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User-Centered Design for a Multi-Role Academic Support System in Higher Education

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ABSTRACT

Effective academic support is a critical component of student success in higher education. As institutions increasingly adopt student-centered learning models, academic counseling emerges as a key mechanism to provide guidance and address individual learning needs. Despite its importance, the counseling process often suffers from structural limitations. Lecturers face heavy workloads that constrain their ability to offer personalized support, while counseling records are typically fragmented and difficult to track. This study aims to design and develop a multi-user system to streamline academic advising and student progress monitoring. The platform incorporates four essential functions: academic scheduling, counseling engagement, performance tracking, and study plan records. It is intended to serve a range of users, including students, faculty advisors, academic staff, and institutional leaders, by facilitating timely and data-informed decision-making. To ensure the system aligns with user needs, a User-Centered Design (UCD) methodology was applied. Focus group discussions were conducted with stakeholders across various roles, including students, lecturers, program heads, deans, and academic staff. The insights were translated into functional requirements, flowcharts, information architecture, and user interface design. The paper also discusses the iterative design process, highlights challenges encountered during development, and offers recommendations for institutions seeking to implement integrated academic support systems using the POUR (Perceivable, Operable, Understandable and Robust) framework as the basis.

Keywords: academic counseling, digital platform, multi-user, user-centered, UI/UX

INTRODUCTION

Academic counseling is a formal service provided by university lecturers to support students throughout their academic journey in Indonesian higher education (Wong et al., 2022). Lecturers serve as appointed academic advisors, guiding students from enrollment as first- year students through to graduation. The main goal of academic counseling is to monitor each student's academic performance, ensuring timely graduation and helping them navigate learning challenges (da Silva et al., 2016). To support this goal, students are encouraged to actively participate in academic counseling as part of a student-centered learning approach, one of the core principles of university education. These sessions provide students with opportunities to discuss academic progress, study plans, personal challenges, and achievements with their assigned advisor through various methods, whether onsite or online, and in written or verbal (Sari, 2021).

Since 2007, as one of private universities in Indonesia that aspires to be the leading institution in the field of ICT, Universitas Multimedia Nusantara (UMN) serves as the case study for this project. With more than 10.000 enrolled students, UMN consists of

four faculties: the Faculty of Engineering & Informatics, the Faculty of Art and Design, the Faculty of Communication, and the Faculty of Business. Our academic offerings span a wide range of programs, including Diploma of Hospitality Management; Bachelor of Accounting, Management, Communication Science, Journalism, Architecture, Visual Communication Design, Film and Animation, Electrical Engineering, Engineering Physics, Computer Engineering, Information Systems, Informatics as well as Master of Technology Management and Communication Science (umn.ac.id, 2025).

Despite the availability of approximately 32 digital platforms to support the institutional services at UMN, a dedicated system for managing academic counseling has yet to be developed or implemented. In recent years, the increasing number of students, along with the growing diversity of academic needs and cases, has made it increasingly difficult for lecturers and academic staff to effectively monitor student progress. With the heavy workload of teaching, research, and community service, lecturers often have limited time to provide personalized academic guidance. Scheduling conflicts between lecturers and students further contribute to low engagement in academic counseling activities. At the same time, academic staff face challenges managing fragmented and unstructured counseling data, leading to difficulties in tracking student development and generating accurate reports. This lack of integration compromises the quality of services provided. From an institutional perspective, decision- makers such as the rectorate, deans, and heads of study programs struggle to access reliable data, making it difficult to formulate well-informed academic policies and interventions.

In general, UMN requires students to participate in academic counseling at least three times per semester, as outlined in the academic handbook distributed at the start of their studies. These sessions must be documented to track each student's academic development across semesters. Currently, several study programs at UMN use varied documentation methods, ranging from Google Forms and digital worksheets to physical logbooks. However, this lack of standardization has proven ineffective, making the documentation difficult to monitor and incompatible with existing academic systems. This issue has been consistently specified over the years, particularly during monitoring and evaluation processes conducted by the Quality Assurance Department, as well as during national and international accreditation assessments.

