

Episteme

A Thesis Knowledge Management System for the Asia Pacific  
College Library

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## Executive Summary

“To read is to voyage through time.” – Carl Sagan

Carl Sagan was a famous and influential figure and an American astronomer that quoted the statement above. As he had mentioned, reading is an important aspect of a person's life. One of the places in which reading is inevitable is a library, which is a place for learning and acquiring old and new ideas. In today's era, the library has evolved alongside technology. One of the features that include technology is *information searching*. In the case of the Asia Pacific College Library, information searching is limited, especially for thesis papers. Other than this, the sorting of existing thesis papers and the encoding of new thesis papers are inefficient, according to the library administrators. With this in mind, the developers created a web application, called Episteme, that would allow the sorting and encoding of thesis papers to be more efficient. This concept is under knowledge management (KM), which is a process of managing, structuring, and the accessing of existing knowledge within an organization (Andreev, 2022).

The developers of Episteme possess both soft and technical skills such as front-end and back-end development, time management, problem-solving, and other necessary skills that are crucial to the development of Episteme. Considering this, the developers are optimistic in the improvement of the library's encoding and sorting system for thesis papers. With Episteme, this will be possible, allowing students and teachers to access and read thesis papers, opening opportunities for new and unique ideas.

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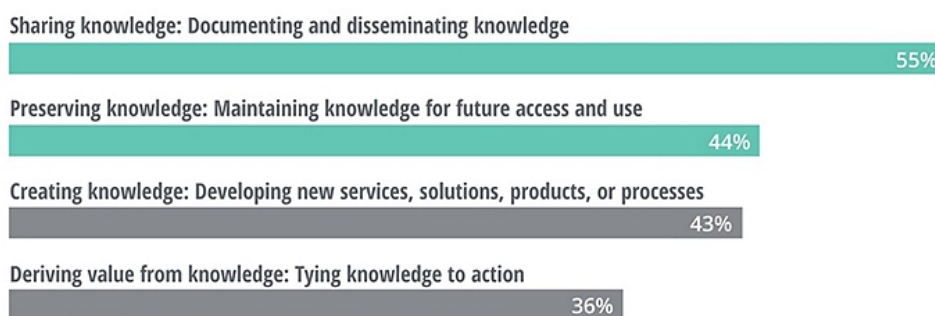
## Introduction

Knowledge management (KM) is defined as a process of managing, structuring, and accessing existing knowledge within an organization (Andreev, 2022). It was first coined in the early 1990s at a Boston conference as the notion of internet and its use for managing information at that time was expanding at a fast rate (Indeed Editorial Team, 2022). Today, many organizations and companies use knowledge management to support the sharing of information across an organization. In a survey conducted by Deloitte Global Human Capital Trends (2020), more than 50% view knowledge management to document, disseminate, and maintain knowledge for future use. Figure 1 below shows the results of the survey:

FIGURE 1

### More respondents view knowledge management as sharing or preserving knowledge than as creating or deriving value from knowledge

How does your organization define "knowledge management"? (Select all that apply.)



Source: Deloitte Global Human Capital Trends survey, 2020.

Deloitte Insights | [deloitte.com/insights](https://deloitte.com/insights)

**Figure 1:** Deloitte Global Human Capital Trends KM Survey (2020)

The sharing of knowledge can lead to greater success in productivity as it will be easier for students and educators inside an academic institution to collaborate and discuss new and existing information. This is supported by a Harvard study by Lane et al. (2019) wherein the sharing of knowledge leads to better knowledge creation if people share overlapping interests.

In an academic institution, knowledge is one of the main outputs. As many research papers with new information are being released annually, this information should be sorted (Botkin-Kowacki, 2022). Simultaneously, once this information is sorted with knowledge management, it should also be easily accessible to learners. As per Dhamdhere (2015), the use of knowledge management (KM) of an academic institution is “makes good sense” because it increases the efficiency and effectiveness of research and education by allowing learners and educators to access old and new information. Moreover, this enables educational institutions to strengthen their curriculum as they can review existing information with knowledge management. However, KM still has drawbacks and limitations when being used; in a study done by Friehs (2003), educators do not allow themselves to share knowledge among their peers as their knowledge is what makes them have a good reputation. Furthermore, a lack of trust between learners, educators, and even administrators in an educational institution could deem the use of knowledge management as ineffective.

## **Project Context**

Currently, the Asia Pacific College Library manually sorts and encodes the information from the theses papers of students by using a web application called *koha*. As per the library administrators, it consumes time from the uploading process of a thesis paper to encoding basic information such as the title of the thesis paper, author, and control number. This manual process is inefficient considering that many papers in Asia Pacific College are being created annually. Moreover, this can lead to data inaccuracy based on factors such as human error and time constraints. As the APC Library envisions a faster process of data entry and an efficient knowledge management system, the developers intend to contribute to the vision by creating a web application, called *Episteme*, that allow students to encode their theses information instead.



This web application is intended for students of APC who have been able to finish their thesis paper, and also the library administrators of APC who will verify the encoded information of the students. To be specific, it will ask for the thesis paper title, name of the author/s and the professor, submission date for copyright purposes, description, school category of the authors, GitHub link for source code if applicable, keywords, and soft copy of their thesis paper. In addition, the web application will be user-friendly, with features such as log-in and register, progress tracking, and designs that are easy to understand for users.

### **Statement of the Problem**

Knowledge management is the process of identifying, organizing, storing, and disseminating information within an organization. When knowledge is not easily accessible within an organization, it can be incredibly costly to a business as valuable time is spent seeking out relevant information versus completing outcome-focused tasks. A knowledge management system contains the collective knowledge of an organization, leading to better efficiency.

With this in mind, the Asia Pacific College Librarians have issues regarding getting new theses from educators and students and organizing them. They experience difficulties in being able to receive new theses and to sort it with other existing theses with ease and in a short amount of time.

### **Objectives**

The project aims to help the library manage theses submitted by educators and students and enable the procedures of creation, storage, sharing, and application of

knowledge via a knowledge management system. To be specific, the developers' objectives are as follows:

1. Improve the APC Library's efficiency of sorting current and past thesis papers of educators and students at Asia Pacific College by creating a web application that allows users to encode basic information and upload a soft copy of the thesis paper.
2. Contribute to avoiding data inaccuracy when encoding information.
3. Enable administrators, educators, and students at Asia Pacific College to access all theses that are verified by the library administrators with convenience.

### **Significance of the Project**

This study will be highly beneficial to the following:

1. Asia Pacific College Library. This project can help the library manage thesis papers submitted by educators and students more efficiently and effectively.
2. Asia Pacific College Educators. This project can help educators submit theses better to the library. This can also help educators have access to research relevant to lessons that they are teaching in class and can use them effectively.
3. Asia Pacific College Students. This project can help students maintain and manage their theses lifecycle. This can also help students to use theses published in the knowledge management system to use as related literature.

## **Scopes and Limitations**

### **Scopes**

1. Episteme will have an account (login/registration) system using Asia Pacific College to help manage access control for theses and ensure that only authorized users have access to the project.
2. Episteme will be able to store and manage both explicit and tacit knowledge.
3. Episteme will be able to manage the entire lifecycle of theses, from submission to publication.
4. Episteme will be able to manage metadata about theses, such as author name, title, abstract, keywords, etc.
5. Episteme will be able to manage access control and version control for theses.

