create wireframes to visualize layout and structure of the website. I will also work with development frameworks and database in this stage. In this stage where I will use Xampp, PHPmyadmin, and IDE.
4. **Development:** In this stage, I will work on the building of the full functioning website. User profiles, books catalogue, shopping cart, and log out process will be developed. I will implement secure user authentications such as login, registration features and so on. Multifactor authentication and SSL certificates will be added in this stage.
5. **Testing:** Unit testing, security assessment, OWASP analysis, and vulnerability analysis is going to be carried out in this stage.
6. **Deployment:** In this stage, I will be setting up the server, database, and domain setting.
7. **Final Report:** After the deployment stage, I will write a final report which is a summary of the whole project.
8. **Presentation:** By the time I have completed the final report, this project will be presented in front of the professors.
9. **Post Deployment:** Consider the further improvements of the website, along with fixing bugs and do maintenance.

## 1.7 Project Plan

The following are the plan of my project with spreadsheet and gantt chart.













		Name	Duration	Start	Finish	Predecessors	Resource Names
1		Defining Project	1 day?	4/8/24 8:00 AM	4/9/24 8:00 AM		Zulkifli Bin Jalil
2		What to do?	1 day?	4/8/24 8:00 AM	4/8/24 5:00 PM		
3		Discussed with professor	0 days?	4/8/24 8:00 AM	4/8/24 8:00 AM		
4		Idea to do a bookselling web	0 days?	4/8/24 8:00 AM	4/8/24 8:00 AM		
5		Goal Identification	0 days?	4/9/24 8:00 AM	4/9/24 8:00 AM		
6		Research	5 days?	4/9/24 8:00 AM	4/15/24 5:00 PM		Kyaw Zin Latt
7		Creating Survey form	1 day?	4/9/24 8:00 AM	4/9/24 5:00 PM		
8		Conducting Surveys	3 days?	4/9/24 8:00 AM	4/11/24 5:00 PM		
9		Market Research	1 day?	4/12/24 8:00 AM	4/12/24 5:00 PM		
10		Literature Review	1 day?	4/12/24 8:00 AM	4/12/24 5:00 PM		
11		Gathering material to build a website	1 day?	4/12/24 8:00 AM	4/12/24 5:00 PM		
12		Proposal Writing	2 days?	4/12/24 8:00 AM	4/15/24 5:00 PM		Kyaw Zin Latt
13		Wrote a proposal	2 days?	4/12/24 8:00 AM	4/15/24 5:00 PM		
14		Software Development	41 da...	4/18/24 8:00 AM	6/13/24 5:00 PM		Kyaw Zin Latt
15		Requirements	3 days?	4/18/24 8:00 AM	4/22/24 5:00 PM		
16		Gathering and Analyzing tools	3 days?	4/18/24 8:00 AM	4/22/24 5:00 PM		
17		Design	4 days?	4/24/24 8:00 AM	4/29/24 5:00 PM		
18		Wireframe design	3 days?	4/24/24 8:00 AM	4/26/24 5:00 PM		
19		Review	1 day?	4/29/24 8:00 AM	4/29/24 5:00 PM		
20		Development	24 da...	5/1/24 8:00 AM	6/3/24 5:00 PM		
21		Localhost setup	2 days?	5/1/24 8:00 AM	5/2/24 5:00 PM		
22		Create databases	1 day?	5/3/24 8:00 AM	5/3/24 5:00 PM		
23		Register and login pages	3 days?	5/7/24 8:00 AM	5/9/24 5:00 PM		
24		User Account page	3 days?	5/11/24 8:00 AM	5/15/24 5:00 PM		
25		Browse Books and Search buttons	2 days?	5/16/24 8:00 AM	5/17/24 5:00 PM		
26		Checkout and Payment methods	3 days?	5/21/24 8:00 AM	5/23/24 5:00 PM		
27		Apply Encryption Protocols	1 day?	5/24/24 8:00 AM	5/24/24 5:00 PM		
28		Add Hashing Algorithms	2 days?	5/27/24 8:00 AM	5/28/24 5:00 PM		
29		Add SSL Certificate	1 day?	5/30/24 8:00 AM	5/30/24 5:00 PM		
30		Review	0 days?	6/1/24 8:00 AM	6/3/24 5:00 PM		
31		Testing	9 days?	6/3/24 8:00 AM	6/13/24 5:00 PM		Kyaw Zin Latt
32		Functionality testing	1 day?	6/3/24 8:00 AM	6/3/24 5:00 PM		
33		Security Testing	1 day?	6/5/24 8:00 AM	6/5/24 5:00 PM		
34		Review	4 days?	6/10/24 8:00 AM	6/13/24 5:00 PM		
35		Final Report	6 days?	6/6/24 8:00 AM	6/13/24 5:00 PM		
36		Write Final Report	6 days?	6/6/24 8:00 AM	6/13/24 5:00 PM		
37		Viva	5 days?	6/12/24 8:00 AM	6/18/24 5:00 PM		Kyaw Zin Latt
38		Do Presentation Slides	3 days?	6/12/24 8:00 AM	6/14/24 5:00 PM		

