Proceedings of the International Conference on Education, Vol. 11, Issue 1, 2025, pp.128-143
Copyright © 2025 Jamaludin AR et al
ISSN 2424-6700 online
DOI: https://doi.org/10.17501/24246700.2025.11110

A COMPARATIVE STUDY OF ACADEMIC ADVISING SYSTEM IN FOUNDATION PROGRAMS AND THE DEVELOPMENT OF A WEB-BASED ADVISING INTERFACE FOR MALAYSIAN UNIVERSITIES

Jamaludin AR*, Mohd Zain NH, Hairudin H, Halifi AS, and Mohd Lokoman R

School of Professional and Continuing Education (SPACE), UTMSPACE, Universiti Teknologi Malaysia, Johor Bahru

Abstract: Academic advising plays a vital role in supporting student success, especially in foundation programs where clear and structured guidance helps students transition smoothly into higher education. In Malaysia, traditional advising methods face challenges such as limited accessibility, inefficient communication, and a lack of real-time monitoring. These obstacles can make it difficult for advisors to provide timely, personalized support to students who may need extra help. This study compares academic advising practices in Malaysia with those in the United States, United Kingdom, and Australia to identify key gaps and areas for improvement. The findings reveal several critical issues, including unstructured advising frameworks, limited advisor training, and low adoption of digital tools. To address these challenges, a web-based academic advising system was developed specifically for foundation students. This system enhances communication, enables real-time tracking of academic progress, and supports early intervention efforts to assist students who may be at risk. Key features include personalized dashboards for both students and advisors, structured advising checklists, and a centralized platform designed to efficiently manage student inquiries. The system's interface and functions were carefully designed to align with international best practices while effectively addressing common advising problems found in local institutions. By integrating these elements, the proposed system offers a practical and flexible solution to improve advising services. Ultimately, it aims to boost student engagement, facilitate timely academic decisions, and contribute to better overall academic outcomes for foundation students.

Keywords: academic advising, foundation programs, web-based system, advising system development, Malaysia, student tracking

Introduction

Academic advising plays a vital role in guiding students through their academic journey by assisting them with course selection, goal setting, and career exploration. However, traditional advising methods face several challenges, including poor communication, limited availability, and time-consuming administrative tasks. These issues highlight the need for a more structured and effective advising system, especially for foundation-level programs. This study aims to investigate how a digital academic advising system can help overcome these challenges by enhancing efficiency, communication, and the overall support provided to foundation students in Malaysia.

This paper explores how academic advising practices in Malaysia compare with those in other countries and introduces the early development of a digital advising platform designed to improve support for foundation students. The system, designed specifically for the UTM Foundation Program, aims to provide a more organized and accessible structure to assist students preparing for higher education. The study will evaluate the effectiveness of the digital advising system in enhancing student engagement and communication between students and advisors. It will also assess how the system can reduce administrative burdens while improving the efficiency and accessibility of advising services.

*Corresponding Author's Email: *aaishah@utmspace.edu.my

Furthermore, the research seeks to measure the platform's impact on students' academic progress and retention. By concentrating on these measurable outcomes, the study clearly links the system's development to its expected benefits for both students and advisors.

Foundation students often require personalised academic guidance, structured study plans, and continuous monitoring to support their progression to degree programmes. However, the large number of students compared to the limited number of available advisors makes it difficult to provide timely and effective support. Traditional advising methods often lack real-time communication, consistent follow-up, and data-driven processes, which can negatively affect student engagement and academic planning. To address these limitations, a digital advising platform is essential. The proposed system aims to fill these gaps by providing an interactive and automated platform that enhances communication and advising efficiency.

Several studies have highlighted the shortcomings of traditional academic advising methods, including limited availability, accessibility, and inefficient communication, which often lead to scheduling conflicts and a lack of real-time interaction between students and advisors (Afify & Nasr, 2017). Students struggle with accessing their advisors' schedules and face challenges in rescheduling appointments due to the absence of real-time updates. Additionally, these methods often result in inconsistent follow-up on student progress and difficulties in gathering data to improve advising practices. Moreover, academic advisors find it difficult to be productive because the process is time-consuming, as lecturers are often overwhelmed by other academic responsibilities, such as teaching, evaluation, and research (Okolo & Ogbozor, 2022). Another issue is the inaccurate representation of information, which can disrupt the advising process (Henderson & Goodridge, 2015). Paper based document is prone to a high possibility of having incorrect information due to human error. This leads to a lack of decision-making capabilities based on student data, requiring the advisor to thoroughly analyze the information before reaching a reasonable conclusion. Furthermore, administrative issues significantly impact the quality of advising, as advisors need to be well-informed about degree requirements and program changes to provide accurate guidance (Nwelih & Chiemeke, 2012). When advisors lack up-to-date information due to poor communication, students may receive incorrect advice, which can lead to dissatisfaction, frustration, and delays in graduation.

A comparative study was conducted to identify the differences between findings from previous research.

