APPLIED INFORMATION TECHNOLOGY AND COMPUTER SCIENCE
e-ISSN: 2773-5141

AITCS

Vol. 6 No. 1 (2025) 2215-2230
https://publisher.uthm.edu.my/periodicals/index.php/aitcs

Learning Management System: UTHM Class Hub

Luqman Hakim Razlan[1], Mohd Zaki Mohd Salikon[1]*

[1] *Fakulti Sains Komputer dan Teknologi Maklumat,*
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

*Corresponding Author: mdzaki@uthm.edu.my
DOI: https://doi.org/10.30880/aitcs.2025.06.01.124

Article Info

Received: 23 July 2024
Accepted: 17 June 2025
Available online: 30 June 2025

Keywords

Learning Management System, Software Development, Scrumban Methodology, Jitsi Meet, Classroom

Abstract

The development of this Learning Management System (LMS) for UTHM addresses the limitations of current online education platforms, including one-way learning, limited interactivity, and user-unfriendliness, which hinder effective online education, particularly for diverse age groups. This study focuses on designing and developing a web-based LMS to enhance online education through interactive and collaborative tools, aiming to create a platform that actively engages students in the learning process. Using the Agile methodology, specifically the Scrumban approach, the project successfully integrated interactive elements like real-time conferencing, voting systems, private discussions, and task management. The resulting LMS significantly enhances collaborative learning, structured discussions, and interactive learning experiences, contributing to educational technology by providing insights into developing more user-friendly platforms that cater to modern learners' needs. These findings suggest that such systems can transform the educational experience by fostering active student participation and improving overall learning outcomes, paving the way for future research into advanced technologies for elevated user engagement in online education.

1. Introduction

A Learning Management System (LMS) is a foundational pillar in modern education, transforming the delivery, administration, and consumption of learning. Rooted in technology and pedagogy, the LMS streamlines course management, content delivery, and tracking, marking a shift to dynamic online and blended learning. Serving as a centralized hub for educators and learners, LMSs enhance accessibility, efficiency, and effectiveness in academic and corporate settings.

The LMS process involves educators creating digital content, organizing it on the platform, and granting access to learners. Learners engage with course materials, submit assignments, and participate in discussions, while the LMS monitors progress, grades assignments, and facilitates communication. Despite their merits, existing LMS solutions often prioritize content delivery, potentially neglecting active engagement and collaboration among students and educators. “When the expository techniques adopted, learning begins with the interaction and transaction between lecturers and learners [1].”

This research addresses the gap in current LMS offerings by introducing a system designed to foster online collaboration [2]. Recognizing the importance of collaborative

learning, the system empowers students to actively engage with course materials, learn from peers, and control their learning experiences [3]. In the evolving landscape of online education, this innovative system aims to facilitate seamless collaboration, elevating learning outcomes for students.

2. Literature Review

In the dynamic realm of education, Learning Management Systems (LMS) have become foundational, reshaping learning administration. Technology integration has spawned digital platforms for creating, managing, and delivering educational content. Embraced by institutions and organizations, LMS platforms transition traditional instruction to dynamic online and blended learning hubs, centralizing course content, assignments, assessments, and communication [4].

While LMS systems excel in content delivery and organizational efficiency, there's a growing recognition of potential passivity among students in the online learning environment [5]. This underscores the need for innovative tools prioritizing active engagement, collaborative discussion, and virtual learning communities.

This research explores the LMS landscape and emphasizes the imperative for collaborative learning. Drawing from research and practical experiences, it sheds light on LMS evolution, current state, and the demand for platforms fostering meaningful engagement.

This study analyzes LMS processes, noting strengths and shortcomings in promoting collaboration. It then shifts focus to our innovative education platform, designed to address this gap. Empowering students to actively engage with course material and collaborate, the system offers a solution to contemporary online education challenges.

2.1 Study of Existing Related Systems

Examining similar existing systems emerges as a critical step in the development of an improved system. These systems essentially function as guiding references throughout the ongoing development process. In parallel, feedback and user reviews pertaining to the current system hold substantial value, offering developers a clear roadmap for identifying areas requiring enhancement in terms of functionality and system requirements. Such relevant information proves indispensable in refining and advancing system development by facilitating the identification and rectification of existing flaws, thereby diminishing the likelihood of future errors. Consequently, researching and analyzing existing systems closely related to the proposed system stands as an inevitable task. The selection of these relevant existing systems hinges on their respective feature sets and diverse functionalities, with the overarching objective being a comprehensive comparative analysis to facilitate the assimilation of effective elements into the new system.

Table 1 System Comparison

Features	Author	Moodle LMS	Google Classroom	UTHM Class Hub
Login/Registration	✓	✓	✓	✓
Classroom	✓	✓	✓	✓
Dashboard	✓	✓	✓	✓
File Sharing	✓	✓	✓	✓
Forum	×	×	×	✓
Discussion	✓	✓	✓	✓
Task Management	×	✓	✓	✓
Real-Time Conferencing	×	×	×	✓
Admin Panel	✓	✓	×	✓
Analytics	×	✓	×	✓

3. Methodology

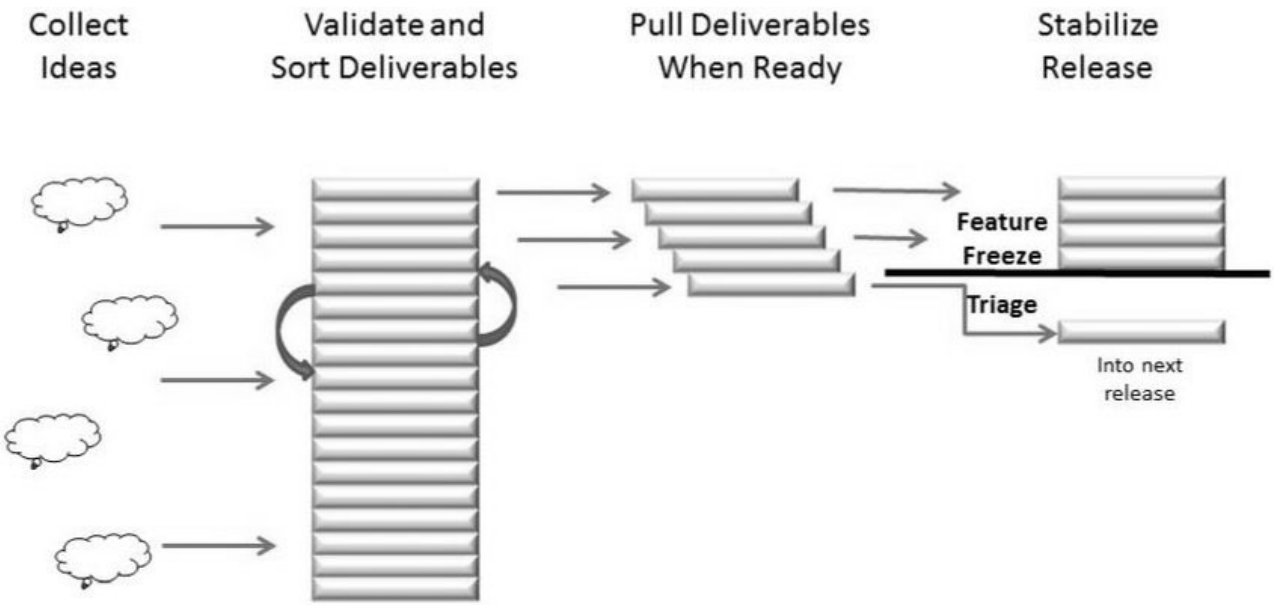
Agile methodology is a modern and flexible approach to software development that prioritizes adaptability, collaboration, and customer feedback [6]. Unlike traditional waterfall methods, Agile doesn't rely on a strict, linear sequence of tasks but instead adopts an iterative and incremental approach. It enables project teams to respond to changing requirements and evolving project needs with agility, ensuring that the end product better aligns with user expectations.