Figure 6 Project Plan in Spreadsheet

## BSc (Hons) Cyber Security Final Year Project Report

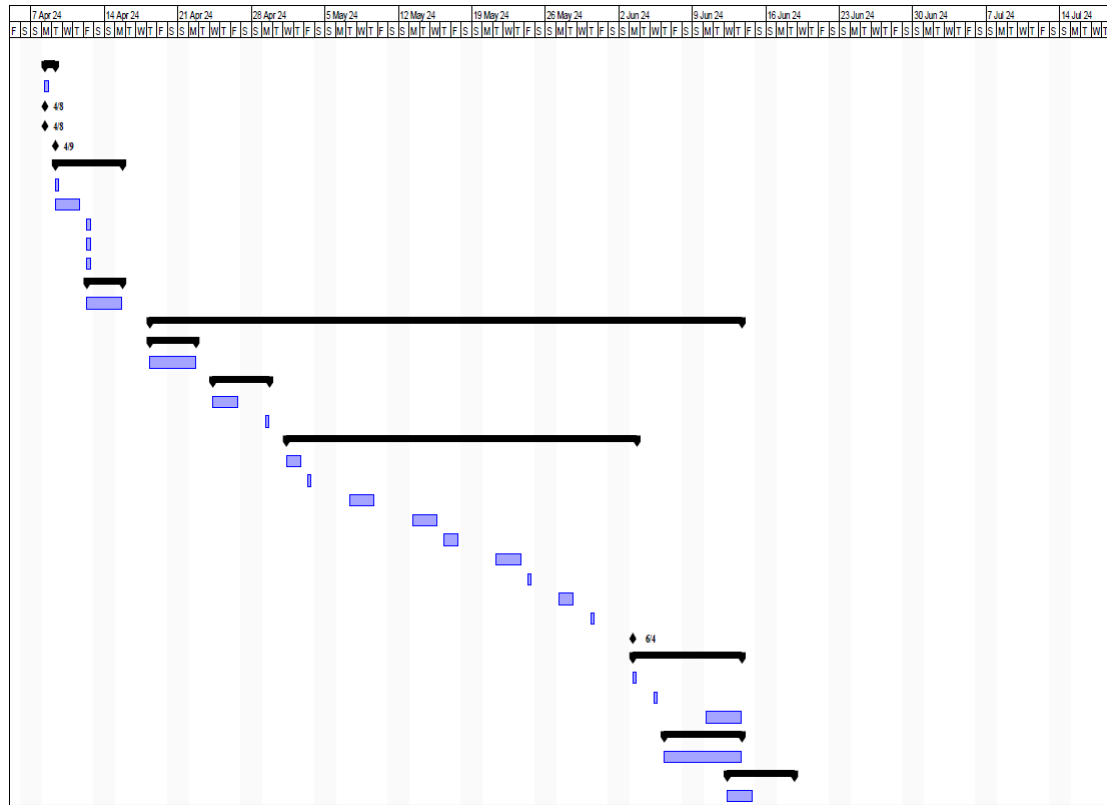


Figure 7 Project Plan in Gantt Chart

## 1.8 Hardware and Software Requirements

### 1.8.1 Hardware Requirements

- Window desktop or laptop

### 1.8.2 Software Requirements

- Notepad or Visual Studio Code for editing
- PHP programming language
- Xampp for the development environment
- PHPmyAdmin for interacting with database.

## 2. Literature Review

### 2.1 Background Study

The main aim of this project is to develop a secure book selling web application, so I have conducted a literature review mostly based on the security perspectives. In this section, I have examined features, functions, user experiences, and security features of existing bookstore platforms such as Bookmate, Scribd, Kobo, and Booktopia.

#### 2.1.1 Bookmate

Bookmate is an e-library where users can borrow e-books and audiobooks. It is a subscription-based website. Bookmate have implemented strong encryption and robust authentication systems. A user can instantly signup with their existing account like gmail, Facebook, or Twitter. Even though it is a user-friendly approach, it is not considered as a best security practice. However, it has a verification of user's google account which is good practice.