### **Limitations**

1. The account system of Episteme will only be limited to the school's account. External accounts such as Google and personal Microsoft accounts will not be allowed to restrict unrecognized accounts for security purposes.
2. Episteme will not be available for offline use as the data will remotely be transferred to another device once accessed.
3. The validation process of whether the paper is ready to be published or not will not be under Episteme. The process will be solely done by the adviser of the thesis paper and the panelists.
4. Only the library administrators will have exclusive access to viewing, modifying, and updating the progress tracker for all submitted papers.
5. Only the library administrators and teachers will be able to verify all submitted thesis papers.

## **Review of Related Literature**

### **Importance of Login Form**

Chávez et al (2021) mentioned that a login system allows users to go to a website, simultaneously accessing your data. This data is significant in the improvement of the user experience as the information can help personalize a web application. Moreover, the authors stated that it is better to use email addresses for username rather than real names as it is unique. This instance helps users avoid social engineering, which is a technique for exploiting human psychology, accessing an individual or an organization's personal information (Fruhlinger, 2022). So, with a login system that asks for the user's information, it is key to ensure that it has good security measures as well. Chávez et al (2021) proposed a way to ensure security measures by locking the user's account after a few login attempts.

This study will be relevant to the developer's web application, Episteme, as the developer's product will use a login and register system as well. As the product is for an educational institution, a good security measure is crucial to keep confidential information of both educators and students.

### **Responsive Web Design and its Impact on User Experience**

Web Technology has been around since 1990 with it being called Web 1.0 or Read-only Web. As the name suggests, its only feature is to allow users to read content created by other people, not allowing users to interact with the website. Then, around 2000s, Web 2.0, or known as read-write Web, was created. Unlike Web 1.0, this version allows users to communicate with each other. Moreover, web technologies like Cascading Style Sheet (CSS) and JavaScript (JS) emerged and were widely used to enhance the user experience. Finally, as of 2010 onwards, Web 3.0, or read-write-execute Web, emerged. This version is similar to the previous version, but

this version can understand data. With this progression comes with the development of a more responsive design as well. According to Bhanarkar et al (2023), a responsive web design is able to change the layout and the size of the images based on the screen size of the user and use lower bandwidth images for users in a mobile device.

A good web design allows users to have a better user experience considering the number of different devices being used today. For the developers, it is also important to have a responsive web design for Episteme as not all users have the same type of device. This will make the process more efficient as the user will be able to easily understand the web application; it will be achieved by using minimal designs and also web technologies such as CSS frameworks and programming languages.

### **Web Application with Python and Security of the Information System**

The development of technology has rapidly influenced the sector of information technology switching from traditional real-time interaction to automated electronic methods of information passing. With innovative technologies, it contributes to organizations' desire: reduce the cost of time, material and labor resources and the simplification of information processing. This can be possible with the use of a programming language called Python, and a database management system called MySQL.

Python is capable and suitable for the development of databases as it supports CRUD (Create, Read, Update, Delete) functionalities for recording purposes. It is also an object-oriented language with cross-platform compatibility. On the other hand, MySQL is a relational database system software that implements a client-server model (Richard, 2023). Both Python and MySQL can be used to create an efficient application by linking the Python application through MySQLdb library. For instance, Halachev (2020) stated an example from the project of Siahaan et al. (2019)

wherein the developers have also used Python and MySQL to create an information management for an institution. As the developers have said, they could access information anywhere in the

educational institution. **Table 1** below shows how a developer can connect Python to MySQL

```
#!/usr/bin/python
import MySQLdb

db = MySQLdb.connect(host = "localhost",
                     # usually localhost
                     user = "user",
                     # username
                     passwd = "*****",
                     # password
                     db = "PHD_STUDENTS")
                     # name of the database

# Creation of a Cursor Object
# Allows the execution of SQL quires
cur = db.cursor()

# Execution of a SQL query
cur.execute("SELECT * FROM DOCTORANTS")

# Printing the first column of the result
for row in cur.fetchall():
    print row[0]

# Closing the connection
db.close()
```

**Table 1:** Executing SQL Query to database (Halachev, 2020)

The notion of Python and MySQL, and the mentioned study can be linked to the developers' project as the web application's foundation will be the same. Episteme can be accessed anywhere within the institution, allowing users the flexibility of encoding, and verifying. With this in mind, it can optimize the encoding process, and reduce costs such as time and resources.

### Efficient Way of Web Development Using Python and Flask

Vyshnavi & Malik (2019) mentioned that with the use of Python Flask, which is a web framework, web development will become more efficient. This framework enables developers to

create a web application with the use of tools, libraries, and technologies. In the case of Episteme, Flask will be a crucial tool for the developers as this will open better opportunities in the web development side. Moreover, the framework uses Jinja2 templating, which is a templating language that would make it easier for developers to write codes with the presets made.

With Python and Flask, it will be possible for the developers of the project to have robustness as the mentioned framework allows the program to cope with errors during execution. In addition, both are open source, which makes it easier to modify the original design. This adds the ability to collaborate with different developers, improving productivity level of an individual or organization.

### **Knowledge Management and Organizational Learning**

Knowledge management is the planning, organizing, sharing, and controlling of people, processes, and systems in the organization (Okhawere, 2023). Moreover, it is basically seeing knowledge as a resource for every member in an organization. With knowledge dating back to the existence of man, it created many definitions in different fields. In the Information Technology industry, it is information that the receiver can upon it once understood. In a broader perspective, knowledge can also be a means to information. In an academic setting, knowledge is vital both for students and educators. As information is being passed to different people, having a knowledge management system (KMS) is helpful in making knowledge profitable. In the case of the developers' project, Episteme, this can contribute to the existing knowledge management system of the APC Library. In turn, Episteme makes the system of the APC Library more efficient as it saves both time and energy for the administrators. Since this process is under KMS that uses manual processes, this system might be slower than systems that are automated. Nevertheless, this manual process is important as there is a need for human evaluation or assessment with regards to the incoming information. Associating this to Episteme, it is crucial for a manual

evaluation to occur to avoid inaccuracies; there is no guarantee that an automated filler can do the work of a human evaluator.

### **Libraries in the Digital Age: Importance of ICT in Enhancing Value-Added Library Services**

Libraries in human society have been an essential component for storing and accessing information (Hoque, 2023). It dates to 600 BCE, with an Assyrian ruler creating the first-ever library to store 30,000 cuneiform tablets by topic (Presssreader Team, 2021). However, as technology is rapidly changing and progressing, library systems have also adapted to it under Information and Communication Technology (ICT). Before, libraries were only the collection of physical books or papers in a physical site, but nowadays, it is a repository for both physical and digital books, articles, and papers. The use of technology allowed the ease of access to information at any time. Moreover, the indexing of information became easier with features like sorting, and word search. Despite the huge potential of digitalizing libraries, Hoque (2023) mentioned that it also has setbacks and challenges. The rapid development of technology is also an indicator of the swift changes of the users' needs. Factors that may disrupt this development include lack of funding, low number of administrators, and an unadaptable environment.

The use of ICT in libraries is expressed in many ways. These include Library Management Systems (LMS), which is the management of library collections, acquisitions, and circulation; Digital Libraries, which is a web-based system to access digital resources; Institutional repositories, which is a platform for storing and accessing works created by a member of the institution. This comes with numerous benefits such as the easy access to information resources, improved library management, collaborative, cost savings, remote access, and increased visibility of the works that are available (Hoque, 2023).