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 2215-2230

Agile methodology has been chosen for this software development project due to its strategic advantages in ensuring flexibility and adaptability throughout the project's lifecycle. Unlike the waterfall model, where each phase must be completed before moving to the next, Agile methodologies allow for seamless adjustments in strategies without disrupting the project's flow. This adaptability is essential in the ever-evolving landscape of software development, where requirements and priorities often change during a project. Agile methodologies, such as Scrumban, offer a responsive framework that accommodates shifts while maintaining a smooth project trajectory [7].

The Scrumban methodology combines the strengths of Scrum and Kanban, providing a balanced and efficient framework for this project's unique needs [8]. While it doesn't adhere to a fixed set of phases like traditional methodologies, it follows a continuous cycle of planning, executing, and improving, ensuring that work progresses steadily and adapts to changing conditions. Figure 1 shows the four key phases of continuous development in Scrumban.

Figure 1 Scrumban Phases [9]



Agile Scrumban is a dynamic and adaptable software development methodology that effectively combines Scrum and Kanban practices [10]. This hybrid approach allows teams to manage projects with a high degree of flexibility and responsiveness. The methodology is structured into four pivotal phases.

In the initiation phase, teams form a cross-functional unit, define the project's vision, and create an initial product backlog that evolves as the project progresses. The planning phase involves continuous refinement of the backlog, sprint planning, and the establishment of work in progress (WIP) limits to ensure a steady workflow. During the execution phase, teams engage in daily stand-up meetings, adopt a pull system for task management, and emphasize continuous improvement and adaptability. The final phase focuses on delivering product increments for regular feedback from stakeholders, collecting customer input, and conducting retrospectives to refine processes. This iterative and responsive approach makes Agile Scrumban well-suited for the ever-changing landscape of software development, promoting collaboration and delivering value throughout the project's lifecycle.

4. Analysis and Design

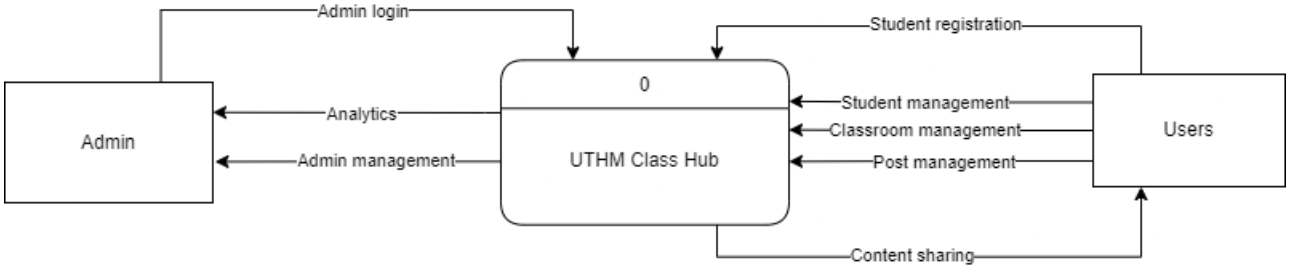
In the system analysis and design phase, a series of visual representations are employed to illustrate the functioning of the collaborative learning system. The Data Flow Diagram (DFD) outlines how information circulates within the system, offering a clear map of data movement and processes. The Entity Relationship Diagram (ERD) visually outlines essential components and their relationships, providing a structured overview of the system's data model. These visuals play a pivotal role in shaping the conceptualization of the collaborative learning platform. A complementary Flowchart details the user journey, mapping out pathways through features like forums and real-time conferencing.

Transitioning to the design phase, the System Architecture serves as a technical blueprint, elucidating component integration and data flow mechanisms. This establishes the foundation for the platform's robust implementation. The User Interface (UI) Design, another critical aspect, prioritizes a user-centric approach to enhance accessibility and engagement. Collectively, these visual and architectural elements shape the collaborative learning management system, ensuring a seamless and visually appealing experience for educators and students in the digital learning environment.

4.1 Context Diagram

The context diagram shows the data flow between admin, UTHM Class Hub, and users. Fosters interactions between admins, teachers, and students through a centralized platform. Admins manage user accounts, monitor analytics, and control system settings. Teachers create and manage classrooms, share content, and interact with students through posts. Students register, participate in classrooms, and collaborate on content. Data flows include login credentials, classroom interaction data, and content shared among users.