In response to these challenges, and through a collaborative effort between the Visual Communication Design program, Information Systems program, and the university's Academic Information Department, this project proposes the development of an integrated information system to support academic counselling at UMN. The system will provide customized access to students, lecturers, deans, heads of programs, academic staff, and the rectorate, tailored to their specific roles and needs. It aims to facilitate five key features, including progress tracking, study planning, counseling activity, scheduling, and session records. Additionally, the system will enable academic staff and university's decision makers to monitor counseling activity and engagement more effectively. Integration with UMN's existing academic platforms is a key objective of this initiative.

de-lite
Vol. 5, No. 1

LITERATURE REVIEWS

User Interface/ Experience (UI/UX)

Designing digital platforms, whether applications, web-based systems, or interactive media, requires more than just visual appeal. It begins with a deep understanding of user context, goals, and behavior patterns. The core of this process is understanding the target user, including their knowledge, expectations, challenges, and motivations. An effective platform is not only visually engaging but also capable of solving the right problems and helping users achieve their goals in meaningful ways (Tidwell et al., 2020). While UI (User Interface) and UX (User Experience) are distinct, they are deeply interconnected. UX focuses on macro-level elements that are more subjective, emotional, and experiential-based, while UI addresses micro-level aspects that are more objective and controllable. The process of UI/UX design is iterative by nature, involving a continuous cycle of researching, designing, prototyping, testing, and refining. This back-and-forth exchange is essential to ensure that the final product is both functional and relevant.

Visual hierarchy, interaction flow, and consistency are considered foundational elements that shape how users navigate and utilize a digital platform. These components not only support usability but also influence user satisfaction and task efficiency. To guide the creation of such user-centered experiences, Peter Morville's UX Honeycomb identifies seven key dimensions of meaningful User Experience (UX): useful, usable, desirable, valuable, findable, accessible, and credible (Interaction Design Foundation, 2018). These principles expand the focus beyond functionality, emphasizing emotional and contextual resonance with users.

Complementing this perspective, Kearney (2018) emphasizes that placing people at the center of a project requires making accessibility a core priority, particularly when the platform serves a wide range of users with varying roles and needs. Accessibility ensures that all individuals, regardless of ability or context, can interact with the system effectively. This principle is further articulated in the Web Content Accessibility Guidelines (WCAG) 2.0, which are organized around the POUR framework:

1. Perceivable (can users understand the content?)
2. Operable (can users use UI components and browse content?)
3. Understandable (can users understand the content and interface without confusion?)
4. Robust (can content be consumed by a wide variety of user granted access?)

Accessibility is also part of a broader framework known as Universal Design, which seeks to ensure that products are usable by the widest possible range of people, regardless of ability, background, or circumstance. According to Kearney (2018), universal design incorporates seven principles: equitable use, flexibility, simplicity, perceptible information, tolerance for error, low physical effort, and appropriate space for interaction. By integrating these frameworks, a platform can be developed that not

only functions well but also supports diverse users in real contexts with clarity and purpose.

Mobile Application

Mobile applications remain a central focus in modern software development due to their widespread adoption and versatility across various user contexts. As dependence on mobile platforms increases, concerns regarding their reliability have grown. Wimalasooriya et al. (2022) note that although reliability testing is commonly addressed in the literature, there is a need for broader attention to factors such as context-awareness, self-recovery, system aging, and runtime event handling. They argue that future research should move beyond conventional testing and integrate real-world usage scenarios and industry-standard quality practices to enhance the resilience of mobile applications.

In addition to reliability, user experience plays a critical role in the success of mobile apps. Vyas et al. (2024), through a systematic review using the TCCM (Theory, Context, Characteristics, Methodology) framework, identified key elements influencing mobile user experience, including interface design, responsiveness, and functional consistency. Their work offers a unified framework for developers to enhance app quality from a user-centered perspective.

In the educational domain, the demand for adaptive mobile learning applications continues to rise. Nepomuceno et al. (2024) examined the software architecture of such systems and highlighted the effectiveness of service-oriented and microservice-based architectures in supporting scalability and flexibility. As personalized digital learning becomes increasingly essential, these architectural strategies are proving vital for delivering responsive and adaptive educational experiences.

Web-based Systems

Web-based systems have become foundational to modern digital infrastructure due to their accessibility, cross-platform compatibility, and ease of maintenance. They support a broad spectrum of applications, from e-commerce platforms to complex enterprise solutions. As these systems grow more dynamic and user-centered, their architectural design and performance optimization have become critical to success.