The digitalization of libraries helps academic institutions in making the access of information easier. For the APC Library, the digitalization of storing theses will make it easier for students, educators, and administrators to store and access these. With Episteme, this change is imminent by contributing to the digitalization of resources starting with thesis papers.

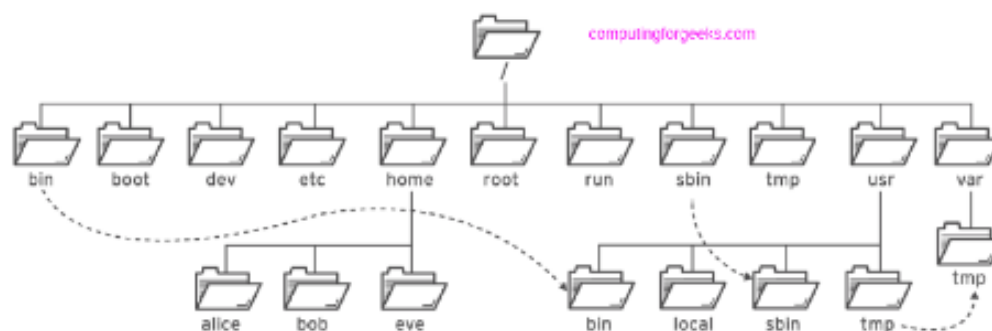
### **Digital Services in Academic Libraries: An Innovative Approach**

The use of the internet emerged in the 1950s, but in a minimal way only. Only around the 1990s did it become fully utilized by many people. This changed numerous services from finance, database management, and communication. One of the services that was affected by this change is the library. This change was strengthened during the COVID-19 pandemic as most people did not have the chance to go outside and visit library centers; the process of searching and collecting information became harder. So, libraries had to adapt to the changing environment. Furthermore, technology is changing the role of academic libraries. Librarians must adapt to the changing environment by learning new skills that can be utilized in a digitalized library. This can include the use of Web 3.0 applications to allow internet users to access the digital library, digital interfaces that are similar to what a user can experience in a physical book, and the mobilization of it as well since many people are hooked to their smartphones every day.

This digitalization will have a huge impact for users as it will be more efficient for them to search through the library. As per Lal et al. (2023), the use of OPAC or Online Public Access Directory, which is a database of a library, will save time when looking for specific information. This digital service can be linked to Episteme as one of the features included on the project is the search index. Users will be able to sort and categorize thesis papers with different options like date published, and alphabetical order (A-Z, Z-A).

## Use of DBMS for Greater Efficiency in Library Management System

A file-based system is a structure of organizing and accessing data using root folders. This is suitable for small data storage only but for big data storage such as a library management system, this will be inefficient, costing users their time in searching for specific data. Figure 2 below shows a flow chart of a file-based system:



**Figure 2:** A Linux File System Hierarchy (Gomez et al., 2022)

Other than being inefficient, multiple types of files that are stored can become compatible with each other as a system grows. According to Gomez et al. (2022), it could bring confusion for admins and employees when making changes to the system. However, with database management system (DBMS), it could solve the mentioned problems. DBMS is software for organizing, retrieving, editing, and processing data. This will be used by the developers of Episteme as the project will handle a large amount of data from different theses. DBMS is not only storing data, but it also allows users to create metadata for the existing data; this will be easier for users to comprehend the database structure better like the figure below shows:

employee_id	first_name	last_name	min	department_id
44	Simon	Martinez	HH 45 09 73 D	1
45	Thomas	Goldstein	SA 75 35 42 B	2
46	Eugene	Comelien	NE 22 63 82	2
47	Andrew	Petulescu	XY 29 87 61 A	1
48	Ruth	Stadick	MA 12 09 36 A	15
49	Barry	Scardels	AT 20 73 18	2
50	Sidney	Hunter	HW 12 94 21 C	6
51	Jeffrey	Evans	LX 13 26 39 B	6
52	Doris	Bemdt	YA 49 08 11 A	3
53	Diane	Eaton	BE 08 74 68 A	1
54	Bonnie	Hall	WW 53 77 68 A	15
55	Taylor	Li	ZE 55 22 80 B	1

Data

Column	Data Type	Description
employee_id	int	Primary key of a table
first_name	nvarchar(50)	Employee first name
last_name	nvarchar(50)	Employee last name
min	nvarchar(15)	National Identification Number
position	nvarchar(50)	Current position title, e.g., Secretary
department_id	int	Employee department. Ref: Department
gender	char(1)	M = Male, F = Female, Null = unknown
employment_start_date	date	Start date of employment in organization
employment_end_date	date	Employment end date. Null if employee is

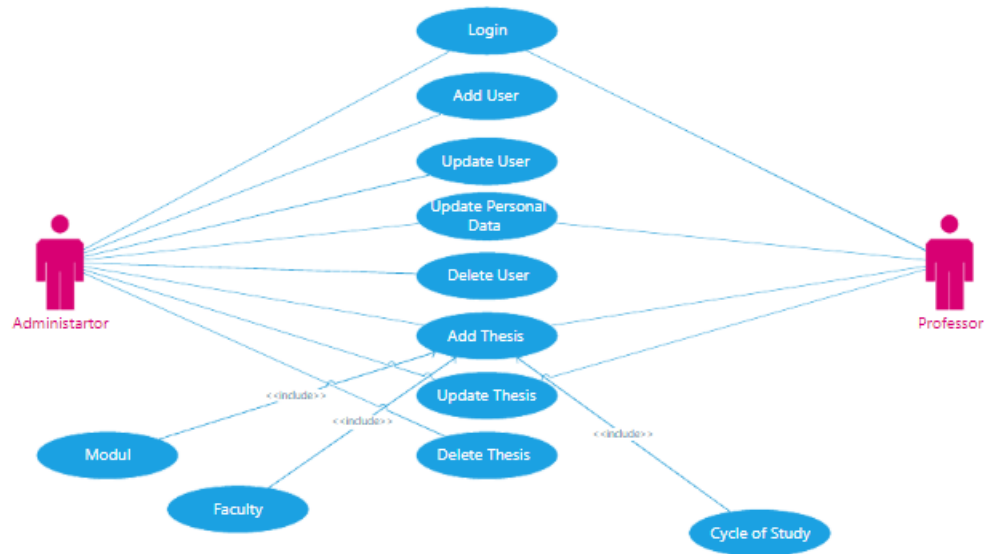
Metadata

**Figure 3:** Data and metadata in a DBMS (Gomez et al, 2022)

With this table, it would be easier to identify the relationship between each data. On the other hand, security measures can also be implemented by adding user privileges. This will ensure that no data will be leaked by an unauthorized user. In the case of Episteme, there will be different privileges for the developers and the administrators, while students will not be able to access the database. Moreover, DBMS allows the avoidance of data redundancy, with its primary and foreign key concept that would ensure that each specified row of information is unique.

