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Group No.	:	Blue Team
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1.0 INTRODUCTION

1.1 Introduction to the Company

Bookworm Paradise is a large and popular bookstore, located in Kuala Lumpur, Malaysia. A plethora of book collections from different generations and genres can be found in this bookstore. Hundreds and even thousands of people visit the bookstore daily, Bookworm Paradise is very aware of this, and they always strive to provide their customers with enough resources to satisfy their curious minds.

1.2 Business Process

The business currently revolves around the standard operations of what a bookstore is, the sale of reading material in different forms, from a variety of publishers towards interested customers. To support the plan of expanding Bookworm Paradise outlets around the country, the company is adamant on having a digital platform, capable of displaying and showcasing the extensive collection of books available, to rake in new customers, introducing them to the services they can provide. This new digital platform should be able to bring its primary operations online, allowing customers to view and purchase reading materials of their choice. Consequently, the purchased items will then be delivered to their doorstep or desired location.

1.3 Overview of the Proposed System

We plan to develop a prototype that is seamless, attractive, and easy to use. The prototype should contain all the necessary features required to carry out current business operations, such as handling book orders, rentals, appointments, payment processes, business reports, and so on. Data used within the system runs on cloud hosting and database, allowing for constant 24/7 operation, enabling access anytime, anywhere. The proposed system should also be easily scalable, should Bookworm Paradise wish to expand even further.

1.4 Project Objectives

- To develop a prototype of an online bookstore management system that closely resembles the functionality of the physical bookstore
- To maintain the satisfaction of current customers, whilst attracting new ones
- Providing online customers with a swift and easy shopping / browsing experience
- To provide managers of Bookworm Paradise concise, easy to read reports about online rentals and sales of reading material
- To expand the brand’s coverage and become a well-known bookseller

2.0 PROBLEMS & PROPOSED SOLUTIONS

2.1 Problems in Existing System

We noticed a few vulnerabilities in the services and current operation mode of Bookworm Paradise. Firstly, Bookworm Paradise operates in a traditional way where customers will **need to physically visit the store to buy books**. This limits the market of the bookstore, as non-locals will not be able to stop by due to the lengthy journey. Consequently, such scenario is unfavorable for a bookstore that is seeking to build its reputation and revenue.

Besides, the bookstore offers **only book selling and buying service**, which is insufficient to satisfy the new market demands of customers. As a result, customer loyalty may deteriorate, causing a drop in repeated patronage. To retain existing customers and attract newcomers, Bookworm Paradise must outperform its business competitors by expanding their services.

Furthermore, although Bookworm Paradise provides customer with a vast collection of reading materials, it may be difficult for them to find the specific book that they are looking for. Assistance is readily offered by the bookstore staff, but it is undesirable for a running business to perform their duty this way especially during peak hours when an overwhelming volume of customers needs to be served.

Lastly, the current mode of operation **requires staffs to manage data manually**. This contributes to a few drawbacks such as high time-consumption for data entry and lookup, as well as the risk for unorganized data, resulting in data loss. Not the mention, the data accuracy is low as they are prone to human errors. As such, we believe that the traditional file-based system stated above is unsustainable as it lacks efficiency, integrity, and convenience.

2.2 Proposed Solution

We propose to design a new **online bookstore management system** named *Scout* to facilitate and sustain further business growth of Bookworm Paradise. An online system will be capable of **serving customers globally**, therefore **increase the exposure** of the bookstore, bringing it a step closer to becoming a well-known global bookstore brand.

Service-wise, book rental and in-house reading can be introduced in both physical and online bookstore. This provides other options of accessing books for customers who do not wish to purchase books. A **delivery system** is to be included to manage the delivery of physical books purchased or rented by customers as well.

Apart from that, the bookstore itself needs to implement marketing strategies to encourage repeat patronage. A

subscription which offers exclusive perks to the subscribers can be introduced. In-store and online discounts are to be offered to all customers based on different aspects such as age, nationality, and membership type. This ensures customers obtain chances of enjoying discounts, **encouraging sales** from **different demographics**.

Despite the benefits of an e-bookstore, the system should however require users to **sign in** before accessing all the services. The aim is to ensure all services used by customers are recorded for **reference purposes**, allowing admins to check the historical activities and data to solve customer queries. At the same time, customers may view their past purchases, receipt, delivery status, book rental duration and charges that are linked to their personal accounts.

The new system is expected to provide a **searching tool** which helps user to quickly identify the book, along with information such as book availability. Reading materials should be grouped by categories as well to ease users when exploring them.

A **database** can be linked to the system for the purpose of managing data such as inventory, sales record, delivery information and services purchased by customers. A database helps to ensure accuracy of records, minimizing any errors that may cause financial loss to the bookstore. Besides, the data will be well-organized and aid bookstore administrator in obtaining information quickly. Similarly, the report printing feature comes along, automatically generating latest reports using data from the database.

2.3 Diagrams

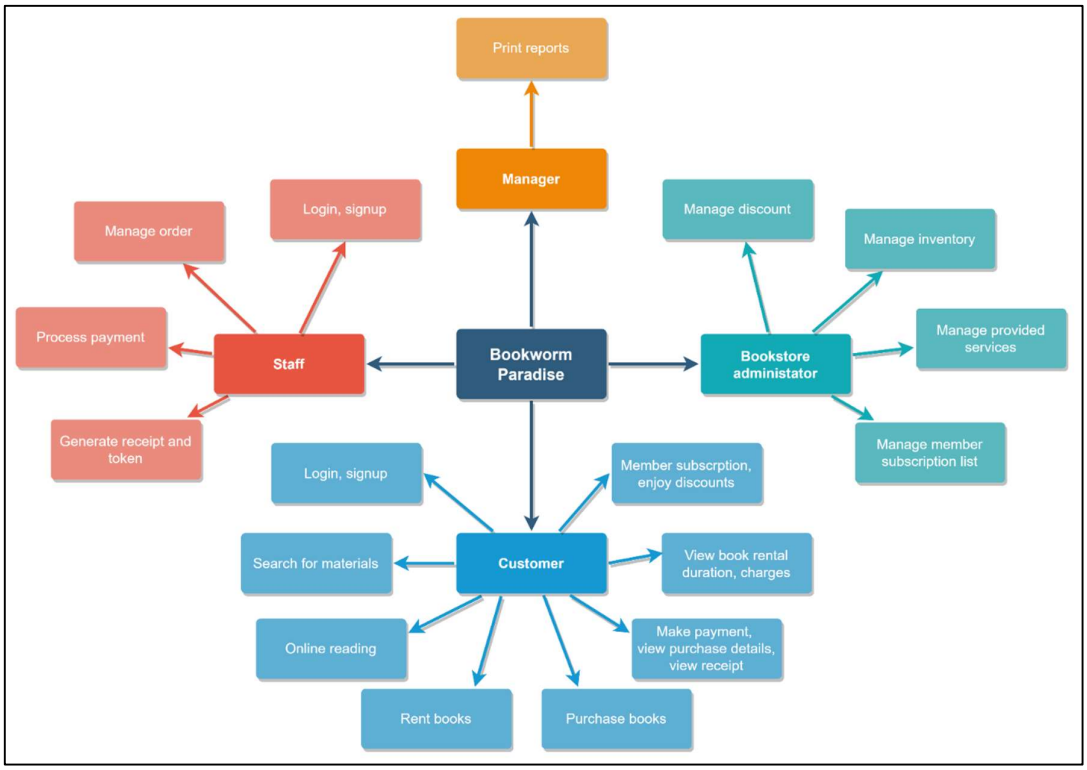


Figure 2.0 – *Mind map for proposed system*

2.4 Scope of the New System

The scopes of the new system are as shown:

- The system must allow all users to sign up for an account.
- The system must include a searching tool for the users.
- The system must not add items to the shopping cart until the user logs in.
- The system should apply discounts based on the latest promotion and subscription benefits when the customers checkout their orders.
- The system must generate an invoice before customers make a payment.
- The system must not unlock the e-reading feature before the customer makes payment for online reading.
- The system must request customers to select book rental duration before processing to payment.
- The system must request customers to confirm delivery information during payments of a book purchase or rental.
- The system must verify customer payment before delivering items.
- The system must allow customers to display their purchase histories.
- The system can be linked with an external SQL database.
- The system can include a feedback page to attain customer ratings and comments.
- The system should operate on all devices.
- The system should be accessible on all operating systems.
- The system must be operable by 29 September 2022.
- The project cost must not exceed RM 80,000.

3.0 PROJECT PLANNING

3.1 SDLC Introduction

The System Development Life Cycle (SDLC) is a **traditional methodology** widely used by project managers. It describes all the stages involved in an information system development project, which includes the preliminary investigation & feasibility study, down to the final maintenance of a fully-fledge system. In SDLC, formal documentation is required and are typically done in conjunction with the development process. Hence, the success of a system in SDLC is heavily dependent upon how closely the particular plan was followed.

3.1.1 Justification

SDLC provides maximum management control during the development life cycle of the system as **formal documentations** are required at every phase. As a result, SDLC generally produces a **more precise system** that emphasizes on **meeting all the system requirements** set by the client. In relation to our case study, Bookworm Paradise has allocated a budget of RM80,000 and a timeframe of 4 months for us to develop a new **online bookstore management system**. Although the deadline is pretty tight for a typical SDLC project, we are confident that the generous budget will provide us with necessary resources to produce a great system, pair with a **detailed documentation** on how the system functions as a whole.

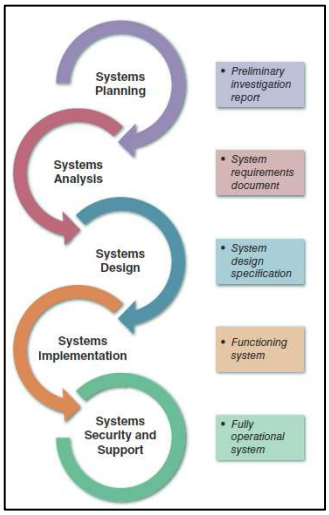


Figure 3.0 – *System Development Life Cycle*

3.2 SDLC Application

3.2.1 System Planning

In this phase, the existing system is evaluated to identify deficiencies and vulnerabilities that are present in the current system (Gillis, n.d.). This can be done through interviewing customers of Bookworm Paradise regarding their shopping experience, or surveying staffs anonymously to discover hidden complaints or problems contained within their current working environment. The results gathered are documented in the **problem statement**, and these problems has to be realistic, current, and major to be considered valid.

After the problems have been identified, a **preliminary investigation** is launched to determine whether these problems are **solvable**. This can be done by observing how their competitors deal with these similar issues. For example, Bookworm Paradise may discover that MPH Bookstore once struggled with scaling their business into the international market but have since solved it by using an **online bookstore management system**. As a result, we can better understand the problems, as well as the different ways to overcome them.

The next step is to conduct **feasibility studies**. A feasibility study determines whether a project has a reasonable chance of success. These include operation, schedule, economic and technical feasibilities. For instance, a feasibility study can be deployed to determine whether book-rental is a feasible idea, which may yield favourable results, such as:

1. Yes, customer may have insufficient storage to store the books if they buy it
2. Yes, certain books may be exorbitant, and out of the customers' budget
3. Yes, customer may feel inclined to spend full amount on books that he/she may not like

Based on these results, BWP can confidently include the book-rental feature in their system requirements alongside any other feasible features they may come across during this study.

Finally, a Gantt Chart is created to illustrate the project schedule of this system. Gantt chart helps the team organize workflow, display realistic project timeline, and keep everyone on track so that software crisis such as late delivery can be avoided.

3.2.2 System Analysis

System analysis is the process in which an individual or a group studies a system such that the information system could be analysed, logically modelled, and have its system requirements written in a clear and concise manner (Barrier, 2002). This phase is important as the outcome of the project with solely depend upon the specific protocol given by the client. When a **system change request** is proposed, Bookworm Paradise's system change committee has to liaise with all the stakeholders that are involved and consider the consequences each change may incur. Although develop a new system may be costly, it is crucial to inform the stakeholders that these changes will be beneficial in improving business performance, reducing long-term cost, and allowing for stronger control over the bookstore market.

The deliverable of this stage is the **system requirements specification (SRS)** which entails the both the functional and non-functional requirements of the system. The SRS will be the blueprint for developers to build the system upon and must not be amended later on as it may disrupt the development process, causing delay the due date of the final product.

3.2.3 System Design

System design is the process of defining physical models, architectures, system components, and interfaces based on the specified requirements documented in SRS (TheEconomicTimes, 2022). In this stage, a systematic approach is taken to construct a **context diagram** to detail the processes that data undergoes in a system. Further expansion of DFD Level 0s and 1s are created to further elaborate on the back-end functionality of the system. These graphical representations will aid Bookworm Paradise to visualize how the system would function on the granular level. The uses of other UML diagram such as activity diagrams may be considered to describe the behavioural and structural model of the system, allowing for more schematic understanding. In the meantime, these proposed models will be documented under the **system design specification**, which keeps track of all the desired design for the bookstore system.

This phase is unique as it puts a heavy emphasis on the involvement of both the developers and clients to produce a mutually desired outcome. Ultimately, these logical designs will be reflected in the **physical design** of the prototype, where the user interface/user experience (UI/UX) design and website frameworks choices are all specified and justified.

3.2.4 System Implementation

System implementation is a set of procedure to implement the design contained in the approved **system design specification** to test, install and begin using the new or reformed information system (Gelinas, 2016). A domain name needs to be purchased from GoDaddy to be registered under Bookworm Paradise newest system called **Scout** (as shown in Figure 3.1). Scout's interface will be constructed using WIX in accordance with the system design specification. Once that's completed, the back-end PHP codes and SQL databases are interlinked to create a functional online bookstore management system that is ready to be tested.

Figure 3.1 – *Scout, for Bookworm Paradise*

The newly programmed system will be put under heavy scrutiny through **system testing**, which is a **quality assurance** (QA) process conducted with the goal of ensuring intended outcome of a system is met. These tests ranges from performance testing to security testing to ensure the programs meets the requirements laid out by the clients.

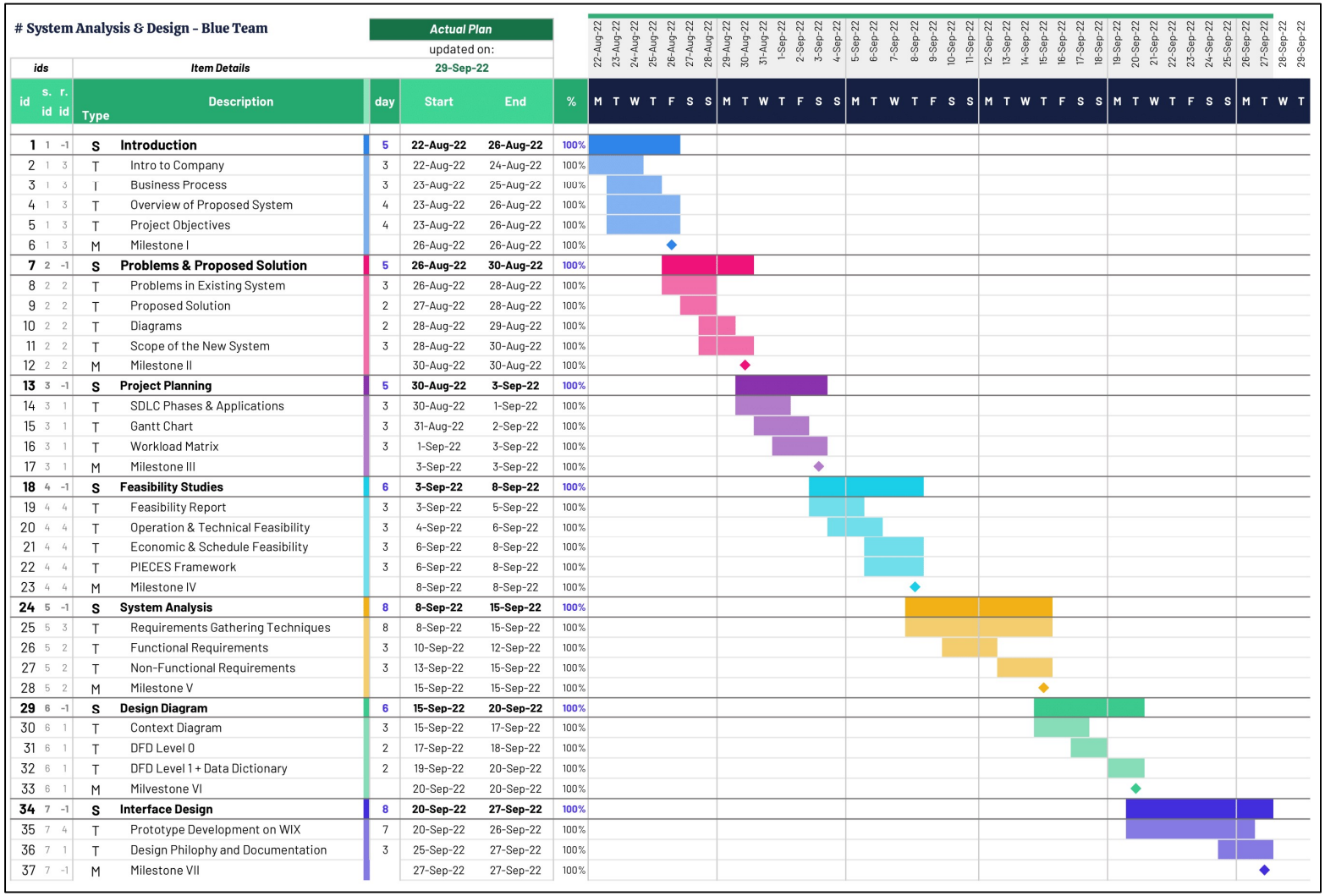
Finally, the Scout software is introduced to a small pool of **beta testers** in hopes of catching overlooked bugs, and eventually publicly as a **fully-fledged system**. This integration will mark a huge milestone and lay a solid foundation for the sustained business growth of Bookworm Paradise.