Table 1: Summary of Comparative Study

Dimension	Malaysia (Ismail et al., 2020; Mohd Noor et al., 2019)	USA (Grites, 2013)	UK (Thomas, 2012)	Australia (Kift, 2009)	Weaknesses
Advising Model	Reactive	Developmental / Proactive	Developmental	Developmental / Analytics-driven	Malaysia: lacks structure; USA: scalability in large institutions
Advisor Role	Academic staff	Full-time trained advisors	Personal tutors	Mixed model	Malaysia: overloaded faculty; UK: inconsistency in tutor engagement
Technology Use	Limited (Excel, email)	Advanced platforms (Starfish, etc)	VLE-based advising tools	CRM + Learning Analytics	Malaysia: no integration; UK: limited automation; USA: costly systems
Advisor Training	Minimal	Mandatory and certified	Inconsistent, improving	Standardized training	Malaysia: no standard training; UK: varies across institutions
Student Engagement	Low	High	Moderate	High	Malaysia: passive students; UK: some students unaware of tutoring availability

The comparative analysis highlights key differences in academic advising systems across Malaysia, the United States, the United Kingdom, and Australia (Table 1). In terms of advising models, Malaysia primarily follows a reactive approach where advising occurs only when issues arise, whereas the other countries have adopted more proactive and developmental models that emphasize continuous student support. The roles of advisors also vary. Malaysian advisors are typically academic staff with multiple responsibilities, while countries like the U.S. employ full-time, professionally trained advisors. In the

UK, personal tutors handle advising duties, while Australia utilizes a mixed model that combines faculty and professional staff. These structural differences directly impact the effectiveness, consistency, and responsiveness of the advising systems in each context.

Technology integration and advisor training further distinguish these systems. Malaysia relies on basic tools such as spreadsheets and emails, whereas the U.S. and Australia use advanced platforms with learning analytics and customer relationship management (CRM) systems to monitor student progress and trigger interventions. Advisor training in Malaysia is minimal and not standardized, in contrast to the structured and mandatory programs in the U.S. and Australia. The weaknesses column underscores that while Malaysia faces systemic limitations like lack of structure, minimal digital integration, and low student engagement, other countries also face challenges such as cost, scalability, and inconsistency in tutor effectiveness. These insights inform the design priorities for an improved advising system tailored to Malaysia's needs.

In line with current technological advancements, it is essential to digitize academic advising as it enhances efficiency, accessibility, personalization, and data-driven decision-making. These improvements are not simply technical enhancements; they play a significant role in improving student engagement, supporting accurate academic planning, and enabling timely interventions, all of which are important for the success of foundation students. A digital advising system can also streamline administrative tasks by automating processes such as appointment scheduling, record-keeping, and progress tracking. This helps reduce the manual workload for advisors, minimizes errors, and promotes more organized and responsive management of student information and advising sessions.

In order to achieve these improvements, this study presents the design and implementation of a web-based academic advising system specifically tailored to support foundation students. The following section describes the system's architecture and implementation, highlighting how it addresses the identified needs for enhanced advising efficiency and student support.

Materials and Methods

In this study, the system was designed using a client-server architecture to support efficient data management and user accessibility. The server side integrates a database management system to store and manage student information, academic resources, and advising records. On the client side, a web-based interface was developed, enabling students and advisors to interact with the system easily through standard web browsers. This architecture was selected based on its ability to provide centralized control, data security, and ease of maintenance within the university's existing infrastructure.

Although cloud-based systems are increasingly popular due to their scalability and flexibility, they may not always be the most appropriate choice, particularly for institutions that require full control over data and have limited operational budgets. The client-server model offers a cost-effective solution that can be managed internally while still delivering the necessary functionality and user experience. Furthermore, it ensures compliance with institutional data governance policies and allows for more direct control over system performance and updates. As noted by Kotyk and Vavruk (2022), client-server architecture remains a practical choice for educational environments that prioritize security and manageability over scalability. The following section outlines the methodology used in developing the web-based system.

Development Phase

This project was divided into five phases: The Planning and Analysis Phase, the Design Phase, the Development Phase, the Testing Phase and the Implementation Phase. The project was acknowledged by the end of September 2024 and was initially started at the end of October 2024. The project duration is illustrated in Table 2 as follows:

Table 2: The Development Phase and Duration

Phase	Task	Duration
Planning and Analysis Phase	1. Project kick-off	1 day
	2. Collect system requirements and specifications	10 days
	3. Feasibility studies	10 days
	4. Initial requirements meeting with Stakeholders	1 day
	5. Server, storage and network connectivity	5 days
Design Phase	1. System architectural design - server and software design	5 days
	2. Database design - Entity Relationship Diagram	5 days
	3. System Design - System flowchart and system diagram	5 days
	4. Interface design - Display, input, output, data storage, data processing and system control	20 days
Development Phase	1. Develop User Interface (Administrator, Advisor, Student)	20 days
	2. Develop System Module - Administration, Advisor, Student, Backend Service Module (Report Analytics, Communication Tools, System Management)	30 days
	3. Platform configuration and setup	5 days

	4.	Integrate system module	5 days
	5.	Application and database integration	5 days
Testing Phase	1.	Preliminary system testing	5 days
	2.	Function testing and debugging	20 days
	3.	Final system testing	5 days
	4.	User Acceptance Test	5 days
Implement Phase	1.	Complete module installation and integration	5 days
	2.	Module and system documentation	5 days
	3.	System commissioning	1 day
	4.	System Launch	1 day

The phased approach aligns with the Software Development Life Cycle (SDLC) methodology, which ensures systematic progression from requirements gathering to deployment (Sommerville, 2016). While the system was thoroughly tested internally to ensure functionality and usability, direct feedback from students and advisors wasn't collected during development. Gathering user feedback is planned for future stages to improve the system based on real experiences and to compare its effectiveness with traditional advising methods.

Software Requirements

These are the specific functionalities, features and characteristics that a software system must possess to meet the needs and expectations of its users. These requirements serve as guidelines for the development of this student academic advising software process and help ensure that the final product meets the desired objectives.