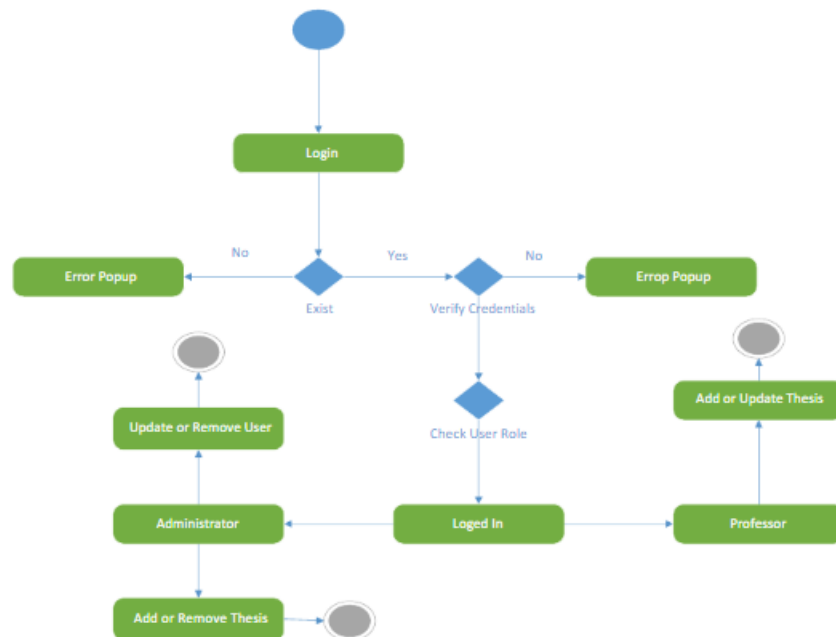
### **E-Thesis Repository System**

The rise of technology in today's generation has played a significant role by replacing manual services with digital services such as a repository system for thesis papers. Bajrami et al. (2021) created a thesis repository system that allows students to get study materials and access published theses with a web application. The developers' application has two types of user interfaces: Administrator side and Professor side wherein the administrator will be able to fully access the web application. For the professor's side, the only privilege the professor can obtain is the updating and changing of personal data. The figure below shows a use-case diagram from the developers, explaining both user interfaces:



**Figure 4:** Use case diagram

On the other hand, the developers of the project have also shown the process of using their web application, from login to the adding and updating of thesis for the professor's side, to the adding or removing of thesis papers for the administrator's side. Figure 5 below shows the mentioned process:



**Figure 5:** Web application process

This research is highly relevant to Episteme as the idea of having a repository system for thesis papers in an education institution is basically the concept for Episteme. With the mentioned figures above, it will be like Episteme as there will be two user-interfaces as well: the Library Administrator's side, and the student's side. For the student's side, they will be able to encode their thesis papers and upload a soft copy. For the administrator's side, they will be able to view the submitted papers and are subject to verification.

### **Python for Web Development**

As web pages evolve over time, some languages are becoming popular as well; this includes Python (Singh et al, 2022). Due to its flexibility and simple syntax, many developers are now turning to Python for their web creation. Below are some of the benefits if developers use Python as the main programming language for their project:

#### ***Open source***

Python is operating under an open-source license. This gives the ability to use it freely even for commercial use. Furthermore, Python has an active community that contributes to the language's development such as fixing bugs, and updates.

#### ***Easy to Learn***

With its simple syntax and statements, beginners will easily understand and learn Python. Then, as the Python community is active, it would be easy for everyone to understand the language through collaboration and communication from the community.

#### ***Web Development***

Python is not limited to being a back-end programming language only. This can also be integrated into web development with the support of web frameworks such as Flask, Django, and Pyramid. In addition, it also supports web protocols such as HTML, and XML.

### ***Image and Text Processing***

Python offers the feature of image processing libraries like OpenCV, and Python Imaging Library (PIL). This makes it easier for developers to simplify the tasks of image processing under machine learning and deep learning. On the other hand, Python can also handle text processing, which is the handling of large texts through formatting.

### ***Web Server Application Development***

Other than handling the front-end side of a web application, Python can also connect both the client and server side of a web application. This includes the connection of the database to the web application, thus, allowing the feature of CRUD (Create, read, update, and delete) to occur.

Looking at the features and benefits of Python, Python is the key programming language that would allow the developers of Episteme to push through the development process. Moreover, the programming language, being an open source, makes it easier for the developers to analyze and debug Episteme. Lastly, as Python has a wide range of libraries, it would be easier for the developers to create a web application with the use of the framework *flask*. Thus, Python will be used on the said project.

## **E-library Management System**

Kavitha & Valarmathy (2022) discussed the concept of an online library management system, which is a system that manages the information from books that can be seen in a specific library. The authors introduced the problem of losing files and information from factors such as the environment, human error, and even natural disasters. Moreover, having a physical storage requires more space, which is costly for the management of the library. To fix the existing problem of the existing system, the authors proposed an online library with features such as registration of accounts for students, the ability to access information, and e-books. On the other hand, the authors used software tools such as HTML, PHP, CSS, and JavaScript.

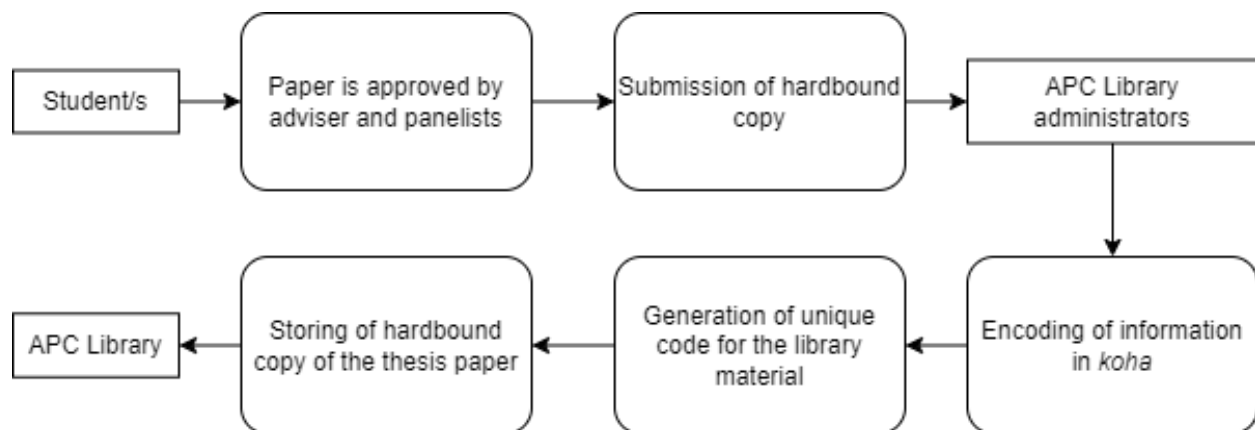
The concept given by Kavitha & Valarmathy (2022) can be used for the development of Episteme as the project will also fall under the notion of online library management system. Moreover, the mentioned problem on their study can also occur the library system of Asia Pacific College as well with factors such as the degradation of thesis papers, and human error. In terms of the development of the idea, the authors will also use a web application, which is like the concept of Episteme.

## Technical Background

This section aims to discuss the current system of the APC Library in terms of the encoding process of thesis papers with tables to fully discuss the existing system. Simultaneously, this will tackle the developers' proposed system on how the process could be more efficient and less time consuming. By seeing the overview of both the current and proposed system, this will show how the proposed system can be utilized and lay the foundation for future development of the thesis encoding process.