3.2.5 System Security & Support

System security and support is an ongoing maintenance given to an existing application to ensure that it stays secure, reliable, maintainable, and scalable (Galeon, 2013). Nowadays, business processes changes rapidly, therefore a well-designed system such as Scout must be able to adapt to new business requirements and volumes. As such, Scout is expected to undergo regular maintenance to fix, protect, and enhance the system. Thus, a small fee will be collected every month to keep Scout up and running, safely and securely.

3.3 Gantt Chart

Gantt Chart is an illustration tool that helps in managing, monitoring, and scheduling of specific tasks and resources in a project. As the deadlines are strict in this system development project, we have devised one to ensure the timely delivery of the products and services to our clients at Bookworm Paradise.



System Analysis & Design - Blue Team

Actual Plan
updated on:
29-Sep-22

ids			Item Details			day	Start	End	%
id	s. id	r. id	Type	Description					
1	1	-1	**S**	**Introduction**		**5**	**22-Aug-22**	**26-Aug-22**	100%
2	1	3	T	Intro to Company		3	22-Aug-22	24-Aug-22	100%
3	1	3	I	Business Process		3	23-Aug-22	25-Aug-22	100%
4	1	3	T	Overview of Proposed System		4	23-Aug-22	26-Aug-22	100%
5	1	3	T	Project Objectives		4	23-Aug-22	26-Aug-22	100%
6	1	3	M	Milestone I			26-Aug-22	26-Aug-22	100%
7	2	-1	**S**	**Problems & Proposed Solution**		**5**	**26-Aug-22**	**30-Aug-22**	100%
8	2	2	T	Problems in Existing System		3	26-Aug-22	28-Aug-22	100%
9	2	2	T	Proposed Solution		2	27-Aug-22	28-Aug-22	100%
10	2	2	T	Diagrams		2	28-Aug-22	29-Aug-22	100%
11	2	2	T	Scope of the New System		3	28-Aug-22	30-Aug-22	100%
12	2	2	M	Milestone II			30-Aug-22	30-Aug-22	100%
13	3	-1	**S**	**Project Planning**		**5**	**30-Aug-22**	**3-Sep-22**	100%
14	3	1	T	SDLC Phases & Applications		3	30-Aug-22	1-Sep-22	100%
15	3	1	T	Gantt Chart		3	31-Aug-22	2-Sep-22	100%
16	3	1	T	Workload Matrix		3	1-Sep-22	3-Sep-22	100%
17	3	1	M	Milestone III			3-Sep-22	3-Sep-22	100%
18	4	-1	**S**	**Feasibility Studies**		**6**	**3-Sep-22**	**8-Sep-22**	100%
19	4	4	T	Feasibility Report		3	3-Sep-22	5-Sep-22	100%
20	4	4	T	Operation & Technical Feasibility		3	4-Sep-22	6-Sep-22	100%
21	4	4	T	Economic & Schedule Feasibility		3	6-Sep-22	8-Sep-22	100%
22	4	4	T	PIECES Framework		3	6-Sep-22	8-Sep-22	100%
23	4	4	M	Milestone IV			8-Sep-22	8-Sep-22	100%
24	5	-1	**S**	**System Analysis**		**8**	**8-Sep-22**	**15-Sep-22**	100%
25	5	3	T	Requirements Gathering Techniques		8	8-Sep-22	15-Sep-22	100%
26	5	2	T	Functional Requirements		3	10-Sep-22	12-Sep-22	100%
27	5	2	T	Non-Functional Requirements		3	13-Sep-22	15-Sep-22	100%
28	5	2	M	Milestone V			15-Sep-22	15-Sep-22	100%
29	6	-1	**S**	**Design Diagram**		**6**	**15-Sep-22**	**20-Sep-22**	100%
30	6	1	T	Context Diagram		3	15-Sep-22	17-Sep-22	100%
31	6	1	T	DFD Level 0		2	17-Sep-22	18-Sep-22	100%
32	6	1	T	DFD Level 1 + Data Dictionary		2	19-Sep-22	20-Sep-22	100%
33	6	1	M	Milvestone VI			20-Sep-22	20-Sep-22	100%
34	7	-1	**S**	**Interface Design**		**8**	**20-Sep-22**	**27-Sep-22**	100%
35	7	4	T	Prototype Development on WIX		7	20-Sep-22	26-Sep-22	100%
36	7	1	T	Design Philophy and Documentation		3	25-Sep-22	27-Sep-22	100%
37	7	-1	M	Milestone VII			27-Sep-22	27-Sep-22	100%

Figure 3.1- *Gantt Chart, Scout*

3.4 Workload Matrix

Attached below is the workload matrix for each member of the BlueTech Team.

ASIA PACIFIC UNIVERSITY OF TECHNOLOGY AND INNOVATON
AAPP007-4-2-SYAD
Student Coursework Workload Matrix - Grades and Feedback Attachment

INTAKE: UCDF2104ICT(SE)	STUDENT NAME	Amadea Lim Yi Wen	Bryan Wong Win Kit	Gan Ming Liang	Ian Joesph Lai Zi Jin	-	-
System Name: Scout	TP NO.	TP064038	TP063248	TP063338	TP063403	-	-

A. Group Component

CLO	ASSIGNMENT COMPONENT	ALLOCATED MARKS	CONTRIBUTION PERCENTAGE	CONTRIBUTION PERCENTAGE	CONTRIBUTION PERCENTAGE	CONTRIBUTION PERCENTAGE	CONTRIBUTION PERCENTAGE	CONTRIBUTION PERCENTAGE	TOTAL %
1	Introduction	5	0.00	0.00	0.00	100.00			100
2	Problems and Proposed Solutions	5	100.00	0.00	0.00	0.00			100
3	Project Planning	5	0.00	0.00	100.00	0.00			100
4	Feasibility Study	10	0.00	100.00	0.00	0.00			100
5	System Analysis	5	25.00	25.00	25.00	25.00			100
6	Design Diagram	15	25.00	25.00	25.00	25.00			100
7	Interface Design	20	25.00	25.00	25.00	25.00			100
	Total Marks and Contribution	65	25%	25%	25%	25%	0%	0%	

Signature

print until this point only

Figure 3.2 – *Workload Matrix, BlueTech*

4.0 FEASIBILITY REPORT

A feasibility study is conducted to determine whether the idea for the proposed system is practical and feasible to proceed with. The report is broken down into multiple types of studies to determine the feasibility of the project. The first being operational feasibility to determine how well the proposed system can operate in terms of the PIECES framework. Next, the technical feasibility study of assessing whether it is technically possible to develop the proposed system. Thirdly, economic feasibility study, to determine the benefits gain and funds required to support the project. Lastly, the schedule feasibility, to verify if the time allocated by the Bookworm Paradise owners is adequate to complete the project and to ensure that the system is still relevant after deployment.

4.1 Operational Feasibility

The operational feasibility is conducted to determine if the Bookworm Paradise online system would solve the current operational problems and whether the proposed system will be used after being developed and implemented. In this section, we will be using the **PIECES framework** to analyse the proposed information system through six variables, which are performance, information, economics, control and security, efficiency, and service.

4.2 PIECES Framework

4.2.1 Performance

Q1: Does the proposed system provide an optimal page/site speed?

Yes. Our webpage will be configured to **load within 0.3 to 3 seconds**. This is because users will tend to feel tangible stress and possibly leave the site if the page takes too long to display the store's content. Based on statistics, a business may lose about a quarter of its online visitors if the site takes over 4 seconds to load (Patel, n.d.).

Q2: How will the proposed system provide an optimal page/site speed?

Several measures are taken to optimize the website's speed configuration. **Enabling browser caching** is one of the most popular and effective methods to use. This allows us to request browsers to store and reuse essential files each time a user returns. In other words, the browser does not have to retrieve each file directly from the servers each time a returning visitor accesses the site. Therefore, website load times will be reduced for recurring visitors without requiring extra effort from the development team.

4.2.2 Information

Q1: Does the proposed system provide accurate and reliable data for Bookworm Paradise's business?

Yes. Data collection tools like **Google Analytics** are integrated into the proposed system that helps provide insights on the best-performing pages and the pages of the website that are gaining a relative number of visitors. For example, if certain products on the website is gaining sudden traction, the Bookworm Paradise owners can strategize on what kind of content to invest in and how they could allocate their efforts accordingly. In other words, the business is able to quickly comprehend its clients by having the ability to track its customer's behaviour from the acquisition stage through the retention stage. By being able to access how marketing, products, and content are performing in relation to user engagements based on accurate data can help keep the business successful and allow it to stay ahead of the competition.

Q2: How does Bookworm Paradise benefit from the information provided by the proposed system?

Providing accurate and cleansed data is an effective method for making the right decisions and driving sales, which will increase the business's revenue. Accurate and up-to-date data enables the Bookworm Paradise owners to **market to the right audience** and keep them engaged, thereby saving a significant amount of money that would otherwise be spent on ineffective strategies and tactics if inaccurate data is utilized. With access to reliable and accurate data, we can prevent wasting a substantial amount of time from having to rectify mistakes and errors, hence improving business productivity.

4.2.3 Economy

Q1: Does the proposed system reduce the overall operational costs?

Yes. In contrast to the traditional brick-and-mortar Bookworm Paradise store, launching an online store is **far more cost-effective**. With the newer system, the majority of business processes in Bookworm Paradise are automated and expected to have more reliable outcomes which will increase the overall efficiency of the operating process. This is accomplished by leveraging from automation tools that reduces the amount of time spent on mundane tasks which leads to fluid and efficient management. As a result, the Bookworm Paradise organization is able to raise their total revenue while simultaneously reducing their expenditures on employment salaries.

Q2: Does the proposed system bring more benefits to the organization?

Yes. The proposed system allows the **business to liberate** itself from the confines of standard operating hours by transforming it into a 24/7 business. Customers are able to access the website and make purchases at any time of the day. Furthermore, having an online presence allows the Bookworm Paradise business to have an increased customer reach as customers will gain the ability to access the shop through their laptops, desktop, and mobile devices from anywhere in the world. In conclusion, with the features of unrestricted store hours and high customer reach, Bookworm Paradise will certainly increase its total revenue gain.

4.2.4 Control and Security

Q1: Is the proposed system well secured and protected against website attacks?

Yes. Actions have been taken to ensure sensitive business information is **not exposed** to cybercriminals or to prevent exploitations of the website in any way. Proper security solutions have been taken to shield the site from security threats such as malware, blacklisting, vulnerability exploits, and DDoS attacks.

Q2: What type of security solutions are taken to protect against website attacks?

To ensure the secure protection of our proposed system against attacks launched by malicious actors, proper security solutions are implemented.

1. Our first layer of defence will be **sanitizing user inputs** before it is incorporated into structured query language statements or scripts. This consists of removing any unsafe characters from user inputs and checking if the data conforms to the expected format and type.

2. **All third-party code will be audited** to ensure that no unexpected code is being delivered to the end user. This is also important to ensure that no security vulnerabilities are introduced throughout the development of the project.

3. A few static and dynamic **security scans** against the website code and system will be conducted on a weekly basis to identify any potential vulnerabilities, malware, and other security issues. Any existing security issues will be eliminated immediately or flagged for the developing team to address them appropriately.

4.2.5 Efficiency

Q1: Will the proposed system increase the efficiency of the workforce?

Yes. The proposed system will **boost employee morale** because they will no longer be required to concentrate on manual repetitive chores, which hinders their capacity to learn, grow and advance professionally. Employees gain from digitalization since it automates these repetitive tasks, hence, allowing them to engage in more significant initiatives and so increasing the workforce efficiency.

Q2: Can the proposed system scale efficiently with more products introduced over time?

Yes. A physical Bookworm Paradise store would require more extra floor space, shelf space, and employees whenever the owners want to expand their product line or add new locations to their retail business. As opposed to the traditional approach, the proposed system only requires a few minor digital adjustments and some additional storage space which completely eliminates the need for constructing a new store in another location or expanding shelf space.

4.2.5 Service

Q1: Will the proposed system provide a reliable service for the end-users and management team?

Yes. The website content is always constantly updated with impartial and up-to-date information about the latest products launched by Bookworm Paradise. This helps customers to grasp the idea of the products on sale by conveying the benefits to them, hence keeping customers well informed and satisfied.

Furthermore, the proposed system does provide a reliable service to the management team as well. For example, in the context of handling databases, all data tables are normalized to reduce any redundancy and to eliminate undesirable characteristics such as deletion, update, and insertion anomalies. This is crucial as it provides accurate and reliable data for all backend engineers to work with during production.

Q2: Does the proposed system scale?

Yes. The system is built to cope with an increasing number of users concurrently interacting with the app while minimizing disruptions to the user experience.

We have decided to focus on four scalability metrics which are:

1. **Memory utilization**
    - The amount of RAM used by the system at a certain unit of time.
2. **CPU usage**
    - How much workload can be driven with the current CPU resources.
    - High CPU usage typically indicates that the system is experiencing performance issues and requires additional CPU resources.
3. **Network input/output**
    - How well a network can handle sending a large amount of data from one tracked process to another.
4. **Disk input/output.**
    - Measuring the number of operations that can happen on a physical disk.

By prioritizing the scalability of our system, it can lead us to lower maintenance costs, higher service agility, and better user experience.

4.3 Technical Feasibility

Technical feasibility is a study of the technical capabilities of an organization to determine whether it is possible to support the technical requirements of the proposed project. By conducting the study, we can determine whether we have the **technical expertise** necessary to achieve the requirements of the proposed project.

Q1: Is the proposed system practical and realistic?

Yes. E-commerce sites are so ubiquitous these days that it has become an integral part of the global retail framework. An estimate of 18 million e-commerce sites across the entire globe has been developed and with more being created every day (Gennaro, 2022). The method of generating sales through e-commerce has become so popular that the US e-commerce market has forecasted to reach over $875 billion in revenue by the end of 2022 (Keenan, 2022). In addition to that, with the availability of modern e-commerce platforms and powerful tools on the market, building a system like this has become way easier to accomplish.

Q2: Do we have the required technology?

Yes. In terms of hardware, we have an adequate amount of desktop computers that are fully functional and prepared for our team to carry out necessary research and development for our website. We will be using an open-source e-commerce framework to set up a fully functional e-commerce website for our system. Our system will rely on a cloud database server to store all necessary data like customer transactional details, product reviews, and useful information.

Hardware

- 4x desktop computers & 4x laptop computers
- External hard drive (10 TB)
  - To store and back up sensitive information that is not stored in the cloud database.
- Modem and wireless routers
  - For high-speed network connectivity specifically dedicated to our project business.
  - To keep all host devices, cloud database servers, external application servers, and web servers connected.

Software

- **WiX eCommerce**
  - To develop the website in the aspects of its structure, design, and website behaviour.
  - Allow developers to easily add new features like a functional payment system, customer-focused features, and display product contents on product pages and merchant profiles.
  - Provides a stable hosting server for our system to store all online content including, product images, videos, texts, and code.
  - Allow consistent website uptime and high availability.
- **Text-editor (Visual Studio Code)**
  - Provide developers with the tools to code multiple programming languages, debug, task run, and source control.
  - Enables developers to be able to work with APIs and add JavaScript to the website

Q3: Do we have the required expertise to meet the project requirements?

Yes. A team of experts will be employed to make sure that the internal IT requirements are constantly kept up to date and operating smoothly. They will also be the ones responsible for maintaining the website's availability and enhancing the user experience. For instance, customers may easily load the website quickly on both mobile and desktop browsers, with all product content resized automatically according to their device's screen resolution.

- **Project Manager**
  - Responsible for the overall planning, monitoring, control, and execution of the project.
  - Ensures that the goals of projects closely align with the strategic goals of the system.
  - Ensure that the project architecture is rigorous and it fits effectively within the framework of the project's requirements and scope.

- **System Analyst**
  - To act as a liaison between clients and IT professionals by interacting and coordinating with developers and Bookworm Paradise owners.
  - Improve the overall system productivity by diagnosing issues and advising management about system innovations.

- **Software Tester**
  - Performs software quality testing procedures by evaluating and verifying that the system is functioning as per the expectation of the Bookworm Paradise stakeholders.
  - Identify bugs, defects, errors, or any problem that can harm the performance of the system.
- **Programmer**
  - Performs coding activities to develop, test, and maintain the system.
  - Debug, analyze, and troubleshoot systems to ensure that everything runs smoothly.
  - Regularly enhance system security to protect against malicious attacks, hacking, and other online risks by testing for potential vulnerabilities and following security best practices.

- **UI/UX Designer**
  - Responsible for the overall art design of the website's user interface that supports both desktop and mobile devices.
  - Translate project requirements into wireframes and navigation flows that leads towards intuitive user experiences.
  - Communicate and collaborate efficiently with other departments such as the project management team and web team.

4.4 Economic Feasibility

The purpose of an economic feasibility study is to assist the Bookworm Paradise owners and the project team in identifying the costs, risks, benefits, and rewards of implementing a completely new approach to a business operation. A cost-benefit analysis chart is created to help the team make better sense of financially complex situations by laying out the resources and risks involved to develop the proposed system.

Cost-Benefit Analysis				
Cost classification	Cost Description	Cost per Month (RM)	Quantity/Period	Total (RM)
Tangible costs	Employee salary			
	Project Manager	2200	1	2,200
	System Analyst	2100	1	2,100
	System Tester	2100	2	4,200
	Programmer	2000	3	6,000
	UI/UX Designer	2000	1	2,000
	Total salary cost for 1 month			16,500
	Total tangible costs (4 months)			66,000
Operational costs	Software rentals			
	Wix Ecommerce subscription	70	4 Months	280
	Network fees			
	Unlimited broadband internet subscription	100	4 Months	400
	Total operational costs			680
Direct costs	Hardware costs			
	Desktop computers	1100	4	4,400
	Laptop computers	1200	4	4,800
	External hard drive	1000	1	1,000
	Modem and Wireless router	110	1	110
	Total direct costs			10,310
Total allocated capital				80,000
Total cost				76,990
Remaining capital				3,010
Benefit classification				
Tangible Benefits (4 months after system deployment)				60,000
Intangible Benefits (4 months after system deployment)				3,000
Total Benefits (4 months after system deployment)				63,000

Figure 4.0 - *Cost Benefit Analysis (CBA)*

Q1: What are the operating expenditures of the proposed system?