It is important to gather, analyze and document software requirements effectively to avoid misunderstandings, scope creep and project delays (Wiegers & Beatty, 2013). Techniques such as requirements elicitation, documentation, prioritization and validation are commonly employed to ensure that the software requirements are accurately captured and addressed throughout the development lifecycle.

For this project design of a UTMSPACE Academic Advising System, the following software is used:

- XAMPP software package, which includes Apache web server, PHP interpreter and MySQL database management software
- A text editor or an Integrated Development Environment (IDE) software, such as Visual Studio Code, Sublime Text, or Notepad, for editing and modifying the PHP code
- A web browser, such as Google Chrome, Mozilla Firefox, or Microsoft Edge, for accessing and using the web-based UTM SPACE Academic Advising System.
- Git version control software, for managing code changes and collaboration.
- Composer package manager software, for installing and managing third-party libraries and dependencies.
- Command-line interface (CLI) software, such as Terminal or Command Prompt, for running PHP scripts and executing system commands, if needed.

These software requirements may vary depending on the specific features and functionalities of UTMSPACE Academic Advising System in designing and implementing.

Hardware Requirements

Hardware requirements refer to the specific hardware components and configurations needed to support the proper functioning and performance of a software system or application. These requirements ensure that the software can run effectively and efficiently on the hardware infrastructure.

Hardware requirements can vary depending on the nature and complexity of the software application, as well as the expected workload and user base. Here are some common hardware requirements to consider:

- Processor: A multi-core processor with a clock speed of 2.0 GHz or higher is recommended.
- Memory (RAM): At least 4 GB of RAM is recommended for small to medium-sized systems. For larger systems with high user traffic, 8 GB or more may be required.
- Storage: A hard drive with a minimum of 50 GB of free space is recommended for the system and database files.
- Display: A monitor with a minimum resolution of 1280 x 768 pixels is recommended.
- Internet Connection: A high-speed internet connection with sufficient bandwidth is recommended for running a web-based UTM SPACE Academic Advising System.

These specifications align with standard requirements for web-based academic advising systems, ensuring optimal performance and user experience (Okolo & Ogbozor, 2022).

Application Requirements

The application requirements are as follows:

- XAMPP is a popular open-source software package that provides a complete web server solution for developers. It stands for Cross-platform (X), Apache (A), MariaDB (M), PHP (P), and Perl (P), representing the components it includes. XAMPP allows users to set up a local web server environment on their computer, making it easy to develop and test web applications without the need for a dedicated server.

- Microsoft Windows is a widely used operating system developed by Microsoft. It provides a user-friendly and intuitive interface, making it accessible to users with varying levels of technical expertise. Windows offers extensive compatibility with software applications, including web development tools and frameworks like XAMPP.

Following the detailed methodology outlining the system design and development process, the next section presents the results of implementing these methods. The following section presents the outcomes of the development, highlighting the system's interface, key functionalities, and overall performance. These results reflect the system's capability to improve the academic advising process compared to the previously traditional approach.

Results and Discussion

This section explains the results of the system interface. The system interface was developed using HTML, CSS and JavaScript. Then, PHP language was used to accomplish system functions and to connect with MySQL database.

Based on the comparative study in the Table 1, technology used in Malaysia is limited. Hence, this influences to develop a systematic approach for academic advising purposes. This system is designed to be user friendly and real times update. Moreover, the advisor role in Malaysia mostly consists of academic staff. The academic staff responsibilities are not limited to teaching and learning in the class and research activities, however they also need to provide guidance to their students that are assigned to them. This system creates advisor roles to help the academic staff to monitor their students efficiently and make sure their students are in the right path. Additionally, different class schedules between academic staff and students make the engagement low and difficult to communicate physically. Hence, it influences this system to design interface for Enquiries for the student to ask any questions to the advisor. Despite the tight schedules, the advisor still can make time to solve the enquiries without missing any questions from the students.

Homepage

The UTMSPACE Academic Advising System consists of a homepage as shown in Figure 1, in which all the login pages options are accessible. It serves as the central hub for accessing various features and functionalities. The homepage supports three components such as student Login, Advisor Login and

Admin Login. The HTML structure provides the foundation for organizing elements, while CSS enhances the visual appearance and styling. JavaScript adds interactivity, allowing for dynamic content loading and user-friendly features. PHP handles server-side processing, retrieving data from MySQL database to populate the homepage with relevant information. Bootstrap ensures a responsive and mobile-friendly layout, optimizing the user experience across different devices.