### Current System

The current system for the encoding process of thesis papers is only done by the library administrators once students have handed it over to them. Figure 4 below shows a diagram representation of the current system:

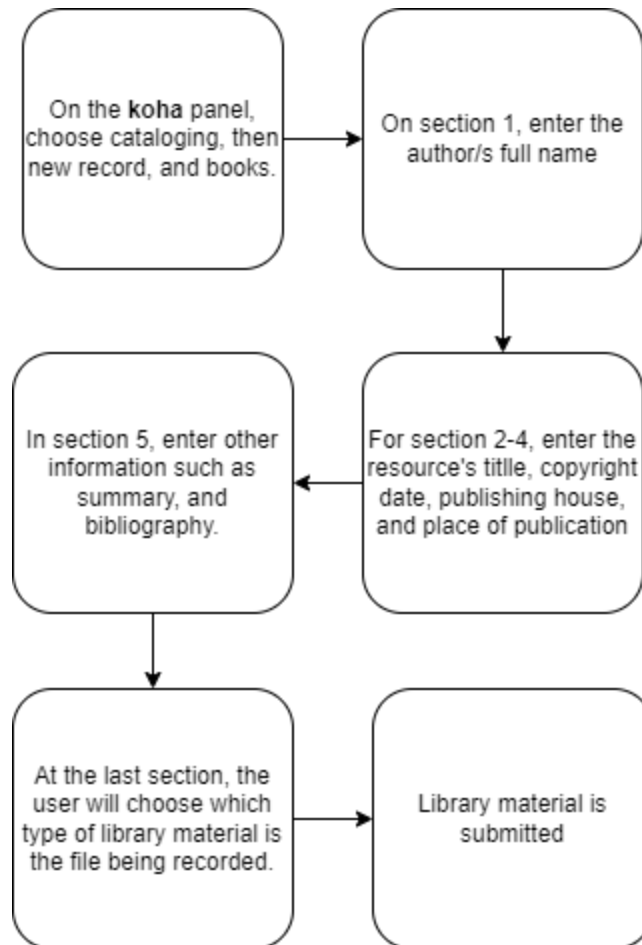


**Figure 6:** Current thesis encoding process

The first part of the process is the students having their thesis paper approved by the appropriate signatories of the paper. Usually, this is approved by the adviser and the panelists of the study. Then, the usual next step for students is to have their thesis paper physically be printed in a hardbound format. With this, they are now able to give it to the APC Library that is subject for verification. The administrators will encode the necessary information in a web application called



*koha*, alongside with the generation of a unique code for the specific thesis paper. Then, the last step is to keep the hardbound copy on the library shelves. At the third rectangle, there are sub-phases that are under the web application *koha*. The figure below shows the sub-phases of the third step:



**Figure 7:** Sub-phases of the third step

The entire process of the current system may look like an efficient process but according to the library administrator themselves, it is inefficient. Moreover, when searching for a specific thesis paper physically, it would be a slow process as it is time-consuming, and the user will only have a limited visibility when searching for resources.

## **Drawbacks in the Current System**

In this portion of the current system, the performance issues and vulnerabilities of the current encoding process will be discussed. Below shows the problems the library administrators are currently facing:

### **Time-consuming**

The librarians are the only ones who manually encode and sort each thesis one by one which majority, if not all, are hardbound copies. It takes a significant amount of time to manage many copies of theses in an entire day. Moreover, the library administrators must carefully manage and review the information needed, requiring more time as well.

### **Human Error**

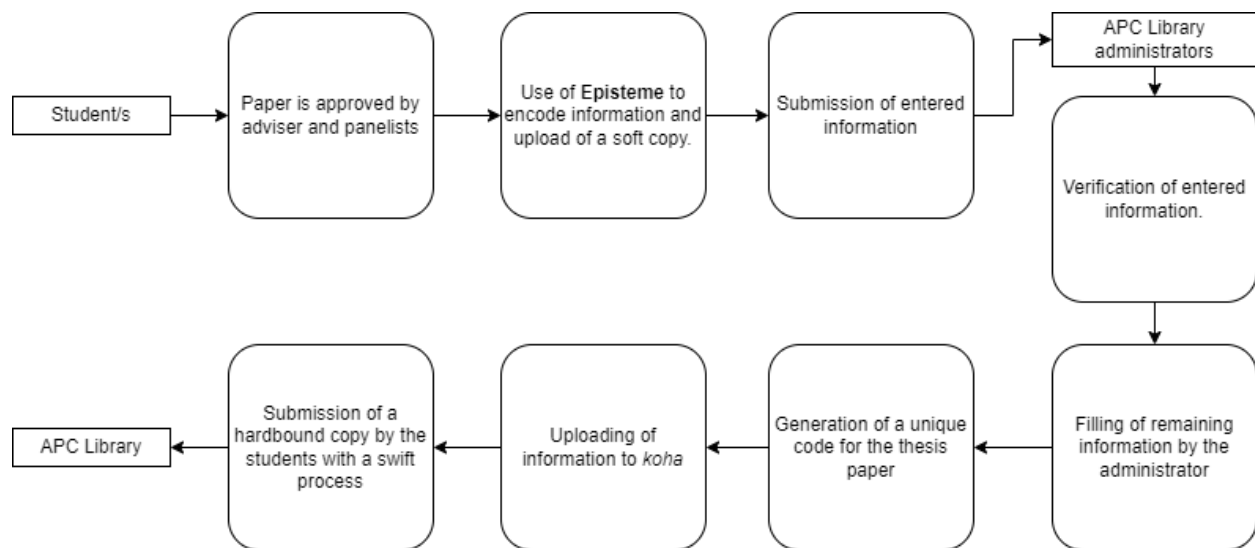
Since the library administrators would usually encode information to their system, errors may occur as the information they place are based on the physical copy that the researchers have given to them. So, errors such as misspelled names and title may occur that could have an impact in storing theses. For instance, a thesis paper with a misspelled term may cause problems when users search for a specific keyword.

### **Backup Issues**

A physical copy of the thesis paper must be submitted to the APC Library for it to be encoded and stored within their database. However, if this physical copy gets broken or damaged, it can lead to several problems. These problems include the loss of information, and inaccessibility to content.

## Proposed System

With the developers' proposed system, both students and the administrators will now do the encoding process of thesis papers. Initially, the library administrators will encode all details based on the given thesis paper, but with the proposed system, students will now become part of the encoding process by adding necessary information on the first portion of the process. Furthermore, users will now be able to browse thesis papers through keyword searching, categorization, and sorting. Figure 8 below shows a diagram representation of the proposed system:



**Figure 8:** Proposed encoding process system

Like on the current system, the first step on the proposed system is having the thesis paper of the students be approved by the adviser and the panelists with their signatures on the thesis paper. This signifies that the paper is ready for encoding at the APC Library. Then, the next step is for students to use the web application *Episteme* to start encoding their thesis paper. They must double check if the information they have entered are correct. Once done, they can submit the information and the library administrator will receive the entry; a verification process will be initiated, and the administrator will also fill out necessary information in *koha*. Once done, the administrator will have to generate a unique code for the library material and will be available for

storing. The last step is for students submitting a hardbound copy. This will be the last option since with the encoding process finished, the process of submitting a hardbound copy will be faster.

## Technology Selection

For Episteme to be developed, numerous technologies will be used by the developers. For the programming language, the developers will use Python as it is a versatile language that is capable for the development of numerous functionalities such as web logic, web design, and databases. Considering this, the developers would use flask that would allow the creation of a web application with the use of Python. Then, the developers would also use HyperText Markup Language (HTML) and Cascading Style Sheets (CSS) to build the framework of the web application and design it as well with the use of the CSS framework *Bulma*.