Figure 2 Context Diagram

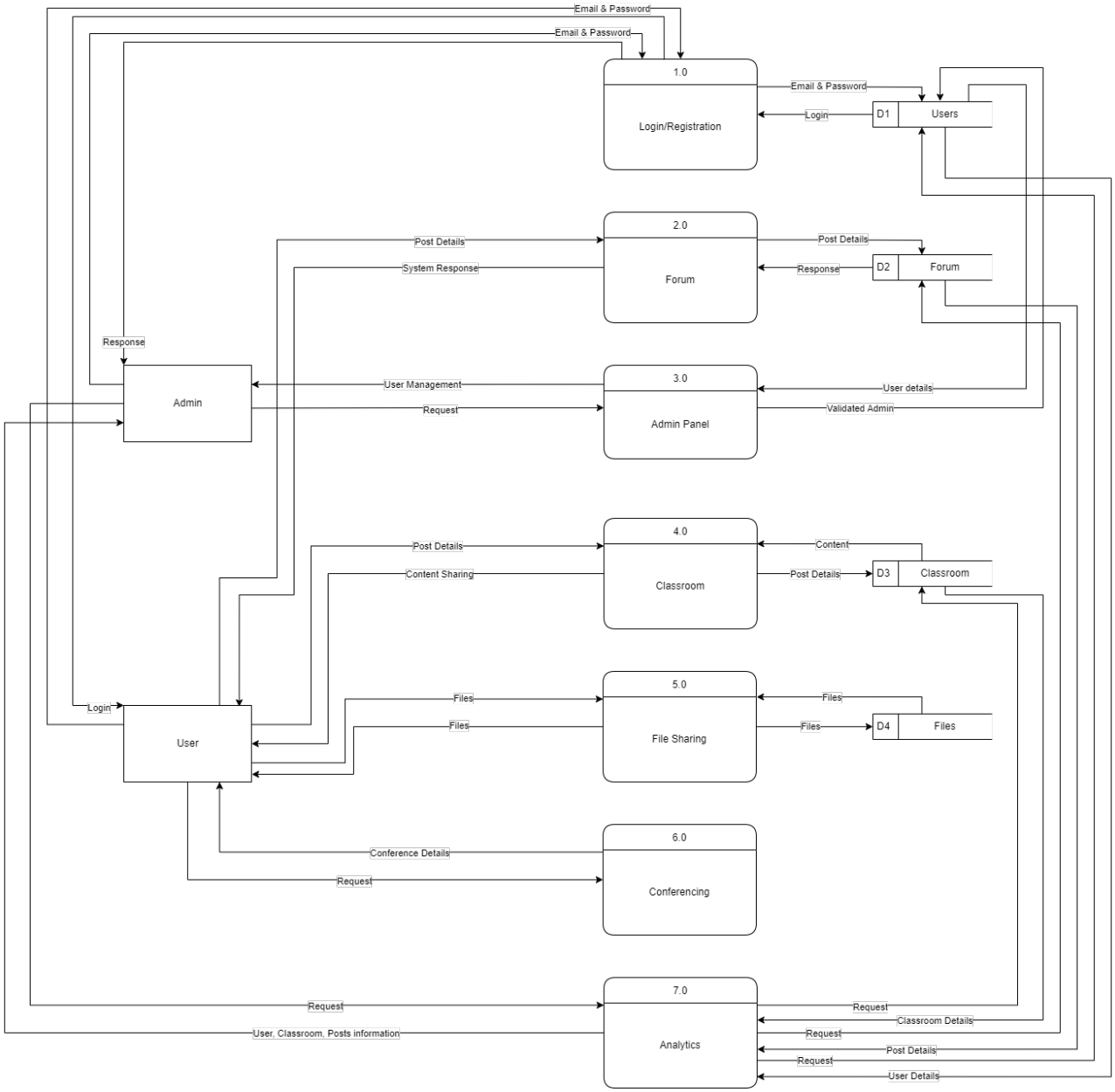


4.2 Data Flow Diagram Level 0

Level 0 process for Data Flow Diagram (DFD) shows that the UTHM Class Hub system interacts with two external entities, Admin and Users, to facilitate classroom management, communication, and content sharing. Admins provide login credentials, manage users, and access analytics, while users provide registration information, classroom data, and posts. The system, in turn, provides access to features, feedback, and shared content. Key processes include login/registration, forum management, user management, content sharing, file sharing, conferencing, and analytics, each interacting with specific data stores for users, forums, classrooms, files, and analytics data.

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 2215-2230

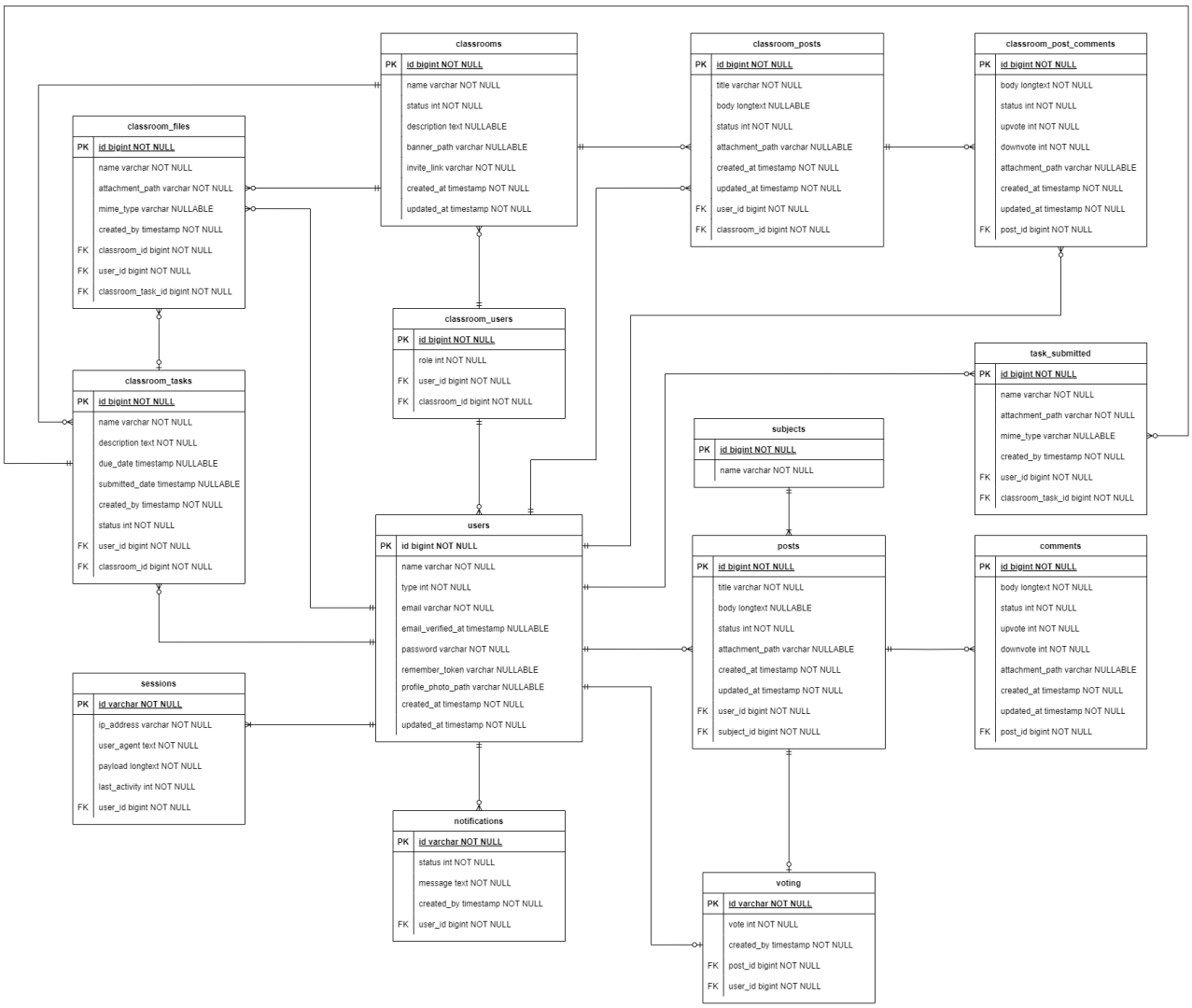
Figure 3 Data Flow Diagram Level 0



4.3 Entity Relationship Diagram

The ERD for the UTHM Class Hub, a Learning Management System, maps the relationships between key entities within the platform, emphasizing student registration, classroom management, and content organization. Central entities include Students, who hold personal information and enrollment details, and Courses, which store course titles, descriptions, and instructors. These entities connect through the Enrollment entity, tracking student participation in courses. Additionally, Courses link to Classrooms, where discussions and content sharing occur, and to Assignments, used for task management and assessment. This structure supports efficient student registration, course organization, and learning activities within the system.