One key concern in web system development is application state management (ASM), which involves handling data and interface states across user interactions. Donvir et al. (2024) provide a comprehensive review of ASM strategies in web-based systems, categorizing them into local state management (such as JavaScript objects or browser storage), state libraries (such as Redux or MobX), and server-side management (such as sessions or REST APIs). Each method involves trade-offs in complexity, performance, and developer control. Effective state management is especially

important in single-page applications (SPAs), where interfaces must reflect backend data without full-page reload.

Another emerging concern, particularly in mobile web contexts, is energy efficiency. As battery- powered device usage increases, developers must balance performance with power consumption. Dornauer and Felderer (2023) reviewed a decade of research on energy-saving techniques, including JavaScript optimization, content compression, reduced screen redraws, and intelligent caching. These approaches not only conserve energy but also enhance load times and reduce server load. However, the authors note a lack of standardized frameworks for measuring energy efficiency, calling for more integrated approaches in the software development lifecycle.

Architecturally, web systems are shifting from monolithic designs to modular, service-oriented architectures. Microservices offer benefits such as scalability, parallel development, and fault isolation but pose new challenges in orchestration, service discovery, and state synchronization. Research increasingly explores how cloud-native tools like Docker and Kubernetes, along with reactive programming approaches such as RxJS, support these distributed systems.

User experience and performance also remain at the forefront of web design priorities. Users expect fast, seamless, and personalized interactions across devices. This demand has driven the adoption of front-end frameworks like React, Vue, and Angular, although these frameworks can introduce complexity in terms of bundle size and rendering performance. Developers are increasingly turning to server-side rendering (SSR), static site generation (SSG), and code splitting to maintain interactivity while improving speed and efficiency.

Existing Study

When working with single studies or small sample sizes, it becomes essential to review and synthesize existing research to gain a richer perspective, establish a relevant theoretical foundation, and identify research gaps or directions (Booth et al., 2016). Given the project's emphasis on customization, it is critical to examine existing studies to gain insights into past limitations and challenges, ensuring that previous shortcomings inform the design of a more accurate and contextual solution (Tidwell et al., 2020). To strengthen local relevance, this study also refers to existing journal articles and documented best practices related to academic platforms in Indonesia at the same level of education. These sources were analyzed and compared based on their methodologies and system testing outcomes, offering a more grounded basis for this research and its development framework. The following five studies were compiled as a preliminary reference.

Table 1 Comparison of Existing Studies

Journal Title	Paper Title	Authors	Background	Method	Findings
S@cies 7, no. 2 (2017)	*Pengembang an Sistem Informasi Bimbingan Akademik di STMIK STIKOM Indonesia*	Budayasa, Sandana	Limited support for transfer students and incomplete study progress tracking. Need for detailed performance indicators and recommendati ons.	Data collection, literature review, analysis, design, system development, testing, conclusion.	The system met functionality goals and successfully supported final project proposal similarity checks.
Jurnal Sistem Informa si Bisnis 9, no. 2 (2019)	*Perancangan Sistem Informasi Konsultasi Akademik Berbasis Website*	Manuhutu, Wattimena	To design a website-based system for easier academic consultation at Universitas Victory Sorong.	Prototype model and UML design methods.	System improved consultation efficiency; passed black box tests for error handling and data accuracy.
Jurnal Ilmiah Fifo 9, no. 1 (2017)	*Sistem E-konseling Terintegrasi Web dalam Upaya Meningkatkan Kualitas Bimbingan Akademik Mahasiswa*	Abdurrasyid, Yosrita, Amarullah	Face-to-face guidance scheduling and manual documentation problems; a web-based solution is proposed	Waterfall development; cognitive walkthrough and black box testing.	Web-based app met user needs, supported multi-role access, and enabled digital evaluations.
Informat ics and Digital Expert (INDEX) 1, no. 1 (2019)	*Pengembang an Sistem Informasi Layanan Bimbingan Akademik Mahasiswa*	Hikmatyar, Sumaryana	Ineffective guidance process at Universitas Perjuangan Tasikmalaya, need for controlled progress records.	Web-based system using PHP/MySQL; analysis, design, implementation, testing, maintenance.	System successfully built using PHP and MySQL for academic advising services.
Teknol. Inf 6, no. 1 (2022)	*Sistem Dokumentasi Elektronik (Logbook) Bimbingan Akademik Mahasiswa*	Wong, Tejawati, Hajrah, Pakpahan	Academic advising needs structured digital documentation ; proposes an electronic logbook system.	Waterfall method; black box testing based on electronic logbook.	System improved efficiency and effectiveness of academic guidance between lecturers and students.