Episteme will also have a login and register system, requiring the developers to have data storage. Hence, MySQL will be used for this requirement. According to Dyer (2022), MySQL is used by many web developers as it is easy to use, offers many features such as the support of different data types, and stable. Figure 7 below shows the register page of Episteme that would use MySQL to store data from users.

**Figure 9:** Register page of Episteme

## **Data Retention**

Data Retention is the preservation of data in a specific period of time wherein users can store, use, and delete data (Smith, 2021). This concept will be used on Episteme; the proposed project will be keeping the data of the users and their submissions indefinitely as the sole purpose of the project is for public interest and historical research purposes. Though data will not be deleted, they will be archived if they have not been accessed for the specific amount of time the institution wants to set for their own data privacy policies. Archiving data means that it is no longer actively used by the organization but still needed for long-term retention. The organization using Episteme might need data shifted to archives for future reference or for compliance.

## **Peopleware**

The development of Episteme requires developers to acquire technical and soft skills for the project. Below shows each soft skill the developers must have to push through the development process of Episteme:

### ***Communication***

As a team, communicating is vital in the development process as this will set clear expectations from each member of the team. Other than clear expectations, each member will also be guided of the project goals and objectives. On the other hand, communicating with the client of the project is key to know their needs that would potentially help the developers in the development process.

### ***Problem-solving***

As developers, encountering issues when it comes to the development process is inevitable. With this skill, programmers will be able to identify simple to complex problems in the coding process. This skill is supported with the utilization of creativity and logical thought processes (Arc Team, 2022).

***Time management***

Time management is not just about project deadlines and time-blocking, it is also about project planning. As a team, it is crucial for the developers to plan their execution of the development process to meet the needs of the client on the specified date and time. With this in mind, this will make the completion of the tasks more efficient and will boost the team's collaboration and communication skills as well.

***Patience***

Testing and debugging the web application is crucial to know if there are any errors when running the program. This requires the developers to be patient as it is time-consuming. Moreover, when solving problems, patience is needed to analyze the issues deeply, which makes the program have more quality and accurate as well. The key takeaway for having patience is that it is not always the case that the developers will instantly meet their expectations for the project; the control of the developers' emotional responses is critical for the success of the team and the project (Herrity, 2023).

On the other hand, the development of Episteme requires the developers to acquire a range of technical skills. Below shows the important skills the developers of Episteme need to possess:

***Web development (Front-end)***

Episteme is a web-based application, requiring developers to have knowledge when it comes to creating web applications. This includes HTML, CSS, and JavaScript which are the building blocks of web applications. Moreover, having a responsive design and a cross-browser compatibility for Episteme will make the application navigable and understandable.

***Database management***

Episteme will use database management system (DBMS), which is a system for “quick search and retrieval of information from a database” (The Editors of Encyclopaedia Britannica, 2023). To be specific, all information such as thesis paper information, and user information will be kept inside MySQL. Then, this can be retrieved with the use of SQL statement called SELECT.

***Web functionality (Back-end)***

Back-end development is the development of server-side logic, which is basically the functionality of the web application (Shiotsu, 2021). For Episteme, the back-end language to be used is Python. With simple syntax and short code length (Shiotsu, 2021), the developers of Episteme will be able to make the code of the program cleaner and efficient.

## Conclusion

Knowledge management is a process for existing information in an organization to be managed, structured, and accessed by members of the organization. Currently, the Asia Pacific College Library sorts and encodes the thesis paper in a manual process. While it is available to all library users, indexing and encoding all thesis papers manually are inefficient. Thus, the developers created a web application called Episteme that allow members of the institution to upload their thesis papers and get verified by the library administrators in a swift process. Episteme will allow the improvement of the sorting and encoding process of thesis papers, avoid data inaccuracy, and allow all users to access available thesis papers with convenience. With the aim of improving the current system of the Asia Pacific College's library system, the project requires the developers to possess soft and technical skills such as communication, problem-solving, web development, and other skills necessary to the development process.



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## **Appendices**

### **Appendix A: Project Vision**

Episteme is a web application that allow students and teachers to upload their thesis paper and get verified under the vision of the APC Library administrators. Moreover, it would serve as a digital repository for all thesis papers verified and published by the authors of the paper. Episteme envisions itself as one of the key knowledge management systems used in the day-to-day operations of the Asia Pacific College Library and its stakeholders. This makes the encoding process faster and more accurate, increasing the efficiency level of the APC Library in general. Moreover, Episteme sees itself as a contributor for students and teachers who would want to seek for published thesis papers inside the institution. With the web application, users will be able to access the papers whether if it is on the library itself or remotely.

On the other hand, the developers envision Episteme as an easy and navigable web application with security features such as the login and register system. This feature will allow the developers to monitor the traffic from the website and check whether if the accounts being used are authorized or not.

## Appendix B: Schedule

The tables below show the schedule of the developers in the creation and the development of both the documentation and the web application from May 11 to June 07, 2023:

	May 11	May 12	May 13	May 14	May 15	May 16	May 17	May 18	May 19	May 20	May 21	May 22	May 23	May 24
Introduction														
Review of Related Literature														
Technical Background														
Web Dev.														

**Table 2: May 11-24 Schedule**

	May 25	May 26	May 27	May 28	May 29	May 30	June 31	June 01	June 02	June 03	June 04	June 05	June 06	June 07
Introduction														
Review of Related Literature														
Technical Background														
Web Dev.														

**Table 2.1: May 25 – June 07 Schedule**

## Appendix C: Product Roadmap

In this appendix, the tables below show the development progress of the web application, Episteme, from May 11 to June 07, 2023:

[illegible]

**Table 3: May 11-24 Schedule**

[illegible]

Selection Page														
Viewing Page														
Submission Page														
Admin's Panel														
Database														

**Table 3.1: May 25 – June 07 Schedule**

## **Appendix D: Users' Manual**

Welcome to the User's Manual for Episteme! This manual provides a comprehensive guide to help you navigate and make the most out of our knowledge management system tailored specifically for learners and faculty at Asia Pacific College.

### **Purpose of the System**

Episteme is designed to serve as a centralized platform for storing, viewing, organizing, and accessing theses of students and teachers within Asia Pacific College. The system aims to streamline the process of thesis management and facilitate efficient knowledge sharing within the APC community.

1. **Streamlined Thesis Management:** Episteme simplifies the process of managing theses by providing a user-friendly interface for uploading, organizing, and tracking thesis submissions. It eliminates the need for manual paperwork and streamlines the administrative tasks involved.
2. **Efficient Knowledge Sharing:** Episteme promotes efficient knowledge sharing within the APC community by creating a knowledge library that houses a collection of theses. This repository allows users to easily access and explore a wide range of research topics, fostering a culture of continuous learning and intellectual growth.

### **System Features**

Episteme offers a range of features and capabilities to support your thesis management and knowledge sharing needs. Some key features include:



1. **User Registration:** The system allows users to create accounts, providing secure access to their personal workspace and ensuring privacy and data protection.
2. **Thesis Submission Form:** Episteme provides a dedicated thesis submission form where students can upload their thesis documents, input relevant metadata, and track the progress of their submission.
3. **Knowledge Library:** The knowledge library serves as a comprehensive repository of theses. Users can search, browse, and access theses based on different criteria such as author, topic, and date of submission.

## **Getting Started**

This section will guide you through the initial steps to get started with Episteme.