Figure 4 Entity Relationship Diagram



4.4 Flowchart

Depicted flowchart outlines the user's progression in creating or joining a classroom within the UTHM Class Hub platform. Commencing with the user either logging in or registering, registered users can directly input their email and password for login, while new users must furnish their registration details initially. Following successful login, users have the option to either create a new classroom or join an existing one. Classroom creation involves specifying a name and providing a brief description. On the other hand, joining a classroom necessitates entering the corresponding access code. Subsequently, the user is guided to the classroom dashboard, where they can engage with assigned tasks, generate or comment on posts, and actively participate in forum discussions.

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 2215-2230

Figure 5 Dashboard Flowchart

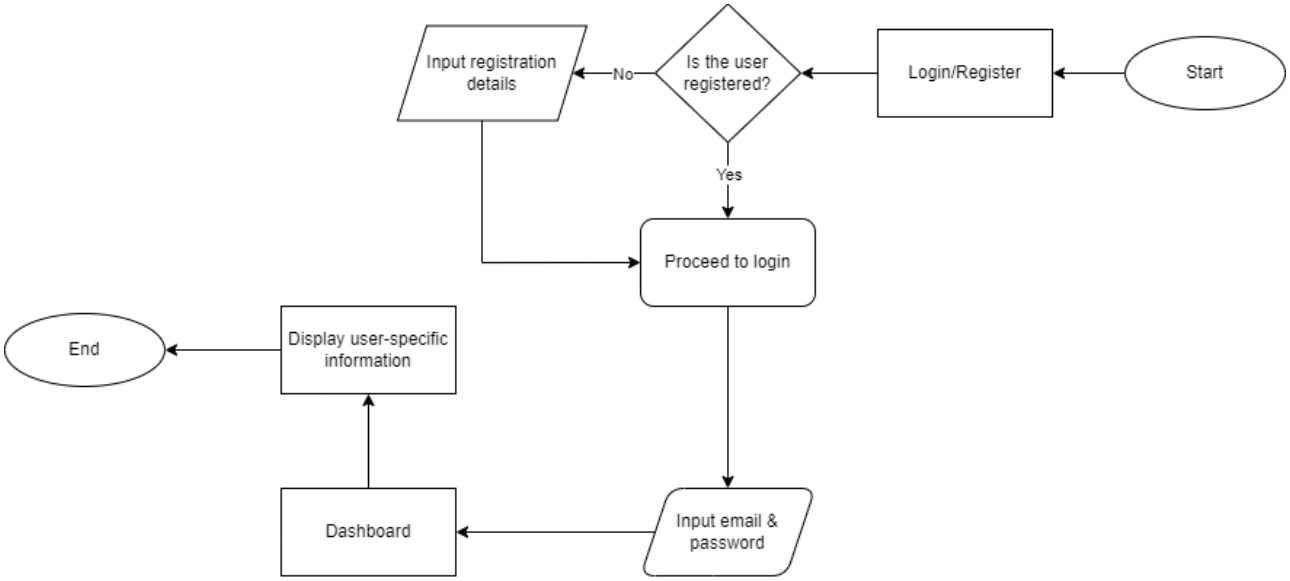


Figure 6 Classroom Creation/Join Flowchart