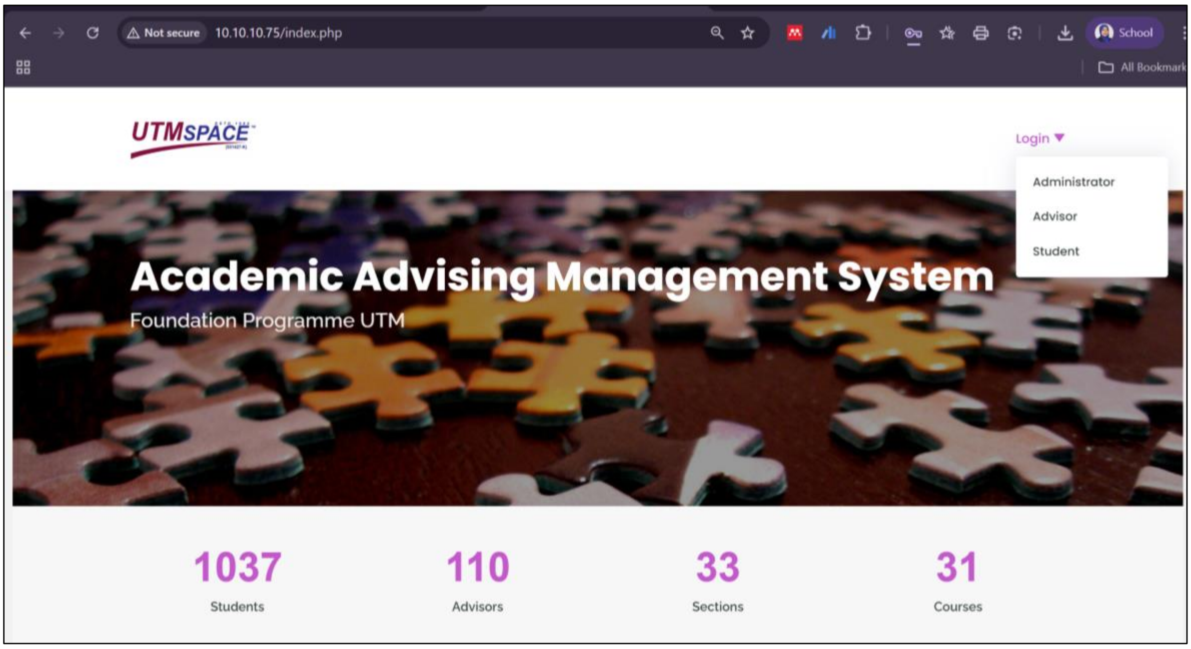


Figure 1: Home Page of UTM SPACE Academic Advising System

User

The UTMSPACE Academic Advising System supports three different types of users, such as Administrator, Advisor, and Students. Each different types of users have a different graphic user interface (GUI) and possible actions. Username and password are required as user authentication to verify the user's identity before allowing them to access a system. It's an important part of information security that helps protect against unauthorized access and cyber-attacks.

Administrator's Interface

The admin login page requires admin to insert username and password. Upon successful validation, admins gain access to the system's administrative features. The Admin Login page is created using HTML for input fields, CSS is used for styling, and JavaScript handles form validation and authentication. The Admin Login page is shown in Figure 2 below.

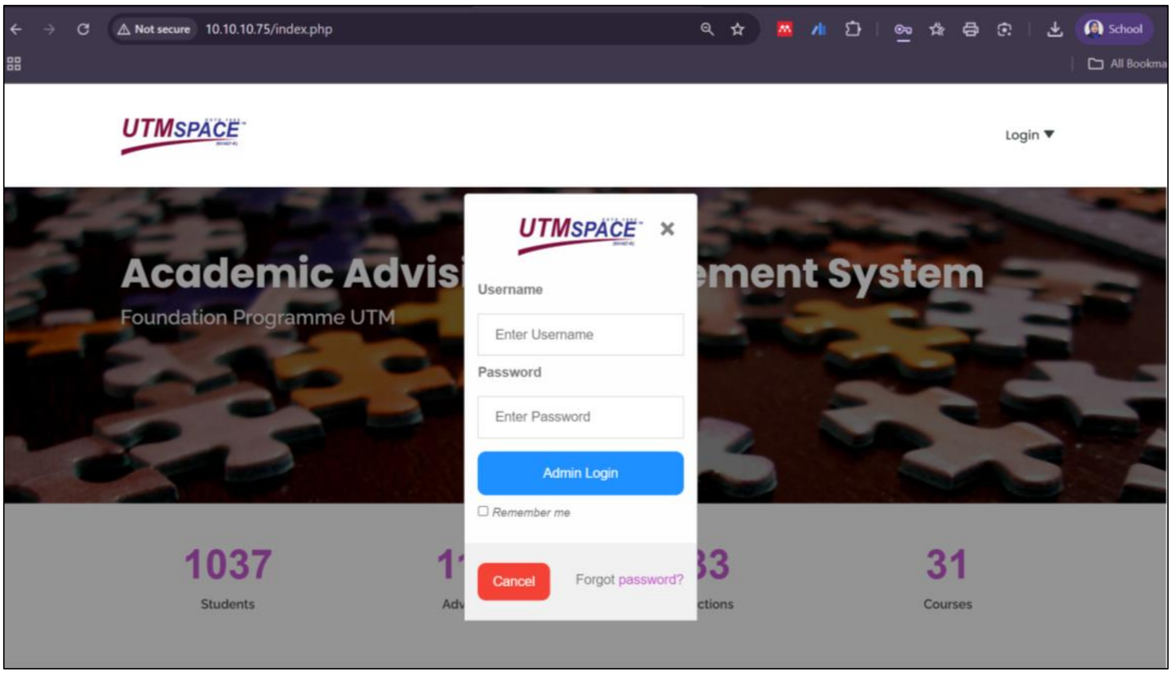
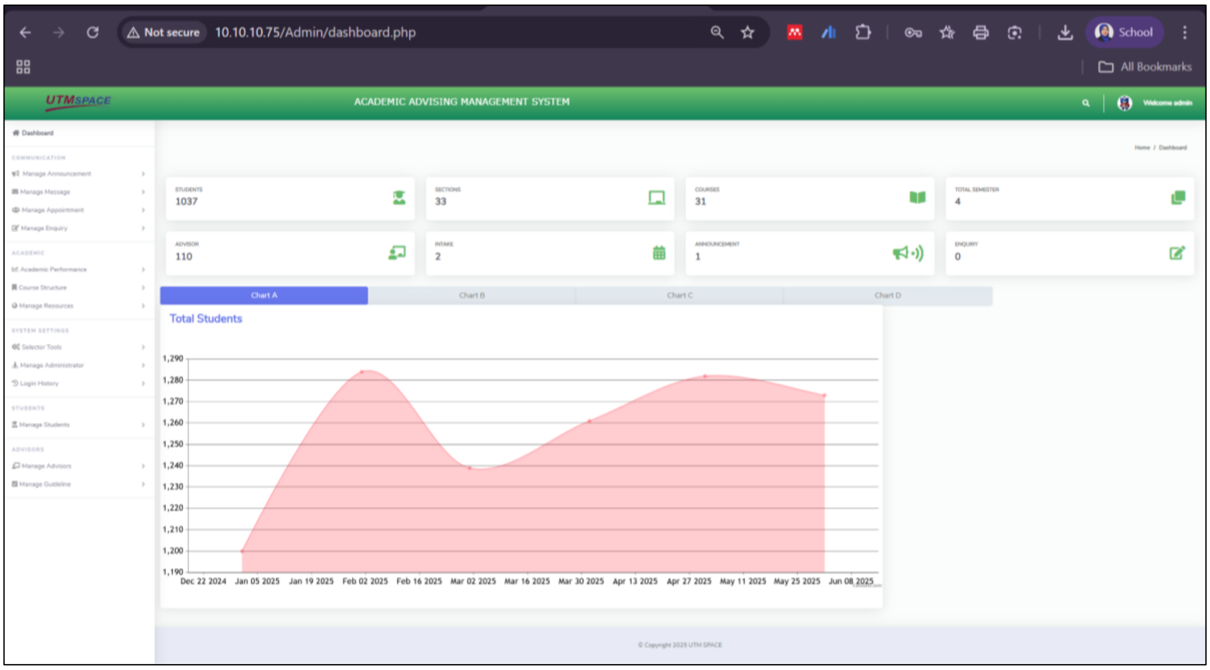