The operating expenditures consist of employee salary, software rentals, network charges, and hardware costs. Based on figure 4.0, the total cost to develop the proposed system is **RM 76,990**.

Q2: What is the remaining savings from the development of the proposed system?

Upon subtracting the total cost with the allocated capital by the owners of Bookworm Paradise, a remaining capital of **RM 3,010** is left.

Q3: Given the resource constraints, is the project possible?

Yes. According to the cost-benefit analysis in figure 4.0, a total of RM 66,000 falls under the tangible expenditures category to cover the salaries of 8 employees over the course of 4 months. Following that, we have a total of RM 680 for operational expenses to support software rentals and network fees. Lastly, the hardware needed to operate the system which comes with a total of RM 10,310. Hence, the total cost to develop the proposed system is RM 76,990, which is still within the amount allocated by the owners of Bookworm Paradise.

4.5 Schedule Feasibility

A schedule feasibility study is a process of assessing the potential time frame and completion dates for all major project tasks. This is essential for determining whether the project can be completed within the allotted time frame.

Project Tasks	Number of days
Phase 1 : System Planning	18
Phase 2 : System Analysis	8
Phase 3 : System Design	11
Phase 4 : System Implementation	26
Phase 5 : System Security and Support	15
Total days to complete the project :	78

Figure 4.1 – *Summarized project schedule*

Q1: Can the proposed system be deployed within the given time frame?

Yes. Based on figure 4.1, the time taken to conduct system planning, analysis, and design only takes about a month to accomplish, leaving us with more than enough time to conduct system implementation and system testing. In other words, there will be extra time allocated to the team if the scope of the project extends beyond its expected perimeters. Hence, the project would still be feasible even if there are any occurrence of **scope creeps**.

Q2: Will the new system still be relevant when the project ends?

Yes. We believe that any potential occurrence of a radical innovation in the e-commerce market for the next few years will **not affect the relevance of our current system** as online shopping has become an integral part of everyone's life. Most people would prefer to shop online more than offline due to the convenience it provides.

5.0 SYSTEM ANALYSIS

5.1 Requirement Gathering Techniques (RGT)

To gather the fundamental requirements for our new system, we have deployed 4 types of fact-finding techniques, which are: survey & questionnaires, interview, research, and observations.

5.2 Amadea Lim Yi Wen (TP064038) – RGT #1

RGT: Survey & Questionnaires

Survey and questionnaire are a research method that is widely used by all ranges of businesses. The researchers will prepare a list of questions and distribute them either online or offline. Offline distribution is paper based, where respondents are required to return the questionnaire to the distributor. Online surveys on the other hand, are distributed through digital platforms. A survey commonly consists of close-ended and open-ended questions.

The survey and questionnaire method has both perks and drawbacks towards a project. A vital benefit of utilizing surveys, specifically the online method, would be its flexibility and ease of participation. The researchers may reach out to a larger population due to remote participation and respondents do not have to show up in person. The use of the Internet also exposes the survey to participants of wider demographic ranges, which brings an advantage to our project. This is because our new system Scout is intended to provide global service to all users, therefore responses from potential Bookworm Paradise shoppers will aid us to better design the system. Apart from that, an online questionnaire provides us with quick data analysis. All responses can be easily retrieved and summarized using graphical charts. Data visualization aids the researchers in gaining a better insight of the responses for decision-making.

Although an online survey encourages diverse responses, its flexibility, however, may result in inaccurate answers. Unlike other research methods that are conducted physically, the researchers are unable to guide the respondents in completing an online survey. As a consequence, some respondents may not fully comprehend the questions, leading them to provide unintended responses. Besides, it is expected that some respondents may overlook the questions and answer mindlessly. This happens when they are disinterested in the survey, thus attempting to complete the questionnaire as quickly as possible. Additionally, the honesty of respondents is unassured due to several reasons. Bias and privacy concerns are two of the

leading factors to respondents' dishonesty while answering a survey. A bias may arise due to poorly designed questions, which lead the participants to think that they "should" select a particular answer over the other available options. This happens as the poorly phrased question unintentionally manipulates the respondents into thinking that they should select the correct answer rather than giving honest opinion (Choi & Pak, 2005).

Survey link attachment - https://forms.gle/L6VvuzBFmiiLMXJP7

For our project, a Google form has been utilized to generate an online survey for requirements gathering. This technique was selected as an approach to reach out to a larger population with the use of the Internet. The targeted survey respondents involve existing customers of Bookworm Paradise, and individuals who are non-customers but interested in visiting the bookstore. This demographic was chosen because they represent the users whom the system is developed for, apart from the bookstore staff. The survey will be distributed on Bookworm Paradise's social media pages which redirects the participants to the survey page by clicking on the survey link. The survey link will also be converted into a QR code to be displayed in-store, this allows customers to scan the code through devices such as mobile phones and tablets.

The name of the questionnaire is "Digital Platform **Scout** for Bookworm Paradise" which highlights our new system Scout. A simple introduction was given to introduce our company as well as informing respondents of the survey purpose and other necessary information.

The questionnaire was further divided into a few sections. However, before getting into the topic, a Respondent Relevancy section was created to check respondents' eligibility to participate in the survey. This section includes one question as shown in figure 5.1.

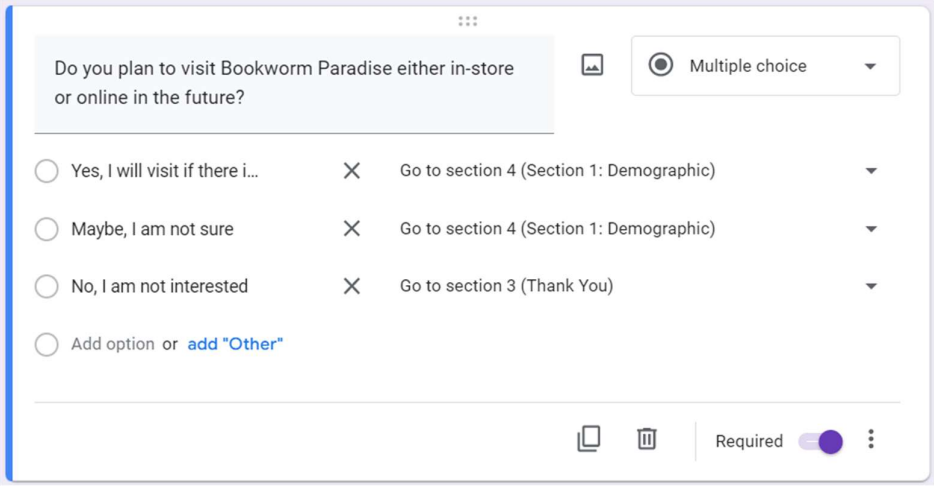


Figure 5.1 – *Respondent Relevancy*

A concern arises from the fact that our survey receives responses from everyone. There could be a risk that irrelevant individuals participate in the survey although they have no interest in either Bookworm Paradise or Scout. This could possibly lead to inaccurate results generated from those who may have participated in the survey for "fun". We therefore screen for eligible respondents. Potential respondents will proceed to the next section of the survey. On the other hand, those who are disinterested, will be redirected to a thank you page which informs them that they are ineligible to participate in the survey.

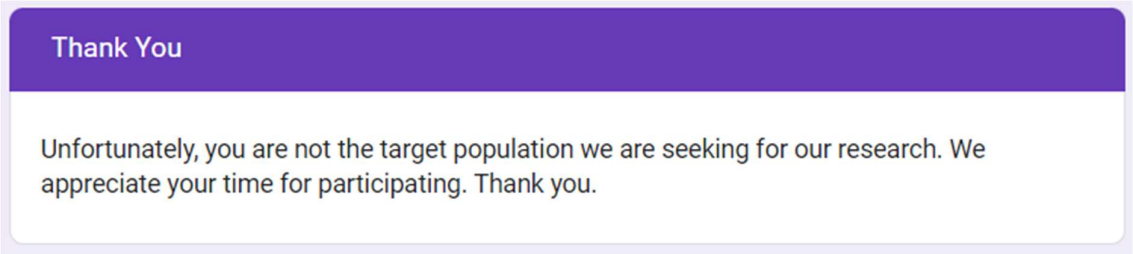


Figure 5.2 – *Thank You page*

The eligible respondents will then go to the first section of our survey, Demographic. We inquire about the respondent's gender, age, and country of residence before proceeding to section 2. The title of section 2 is Determinants of customers' desire to visit Bookworm Paradise.

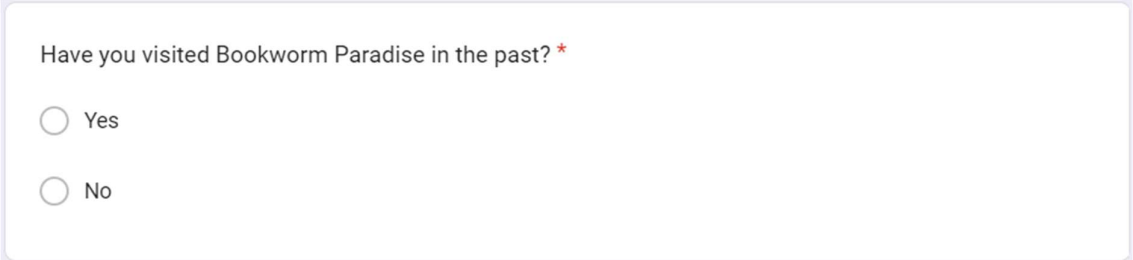


Figure 5.3 – *First question of Section 2*

Figure 5.3 is the first question of section 2, created to aid the researchers in differentiating the data between existing customers and non-customers. Non-customers may be someone who is keen to visit the store but has yet to do so due to multiple reasons. Although non-customers might not understand the bookstore as much as existing customers, they still play a vital role in developing Scout due to the fact that Scout will be accessible by global users in the future, including those who have never visited Bookworm Paradise. Hence, it is recommended that we include them as part of the survey population, while still being able to differentiate their responses from existing customers for better analysis.

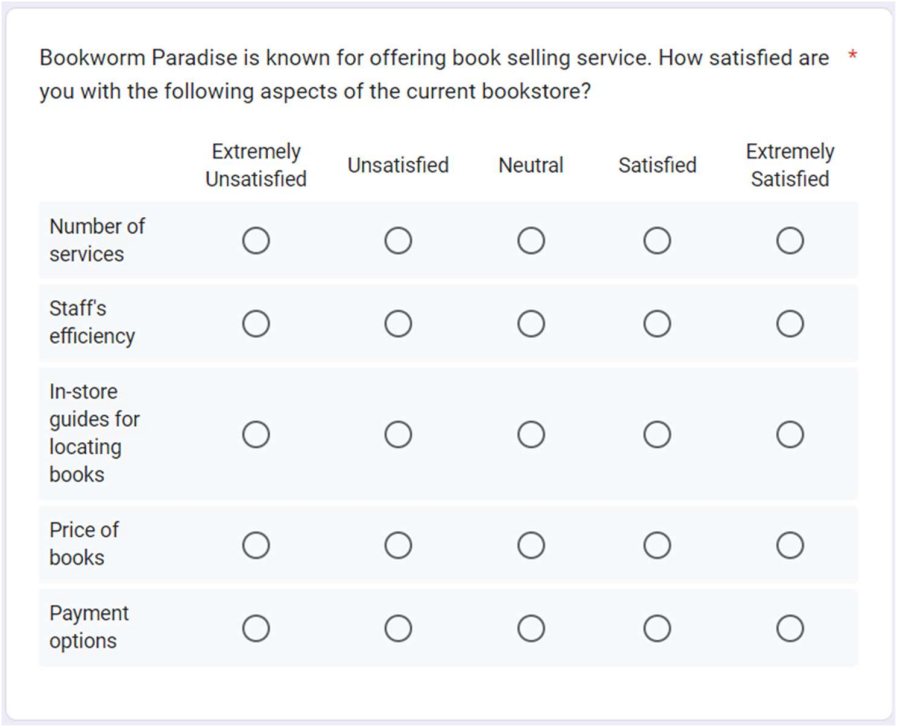


Figure 5.4 – *Evaluating respondent's satisfaction level*

Next, we want to know the respondents' level of satisfaction towards Bookworm Paradise (Figure 5.4). Elements with low satisfaction results are to be given extra emphasis and should be solvable by Scout. This question aids researchers in determining significance of above elements, however, the non-customers may choose the neutral option as without an actual visit to the store, they are likely to be uncertain of the in-store operation. Hence, we have designed the following question, which is applicable to non-customers (Figure 5.5).

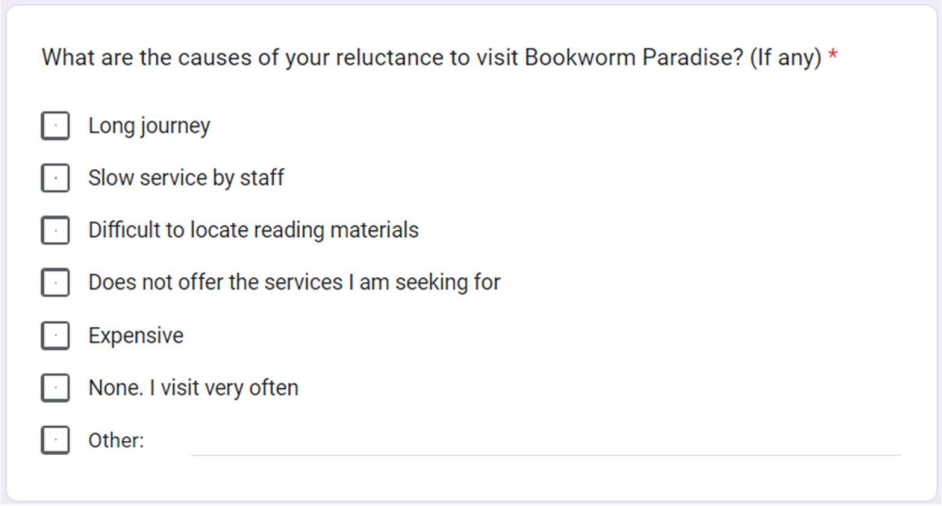


Figure 5.5 – *Evaluating the reasons affecting number of customers*

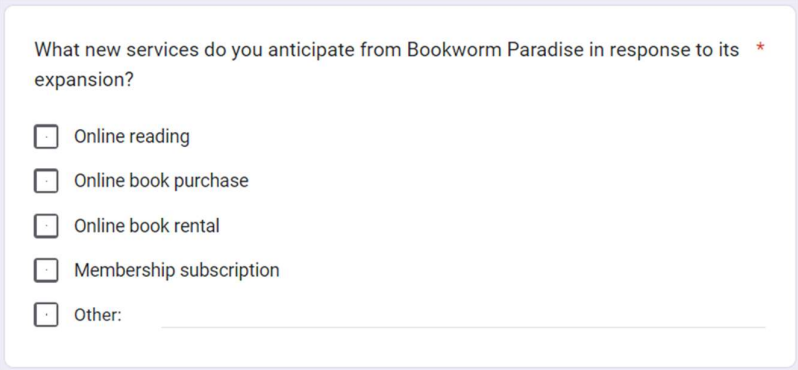


Figure 5.6 – *Respondent anticipation towards new services*

The last question of section 2 (figure 5.6) measures whether the new services requested by the Bookworm Paradise owner are practical and anticipated by the users.

We then proceed to Section 3, which gathers respondents' opinions towards Scout. The first two questions measure the respondents' acceptance towards Scout, whereas the third question is used to evaluate interest of respondents towards Scout. These questions are useful to grasp the needs of respondents, aiding us to implement the respective solutions through Scout.

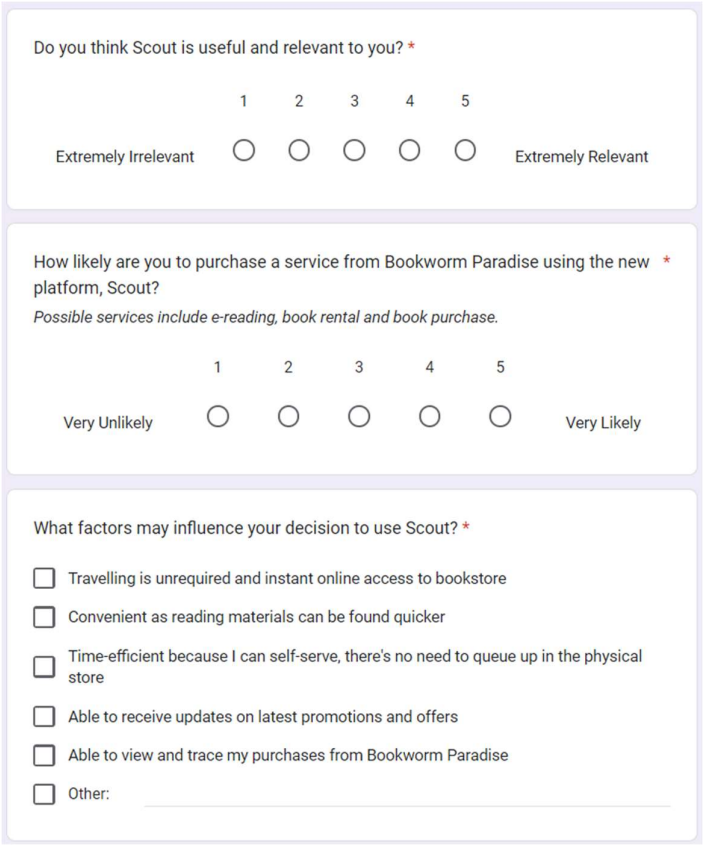


Figure 5.7 – *Questions under Section 3*

5.2 Bryan Wong Win Kit (TP063248) – RGT #2

RGT: Interview

Interviews are a common research technique used to obtain qualitative information directly from people. Typically, interviews involve asking people open-ended questions and noting down their responses. An interview can be conducted in several methods such as one-on-one, group interviews or over a video call. By conducting an interview, we can understand and determine who our target users are, what their needs and goals are and how they behave when interacting with our system.