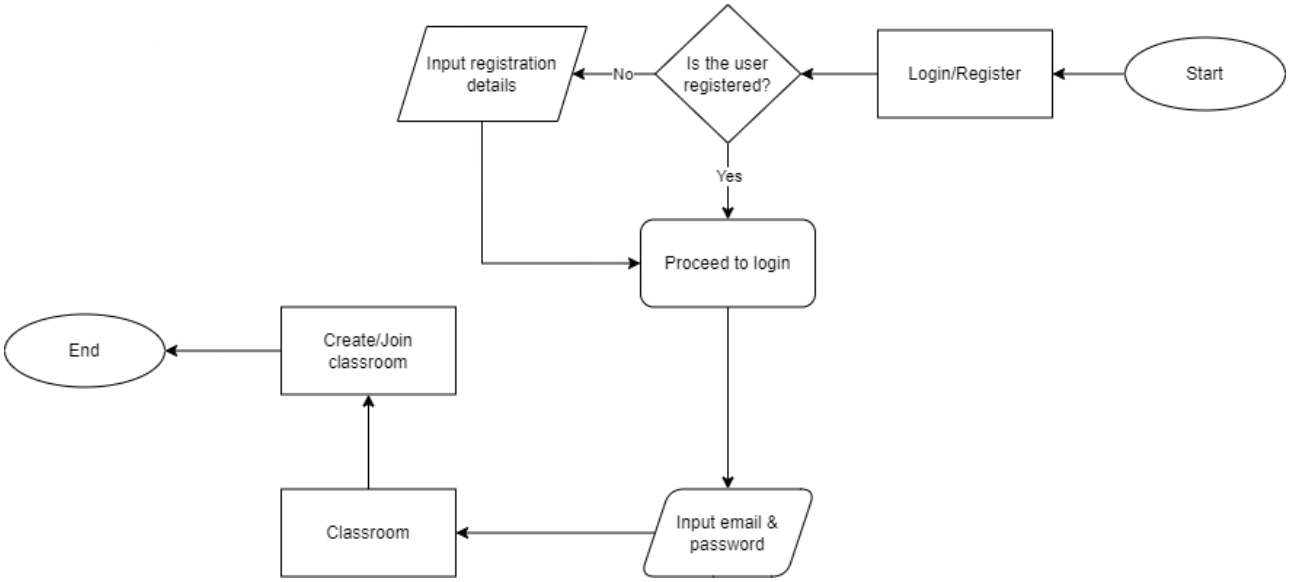


Figure 7 Classroom Post Create/Comment Flowchart

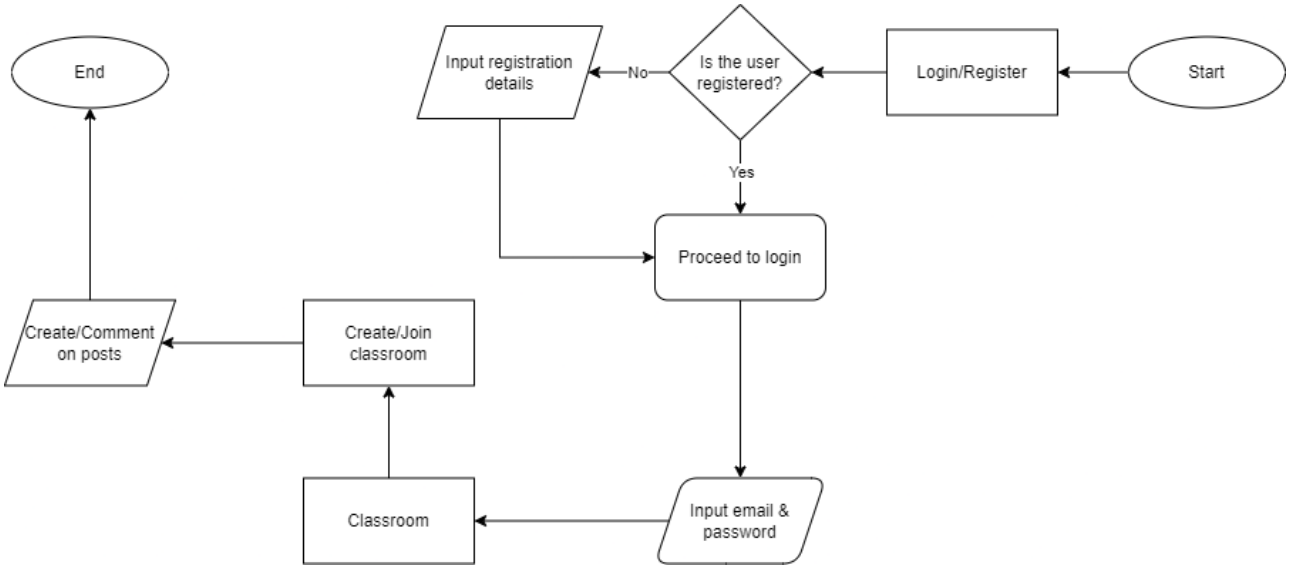
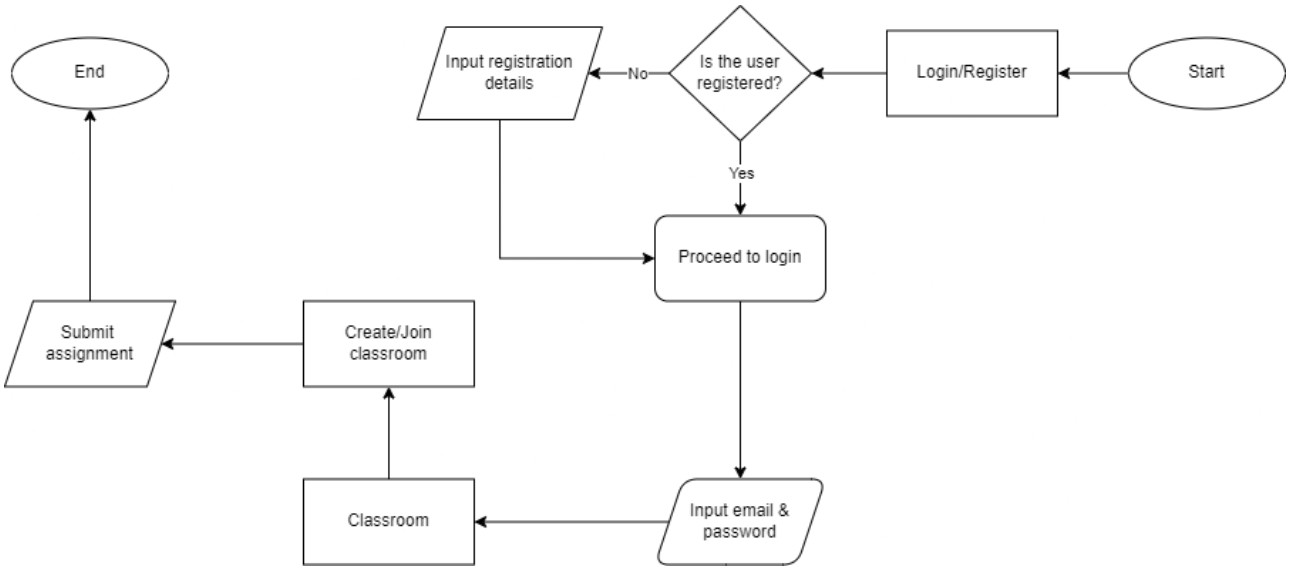
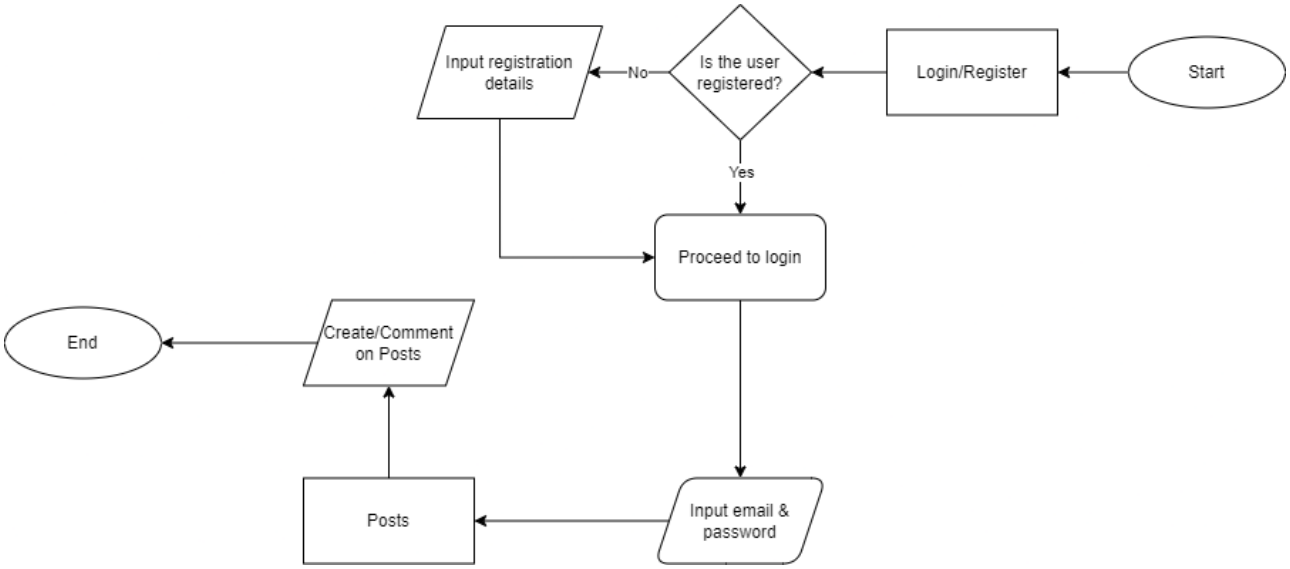


Figure 8 Assignment Submission Flowchart



Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 2215-2230

Figure 9 Forum Posts Creation/Comment Flowchart



4.5 User Interface Design

The User Interface (UI) Design is a critical aspect of the collaborative learning system, prioritizing a user-centric approach. Considerable attention was dedicated to crafting an intuitive and visually appealing digital environment within the UTHM Class Hub. The design principles aimed to enhance accessibility, engagement, and overall user experience for both educators and students participating in the digital learning platform. This section involved creating visually appealing and functional elements to ensure a seamless interaction between users and the platform.