1. **Register for an Account:** Click on register and provide the necessary information to create your account. Upon successful registration, you will be able to log in.
2. **Log In:** Once your account is created, log in using your registered email address and password to access Episteme's features and functionalities.
3. **Explore the Selection Page:** From the landing/home page, proceed to the selection page where you will find two cards representing different options: submitting a thesis and viewing theses. Choose the appropriate action based on your current needs.

The creators of Episteme hope this user's manual empowers you to leverage Episteme effectively, making the most out of its features and functionalities. Enjoy the seamless thesis management experience and the wealth of knowledge Episteme brings to your fingertips!

*End of Episteme User's Manual*

## Appendix E: Team Meeting

Team meetings are crucial for the developers to make sure that each member is aligned with the goals and objectives of the project.

Tables 3 and 3.1 below show the schedule of all meetings done by the development team from May 11 to June 07, 2023:

	May 11	May 12	May 13	May 14	May 15	May 16	May 17	May 18	May 19	May 20	May 21	May 22	May 23	May 24
Onsite Meeting														
HyFlex Meeting														
Online Meeting														








**Table 4:** May 11-24 Schedule

	May 25	May 26	May 27	May 28	May 29	May 30	June 31	June 01	June 02	June 03	June 04	June 05	June 06	June 07
Onsite Meeting														
HyFlex Meeting														
Online Meeting														

**Table 4.1:** May 25 – June 07 Schedule



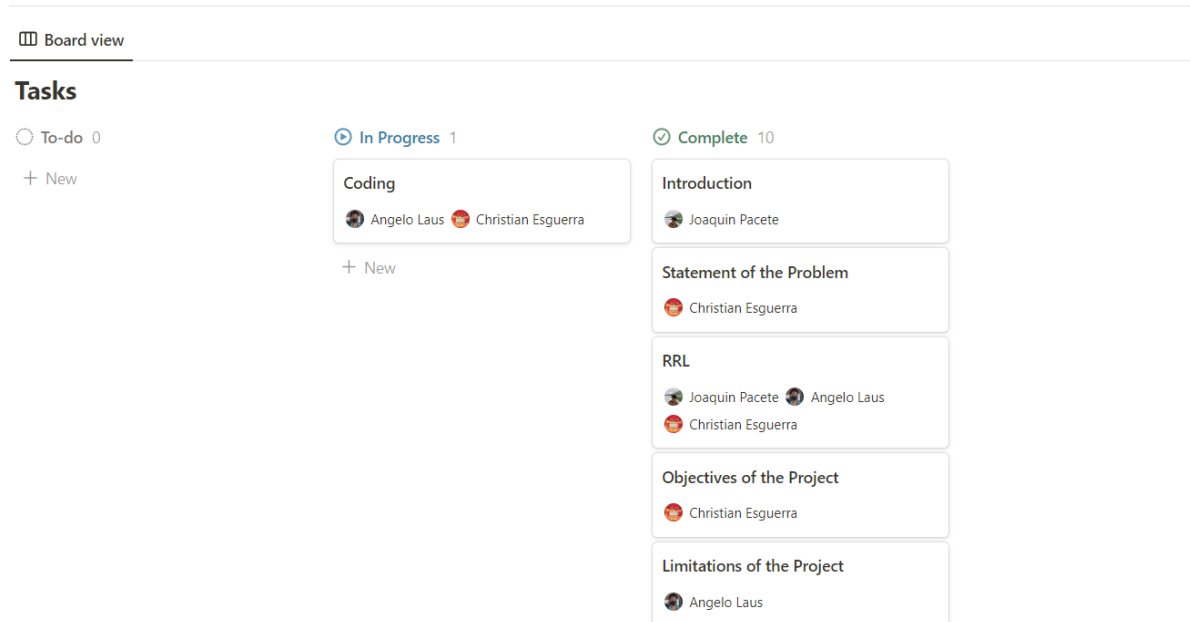
**Figure 10:** Synchronous Meeting/Coding Session

-  [Documentation | MAY 11](#)
-  [Documentation | MAY 12](#)
-  [Documentation | MAY 15](#)
-  [Documentation | MAY 16](#)
-  [Documentation | MAY 17](#)
-  [Documentation | MAY 18](#)
-  [Documentation | MAY 23](#)

**Figure 10.1:** Online meetings/Asynchronous

On figure 10 above, the developers: Esguerra, Laus, and Pacete, are doing their workloads while simultaneously being open to discussions for the project development. As most of the team meetings are onsite and hybrid, this image shows the proof that the developers are meeting with each other. On the other hand, Figure 10.1 above shows some of the documentation process of Episteme. Each documentation will fall all types of meetings as the documentation is being done along with the web application.

## Knowledge Management: The Use of Thesis Encoding Application to Sort Information



**Figure 10.2:** Use of Kanban

To make sure that all tasks are being done and watched, the developers used a Kanban Board, which is a project management tool in visualizing workloads (Radigan, n.d.). This tool contributes to the efficiency of the development process and also see the disseminated tasks for each member of the team.

## Appendix F: Source Code

The figures below show the lines of codes of some of the features of the web application, Episteme. To view the full code, the GitHub link is also provided below:

**GitHub Link:** <https://github.com/bigbrews/knowledge-management-system>

```

15     @app.before_request
16     def check_authentication():
17         # Check if the requested route requires authentication
18         if request.path in authenticated_routes and 'email_address' not in session:
19             # User is not logged in, redirect to landing
20             return redirect('/landing')
21
22         # Check if the user is trying to access the /admin page
23         if request.path == '/admin' and 'email_address' in session:
24             allowed_email_addresses = [
25                 'dev@bigbrews' # Modify this with the actual allowed email addresses
26             ]
27             if session['email_address'] not in allowed_email_addresses:
28                 return redirect('/')
29
30
31     @app.route('/')
32     def index():
33         if 'email_address' in session:
34             # User is logged in, redirect to homepage
35             return redirect('/homepage')
36         else:
37             # User is not logged in, redirect to landing
38             return redirect('/landing')
39
40

```

**Figure 11:** Python Code for User Authentication

```

64 ✓ def login_user(email_address, password):
65     db_connection = create_connection()
66     cursor = db_connection.cursor()
67
68     try:
69         query = "SELECT user_id, first_name, last_name, email_address FROM user WHERE email_address = %s AND password = %s"
70         values = (email_address, password)
71         cursor.execute(query, values)
72         user = cursor.fetchone()
73
74         if user:
75             user_object = {
76                 'user_id': user[0],
77                 'first_name': user[1],
78                 'last_name': user[2],
79                 'email_address': user[3]
80             }
81             return user_object
82         else:
83             return None
84     except Error as e:
85         print(f"The error '{e}' occurred while executing the SQL query")
86         return None
87     finally:
88         cursor.close()
89         db_connection.close()

```

**Figure 11.1: Python Code for User Login**

```

21 ✓ def register_user(first_name, last_name, email_address, password):
22     db_connection = create_connection()
23     cursor = db_connection.cursor()
24
25     try:
26         query = "INSERT INTO user (first_name, last_name, email_address, password) VALUES (%s, %s, %s, %s)"
27         values = (first_name, last_name, email_address, password)
28         cursor.execute(query, values)
29         db_connection.commit()
30         print("Data inserted successfully")
31         return True
32     except Error as e:
33         print(f"The error '{e}' occurred while inserting data into the table")
34         return False
35     finally:
36         cursor.close()
37         db_connection.close()