5.2.1 Advantages

- The interviewer can judge the **non-verbal behaviour** of the respondent which allows for better reading of facial expressions and body language. This helps provide the interviewer with a clearer indication of the candidate's true, honest emotions and feelings.
- An interview has a considerably **higher response and retention rate** than questionnaires because it involves a direct interaction between the interviewer and respondent. When compared to written responses, oral responses are much more informative. Besides, those who cannot read or write are still able to respond to the questions posed.
- Unlike other techniques of requirement gathering, an interview is always conducted in a **private, calm**, and **appropriate location** to minimize distractions that could affect the responses given by the interviewees. It is essential to create an atmosphere where interviewees feel relaxed and approachable, hence resulting in more accurate responses.
- Interviews provide the opportunity for **flexibility** because the questions posed may be rephrased to make them more easily understood by the respondents if they are having difficulty comprehending them.
- Information collected through the interview is known to be **reliable and accurate**. This is because interviews are adaptable in terms of conveying personal opinions, perceptions, and thoughts. It enables both the interviewer and the interviewee to express unbiased opinions without disrupting the communication channel.

5.2.2 Disadvantages

- Face-to-face interviews can be **costly and time-consuming** to conduct as it requires a significant amount of preparation time and frequently includes travelling to several locations. Additionally, data collection, organization, and analysis will require a substantial amount of time to complete.
- The interview process may be **biased**. For example, the respondent's answers can be affected if the interviewee tries to respond in a way that will please the interviewer.
- Respondents might feel uneasy when they interact in face-to-face interviews as interview studies provide **less anonymity** compared to questionnaires.
- Interviews do not have a wide coverage of respondents. In contrast to online surveys, interviews **lack accessibility to respondents** as they cannot be conducted in every part of the world.

5.2.3 Method of conducting interview

Type of interview

The types of interviews are usually distinguished by their level of structure, which are semi-structured interviews, structured interviews, and unstructured interviews. The interview that we will be carrying out is a face-to-face **semi-structured interview** in which the interviewer will prepare a list of open-ended questions but will not necessarily ask them all, or touch on them in any specific sequence. Instead, interviewers will use these questions as a guide during the interview but have the option to deviate from it and discuss other topics if deemed appropriate. Interviewers are allowed to further discuss the topics of interest in more detail to collect rich and qualitative data (George, 2022).

Location and target users

The interview session will be conducted at the **main office** of Bookworm Paradise located in Kuala Lumpur. We will be targeting several individuals that are **interested and passionate about reading books**, as well as individuals that are extremely **supportive** towards the growth of Bookworm Paradise bookstore to participate in the interview.

5.2.4 Questions

The **main objective** of this interview is to gather information about the user's experience and the user interface requirements of the system. Therefore, a set of questions are prepared to help us **analyse user behaviours and usage habits**.

Questions about user behaviour:	1) On a scale of 1 to 10, how often do you see yourself visiting an e-commerce website? 2) What device do you typically use when visiting an e-commerce website? 3) How do you normally get to a website? 4) Have you ever ordered a book from an online store before? 5) What is your average budget on buying books online? 6) Who would you contact if you have questions or issues regarding the system you are accessing?
Questions about the user goals:	1) What is your main goal when visiting a bookstore website? 2) What improvements could be made to make your goal easier to achieve? 3) How do you think an online bookstore is going to benefit you?
Questions about user experience:	1) Would you expect an alert or notification from the system whenever you interact with the website? 2) Is there a particular website that you find visually appealing? 3) Is there a particular software application that you felt easy to understand and use? 4) Can you describe how you would sign up for an account online? 5) Do you have a physical disability that has hinder your experience when interacting with websites?

These questions are divided into three categories that are related to **user behaviour**, **user goals,** and **user experience** respectively.

Understanding **user behaviour** is essential for determining how users interact with the website. Such questions will be answered by analysing the users' behaviour throughout the interview, which will also help us continuously refine the product. Not only does it provide valuable insight about our system, but it also gives a competitive edge in the bookstore industry by ensuring that we meet customer needs and increasing customer retention rates.

Understanding **user goals** entails comprehending both the information they seek and the experience they wish to have when interacting with our site. By identifying the goals of our users, we are able to make decisions on what type of experience we want to create for them. These decisions are used to measure and guide the design of the product which can help us avoid focusing on unimportant elements and instead focus on what is essential.

Understanding **user experience** involves assessing the usability and accessibility of the service provided to our users. Accessibility in user interface design expands the users' coverage by enabling as many people as possible to understand, navigate, and interact with the product easily. For example, it is important to be aware that at least two billion individuals in the world have a disability which has caused websites to be less accessible to them (Borysko, 2022). Therefore, by being able to fully recognize the measures taken to enhance user experience, we can make the website less complicated and more productive for all types of users regardless of their physical or mental condition.

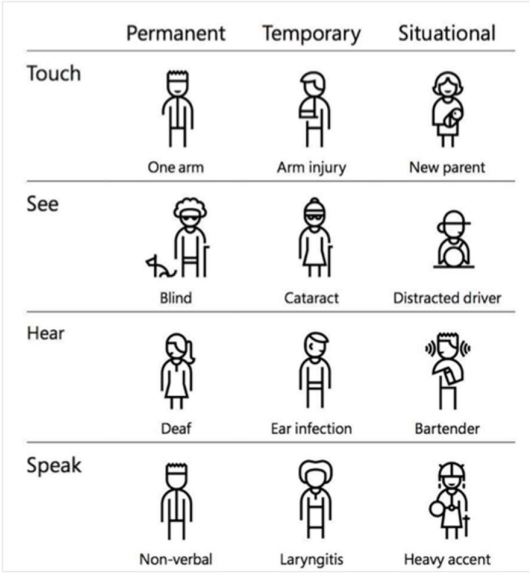


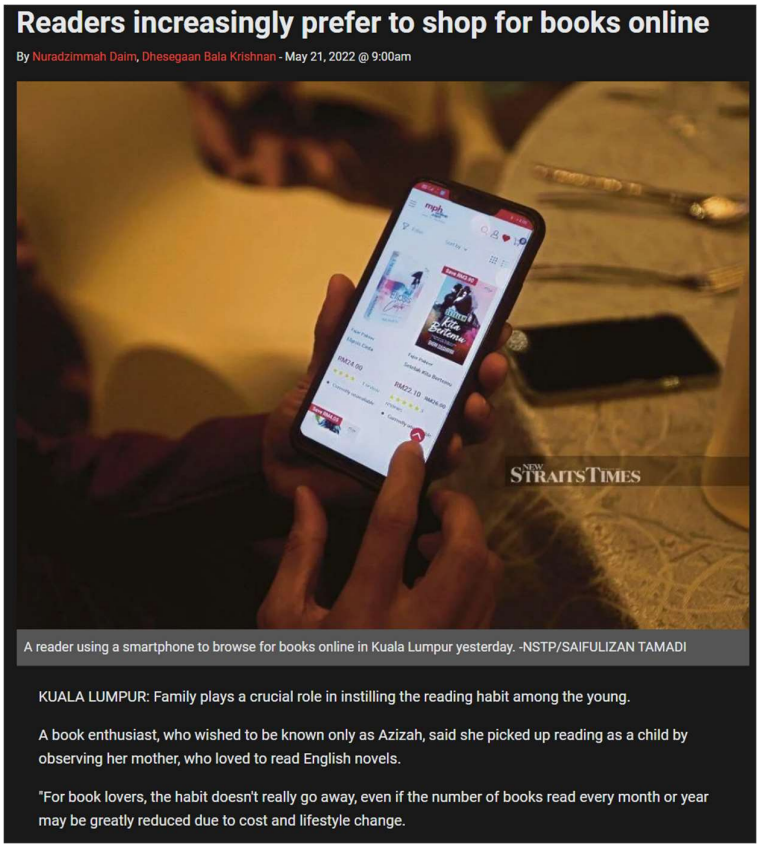
Figure 5.8 – *Types of disabilities*

5.3 Gan Ming Liang (TP063338) – RGT #3

RGT: Research

Research is a **popular** and **highly effective** requirements gathering technique. It involves the collection, analysis, and organization of information to increase knowledges regarding a certain subject or issue. This can be done through journals, internet sites, and documents published by credible researchers in the field.

Before developing *Scout*, it is crucial to identify the **market demand** for an online bookstore management system, which can be done through reading news articles, such as:



Readers increasingly prefer to shop for books online

By Nuradzimmah Daim, Dhesegaan Bala Krishnan - May 21, 2022 @ 9:00am

A reader using a smartphone to browse for books online in Kuala Lumpur yesterday. -NSTP/SAIFULIZAN TAMADI

KUALA LUMPUR: Family plays a crucial role in instilling the reading habit among the young.

A book enthusiast, who wished to be known only as Azizah, said she picked up reading as a child by observing her mother, who loved to read English novels.

"For book lovers, the habit doesn't really go away, even if the number of books read every month or year may be greatly reduced due to cost and lifestyle change.

Figure 5.9 – *Newsletter regarding online bookstore surge, New Straits Times*

According to the article published by (Daim & Krishnan, 2022) in Figure 5.9, the relevance of online bookstore soared during the covid-19 lockdown, and booklovers have since became accustomed to purchasing book online as it was cheaper, more convenient, and safer compared to a physical bookstore.

Furthermore, **trend analysis** is also an important research criterion when determine the functional requirements that *Scout* must include to **appeal to the international market**. The graphs below show the E-book and Audiobook adoption of US adults over the past decade; although E-books usage have flatten in recent years, it still remains as the superior option at 25% compared to audiobooks at 20% in 2019 (Perry, 2019).

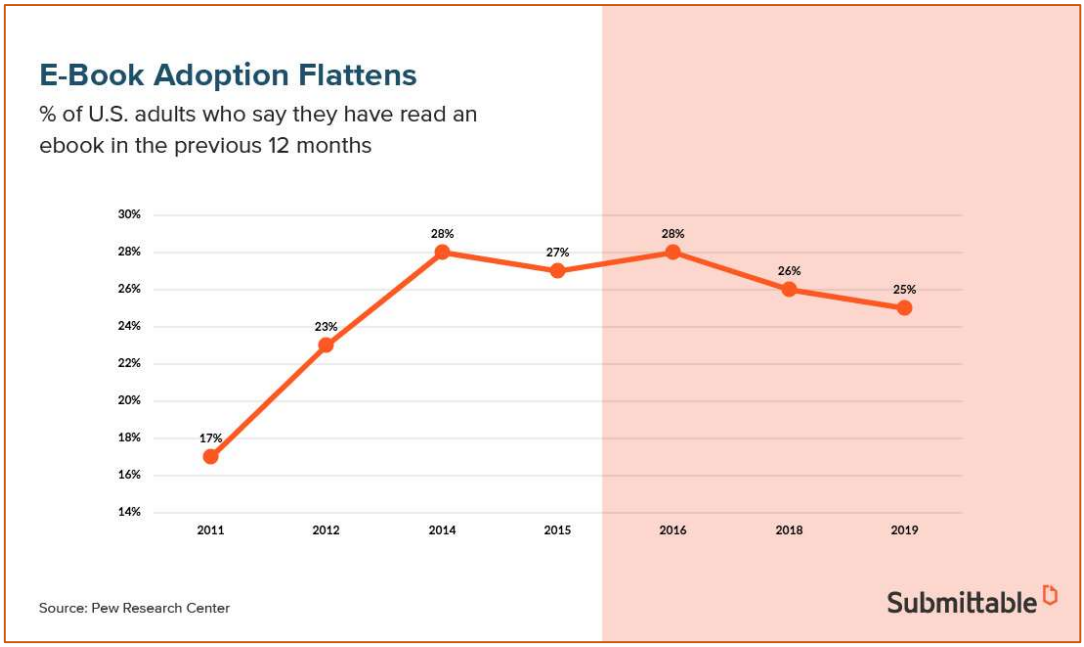


Figure 5.10 – *E-Book Adoption in US, Submittable*

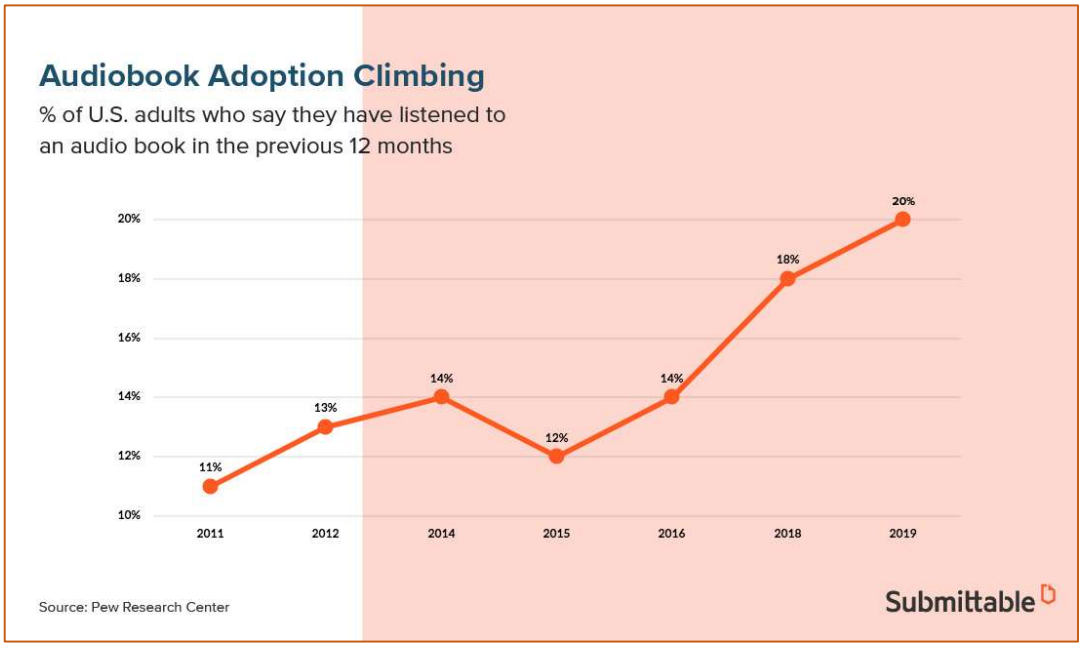


Figure 5.11 – *Audiobook Adoption in US, Submittable*

Alternative, we can **review documents** on existing online bookstore system implemented by **other bookstores** through research papers that are readily available on Google Scholars. This method will retrieve all relevant results based on the keywords that have been entered.

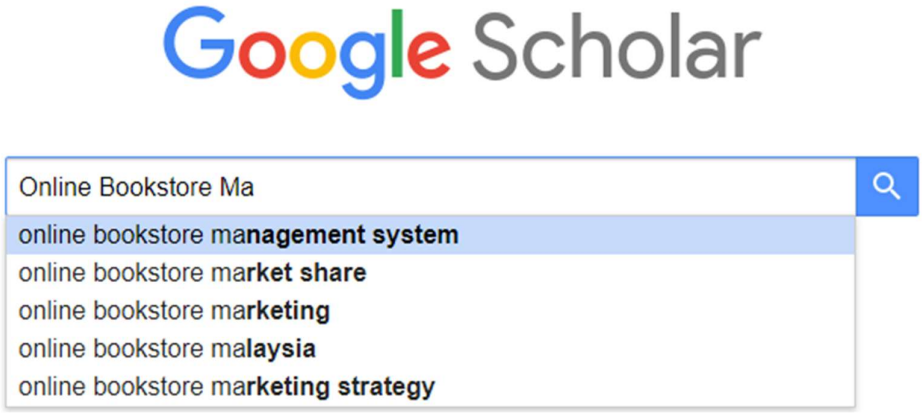


Figure 5.12 – *Google Scholar Search Engine*

As an example, we can search for "**architecture of online bookstore**", which will yield articles with ample UML diagrams including use-case, class, activity, and entity-relation diagrams as references to build our system upon. In short, research can be an amazing tool in gathering requirements when done correctly.