Figure 10 Registration Page

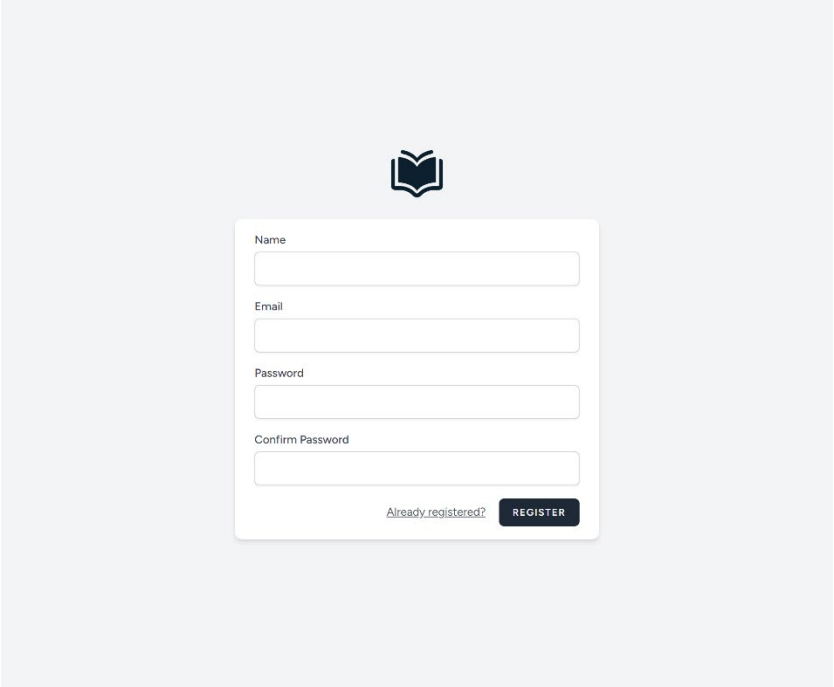


Figure 11 Login Page

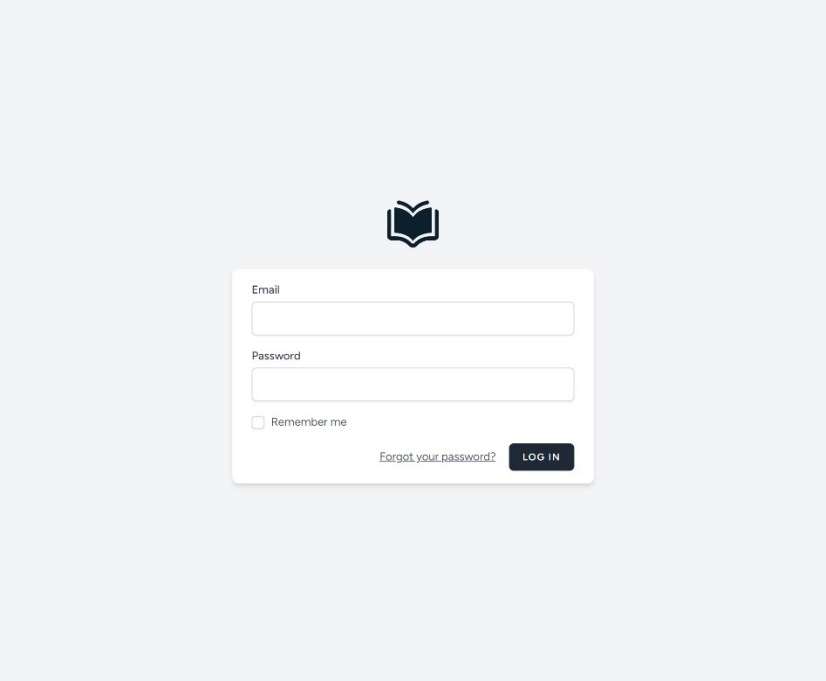
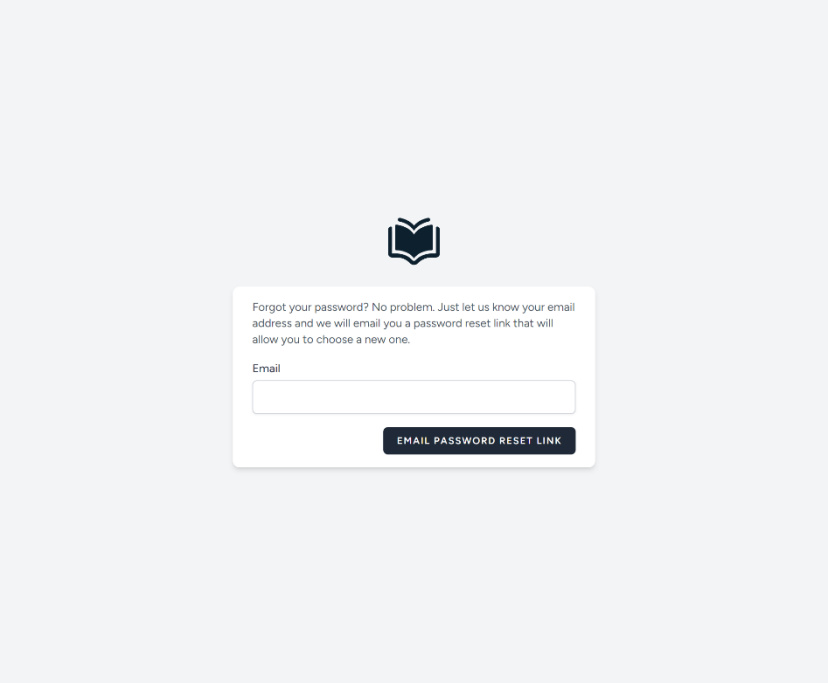