Jurnal Teknologi Pendidikan, 26 (1), 2024	*Analysis of the Need for Development of a Virtual Space for Student Guidance and Counseling*	Wahyuni, Zamroni, Apriani, Fajarianto, Wahat	The limitations of academic guidance systems at Universitas Negeri Malang, particularly the lack of interactivity and accessibility in the existing SIAKAD platform. Many students face obstacles in receiving timely academic support due to busy lecturer schedules and ineffective communication tools. The need for a virtual, interactive, and student-centered guidance system becomes critical.	A development research approach comprising five stages: needs analysis, system design, implementation, evaluation, and dissemination. Data were collected through surveys of 39 students across five departments to understand current challenges in academic advising.	The e-Tutoring system was developed to meet the needs and received positive feedback for enhancing accessibility, interactivity, and support in academic advising

(Source: Yoliando, Wella, & Desiyanti, 2025)

Previous research on academic counseling systems has often been limited in scope, typically addressing the needs of only one user group, most often students or lecturers, without creating a platform that connects all key participants in the academic journey. Common tools like logbooks or standalone web forms are usually used in isolation, lacking both standardization and integration with broader institutional systems. As a result, they fall short in terms of long- term sustainability and scalability. Additionally, many existing solutions overlook the importance of user experience and accessibility, which diminishes their effectiveness for a diverse range of users. In response to these limitations, this study introduces an integrated, multi-user platform that unites students, faculty, academic staff, and institutional leaders within a single, streamlined ecosystem. Grounded in user-centered design and accessibility principles, the platform is broadly usable and compatible with the university's current digital infrastructure. With capabilities such as real-time progress tracking, structured record-keeping, and data-driven insights, the platform equips institutions to offer more effective, enduring, and policy-aligned academic support.

USER-CENTERED DESIGN

Analysis

User-centered design is widely recognized as an effective approach for designing products, services, or systems based on users' real-world activities, motivations, goals, and contextual understanding (Jiboku & Sodeinde, 2021). This method fosters more targeted and meaningful user engagement by focusing on specific needs rather than general human characteristics. It emphasizes the exploration of users' unique behaviors, preferences, and experiences to inform the development of tailored solutions for clearly defined challenges. According to Nielsen, this method enables designers to understand user patterns and needs, supporting an iterative process of design and usability evaluation. In this project, user-centered design is applied through focus group discussions (FGDs) involving 18 study program representatives, 5 academic staff, and 5 students. This process was intended to elicit deeper insights and ensure that the resulting academic platform aligns closely with the users' expectations, needs, and institutional context. The FGD summary is presented below.

1. The academic counseling process across study programs is still conducted manually and inconsistently. Some programs rely on physical documents, while others use digital files or online forms. Insights from deans and heads of study programs highlight a clear need for a centralized system to help lecturers and students store academic performance and counseling records.

2. Currently, the policy requiring three counseling sessions per semester is difficult for decision-makers to monitor, making a tracking system essential for verifying students' and lecturers' attendance and engagement.

3. Additional needs from heads and deputy heads of study programs include saving counseling results and agreed-upon study plans, checking transcripts and grade reports, tracking students' study duration, and sending centralized notifications for counseling schedules. They also emphasize the importance of integrating notes for students requiring special attention (e.g., challenges, health conditions, or special needs) across programs and departments.

4. In the long term, it is recommended that students be able to upload portfolios. This would allow academic advisors to monitor student progress and outputs, helping to prevent issues such as impersonation, plagiarism, or misuse of Artificial Intelligence (AI) tools. It would also provide better visibility of students' achievements, making it easier for lecturers to recommend for competitions, grants, or research opportunities.

All insights gathered from deans, heads of study programs, deputy head of study programs, lecturers, and students, as end-users of the platform, were analyzed and used as the foundation for designing this academic counseling system. Their needs, challenges, and expectations form the basis for developing a multi-user platform

consisting of three main interfaces: Lecturers Dashboard, Students Dashboard, and Admin Dashboard.