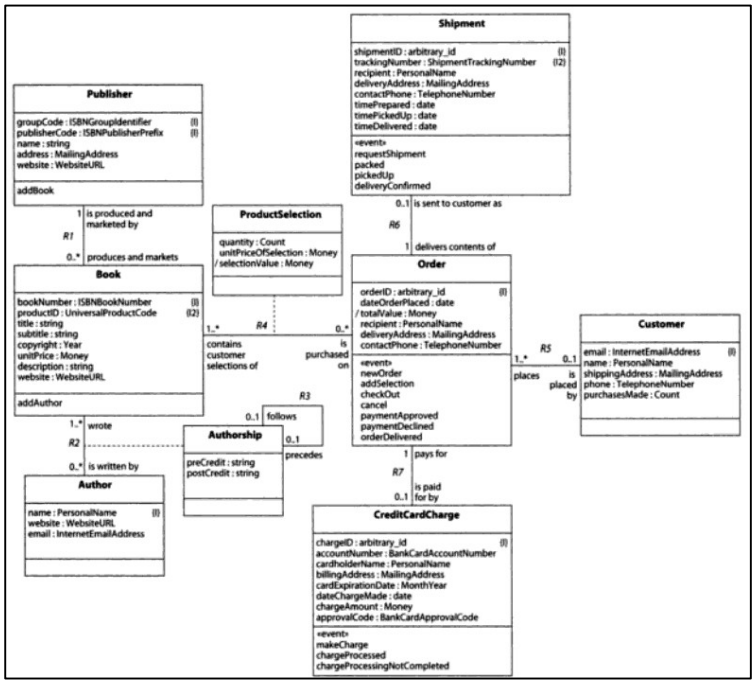


Figure 5.13 – *Class Diagram for Online Bookstore, Jacobson Architecture*

5.3.1 Research implementation for Bookworm Paradise

1. Research Topics (*what to find?*):
    a. What is the market demand for E-Books and Audiobooks?
    b. How does an online bookstore management system looks like?
    c. What are the functions & features of our competitors' system?
    d. What are the sales data regarding book rentals and online reading services?
    e. How much revenue does an online system typically generate for a company?
    f. What are the common mistakes made by a growing e-commerce company?
2. Sources and tools (*where & how to find?)*:
    a. Research Journals Publishers
        i. ResearchGate
        ii. Academia
    b. Periodicals
        i. The Star
        ii. New Straits Times
    c. Books / Online Articles
        i. Springers
        ii. Google Scholar
3. Justifications (*why do we find the information?*)
    a. To identify the importance of a specific bookstore feature, and include them in our system requirements report
    b. To observe successful implementation of other bookstores system in order to grasp the feasibility and success rate of our new system.
    c. To document what the system **must not** do to prevent system failures through an extensive list of non-functional requirements.
    d. To justify the costly development of a new system based on the market demand of an online bookstore.

5.3.2 Benefits and Drawbacks

Although we have only covered the benefits of research so far, it is also important that we understand the drawbacks of this approach to determine whether it is suitable for our case study.

Advantage of Research	Disadvantage of Research
Specific – Researcher can obtain factually-accurate and relevant information from credible publishers for their desired subject.	**Time-consuming** – Conducting research is a very intensive work as documents tend to be lengthy and needs to be cross-analysed to yield accurate results.
Proprietary – Researcher can choose to keep the results private, which could provide the company with a competitive advantage if they made a breakthrough.	**Costly** – Data gathered through this method can be very expensive to prepare. The cost incurred in paying researchers, renting equipment, purchasing license, and experimenting tend to require a generous amount of capital.
Quantitative Information – Research tends to yield numbered data that are measured using metrics. These empirical data can be converted into graphs to provide further insights and deeper understanding for a particular subject.	**Lack of Qualitative Information** – Research is not a good option if qualitative data is needed. Behavioural science, public opinions and customer experience are better captured using a more proactive methods such as conducting an interview.

5.3.3 Summary of Requirements Gathering Techniques - Research

Although research can retrieve fruitful results and insightful data, it may delay the development of a project, and adds extra cost to the budget report. Therefore, in order to obtain both qualitative and quantitative data, whilst staying affordable and meeting deadlines, it is highly recommended to deploy research alongside other requirements gathering technique such as interview, observation, and questionnaires for maximum efficiency and effectiveness.

5.4 Ian Joseph Lai Zi Jin (TP063403) – RGT #4

RGT: Observation

Observation is a rather unpopular, but extremely useful and effective data gathering technique when done by the right person, at the right places, at the right time. Researchers mainly use this method to conduct qualitative research, where data about people, objects, ongoing events, the behaviours, and tendencies of humans are gathered within a natural setting. Researchers pay close attention, watching and listening to ongoing activities while taking important notes down, sometimes even going as far as recording audio or video.

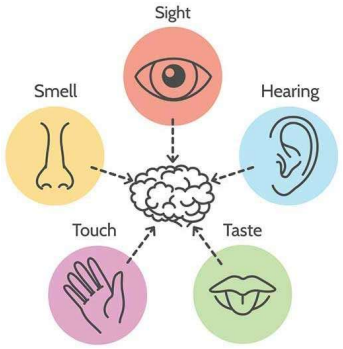


Figure 5.14 – *The five human senses* **-** (Mani, n.d.)

The method heavily depends on the usage of human senses, such as sight, hearing, sometimes even touch or smell. (Voicedocs, n.d.)

5.4.1 Planning before Observation

Planning before conducting an Observation is extremely important, as this is one of the determining factors of the **reliability and accuracy** of the research.

Before starting the observation, it is a good idea to search up on the current market about the bookstore industry in Malaysia. Where are certain hotspots that book lovers love to go to, essentially **selecting a site** to conduct our observation. We as researchers should not only look at the most popular bookstores, but also look at those with a unique twist.

According to (yelp, 2022), Kinokuniya, Times Bookstore and Junk Bookstore are amongst the most popular and highly rated places to go for readers, all of which are based in Kuala Lumpur, making them Bookworm Paradise's regional competitors in the market.

Figure 5.15 – *Kinokuniya Bookstore KLCC* (left) – (Chris & Sue, 2015)

Figure 5.16 – *Times Bookstore Bukit Bintang* (right) - (Foursquare, 2022)

Figure 5.17 – *Junk Bookstore KL* - (Manivaloo, 2020)

While Kinokuniya (Fig. 5.15) and Times Bookstore (Fig. 5.16) are modern looking bookstores which may appeal to most city-goers now, Junk Bookstore KL (Fig. 5.17) is an older establishment, holding reading material from as old as 20 years ago (Manivaloo, 2020). This leads to a potential difference in **customer demographic** and **business process** of operating the bookstore. Conducting an observation at Junk Bookstore would be extremely useful, as it provides an even wider insight on what readers various tastes are when looking for books.

Once sites of interest have been narrowed down, it is important to select **good, experienced observers.** The observers may be any one of us, however it is recommended to pick a stakeholder or other more professional staff members to conduct the observation. Observers should be **well-trained**, as proficient observers will be able to acquire data of higher quality and consistency. Lastly, the timing of which the observation is conducted should also be considered. Observers should **schedule their monitoring** strictly to be in-sync with the activities that are occurring on-site at the bookstores, this helps as observing the right aspects at the right time will answer the questions observers have.

The next stage would be **determining a focus**. For us, we could be watching out for factors such as the peak hours and off-peak hours, the amount of time a person spends at a bookstore, exactly what they are doing in the bookstore, how long are they doing it for, amongst a ton of other factors that can be observed (CDC, 2018).

Once the focus of the observation has been singled out, there sometimes may be too many factors to watch for during an observation, and this can be overwhelming to the researcher. It is good compliment the researcher alongside **a system or method of data collection** (CDC, 2018)**.**

Scale	Statement	Never		Sometimes		Always
		1	2	3	4	5
E[a]	1. Pays attention in class					
E	2. Works well with other children					
I	3. Attempts to do his/her work thoroughly and well, rather than just trying to get by					
D	4. Acts restless, is unable to sit still					
I	5. Participates actively in discussions					
E	6. Completes assigned seatwork					
D	7. Needs to be reprimanded					
D	8. Annoys or interferes with peers' work					
E	9. Is persistent when confronted with difficult problems					
N	10. Doesn't seem to know what is going on in class					
N	11. Is withdrawn, uncommunicative					
E	12. Approaches new assignments with sincere effort					
I	13. Asks questions to get more information					
D	14. Talks with classmates too much					
N	15. Doesn't take independent initiative, must be helped to get started and kept going on work					
E	16. Tries to finish assignments even when they are difficult					
I	17. Raises his/her hand to answer a question or volunteer information					
E	18. Gets discouraged and stops trying when encounter an obstacle in schoolwork; is easily frustrated					

Notes: E = Effort; I = Initiative; D = Disruptive behavior; N = Inattentive behavior.

Figure 5.18 – *An example of a recording sheet / checklist used for observing student behaviour* - (Jang, 2010)

A great option for recording down notes and pointers are **Recording Sheets and Checklists**. It is found to be the standard method for collecting data from observations. These sheets are prepared with statements that are **easily understandable yet have a good description** of the situation that is to be observed. An example for our research could be *"Staff interacts with customer in a friendly manner when inquired for help"*, we can then rate that based on a Likert scale of 1 to 5, or simply put a cross or a check based on the observer's judgement.

5.4.2 Categorising Observation Methods

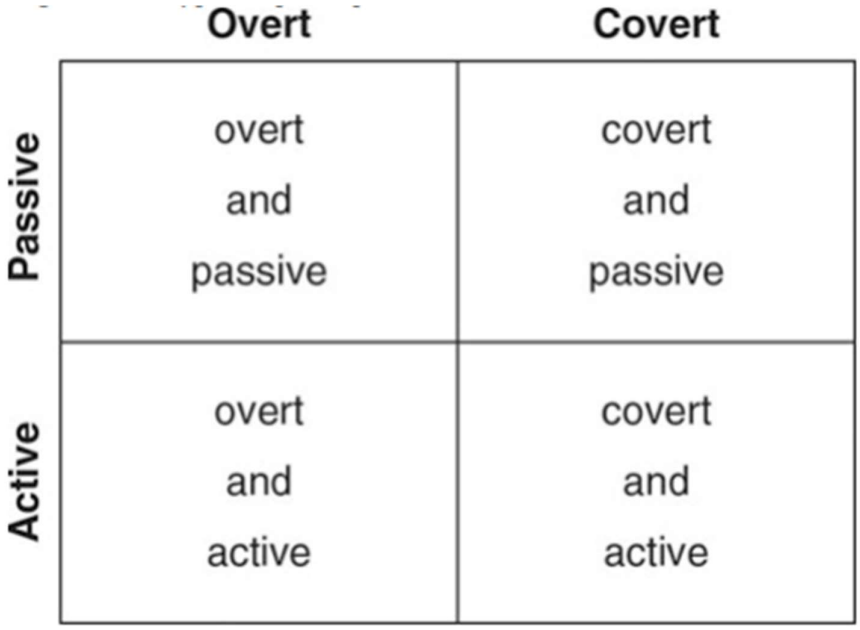


Figure 5.19 – *Diagram showing variants of observation techniques* - (Brancati, 2018)

Observation can first be split into two different variants, **Active** and **Passive Observation**. This categorisation focuses on the **interaction** between the researcher and the environment, objects, or subjects at hand (Brancati, 2018).

In passive observation, behaviours, tendencies, and any activity conducted by subjects are recorded by the researcher without any conversation or interaction between the two (Brancati, 2018). Contrasting with passive observation, researchers converse with subjects, asking questions about the activity or job at hand, to a further extent, even joining in the activities, rituals, or routines that the subjects are partaking in when conducting an active observation. (Brancati, 2018).

To further distinguish between the two observation methods, each of the methods can be split into two different variants as well, being **Overt** and **Covert** observation. This form of categorisation focuses on the researcher's **presence and intentions** towards the subjects (Brancati, 2018).

In Covert observations, the researcher **closely resembles the role of a spy**, not revealing any of their intentions or presence of being a researcher, blending in as a normal person. While Covert Observation is a means of completely concealing identity, it does not mean that Overt Observers will reveal the full details of the research being conducted towards the subjects.

Researchers may their presence known but will generally **steer away** from telling any subject the **specific reason or objective** behind the research, as this could tarnish or disrupt the end results by changing the way the subjects act, leading to inaccurate or unreliable information (Brancati, 2018).

The observation method has many advantages and disadvantages, in retrospect to the multitude of variants available to choose from.

Advantages of Observation	Disadvantages of Observation
Adaptability and Flexibility - The ability to choose between a multitude of variants, depending on the situation or environment the researcher is conducting the research	**Subject to Observer Bias** - Researcher could have a favour or preference towards certain results when writing down reports
Collecting Live Data - Collecting data live during an event, activity or process allows for acquiring the most up-to-date and research specific information	**Dependant on Ability to Observe** - End results can vary depending on how well the researcher can absorb and comprehend information
Reliance - Researcher does not need to rely on the subjects to provide information - Negates the factor of the subject's will or ability to provide information	**The "Hawthorne Effect"** - Applies when subjects are aware they are being watched - Subjects perform better or differently when being observed
Visual Proof - Allows the researcher to observe the actions of subjects, rather than being reliant on the sayings. A concept of "show, don't tell".	**Expensive & Time Consuming** - Cost required to hire observers - Time required to train or search for experienced observers - Time required to conduct one, or even multiple observations

- (CDC, 2018)
- (Perera, 2021)

5.6 Functional Requirements

5.6.1 Login & Registration

- The system must allow user to create an account by entering their credentials
- The system must store the login credentials in the database
- The system must allow users to log in by entering their credentials
- The system must provide an option for users to reset their password
- The system must allow users to log out

5.6.2 Customer Account Details

- The system must allow customers to view and edit their profile and account information

5.6.3 Website Viewing

- The system must allow users to view bookstore products
- The system must allow users to search for books by inserting title, author, publisher, or ISBN numbers
- The system must allow users to filter books by category, price, collections, and tags
- The system must allow user to view informative pages such as store policies and news
- The system must allow customers to contact the bookstore by filling in a contact form

5.6.4 Shopping

- The system must allow customers to add items to cart
- The system must allow customers to book reading sessions
- The system must allow customers to rent a book
- The system must allow customers to buy a book
- The system must allow customers to subscribe to a membership plan

5.6.5 Check-out and Payment

- The system must allow customers to use discount coupons during check-out
- The system must allow customers to save shipping address if they opt for delivery
- The system must charge delivery fee based on chosen destination
- The system must allow customers to select in-store pickup or delivery option
- The system must generate invoice before payment
- The system must generate receipt after payment

5.6.6 Staff and Managers

- The system must allow admins to manage subscription plans
- The system must allow admins to create and update product details
- The system must allow admins to create and update service details
- The system must allow admins to update inventory
- The system must be capable of generate userbase report, subscription report, inventory report and sales reports
- The system must allow managers to download or print reports

5.7 Non-Functional Requirements

5.7.1 Optimization

- The system shall load a webpage within 5 seconds
- The system shall be supported on all modern devices and operating systems
- The system shall be user friendly
- The system shall be secured and reliable
- The system shall be able to process an order within 15 seconds
- The system shall be maintainable
- The system shall be able to handle 1 million users concurrently

5.7.2 Cart and Payment

- The system shall be capable of calculating the total based on cart items and discount
- The system shall only allow customers that are logged in to buy products and services
- The system shall support multiple payment methods such as bank transfer or PayPal

5.7.3 User Profile

- The system shall store relevant details such as wallet balance, subscription, bookings, and order histories under the customer profile page
- The system shall store all relevant credentials such as first name, last name, email, and password under the customer account information page

6.0 DESIGN DIAGRAM

6.1 Context Diagram

A system context diagram outlines how external entities interact with an internal software system. It focuses on the **general structure of the system** and does not delve into the intricacies of each function. As such, they are simple, clear, and easy to understand by our clients at Bookworm Paradise.

With that said, Figure 6.0 is the official context diagram designed for BWP's subsidiary online bookstore management system named *Scout*, consisting of 6 external functions, and 27 data flows that are interconnected within the main system.

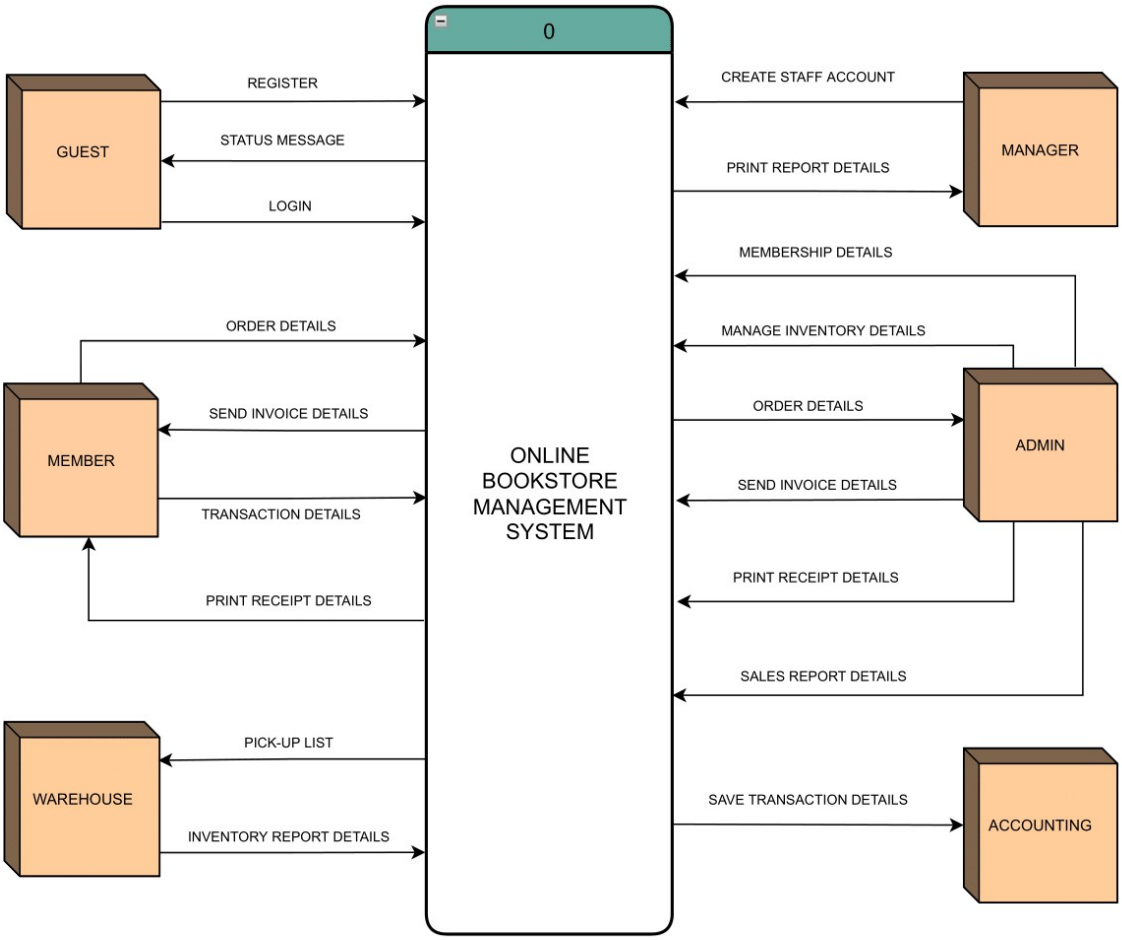


Figure 6.0 – *Scout's Context Diagram*

6.2 Data Flow Diagram - Level 0

A data flow diagram is the **descendent** of a context diagram. It is designed to be more informative through the use of data store and breakdown of a high-level process into small sub-processes. Attached below is BWP's DFD Level 0 that entails 9 processes and 4 data stores.