Figure 2: Admin Login Page. The interface for system administrators to securely access the platform using their credentials. It includes input fields for username and password along with a login button.

After admin login successfully, the admin dashboard will be displayed. The design of Admin Dashboard utilizes HTML and CSS to structure and style the UI elements. Admin dashboard is created using PHP and MySQL to manage server-side processing and database connections. Bootstraps are used to create a comprehensive and interactive interface for the admin dashboard. While JavaScript can enhance the admin dashboard with dynamic content and data management capabilities. Figure 3 shows the interface of the admin dashboard.

The role of administrator is to maintain student records, manage student enquiries, advising students, accessing student details, categorizing problems, and assigning faculty. In addition, the administrators are responsible for monitoring student issues efficiently, providing guidance to the students and academic advisors, as well as track academic progress. Implemented with PHP, MySQL, Bootstrap, CSS, JavaScript, and HTML, the admin dashboard streamlines the problem-resolution process, enhances student support, and facilitates effective academic advising.



STUDENTS 1037

SECTIONS 33

COURSES 31

TOTAL SEMESTER 4

ADVISOR 110

INTAKE 2

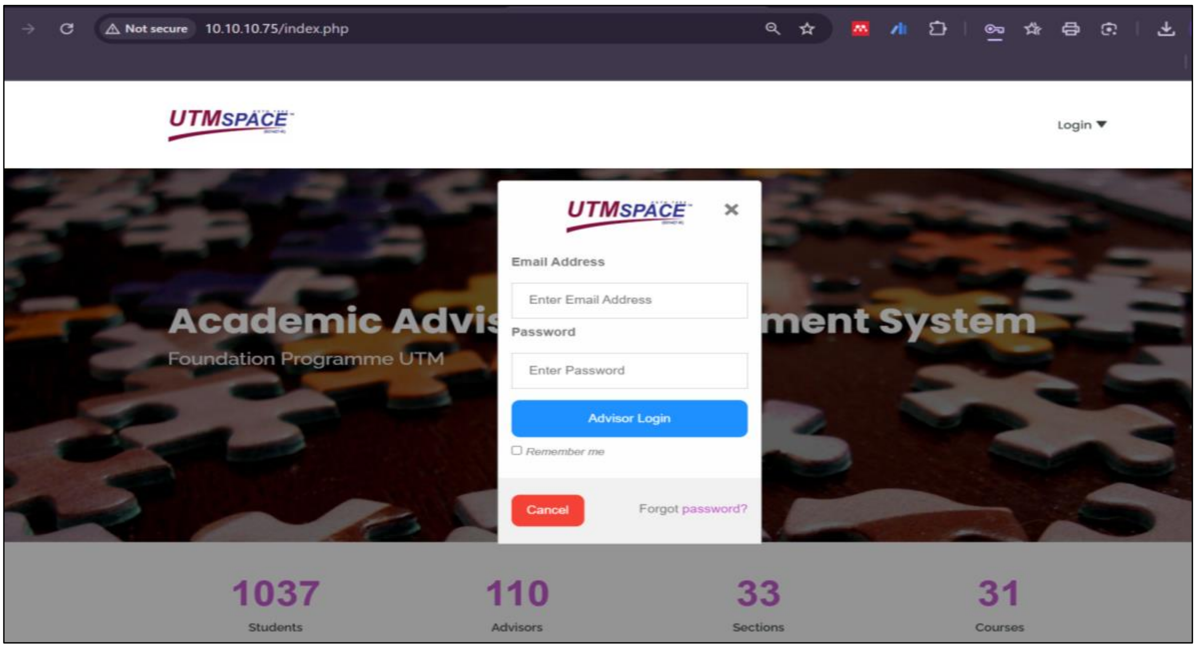
ANNOUNCEMENT 1

ENQUIRY 0

Figure 3: Admin Dashboard. The main control panel for administrators, displaying system overview, user management tools, and quick access to key administrative functions

Advisor’s Interface

Figure 4 shows the Advisor Login Page. The input fields are created using HTML for the advisors to insert their username and password. Upon successful validation, the Advisor could access the system’s administrative features. The structures of elements and styling were created using CSS, and then JavaScript is used to manages form validation and user authentication.