Design

The analysis results were translated into information architecture (IA) frameworks, which serve as structured approaches to organizing and labeling content for optimal comprehension, navigation, structure, and workflow design (Tidwell et al., 2020). This framework provided the foundation for developing flowcharts, along with low-fidelity and high-fidelity prototypes for the three platform types. The platforms for lecturers and administrators are designed as web-based systems accessible via desktop, while the student platform will be developed as a mobile application. This differentiation reflects the specific needs, behaviors, and preferences of each stakeholder group, as identified through the focus group discussions. The results as follows:

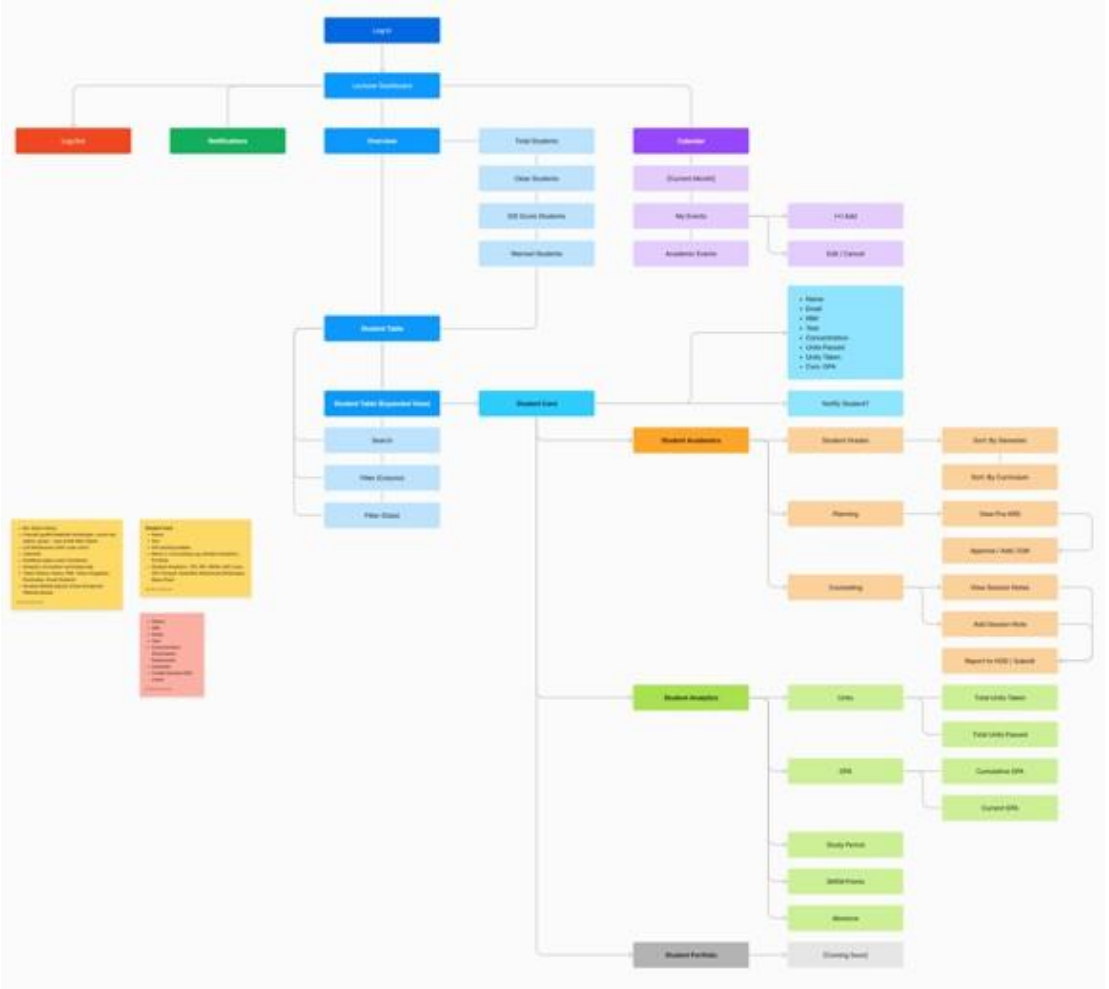

Figure 1 Lecturer's and Admin's IA Framework
(Source: Yoliando, Wella, & Desiyanti, 2025)