Figure 12 Password Reset Page



Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 2215-2230

Figure 13 Forum Page

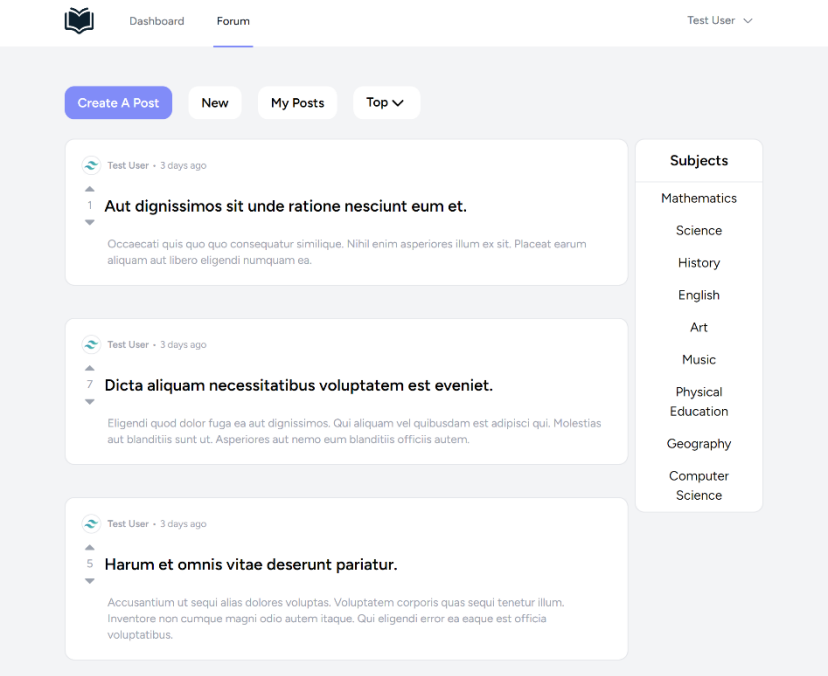
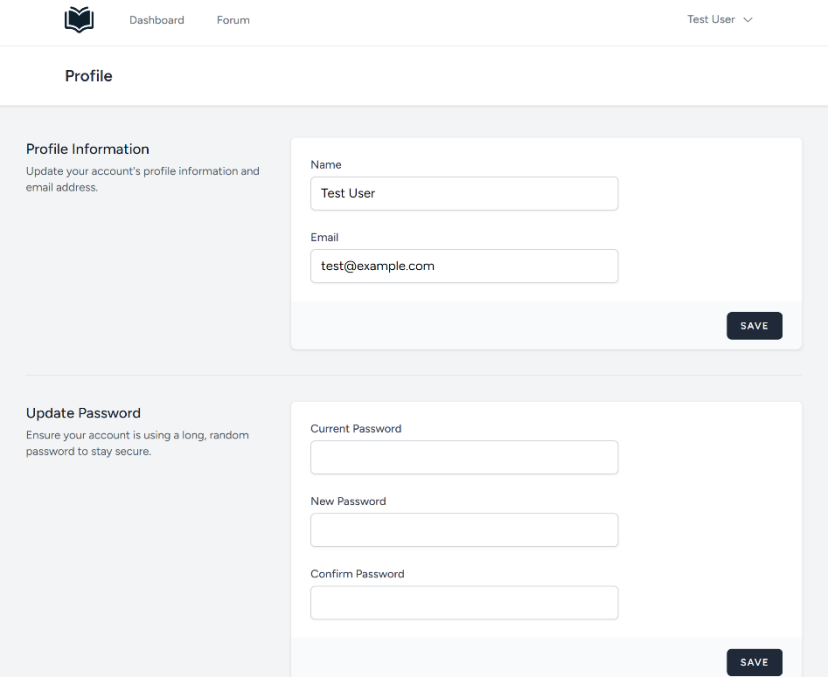


Figure 14 Profile Setting Page



5. Results and Discussion

This section will explain the implementation part. Module covered are Login/Registration, Forum, Classroom, File Sharing, and Conferencing. This section also shows the test case conducted for this system.

5.1 System Module

This section describes the development of functional modules in a system. Source code is provided for further context.

5.1.1 Login/Registration

The Login/Registration module is the gateway for users to access the Learning Management System (LMS). It facilitates the creation of new user accounts and manages the authentication process to ensure secure access. This module is responsible for verifying user credentials, managing password recovery, and maintaining session integrity.

Figure 15 Registration Function

```
public function create(array $input): User
    {
        Validator::make($input, [
            'name' => ['required', 'string', 'max:255'],
            'email' => ['required', 'string', 'email', 'max:255', 'unique:users'],
            'type' => ['required', 'integer'],
            'password' => $this->passwordRules(),
            'terms' => Jetstream::hasTermsAndPrivacyPolicyFeature() ? ['accepted', 'required'] : '',
        ])->validate();

        return User::create([
            'name' => $input['name'],
            'email' => $input['email'],
            'password' => Hash::make($input['password']),
            'type' => $input['type'],
        ]);
    }
```

5.1.2 Forum

The Forum module provides an interactive platform for students and instructors to engage in meaningful discussions, ask questions, and share information relevant to their courses. It serves as a virtual community space where participants can collaborate, exchange ideas, and support each other's learning journeys

Figure 16 Forum Function

```
public function show(Post $post)
{
    $post->load('user', 'comments.user');
    $post->loadCount('votes');

    $post->hasVoted = $post->votes()
        ->where('user_id', auth()->user()->id
)       ->exists();

    return Inertia::render('Forum/Show', [
        'post' => $post,
    ]);
}
```

5.1.3 Classroom

The Classroom module is the heart of the LMS, offering both public and private learning spaces. Public classrooms are accessible to all users, providing a common area for general courses and resources. Private classrooms are restricted to specific courses or groups, ensuring a focused and secure environment for targeted learning.

Figure 17 Classroom Function

```
public function index()
    {
        $ownerPrivateClassrooms = Classroom::where('status', 1)
            ->whereHas('users', function ($query) {
                $query->where('classroom_users.user_id', auth()->user()->id)
                    ->where('classroom_users.role', 1);
            })
            ->with('users')
            ->get();
        $privateClassrooms = Classroom::select('classrooms.*', 'classroom_users.role as pivot_role')
            ->where('status', 1)
            ->whereHas('users', function ($query) {
                $query->where('classroom_users.user_id', auth()->user()->id);
            })
            ->join('classroom_users', 'classrooms.id', '=', 'classroom_users.classroom_id')
            ->orderBy('classroom_users.role', 'desc')
            ->with('users')
            ->get();

        $ownerPublicClassrooms = Classroom::where('status', 0)
            ->whereHas('users', function ($query) {
                $query->where('classroom_users.user_id', auth()->user()->id)
                    ->where('classroom_users.role', 1);
            })
            ->with('users')
            ->get();
        $publicClassrooms = Classroom::select('classrooms.*', 'classroom_users.role as pivot_role')
            ->where('status', 0)
            ->leftJoin('classroom_users', function ($join) {
                $join->on('classrooms.id', '=', 'classroom_users.classroom_id')
                    ->where('classroom_users.user_id', auth()->user()->id);
            })
            ->orderBy('classroom_users.role', 'desc')
            ->with('users')
            ->get();
        $privateClassrooms->load('users');
        $publicClassrooms->load('users');

        return Inertia::render('Classroom/Index', [
            'privateClassrooms' => $privateClassrooms,
            'ownerPrivateClassrooms' => $ownerPrivateClassrooms,
            'ownerPublicClassrooms' => $ownerPublicClassrooms,
            'publicClassrooms' => $publicClassrooms,
        ]);
    }
```

5.1.4 File Sharing

The File Sharing module enables users to upload, share, and access a wide range of file types, including documents, presentations, and multimedia content. This functionality is crucial for supporting the educational process, allowing instructors to distribute course materials and students to submit assignments and projects.