⚠ Not secure 10.10.10.75/index.php

UTMSPACE

Login ▾

Academic Advis ment System

Foundation Programme UTM

Email Address

Enter Email Address

Password

Enter Password

Advisor Login

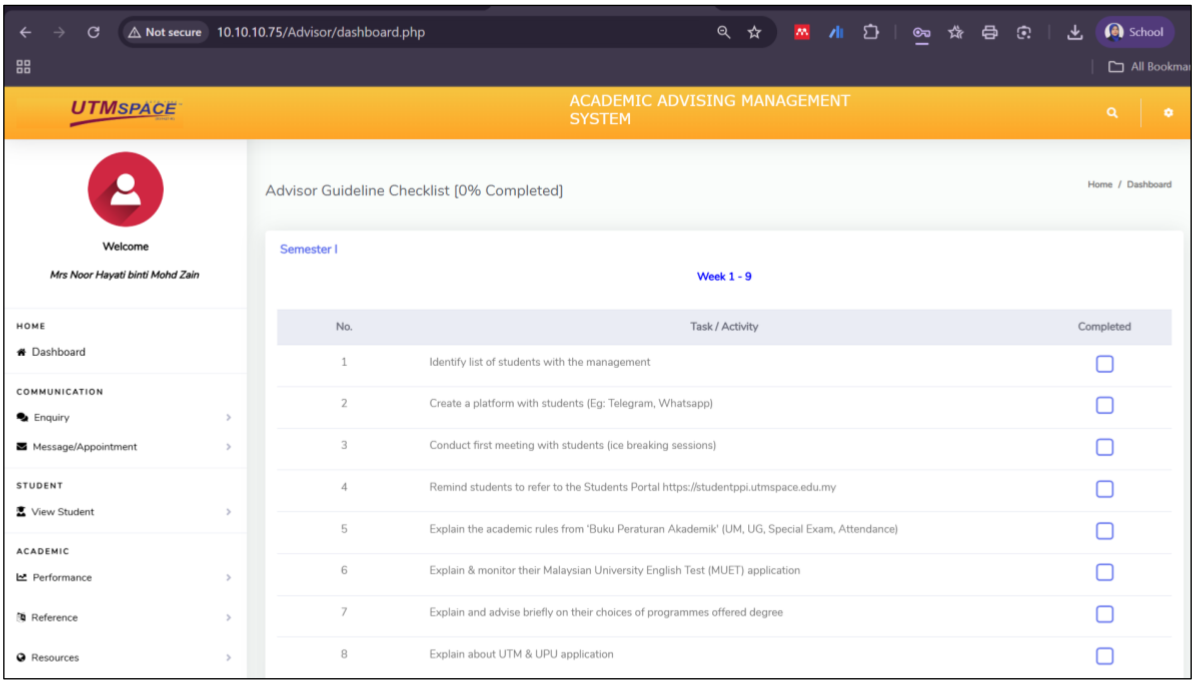
□ Remember me

Cancel

Forgot password?

1037	110	33	31
Students	Advisors	Sections	Courses

Figure 4: Advisor Login Page. The interface for advisor to securely access the platform using their credentials. It includes input fields for username and password along with a login button



⚠ Not secure 10.10.10.75/Advisor/dashboard.php

UTMSPACE

ACADEMIC ADVISING MANAGEMENT SYSTEM

Welcome

Mrs Noor Hayati binti Mohd Zain

HOME
- Dashboard

COMMUNICATION
- Enquiry
- Message/Appointment

STUDENT
- View Student

ACADEMIC
- Performance
- Reference
- Resources

Advisor Guideline Checklist [0% Completed]

Home / Dashboard

Semester I

Week 1 - 9

No.	Task / Activity	Completed
1	Identify list of students with the management	□
2	Create a platform with students (Eg: Telegram, Whatsapp)	□
3	Conduct first meeting with students (ice breaking sessions)	□
4	Remind students to refer to the Students Portal https://studentppi.utmspace.edu.my	□
5	Explain the academic rules from 'Buku Peraturan Akademik' (UM, UG, Special Exam, Attendance)	□
6	Explain & monitor their Malaysian University English Test (MUET) application	□
7	Explain and advise briefly on their choices of programmes offered degree	□
8	Explain about UTM & UPU application	□

Figure 5: Advisor Dashboard. The main interface for academic advisors, providing access to student profiles, advising history, and tools for managing appointments and academic recommendations.

The role of Advisor is to monitor their students' academic performance and progress, communicate with the students effectively using the Enquiries section and monitor their task guidelines. Figure 5 shows Advisor dashboard in the UTMSPACE Academic Advising System. The advisor's dashboard displays guidelines according to the week given. The checklist guidelines provide a list of tasks and activities that should be followed by advisors to engage with the students from time to time. The activities are divided into two semesters, and the advisor needs to tick the complete box after the activity is completed successfully. This system allows the advisor to manage their account settings, update their profile information, and change their passwords. Implemented with PHP, MySQL, JavaScript, HTML, and CSS, the Advisor dashboard offers a user-friendly interface for advisors to efficiently navigate and utilize these functions in the UTMSPACE Academic Advising System.