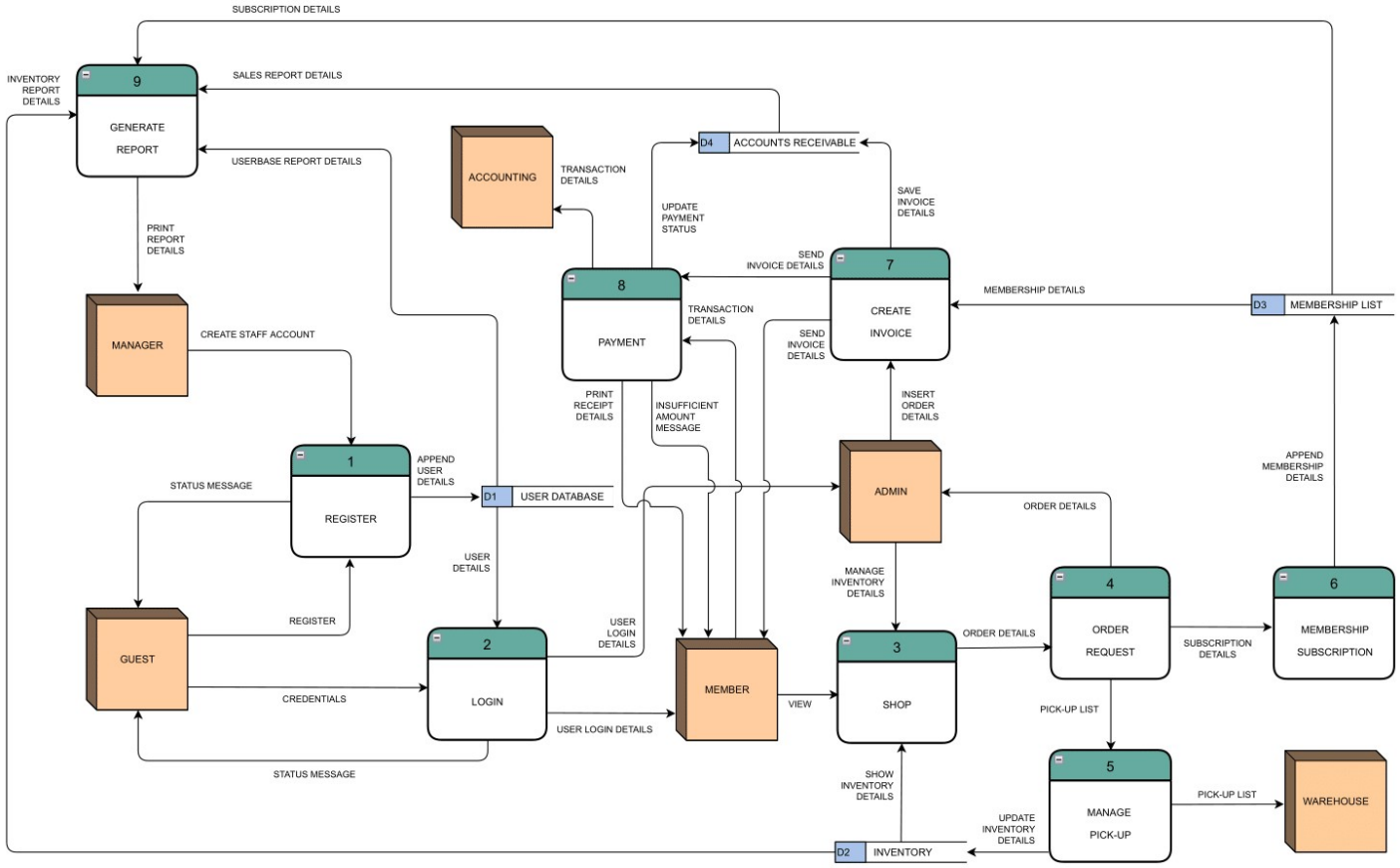


Figure 6.1 - *Scout's Data Flow Diagram - Level 0*

6.3 Bryan Wong Win Kit (TP063248)

6.3.1 **DFD Level 1:** 2.0 – LOGIN

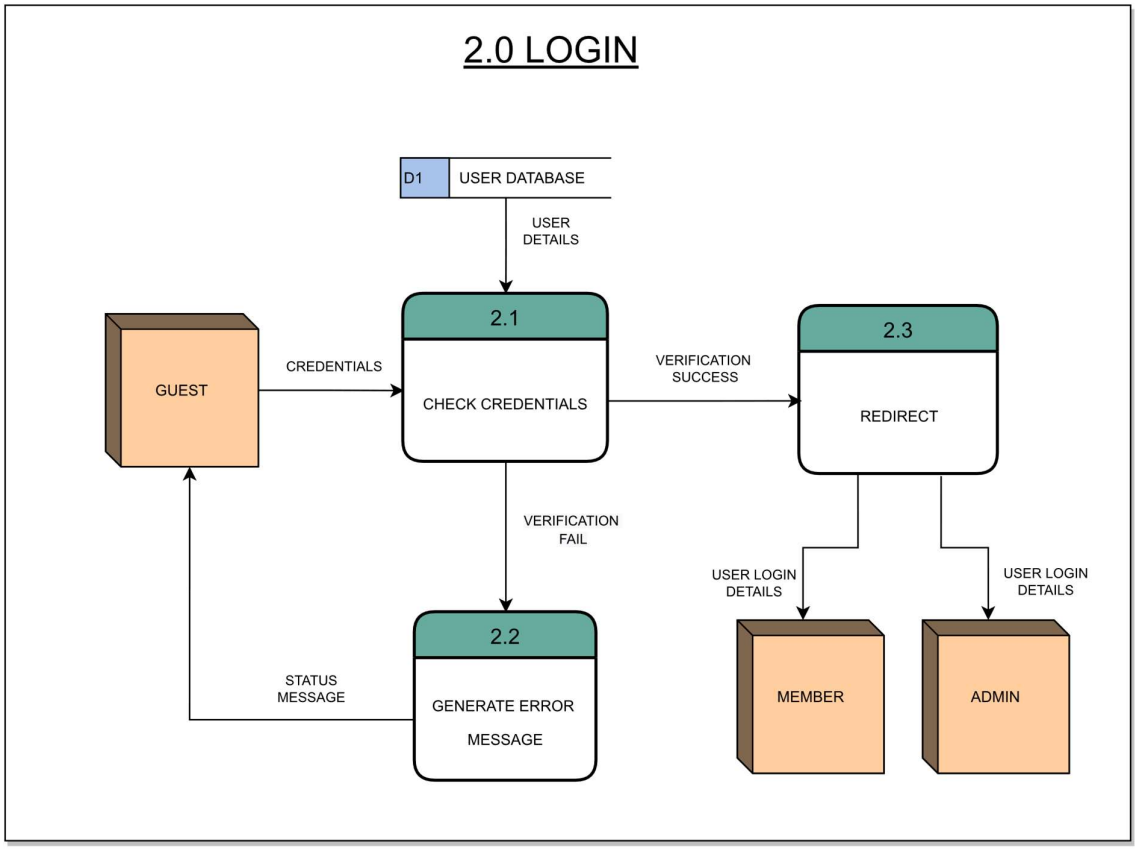


Figure 6.2 - *Data Flow Diagram Level 1, LOGIN*

6.3.2 Data Dictionary

Entity

Name: GUEST

Description: Enter credentials to login admin/member account.

Input data flows: STATUS MESSAGE

Output data flows: CREDENTIALS

Name: MEMBER

Description: Receives member login details to access member functionalities.

Input data flows: USER LOGIN DETAILS

Output data flows: -

Name: ADMIN

Description: Receives admin login details to access admin functionalities.

Input data flows: USER LOGIN DETAILS

Output data flows: -

Process

Name: 2.1 CHECK CREDENTIALS

Description: Verify if the credentials entered exist in the system and matches.

Input data flow: USER DETAILS, CREDENTIALS

Output data flow: VERIFICATION FAIL, VERIFICATION SUCCESS

Process description:

START

OPEN "D1 USER DATABASE"

READ user_details

CHECK (email)

IF email does not match

THEN RETURN “402” RESPONSE CODE

ELSE IF password does not match

THEN RETURN “403” RESPONSE CODE

ELSE IF password is expired

THEN RETURN “404” RESPONSE CODE

ELSE

RETURN “200” RESPONSE CODE

ENDIF

CLOSE “D1 USER DATABASE”

END

Name: 2.2 GENERATE ERROR MESSAGE

Description: Generates error message to display.

Input data flow: VERIFICATION FAIL

Output data flow: STATUS MESSAGE

Process description:

```
START
        DECLARE message AS STRING
        IF (RESPONSE CODE = 402)
                THEN ASSIGN “Email does not match” TO message
        ELSE IF (RESPONSE CODE = 403)
                THEN ASSIGN “Password does not match” TO message
        ELSE IF (RESPONSE CODE = 404)
                THEN ASSIGN “Password has expired” TO message
        ENDIF
        PRINT message
END
```

Name: 2.3 REDIRECT

Description: Redirect user to admin/member account.

Input data flow: VERIFICATION SUCCESS

Output data flows: USER LOGIN DETAILS

Process description:

```
START
    DECLARE role AS STRING
    IF (RESPONSE CODE = 200)
        IF (role = “Admin”)
            THEN REDIRECT USER TO ADMIN ACCOUNT
        ELSE IF (role = “Member”)
            REDIRECT USER TO ACCOUNT
    ENDIF
END
```

Data Store

Name: D1 USER DATABASE

Description: Stores all registered user details.

Input data flow: -

Output data flow: USER DETAILS

Data structure: user_details = user_id + first_name + last_name + email + password

role = [Admin | Member]

Data element:

user_id

- Nvarchar, UNIQUE, NOT NULL (6)
- Example: ME0002
- Description: Uniquely identify the user.

first_name

- Nvarchar (20)
- Example: Mill
- Description: User's first name.

last_name

- Nvarchar (20)
- Example: Swith
- Description: User's last name.

email

- Nvarchar (99)
- Example: Swith@gmail.com
- Description: User's email address.

password

- Nvarchar (30)
- Example: Swith_MillXx
- Description: User's password.

role

- Nvarchar (10)
- Example: Admin
- Description: Categorize user to admins or members.

Data flow

Name: VERIFICATION FAIL

Description: Verification fail code.

Source/Origin: 2.1 CHECK CREDENTIALS

Sink/Destination: 2.2 GENERATE ERROR MESSAGE

Data structure: verification_details = verificationFail_id

response_code = [402|403|404]

Data element:

verificationFail_id

- Nvarchar, UNIQUE, NOT NULL (6)
- Example: VF0001
- Description: Uniquely identify verification code.

response_code

- INT (3)
- Example: 404
- Description: Code to decide what message to be displayed to the user.

Name: USER DETAILS

Description: Registered user details.

Source/Origin: D1 USER DATABASE

Sink/Destination: 2.1 CHECK CREDENTIALS

Data structure: user_details = user_id + first_name + last_name + email
role = [Admin | Member]

Data element:

**As declared in data store D1 USER DATABASE*

Name: VERIFICATION SUCCESS

Description: Verification success code.

Source/Origin: 2.1 CHECK CREDENTIALS

Sink/Destination: 2.3 REDIRECT

Data structure: verification_details = verificationSuccess_id

response_code = 200

Data element:

verificationSuccess_id

- Nvarchar, UNIQUE, NOT NULL (6)
- Example: VS0001
- Description: Uniquely identify verification code.

response_code

- INT (3)
- Example: 200
- Description: Code to decide what message to be displayed to the user.

Name: STATUS MESSAGE

Description: Message to be displayed to user.

Source/Origin: 2.2 GENERATE ERROR MESSAGE

Sink/Destination: GUEST

Data structure: error_messages = message_id + message + error_response_code

Data element:

message_id

- Nvarchar, UNIQUE, NOT NULL (6)
- Example: EM0001
- Uniquely identify message

message

- Nvarchar (255)
- Example: “Email does not exist”
- Description: User’s email address.

response_code

- INT (3)
- Example: 404
- Description: Code to decide what message to be displayed to the user.

Name: USER LOGIN DETAILS

Description: Registered user details.

Source/Origin: 2.3 REDIRECT

Sink/Destination: MEMBER, ADMIN

Data structure: user_login_details = user_id + email + first_name

role = [Admin | Member]

Data element:

**As declared in data store D1 USER DATABASE*

Name: CREDENTIALS

Description: User login credentials.

Source/Origin: GUEST

Sink/Destination: 2.1 CHECK CREDENTIALS

Data structure: login_details = login_id + email + password

Data element:

login_id

- Nvarchar, UNIQUE, NOT NULL (6)
- Example: LD0001
- Description: Uniquely identify registered accounts.

**Other elements declared in data store D1 USER DATABASE*

6.4 Amadea Lim Yi Wen (TP064038)

6.4.1 **DFD Level 1:** 3.0 – SHOP

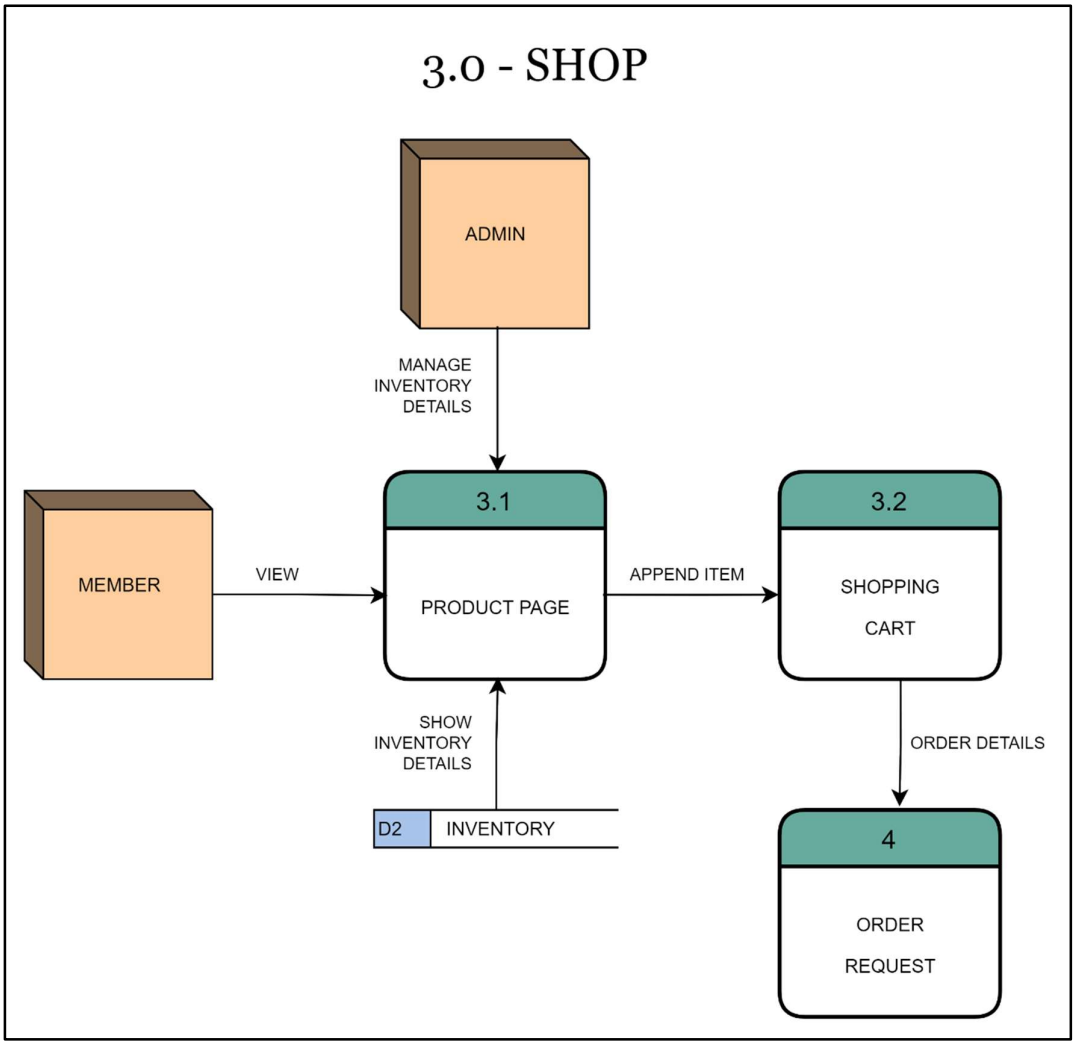


Figure 6.3 - *Data Flow Diagram Level 1, Shop*

6.4.2 Data Dictionary

Entity

Name: MEMBER Description: Member views product page Input data flows: - Output data flows: VIEW

Name: ADMIN Description: Admin manages inventory details Input data flows: - Output data flows: MANAGE INVENTORY DETAILS

Process

Name: 3.1 PRODUCT PAGE

Description: Receives updated inventory details, display products and allow append of items

Input data flows: VIEW, MANAGE INVENTORY DETAILS, SHOW INVENTORY DETAILS

Output data flows: APPEND ITEM

Process description:

START

OPEN file 'D2 INVENTORY'