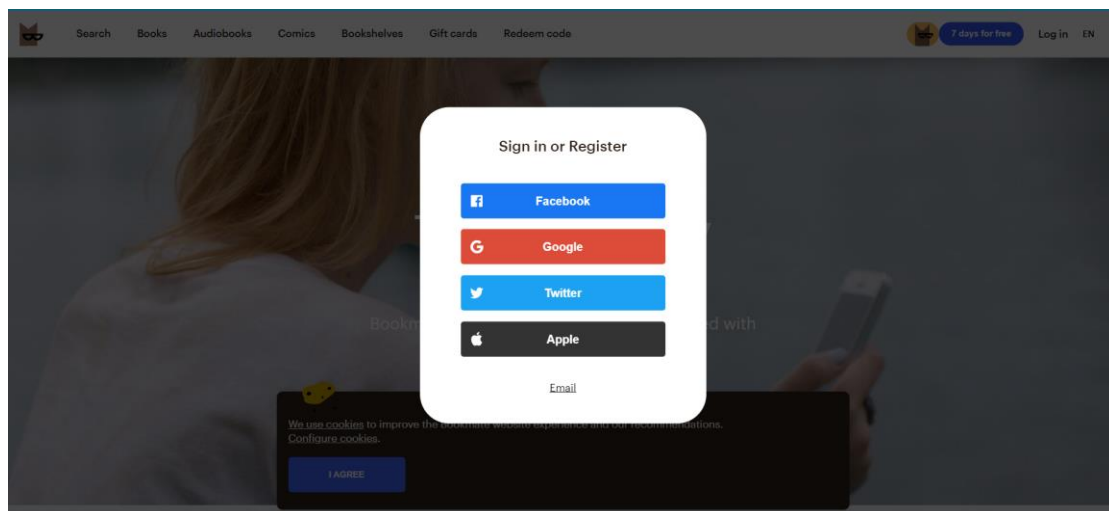


Figure 8 Bookmate Login Mechanisms

#### 2.1.2 Scribd

Scribd is a subscription service where users can access a wide range of contents. It also offers unlimited access to users which made it a distinctive one in the market. It has secure payment systems, data protection features, and strong encryption protocols. It also ensures that the user transactions are safe by adopting industry standards.

#### 2.1.3 Kobo

Kobo is a secure e-book retailer which have secure login mechanisms. In addition, user can view statistics of their activities and can be granted awards based on those activities. While doing such things, they have maintained users' privacy and keep their data confidential. They are also enhancing their security features.

### 2.1.4 Booktopia

It is an online bookstore which have same security features as Scribd and Kobo. Moreover, it has password management and account recovery systems. Booktopia website have customer service contact number. They are willing to help their customers related to security concerns.

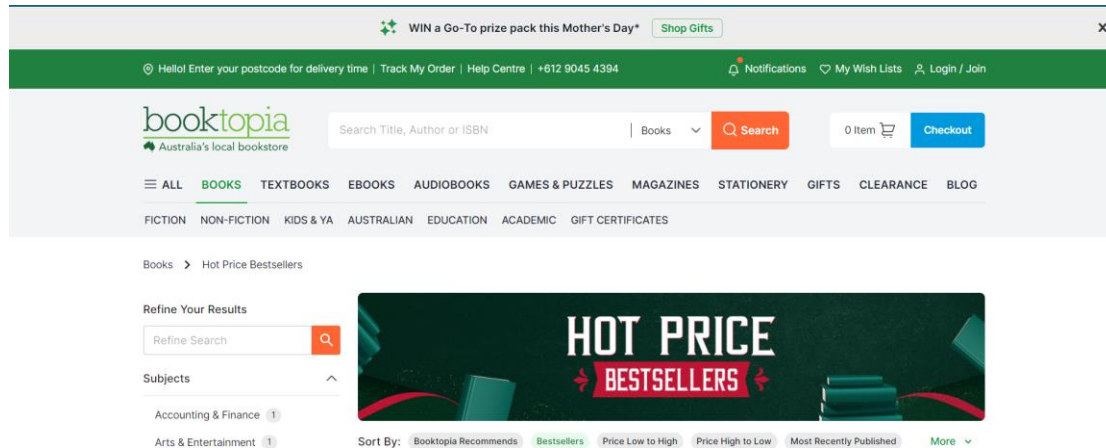


Figure 9 Booktopia Welcome Page

## 2.2 Technical Review

Developing a secure web application needs a proper consideration in selecting tools and technologies. The followings are the details of technical tools that I am going to use in the development of this project.

### 2.2.1 Development Environment

I have chosen Xampp web server to host and test my website locally. Xampp is a popular platform which has integrated with Apache server, MySQL, PHP, and Perl. It allows developers to simulate the production environment on their local machines. It is one of the best development environments for building a website.