Student's Interface

The Student Login page is shown in Figure 6. The student must insert a username and password to login to the system. Upon successful validation, the student gains access to the system's administrative features. If the student forgot their password, they could click the forgot password button to reset the password.

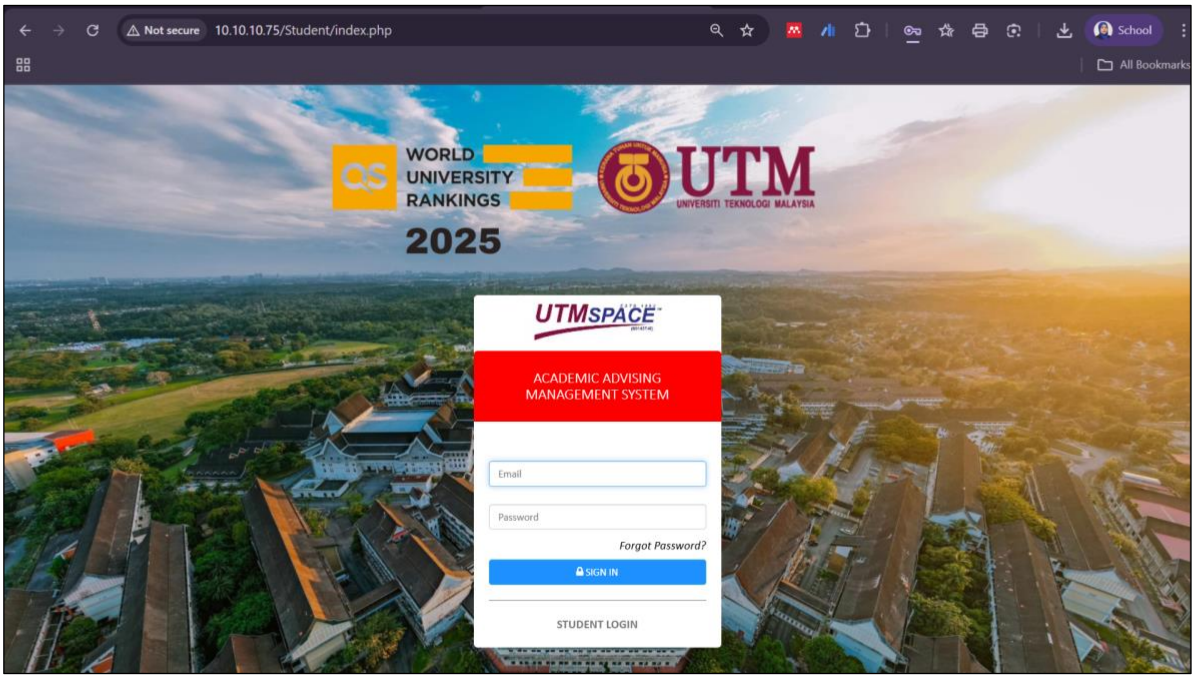
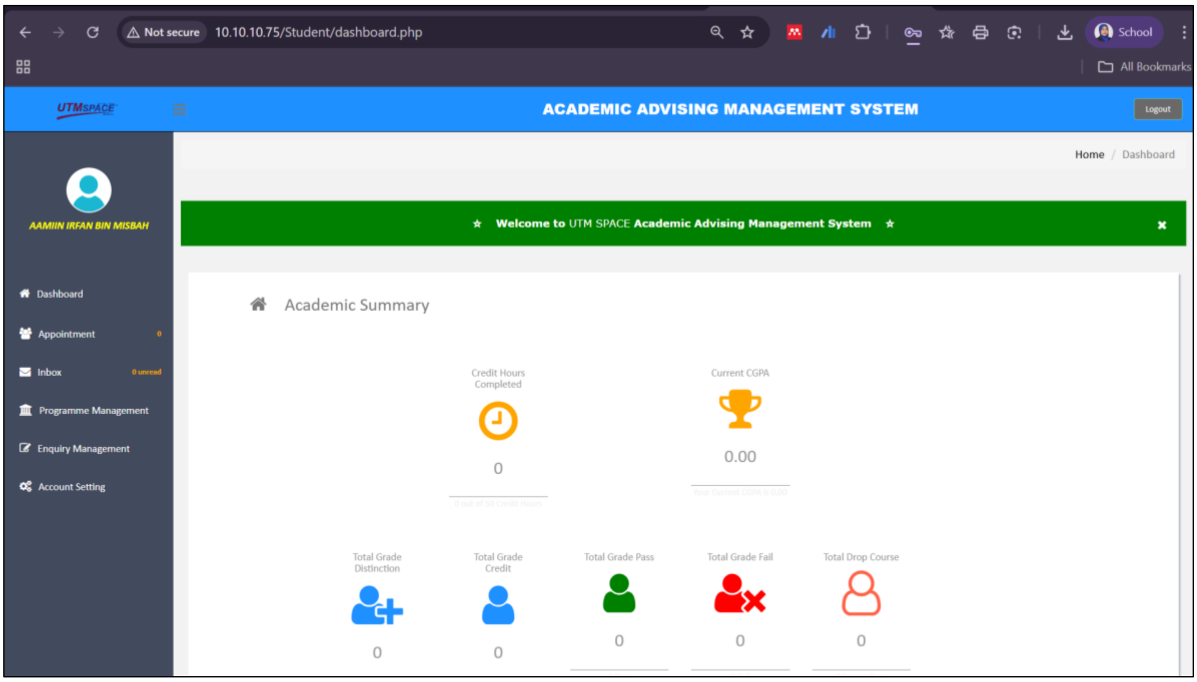


Figure 6: Student Login Page. The interface for students to securely access the platform using their credentials. It includes input fields for username and password along with a login button



ACADEMIC ADVISING MANAGEMENT SYSTEM

★ Welcome to UTM SPACE Academic Advising Management System ★

Academic Summary

Credit Hours Completed: 0 (0 out of 50 Credit Hours)

Current CGPA: 0.00 (Your Current CGPA is 0.00)

Total Grade Distinction: 0

Total Grade Credit: 0

Total Grade Pass: 0

Total Grade Fail: 0

Total Drop Course: 0

Figure 7: Student Dashboard. The student's personalized interface displaying academic information, advising schedules, and access to guidance resources to support academic planning and progress.