OPEN product details page FROM 3.1 PRODUCT PAGE

APPEND inventory details INTO product details page

CLOSE file and product details page

OPEN product details page FROM 3.1 PRODUCT PAGE

APPEND inventory details INTO product details page *(done by admin)*

CLOSE product details page

PRINT book_name, book_category, book_price, service_name, subscription_plan TO 3.1 PRODUCT PAGE

GET 'user_id' AND DISPLAY 3.1 PRODUCT PAGE *(member view page)*

APPEND item INTO SHOPPING CART

END

Name: 3.2 SHOPPING CART

Description: Receives items and generates order details

Input data flows: APPEND ITEM

Output data flows: ORDER DETAILS

Process description:

START

GET item

APPEND item INTO shopping cart

PRINT 'ORDER DETAILS'

END

Data Store

Name: D2 INVENTORY

Description: Stores inventory information

Input data flows: -

Output data flows: SHOW INVENTORY DETAILS

Data structure: inventory details = book_id + book_name + book_category + book_cost + book_price + book_stock;

Data element:

book_id	• uniquely identify each book • varchar, unique, not null (8) • example: BK000001
book_name	• name of the book • varchar (50) • example: Alice In The Wonderland Vol. 2
book_category	• categories to group books • varchar (50) • example: Fiction
book_cost	• cost of a book • decimal (>=1) • example: RM 29.68
book_price	• selling price of a book • decimal (>=1) • example: RM 37.00
book_stock	• quantity of books that are still in-stock • integer (>=0) • Example: 25

Data Flow

Name: VIEW

Description: viewing product page

Origin/Source: MEMBER

Destination/Sink: 3.1 PRODUCT PAGE

Data structure: user_id;

Data element:

user_id	• Uniquely identify each customer • varchar, unique, not null (8) • example: UR000001

Name: SHOW INVENTORY DETAILS

Description: updates and display inventory details

Origin/Source: D2 INVENTORY

Destination/Sink: 3.1 PRODUCT PAGE

Data structure: inventory details = book_id + book_name + book_category + book_cost + book_price + book_stock;

Data element:

***as declared in data store D2 INVENTORY*

Name: MANAGE INVENTORY DETAILS

Description: manually modify and display inventory details

Origin/Source: ADMIN

Destination/Sink: 3.1 PRODUCT PAGE

Data structure: inventory details = book_id + book_name + book_category + book_cost + book_price + book_stock;

Data element:

***as declared in data store D2 INVENTORY*

Name: APPEND ITEM

Description: add items

Origin/Source: 3.1 PRODUCT PAGE

Destination/Sink: 3.2 SHOPPING CART

Data structure: item = [{book_id} + {book_name} + {book_quantity} | service_id + service_name + duration | subscription_plan] ;

Data element:

book_id	• uniquely identify each book • varchar, unique, null (8) • example: BK000001
book_name	• name of the book • varchar (50) • example: Alice In The Wonderland Vol. 2
book_quantity	• quantity of books added to cart • integer (>=1) • Example: 25
service_id	• uniquely identify each service • varchar, unique, null (6) • example: SE000001
service_name	• name of the service • varchar (50) • example: Online Reading
duration	• duration of service • integer (>=1) • example: 2 hours
subscription_plan	• type of subscription plan • varchar (50) • example: Premium

Name: ORDER DETAILS

Description: details of an order

Origin/Source: 3.2 SHOPPING CART

Destination/Sink: 4 ORDER REQUEST

Data structure: order details = order_id + user_id + date +
[{book_id} + {book_quantity} | service_id | subscription_plan]
+ cart_total;

Data element:

order_id	• uniquely identify each order • varchar, unique, not null (8) • example: OR028790
user_id	• uniquely identify each customer • varchar, unique, not null (8) • example: UR000001
date	• date of order generated • varchar (10) • example: 28/09/2022
book_id	• uniquely identify each book • varchar, unique, null (6) • example: BK090001
book_quantity	• quantity of books added to cart • integer (>=1) • Example: 25
service_id	• uniquely identify each service • varchar, unique, null (6) • example: SE007401
subscription_plan	• type of subscription plan • varchar (50) • example: Premium
cart_total	• total price of item(s) • varchar (>=0) • example: RM98.00

6.5 Ian Joseph Lai Zi Jin (TP063403)

6.5.1 **DFD Level 1:** 7.0 – CREATE INVOICE

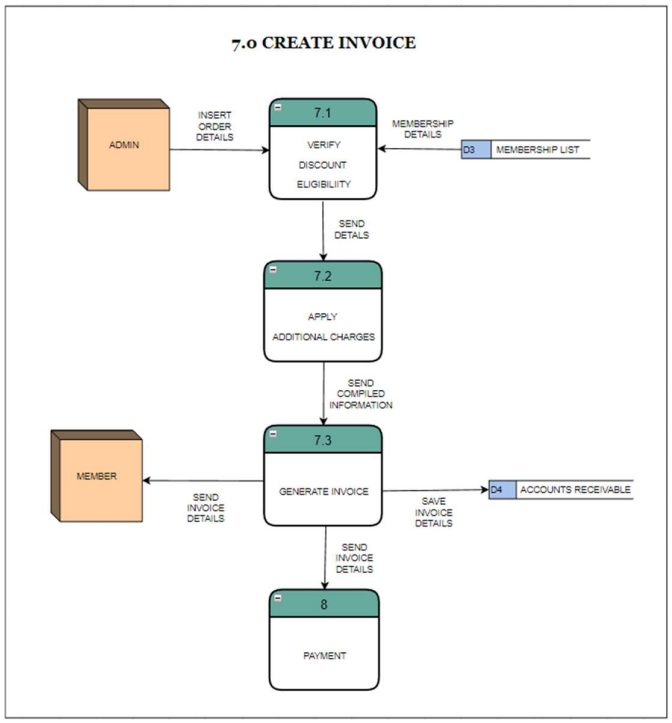


Figure 6.4 - *Data Flow Diagram Level 1, Create Invoice*

6.5.2 **Data Dictionary**

I. <u>External Entity</u>

Name: Admin

Description: Admin inputs order details to be used for invoice generation

Input Data Flows: -

Output Data Flows: INSERT ORDER DETAILS

Name: Member

Description: Member’s make payments for invoices sent to them

Input Data Flows: SEND INVOICE DETAILS

Output Data Flows: -

II. Processes

Name: 7.1 VERIFY DISCOUNT ELIGIBILITY

Description: Applies a discount according to the member's membership status

Input Data Flows: - INSERT ORDER DETAILS, MEMBERSHIP DETAILS

Output Data Flows: - SEND DETAILS

Process Description:

```
START
      OPEN file 'membership list'
      READ subscription_plan
      STORE user_id from 'membership list' into variable temp_user_id
      CHECK (user_id)
      IF user_id EQUALS temp_user_id THEN
            CHECK (subscription_plan)
            IF subscription_plan EQUALS 'Premium' THEN
                  applied_discount = 0.85
            ELSE IF subscription_plan EQUALS 'Gold' THEN
                  applied_discount = 0.9
            ELSE IF subscription_plan EQUALS 'Standard' THEN
                  applied_discount = 0.95
      ELSE
            applied_discount = 1.00
      END IF
      invoice_total = cart_total * applied_discount
      CLOSE file
END
```

Name: 7.2 APPLY ADDITIONAL CHARGES

Description: Applies additional charges such as shipping fees, GST or SST

Input Data Flows: SEND DETAILS

Output Data Flows: SEND COMPILED INFORMATION

Process Description:

```
START
      GET invoice_total
      GET cart_total
      GET book_quantity
      GST = 0.06
      IF book_quantity >= 20 THEN
            add_shipping_fee = 6.5
      ELSE IF book_quantity >= 10 THEN
            add_shipping_fee = 5
      ELSE IF book_quantity >= 5 THEN
            add_shipping_fee = 3.5
      ELSE
            add_shipping_fee = 0
      END IF
      charged_tax = cart_total * GST
      invoice_total += charged_tax
      invoice_total += shipping_fee
END
```

Name: 7.3 GENERATE INVOICE

Description: Generates an invoice based on the compiled information given

Input Data Flows: SEND COMPILED INFORMATION

Output Data Flows: SEND INVOICE DETAILS, SAVE INVOICE DETAILS

Process Description:

```
START
      GET order_id
      GET user_id
      GET invoice_total
      GET service_id

      payment_start_date = current datetime
      payment_end_date = payment_start_date + 30 days

      GENERATE invoice number and STORE into variable inv_no
      invoice_id = 'IN' + inv_no

      APPEND invoice_id, order_id, user_id, service_id, payment_start_date,
payment_end_date, invoice_total into ARRAY invoice_details

      OPEN file 'accounts receivable'
      WRITE invoice_details into 'accounts receivable'
      CLOSE file
END
```

*For Process *8 Payment (8.1 Check Payment DFD 1)*, refer to 6.5.2 Data Dictionary on page 80*

III. Data Flows

Name: INSERT ORDER DETAILS

Description: Admin inserts necessary order information required to generate an invoice

Source: ADMIN

Sink: 7.1 VERIFY DISCOUNT ELIGIBILITY

Data Structure:

Order Details = order_id + user_id + date + {book_id} + {book_quantity} + (service_id) + [subscription_plan] + cart_total

Data Element:

order_id	• Used to uniquely identify an order • char (8), not null, primary key • OR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'OR123456'
user_id	• Used to uniquely identify a user • char (8), not null, foreign key • UR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'UR123456'
date	• Displays the date of the order • date • dd/mm/yyyy • e.g. 27/09/2022
book_id	• Used to uniquely identify a book • char(8), null, foreign key • BK[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'BK123456'
book_quantity	• Used to show the amount of books in an order • int (255), null • e.g. 32
service_id	• Used to uniquely identify a type of service

	• char (8), null, foreign key • SE[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'SE123456'
subscription_plan	• Used to show if a member is a part of any current subscription • varchar(8), null • 'Standard' or 'Premium', or 'Gold'
cart_total	• Used to show the sum of all items within the order • decimal (20,2), null • xx.xx • e.g. 99.99

Name: MEMBERSHIP DETAILS

Description: Membership details are requested for a verification process

Source: D3 MEMBERSHIP LIST

Sink: 7.1 VERIFY DISCOUNT ELIGIBILITY

Data Structure:

Membership Details = membership_id + user_id + subscription_plan + expiry_date + [status]

Data Element:

membership_id	• Used to uniquely identify a membership • char(8), not null, primary key • MP[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'MP123456'
user_id	• Used to uniquely identify a user • char (8), not null, foreign key • UR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'UR123456'
subscription_plan	• Used to show if a member is a part of any current subscription • varchar(8), not null

	• 'Standard' or 'Premium', or 'Gold'
expiry_date	• Displays the date when the membership expires • date, not null • dd/mm/yyyy • e.g. 12/10/2022
Status	• Displays if a membership is active or inactive • varchar(8), not null • 'Active' or 'Inactive'

Name: SEND DETAILS

Description: Sends order information to check for extra charges

Source: 7.1 VERIFY DISCOUNT ELIGIBILITY

Sink: 7.2 APPLY ADDITIONAL CHARGES

Data Structure:

Order Details = order_id + user_id + date + {book_id} + {book_quantity} + (service_id) + [subscription_plan] + cart_total

Invoice Details = invoice_total

Data Element:

refer to Data Flow 'INSERT ORDER DETAILS' above for Order Details*

invoice_total	• The total shown in the invoice after applying necessary additional charges or discounts • decimal (20,2), not null • xx.xx • e.g. 99.99

Name: SEND COMPILED INFORMATION

Description: Sends a compilation of order details and invoice details

Source: 7.2 APPLY ADDITIONAL CHARGES

Sink: 7.3 GENERATES INVOICE

Data Structure:

invoice_details = order_id + user_id + service_id + invoice_total

Data Element:

order_id	• Used to uniquely identify an order • char (8), not null, primary key • OR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'OR123456'
user_id	• Used to uniquely identify a user • char (8), not null, foreign key • UR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'UR123456'
service_id	• Used to uniquely identify a type of service • char (8), null, foreign key • SE[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'SE123456'
invoice_total	• The total shown in the invoice after applying necessary additional charges or discounts • decimal (20,2), not null • xx.xx • e.g. 99.99

Name: SEND INVOICE DETAILS

Description: Sends a generated invoice to be paid for

Source: 7.3 GENERATE INVOICE

Sink: MEMBER, 8. PAYMENT

Data Structure:

invoice_details = invoice_id + order_id + user_id + service_id + payment_start_date
payment_end_date + invoice_total

Data Element:

invoice_id	• Used to uniquely identify an invoice • char(8), not null, primary key • IE[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'IE123456'
order_id	• Used to uniquely identify an order • char (8), not null, foreign key • OR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'OR123456'
user_id	• Used to uniquely identify a user • char (8), not null, foreign key • UR[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'UR123456'
service_id	• Used to uniquely identify a type of service • char (8), null, foreign key • SE[0-9] [0-9] [0-9] [0-9] [0-9] [0-9] • e.g. 'SE123456'
payment_start_date	• Used to display when an invoice can be earliest paid for • date, not null • dd/mm/yyyy • e.g. 22/09/2022

payment_end_date	• Used to display when an invoice payment is due by • date, not null • dd/mm/yyyy • e.g. 12/10/2022
invoice_total	• The total shown in the invoice after applying necessary additional charges or discounts • decimal (20,2), not null • xx.xx • e.g. 99.99

Name: SAVE INVOICE DETAILS

Description: Saves an invoice along with its information into a data store

Source: 7.3 GENERATE INVOICE

Sink: D4 ACCOUNTS RECEVABLE

Data Structure:

invoice_details = invoice_id + order_id + user_id + service_id + payment_start_date
payment_end_date + invoice_total

Data Element:

refer to Data Flow "SEND INVOICE DETAILS" above*

IV. Data Store

Name: D3 MEMBERHSHIP LIST

Description: Stores information on members who have paid for a membership

Source: -

Sink: 7.1 VERIFY DISCOUNT ELIGIBILITY

Data Structure:

Membership Details = membership_id + user_id + subscription_plan + expiry_date + status

Data Element:

****refer to Data Flow "Membership Details" above****

6.6 Gan Ming Liang (TP063338)

6.6.1 DFD Level 1: 8.0 – PAYMENT

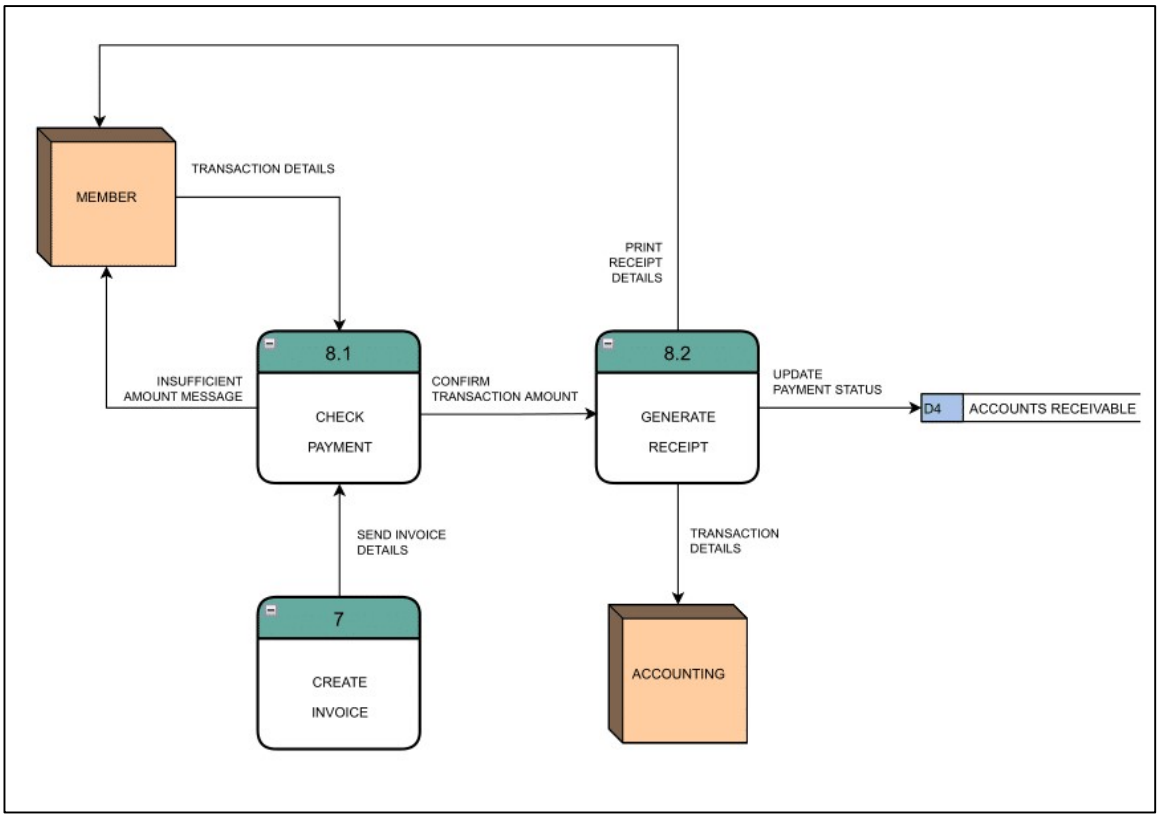


Figure 6.5 - *Data Flow Diagram Level 1, Payment*

6.6.2 Data Dictionary

I. External Entity

★ **Name:** MEMBER

Description: MEMBER makes payments in accordance with invoice given.

Input data flows: PRINT RECEIPT DETAILS, INSUFFICIENT AMOUNT MESSAGE

Output data flow: TRANSACTION DETAILS

★ **Name:** ACCOUNTING

Description: ACCOUNTING receives and record successful transactions.

Input data flows: TRANSACTION DETAILS

Output data flow: -

II. PROCESS

★ **Name:** 8.1 CHECK PAYMENT

Description: Compare transaction amount with invoice amount to verify payment validity.