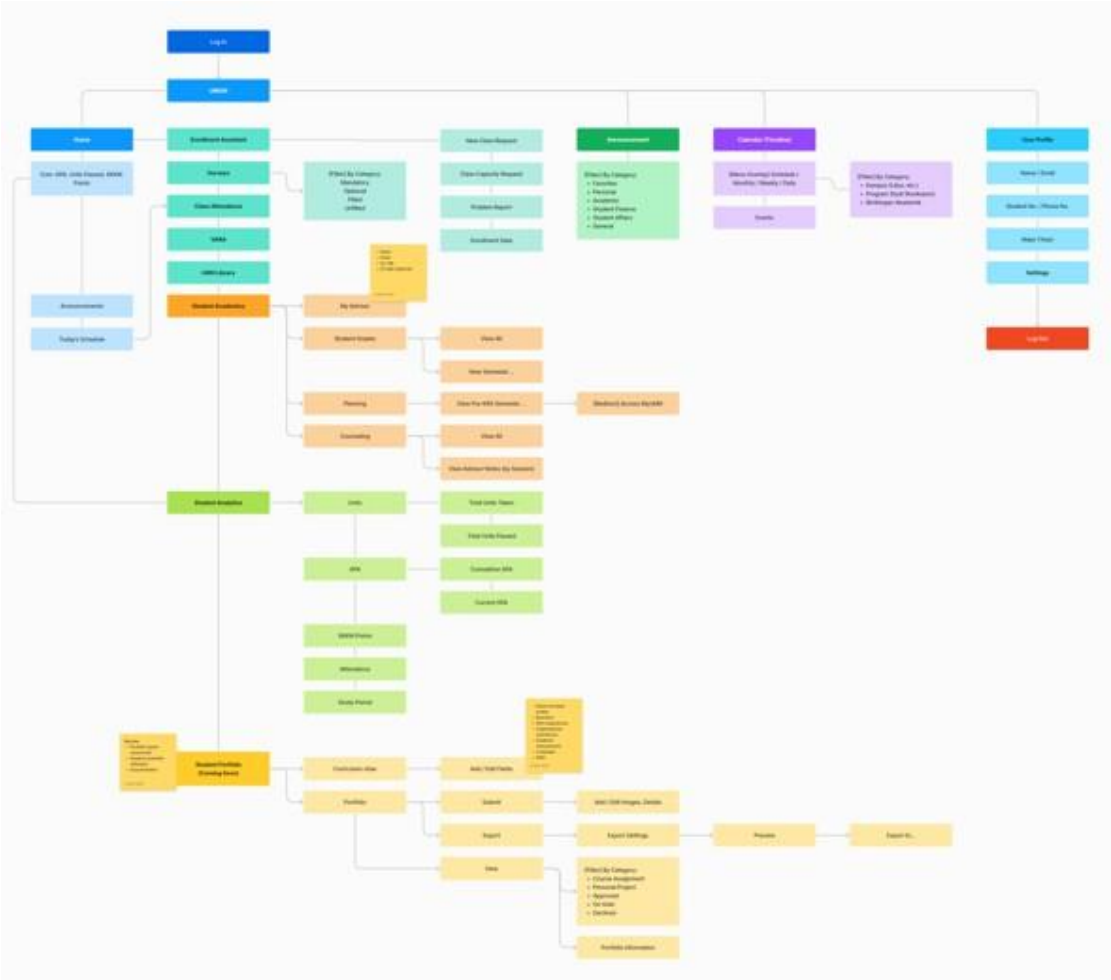

Figure 2 Student's IA Framework
(Source: Yoliando, Wella, & Desiyanti, 2025)

This framework provided the foundation for developing flowcharts, along with low-fidelity and high-fidelity prototypes for the three platform types. The platforms for lecturers and administrators are designed as web-based systems accessible via desktop, while the student platform will be developed as a mobile application. This differentiation reflects the specific needs, behaviors, and preferences of each user groups, as identified through the FGD. This was formalized through flowcharts that illustrate the user journey in utilizing the platform. To address the four main features, academic scheduling, counseling engagement, performance tracking, and study plan records, individual flowcharts were developed for each function.