Figure 18 File Sharing Function

```
public function files($classroom)
    {
        $classroom = Classroom::with('users')->find($classroom);
        $files = ClassroomFile::with('user')->where('classroom_id', $classroom->id)->get();

        foreach ($files as $file) {
            $filePath = parse_url($file->attachment_path, PHP_URL_PATH);
            $fileSize = Storage::disk('do')->size(ltrim('files' . '/' . $filePath, '/'));
            $file->setAttribute('size', $fileSize);
        }

        return Inertia::render('Classroom/Files', [
            'classroom' => $classroom,
            'files' => $files,
        ]);
    }
```

5.1.5 Conferencing (Real-Time Voice, Video, and Chat)

Conferencing module facilitates real-time communication through voice, video, and text-based chat, enabling interactive and dynamic learning experiences. Users can participate in live audio and video sessions, which are essential for lectures, group discussions, and one-on-one meetings. The integrated chat feature supports text-based communication, allowing for instant messaging and collaborative dialogue.

Figure 19 Conferencing Features

```
public function files($classroom)
    {
        $classroom = Classroom::with('users')->find($classroom);
        $files = ClassroomFile::with('user')->where('classroom_id', $classroom->id)->get();

        foreach ($files as $file) {
            $filePath = parse_url($file->attachment_path, PHP_URL_PATH);
            $fileSize = Storage::disk('do')->size(ltrim('files' . '/' . $filePath, '/'));
            $file->setAttribute('size', $fileSize);
        }

        return Inertia::render('Classroom/Files', [
            'classroom' => $classroom,
            'files' => $files,
        ]);
    }
```

5.2 Testing

In this section, a method called User Acceptance Testing (UAT) is used to perform testing.

Table 2 Test Case Result

No	Module Testing	Expected Result	Result
1	Login/Register		
a	Register a new user with valid details	User account is created	Pass
b	Register a new user with invalid email format	Error message displayed indicating invalid email format	Pass
c	Login with valid credentials	User is successfully logged in and redirected to the dashboard	Pass
d	Login with invalid credentials	Error message displayed indicating invalid email or password	Pass
e	Password recovery process	Password reset email is sent to the registered email address	Pass
2	Forum		
a	Create a new forum topic	New topic is successfully created and visible in the forum	Pass
b	Post a reply to a forum topic	Reply is successfully posted and visible under the topic	Pass
3	Classroom		
a	Create a new public classroom	Public classroom is successfully created and visible to all users	Pass
b	Create a new private classroom	Private classroom is successfully created and only accessible to specific users	Pass
c	Enroll a user in a classroom	User is successfully enrolled and gains access to classroom content	Pass

4	File Sharing		
a	Upload a file	File is successfully uploaded and visible in the file list	Pass
b	Share a file with another user	File is successfully shared and accessible by the specified user	Pass
c	Download a file	File is successfully downloaded to the user's device	Pass
5	Conferencing		
a	Start a video conference	Video conference starts successfully and participants can join	Pass
b	Join a video conference	User successfully joins the video conference and can see/hear others	Pass
c	Send a message in conference chat	Message is successfully sent and visible to all participants	Pass
d	Share screen during a conference	Screen sharing starts successfully and is visible to all participants	Pass
e	Record a conference session	Conference session is successfully recorded and accessible after the meeting	Pass

6. Conclusion

This research paper addresses the imperative need for an enhanced Learning Management System (LMS) tailored to the specific requirements of Universiti Tun Hussein Onn Malaysia (UTHM). By acknowledging the limitations of existing LMS, such as one-way learning and limited interactivity, the study has successfully developed and tested the UTHM Class Hub, employing an Agile Scrumban methodology. The collaborative learning system incorporates innovative features such as forums, real-time conferencing, task management, and analytics. The findings reveal the successful integration of interactive elements, contributing to a more engaged learning environment where students actively collaborate and manage their educational tasks. This research contributes to the educational technology field by offering insights into the development of interactive and user-friendly LMS platforms, addressing the evolving needs of modern learners and fostering improved collaboration and structured discussions in the digital learning landscape. Future research endeavors could explore further integration of advanced technologies to enhance user engagement and elevate learning outcomes in online education.

Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support.

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

References

[1] Z. Muhisn, M. Ahmad, M. Omar, and S. Muhisn, "The impact of socialization on collaborative learning method in E-Learning Management System (ELMS)," International Journal of Emerging Technologies in Learning (iJET), https://www.learntechlib.org/p/217125/ (accessed Dec. 23, 2023).

[2] C.-C. Wang, "The Development of Collaborative Learning Environment with Learning Blogs," Journal of Software, vol. 4, no. 2, Apr. 2009, doi: https://doi.org/10.4304/jsw.4.2.147-152.

[3] S. M. Brito, Active Learning: Beyond the Future. BoD – Books on Demand, 2019. Accessed: Dec. 23, 2023.

[4] O. K. Kilag, E. Obaner, E. Vidal, J. Castañares, J. N. Dumdum, and T. J. Hermosa, "Optimizing Education: Building Blended Learning Curricula with LMS," Excellencia: International Multi-disciplinary Journal of Education (2994-9521), vol. 1, no. 4, pp. 238–250, Oct. 2023, Available: https://multijournals.org/index.php/excellencia-imje/article/view/54

[5] E. P. Morris, "A Student-Designed Learning Management System: A Mixed-Methods Analysis of Undergraduate Student Ideas for Improving the LMS," Dissertations, Sep. 2022, Accessed: Dec. 23, 2023. [Online]. Available: https://digitalcommons.lindenwood.edu/dissertations/730/

[6] S. Alsaqqa, S. Sawalha, and H. Abdel-Nabi, "Agile Software Development: Methodologies and Trends," International Journal of Interactive Mobile Technologies, vol. 14, no. 11, pp. 246–270, Jul. 2020.

[7] A. Reddy, The Scrumban [R]Evolution: Getting the Most Out of Agile, Scrum, and Lean Kanban. Addison-Wesley Professional, 2015. Accessed: Dec. 23, 2023. [Online]. Available: https://books.google.com.my/books?hl=en&lr=&id=Y6oKCgAAQBAJ&oi=fnd&pg=PP16&dq=Agile+methodologies

[8] M. Alqudah and R. Razali, "An Empirical Study of Scrumban Formation based on the Selection of Scrum and Kanban Practices," International Journal on Advanced Science, Engineering and Information Technology, vol. 8, no. 6, p. 2315, Dec. 2018, doi: https://doi.org/10.18517/ijaseit.8.6.6566.

[9] P. Rogers, "Team Working Agreement for a Team Transitioning to Scrumban," A Path Less Taken, Jun. 12, 2023. https://medium.com/agile-outside-the-box/team-working-agreement-for-a-team-transitioning-to-scrumban-8c197190e4c7 (accessed Dec. 23, 2023).

[10] J. Grotenfelt, "Agile Software Development and Implementation of Scrumban," www.theseus.fi, 2021. https://www.theseus.fi/handle/10024/497598 (accessed Dec. 23, 2023).