### 2.2.2 Database Management

For data storage and management, I have considered to use phpMyAdmin. It supports MySQL with relational database management system. In addition, phpMyAdmin is a user-friendly interface for designing, querying, and data manipulating. Users can store their data conveniently and do managing tasks efficiently.

### 2.2.3 Programming Language

I have selected PHP language for web application content and interaction with database. It ensures the maintainability of website's backend components. Along with PHP, HTML and CSS serves as a powerful markup and stylesheet languages for creating and designing a website.





### 2.2.4 Security Testing Tools

For penetration testing of my webpage, I will utilize kali linux. It provides various security testing tools. It has OWASP ZAP (Zed Attack Proxy) which assess and enhances security posture of a web application.

## 3. Methodology

### 3.1 Research Methodology

I have conducted a survey related to bookstore application and its security features for research purposes. I have used google forms and collected fourteen responses. The survey was held on 09<sup>th</sup> April 2024 to 11<sup>th</sup> April 2024. These responses helped me to come up with ideas to build the prototype of this project.

Questions Responses 14 Settings

### Market Research For Bookworm Application

Form description

How often do you purchase books online?

☐ Daily

☐ Weekly

☐ Monthly

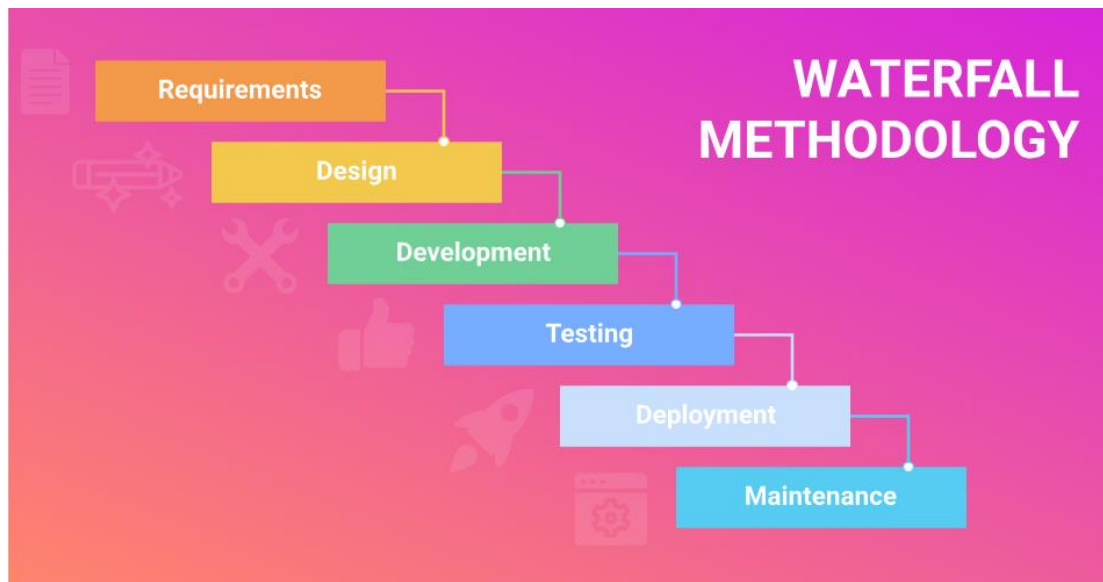
☐ Occasionally

☐ Never

**Figure 10 Overview of Survey Form**

### 3.2 Software Development Life Cycle Methodology

I have selected waterfall methodology as a SDLC model. It is very easy to understand and utilize. This is a process model where each stage must be fully completed before jumping into next stage. Phases contained in waterfall model are gather and analyse requirements, design the system, implementation, testing, deployment, and maintenance. I will carry out all the stages apart from deployment and maintenance throughout the entire project.



**Figure 11 Phases in Waterfall Model**

Among the various project methodologies, I selected waterfall for these reasons. Since I am doing this project alone, waterfall model is suitable for individual projects. I can also review each stage at a time so that reviewing does not overlap. Waterfall method also work well with smaller projects like this. The project we have assigned to do have a limited time and will not be an ongoing project after three months.

## 4. Conclusion

To be concluded, as technology has been emerging rapidly, it is crucial to consider security features while developing a website. Websites like book selling must handle many customer databases. Once the database is compromised, there will be many consequences for web developers and organizations. As a result, Bookworm is a book selling website which is mainly focuses on the security of the application. By doing this project, I have an opportunity to learn more about cybersecurity and web development, along with writing a project proposal properly.

## **REFERENCES**

## **BIBLIOGRAPHY**

## **APPENDICES**