After the student logs in successfully, they can view the student dashboard in the UTM SPACE Academic Advising System as displayed in Figure 7. The student dashboard shows the number of new enquiries, enquiries in process and completed enquiries. The role of students is to seek advice if they have any problems and access their problem history for reference and tracking. This system allows students to manage their account settings, update their profile information, and change their passwords for enhanced security. Implemented with PHP, MySQL, JavaScript, HTML, and CSS, the student dashboard offers a user-friendly interface for students to efficiently navigate and utilize these functions in the UTM SPACE Academic Advising System.

While the system was developed and tested internally to meet design specifications and technical requirements, it is recognized that incorporating actual user feedback is essential for ensuring optimal usability and impact. Hence, a key recommendation for future research is to conduct empirical studies involving academic advisors and students to gather their perspectives, identify usability challenges, and assess the system's influence on academic advising outcomes such as advising efficiency, student satisfaction, and academic performance.

In summary, the UTMSPACE Academic Advising System demonstrates effective implementation across all user interfaces: Administrator, Advisor, and Student through a combination of modern web technologies and user-focused design. The system's structured features, such as the enquiry tracking, checklist guidelines, and role-specific dashboards, offer significant improvements in usability, efficiency, and user engagement when compared to traditional advising methods. These outcomes form the basis for the following conclusion and recommendations, which highlight the system's broader implications and potential for future development.

Conclusion and Recommendation

The web-based Academic Advising System for UTMSPACE Foundation Programs has effectively addressed limitations in traditional advising through technological integration and user-centered design. By implementing distinct modules for administrators, advisors, and students, the system successfully streamlines communication, improves the accessibility, and provides tools for proactive academic monitoring. The advisor and students interface module facilitates structured guidance and promotes engagement through direct communication channels and self-service capabilities through features such as checklist guidelines and grade calculators. Development through the SDLC methodology ensured systematic progression from requirements analysis to implementation, resulting in a secure and functional system that meets institutional needs. This advising platform not only improves operational efficiency but also supports student retention and academic success.

Moreover, the system's architecture allows for future upgrades, establishing a sustainable framework for academic advising in foundation programs and potentially other educational contexts. As this paper focuses primarily on the system's design and development, user feedback and performance evaluation have not yet been conducted; these aspects will be explored in future studies to assess the system's real-world effectiveness. Future research could focus on evaluating the system's impact on student outcomes, including retention, advising satisfaction, and academic performance, through empirical studies. Additionally, adapting and implementing the system in different academic settings would help assess its scalability and broader applicability. Integrating advanced features such as predictive analytics and mobile compatibility could further enhance the effectiveness and accessibility of academic advising services.

Acknowledgements

The authors would like to thank UTMSPACE and the Potential Development Fund (PDF) grant vote no: SP-PDF2408 for the financial funding to this research.

References

Afify, E., & Nasr, M. (2017). A proposed model for a web-based academic advising system. *International Journal of Advanced Networking and Applications, 9*(2), 3345–3361.

Grites, T. J. (2013). Developmental academic advising: A 40-year context. *NACADA Journal, 33*(1), 5–15.

Henderson, L. K., & Goodridge, W. (2015). AdviseMe: An intelligent web-based application for academic advising. *International Journal of Advanced Computer Science and Applications, 6*(8), 129–135.

Ismail, S. A., Mohamed, A. R., & Ahmad, J. (2020). Academic advising in Malaysian higher education: Challenges and strategies. *Malaysian Journal of Learning and Instruction, 17*(1), 45–64.

Kift, S. M. (2009). *Articulating a transition pedagogy to scaffold and to enhance the first-year student learning experience in Australian higher education*. Final Report for ALTC Senior Fellowship Program.

Kotyk, V., & Vavruk, Y. (2022). Comparative Analysis of Server and Serverless Cloud Computing Platforms. *Advances in Cyber-Physical Systems*, 7, 115-120.

Mohd Noor, N. M., Hassan, Z., & Mamat, N. (2019). Academic advising practices in Malaysian universities: An exploratory study. *Journal of Education and Learning, 13*(2), 77–85.

Nwelih, E., & Chiemeke, S. (2012). Framework for a web-based spatial decision support system for academic advising. *African Journal of Computing and ICT, 5*(4), 121–126.

Okolo, L. A., & Ogbozor, C. O. (2022). Design and development of a web-based student academic advising system for Enugu State College of Education (Technical), Enugu. *Journal of Educational Research and Policy Studies (ESCJERPS), 2*(2), 123–130.

Sommerville, I. (2016). *Software Engineering* (10th ed.). Pearson.

Thomas, L. (2012). Building student engagement and belonging in Higher Education at a time of change. *Paul Hamlyn Foundation*, 100(1-99), 1-102.

Wiegers, K., & Beatty, J. (2013). *Software Requirements* (3rd ed.). Microsoft Press.