Input data flows: TRANSACTION DETAILS, SEND INVOICE DETAILS

Output data flow: CONFIRM TRANSACTION AMOUNT, INSUFFICIENT AMOUNT MESSAGE

Process:

```
START
      OPEN file 'transaction details'
      GET transaction_total
      OPEN file 'invoice details'
      GET invoice_total
      CHECK (transaction_total) AND (invoice_total)
            IF transaction_total == invoice_total
                  THEN amount = 'paid'
                  PRINT "Processing"
            ELSEIF transaction_total > invoice_total
                  THEN amount = 'overpaid'
                  PRINT "Processing"
            ELSE
                  amount = 'underpaid'
                  PRINT "Insufficient Amount"
            ENDIF
      CLOSE file 'transaction details'
      CLOSE file 'invoice details'
END
```

★ **Name:** 8.2 GENERATE RECEIPT

Description: Print a receipt to customer if the transaction details is approved

Input data flows: CONFIRM TRANSACTION AMOUNT

Output data flow: PRINT RECEIPT DETAILS, UPDATE PAYMENT STATUS, TRANSACTION DETAILS

Process:

```
START
      OPEN 'D4 ACCOUNT RECEIVABLE'
      CHECK (amount) FROM [8.1 CHECK PAYMENT]
            IF amount == 'paid'
                  WRITE payment_status = 'completed'
                  PRINT "Receipt: thank you for your
                        payment!"
            ELSEIF amount == 'overpaid'
                  WRITE payment_status = 'completed'
                  PRINT "Receipt: thank you for your
                        payment and tips!"
            ELSE
                  WRITE amount = 'pending'
            ENDIF
      CLOSE 'D4 ACCOUNT RECEIVABLE'
END
```

III. Data Flow

★ **Name:** TRANSACTION DETAILS

Description: The payment details that have been made by MEMBER

Source: MEMBER

Sink: 8.1 CHECK PAYMENT

Data Structure: transaction details = transaction_id, transaction_date, transaction_total

Data Element:			
	transaction_id	***type:***	*varchar(18), primary key, not null, min=12*
	➤ *use to identify*	***length:***	*12-18 characters*
	transaction	***format:***	*XXXXXXXXXXXXXX*
		example:	*Maybank2U323289*
	transaction_date	***type:***	*datetime, not null*
	➤ *use to identify*	***length:***	*10 characters*
	transaction date	***format:***	*dd/mm/yyyy*
		example:	*29/09/2022*
	transaction_total	***type:***	*decimal(20,2)*
	➤ *use to identify*	***length:***	*variable*
	transaction total	***format:***	*XXX.XX*
		example:	*69.90*

★ **Name:** INSUFFICIENT AMOUNT MESSAGE

Description: To inform MEMBER that payment amount is insufficient

Source: 8.1 CHECK PAYMENT

Sink: MEMBER

Data Structure: message = ["Processing" | "Insufficient Amount"]

Data Element:			
	message	***type:***	*varchar(20)*
	➤ *use to tally*	***length:***	*variables*
	payment amount	***output :***	*processing	insufficient amount*
		example:	*processing*

★ **Name:** SEND INVOICE DETAILS

Description: Invoice details are retrieved to compare the payment amounts

Source: 7.0 CREATE INVOICE

Sink: 8.1 CHECK PAYMENT

Data Structure: invoice details = invoice_id, order_id, user_id, service_id, payment_start_date, payment_end_date, invoice_total

Data Element: *invoice details as declared in process 7.0 CREATE INVOICE (above section)

★ **Name:** CONFIRM TRANSACTION AMOUNT

Description: To forward valid transactions for receipt generation

Source: 8.1 CHECK PAYMENT

Sink: 8.2 GENERATE RECEIPT

Data Structure: transaction details = transaction_id, transaction_date, transaction_total

amount = [paid, underpaid, overpaid]

Data Element: * transaction details as declared in [8.1 CHECK PAYMENT],

* amount is as follows:

amount	***type:***	*varchar(9)*
➤ *use to declare*	***length:***	*variable*
payment	***output***	*paid* | *underpaid* |
confirmation		*overpaid*
	example:	*underpaid*

★ **Name:** PRINT RECEIPT DETAILS

Description: To print receipt and thank you message for successfully payment

Source: 8.2 GENERATE RECEIPT

Sink: MEMBER

Data Structure:

invoice details =	invoice_id, order_id, user_id, service_id, payment_start_date, payment_end_date, invoice_total
message =	receipt

Data Element: * invoice details are as declared in [8.1 CHECK PAYMENT]

receipt	***type:***	*varchar(30)*
➤ *acts as a proof*	***length:***	*variable*
of payment	***output:***	*"thank you for your payment!" | "thank you for your payment and tips!*
	example:	*thank you for your payment!*

★ **Name:** TRANSACTION DETAILS

Description: To save payment and transaction records to ACCOUNTING for accounting/financial purposes.

Source: 8.2 GENERATE RECEIPT

Sink: ACCOUNTING

Data Structure:

transaction details =	invoice_id, order_id, user_id, service_id, payment_start_date, payment_end_date, invoice_total

Data Element: * transaction details are as declared in [TRANSACTION DETAILS] data flow

★ **Name:** UPDATE PAYMENT STATUS

Description: To update the invoice with a status of either 'completed' or 'pending' for future use.

Source: 8.2 GENERATE RECEIPT

Sink: ACCOUNTING

Data Structure:

transaction details =	invoice_id, order_id, user_id, service_id, payment_start_date, payment_end_date, invoice_total
confirmation =	payment_status

Data Element: * transaction details are as declared previously

payment_status	***type:***	*varchar(9), not null*
➤ *used to track*	***length:***	*variable*
payment status	***output:***	*'completed' | 'pending'*
	example:	*completed*

IV. Data Store

★ **Name:** D4 ACCOUNT RECEIVABLE

Description: To store invoice details and other relevant financial documents as sales report

Source: 8.2 GENERATE RECEIPT

Sink: D4 ACCOUNT RECEIVABLE

Data Structure:

sales report =	payment_date, invoice_id, order_id, user_id, invoice_total, payment_status

Data Element:

payment_date	***type:***	*datetime, null*
➤ *user to record*	***length:***	*10 characters*
payment date	***output:***	*dd/mm/yyyy*
	example:	*31/08/2002*
invoice_id	***type:***	*varchar(8), not null, primary key*
➤ *user as reference*	***length:***	*8 characters*
to track payment	***output:***	*IE000000*

	example:	*IE932909*
order_id	***type:***	*varchar(8), not null, foreign key*
➤ *user to reference*	***length:***	*8 characters*
to track order	***output:***	*OR000000*
	example:	*OR909092*
user_id	***type:***	*varchar(8), not null, foreign key*
➤ *user to reference*	***length:***	*8 characters*
to track user	***output:***	*UR000000*
	example:	*UR903090*
invoice_total	***type:***	*decimal(20,2)*
➤ *user to reference*	***length:***	*variable*
to track user	***output:***	*xxx.xx*
	example:	*232.90*
payment_status	***type:***	*varchar(9), not null*
➤ *used to track*	***length:***	*variable*
payment status	***output:***	*'completed' | 'pending'*
	example:	*completed*

7.0 INTERFACE DESIGN

7.1 Introduction to the Prototype

A website prototype is created to gather opinions and gain agreement from the Bookworm Paradise owners as well as other project stakeholders including the end-users by allowing them to see what the final version of our system might look like. This is essential for ensuring that our project is proceeding in the right path in relative to the project's scope as it helps gauge the feasibility of our initial system concepts. Therefore, we have decided to use a prototyping tool named WIX to create a mock-up representation of the website's potential appearance.

Figure 7.0 - *Logo, WIX*

7.1.1 Justification on prototyping tool

WIX is a cloud-based, web development platform that allows users to create and design websites with drag-and-drop simplicity without the need for technical coding skills. It provides a unique way of developing a website with different tools making it easy to create an assortment of different kinds of websites. In addition, WIX offers more than 500 premium templates that are free to use and designed according to the most recent industry standards. These templates can assist our team to gain inspiration and more options from which to select that best suit the client's design needs when developing the website.

7.2 Concepts & Principles

7.2.1 Colour Palette

The colour palette that is used for the prototype consists of a brown-themed colour scheme that is created on Colorhunt. Warm colours such as Brown helps to elicit a feeling of happiness, optimism, and energy; Vibrant colours such as Yellow helps to grab user and maintain user attention; and cool colours like Dark Blue promotes relaxation and tranquillity.

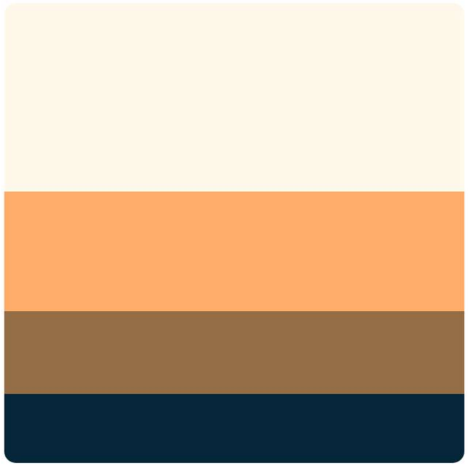


Figure 7.1 - *Scout's Custom Colour Palette, Colorhunt.co*

7.2.2 Targeted Audience

Our target audience are book enthusiast across all ages and demographics. As such, our front-end system is designed to be both visually appealing for young adults, and user friendly for elderly as well. The font-of-choice is Cormorant Garamond Light, which is classy, cool, and comfortable to viewers.

Figure 7.2 - *Font of our choice, FFonts*

7.2.3 Design Philosophy

Good designs are innovative, useful, aesthetic, and user-friendly. As such, each webpage of our system is consistent in terms of colours scheme and font design. We have also included innovative transition such as the “parallax” scroll effect to increase immersion and applied animated buttons to boost user interaction. Each services provided are straight-forward and simple, and the vast headers allows of further scalability of our system should new features be included in the future. As an example, a quick shop preview is attached below in Figure 7.3. For the full documentary of all our functions and features, please refer to our presentation.

Link to prototype: https://studydaltongan.wixsite.com/scout | Admin credentials: [water@bwp.my, ilovebutter]

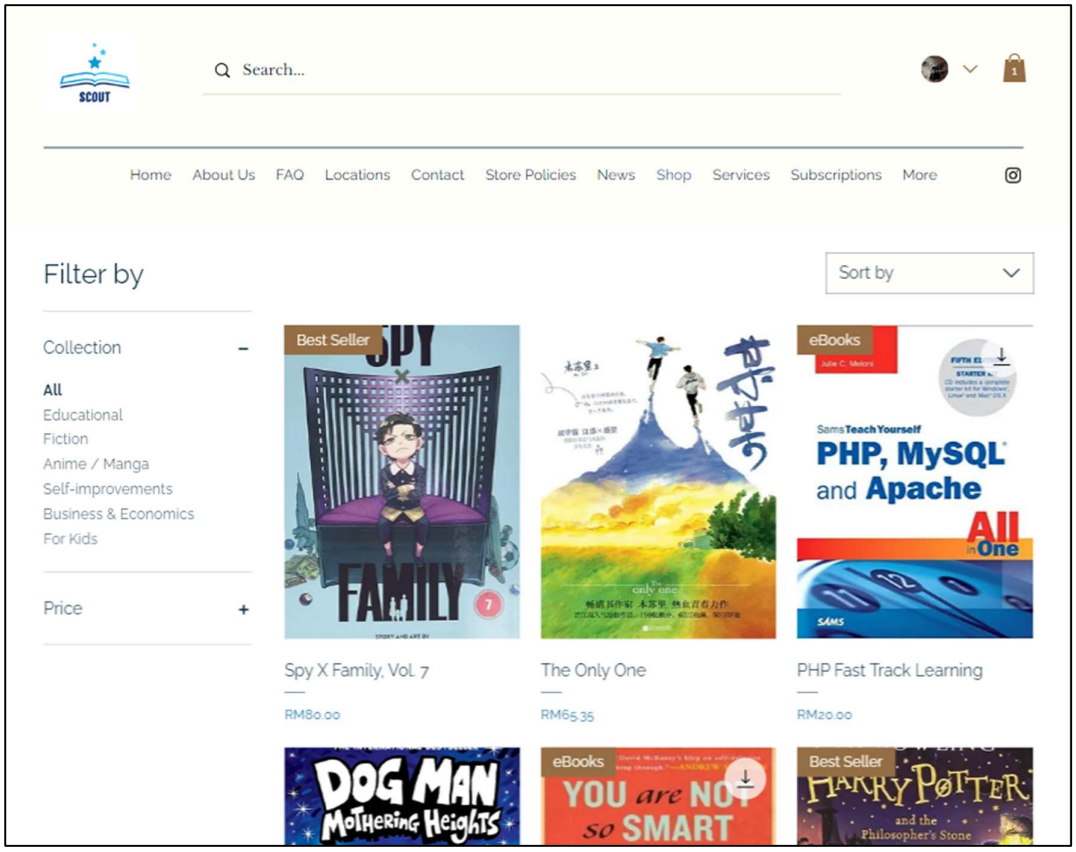


Figure 7.3 - *Bookstore Shop Page , Scout*

7.3 Input & Output Devices

One of the core components of any information system is user interaction. Scout’s interaction is facilitated using input and output peripherals connected to users’ personal computers, laptops, or mobile devices.

7.3.1 Website Preview on User Devices

I. Computers

Users can access the system through their laptop or PC regardless of Operating System and choice of browsers, as long as an internet connection is established. This will bring up the desktop GUI that features a headers and footers for site navigation.

Figure 7.4 - *Scout on Laptop , Photoshop*

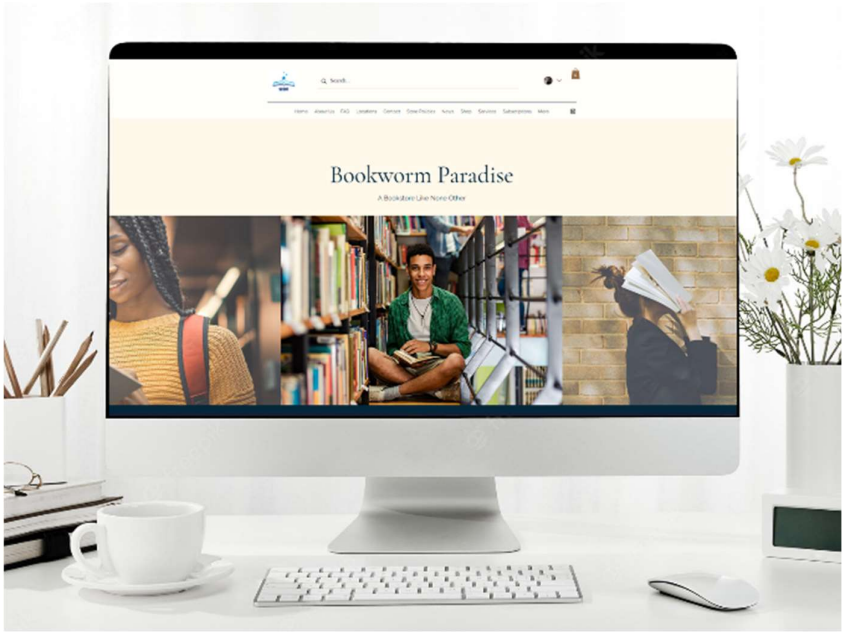


Figure 7.5 - *Scout on PC, Photoshop*

II. Mobile Devices

Users may also access the system using mobile devices such as smartphones and tablets. This will bring up the mobile GUI that features a side-tab entailing all services that are supported by the system.

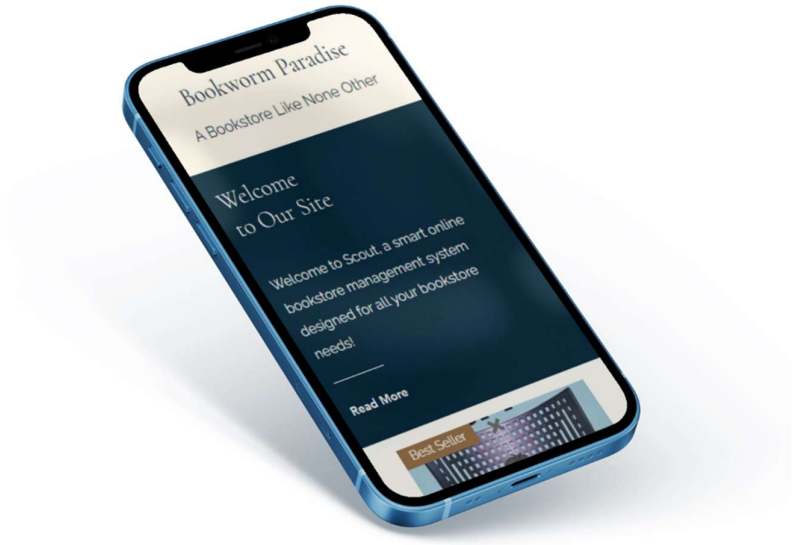


Figure 7.6 - *Scout on smartphone, Photoshop*

Figure 7.7 - *Scout on tablet, Photoshop*

7.3.2 Input Devices

Here is a list of input peripherals that will be required to interact with Scout.

Peripherals	Purpose
Keyboard	To insert information including letters, words, and numbers into the product search bar, contact forms, and coupon box.
Mouse	To navigate between the system on the GUI, this includes selecting product, viewing web pages, making payments, etc.
Touchscreen	To navigate the web system and interact with buttons as an alternative to keyboard and mouse for mobile devices.

7.3.3 Output Devices

Here is a list of output peripherals that will be required to receive outputs from Scout.

Peripherals	Purpose
Monitor / Screen	To display information and output of the system
Printer	To printer reports and documents related to business sales, performance, or relevant databases.

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