```

**Figure 11.2: Python Code for User Registration**

```

60 ✓ def get_user_submissions(user_id):
61     db_connection = create_connection()
62     cursor = db_connection.cursor(dictionary=True)
63
64     try:
65         query = "SELECT * FROM submissions WHERE user_id = %s"
66         values = (user_id,)
67         cursor.execute(query, values)
68         submissions = cursor.fetchall()
69
70         return submissions
71     except Error as e:
72         print(f"The error '{e}' occurred while executing the SQL query")
73         return []
74     finally:
75         cursor.close()
76         db_connection.close()

```

**Figure 11.3:** Python Code to Store User ID

```

15 # Insert the data into the database
16 query = "INSERT INTO submissions (thesis_title, submission_type, full_name, group_name, member_name1, member_name2, member_name3,
17
18 # Optional fields
19 if 'github_repository' in form_data:
20     query += ", github_repository"
21
22 if 'keywords' in form_data:
23     query += ", keywords"
24
25 query += ") VALUES (%s, %s, %s, %s, %s, %s, %s, %s, %s, %s, %s)"
26
27 # Optional field placeholders
28 if 'github_repository' in form_data:
29     query += ", %s"
30
31 if 'keywords' in form_data:
32     query += ", %s"
33
34 query += ")"
35
36 values = (
37     form_data['thesis_title'],
38     form_data['submission_type'],
39     form_data['full_name'],
40     form_data['group_name'],
41     form_data['member_name1'],
42     form_data['member_name2'],
43     form_data['member_name3'],
44     form_data['professor_name'],
45     form_data['submission_date'],
46     form_data['abstract'],
47     form_data['school']
48 )
49
50 cursor.execute(query, values)
51 db_connection.commit()
52 cursor.close()
53 db_connection.close()

```

**Figure 11.4:** Python Code for Thesis Submission to Database

```

1  import mysql.connector
2
3
4  def update_submission_status(submission_id, new_status):
5      # Connect to the database
6      connection = mysql.connector.connect(
7          host="localhost",
8          user="root",
9          password="Big8Brews-23",
10         auth_plugin="mysql_native_password",
11         database="episteme_db"
12     )
13     cursor = connection.cursor()
14
15     # Update the status in the database
16     update_query = 'UPDATE submissions SET status = %s WHERE submission_id = %s'
17     cursor.execute(update_query, (new_status, submission_id))
18     connection.commit()
19
20     # Close the cursor and database connection
21     cursor.close()
22     connection.close()

```

**Figure 11.5:** Python Code for Changing Thesis Submission Details

```

83     {% for submission in submissions %}
84     <tr>
85         <td>{{ submission[0] }}</td>
86         <td>{{ submission[1] }}</td>
87         <td>{{ submission[2] }}</td>
88         <td>{{ submission[3] }}</td>
89         <td>{{ submission[4] }}</td>
90         <td>{{ submission[5] }}</td>
91         <td>{{ submission[6] }}</td>
92         <td>{{ submission[7] }}</td>
93         <td>{{ submission[8] }}</td>
94         <td>{{ submission[9] }}</td>
95         <td>{{ submission[10] }}</td>
96         <td>{{ submission[11] }}</td>
97         <td>{{ submission[12] }}</td>
98         <td>{{ submission[13] }}</td>
99         <td>{{ submission[14] }}</td>
100        <td>
101            <div class="select">
102                <select>
103                    <option {% if submission[15]=='Submitted' %}>selected{% endif %}>Submitted
104                    </option>
105                    <option {% if submission[15]=='Verified' %}>selected{% endif %}>Verified</option>
106                    <option {% if submission[15]=='Published' %}>selected{% endif %}>Published
107                    </option>
108                </select>
109            </div>
110        </td>
111        <td>
112            <button class="button is-primary"
113                onclick="updateStatus('{{ submission[0] }}', this)">Update Status</button>
114        </td>

```

**Figure 11.6:** HTML Code for Viewing Thesis Submission

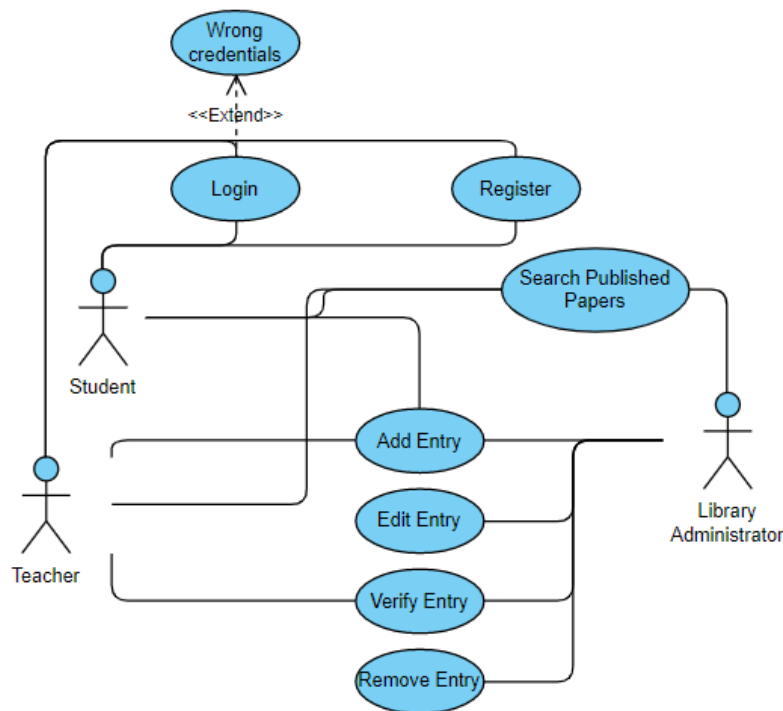


## **Appendix G: Marketing Plan/Study**

The target audience of Episteme is limited; only members of the institution Asia Pacific College will be able to access the web application. To be specific, this includes the students, teachers, administrators, and possibly, the executive heads of the institution. Before the application is marketed to the Asia Pacific College Community, this will be first discussed to the necessary departments before being integrated into the library system itself. Once done, the library administrators can share this new feature through e-mails or verbal exchange with students. According to Amin (n.d.), the use of emails as a marketing tool is an effective way to connect with the target audience of the product. Moreover, email messages can be personalized based on the demographics of the target audience, making it a more effective way.

## Appendix H: Use Case Full Description

A use case diagram summarizes the users of the system and how they interact with the system (Lucidchart, n.d.). These users are called as *actors*, while the blue circles are the use case itself. The lines connected represents the relationship of the actors to the use cases. Below shows a use case diagram of Episteme:



**Figure 12:** Episteme Use Case Diagram

Starting off with the actors, there are three users expected to use Episteme: Student, teacher, and the library administrator. Each actor will have different privileges. For the library administrator, they will be able to access all features such as add, edit, verify, and remove entry. For teachers, they will be able to access all features such as add, edit, verify, and remove entry. For students, they will be able to add and verify all entries. Lastly, for students, they will be able to add an entry only. However, all users will be able to search all verified and published papers. Moreover, they also need to register and login before using Episteme. At the login portion, there is an *extend* relationship with *wrong credentials* use case wherein all users may fail to access Episteme as

they have entered wrong credentials. With this in mind, users are expected to repeat the process of logging in to access the web application.