de-lite
Vol. 5, No. 1

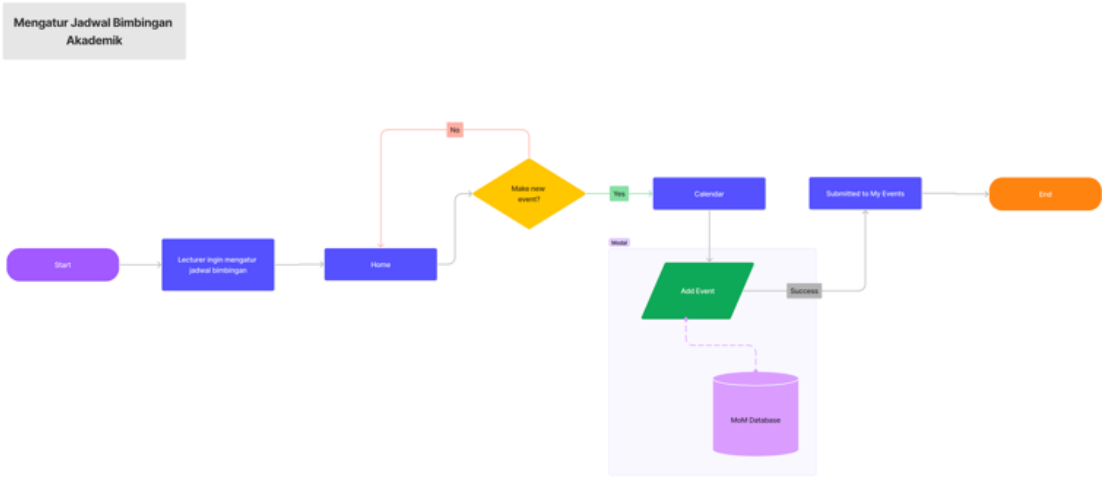

Figure 3 Academic Scheduling Flowchart
(Source: Yoliando, Wella, & Desiyanti, 2025)

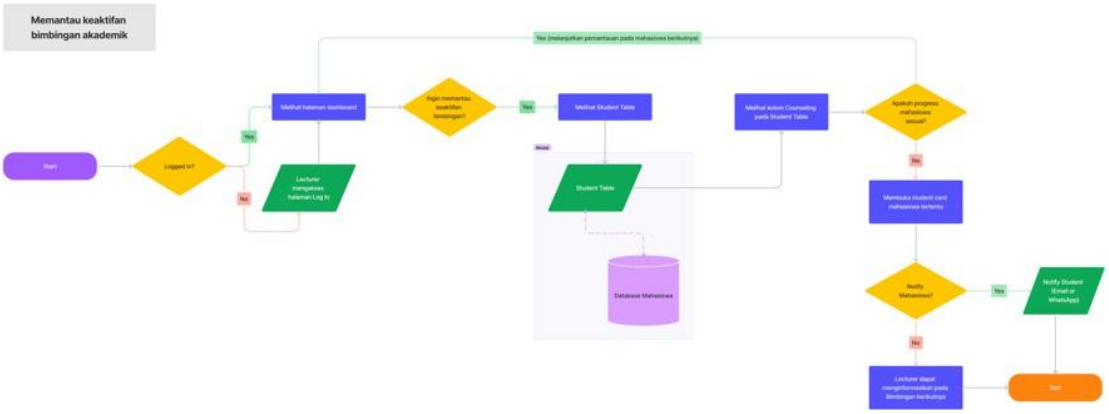

Figure 4 Academic Counseling Engagement Flowchart
(Source: Yoliando, Wella, & Desiyanti, 2025)

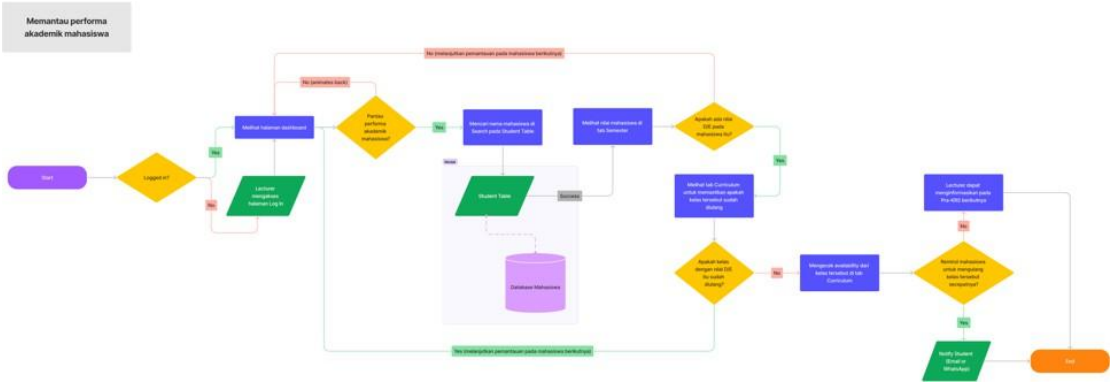

Figure 5 Academic Performance Tracking Flowchart
(Source: Yoliando, Wella, & Desiyanti, 2025)

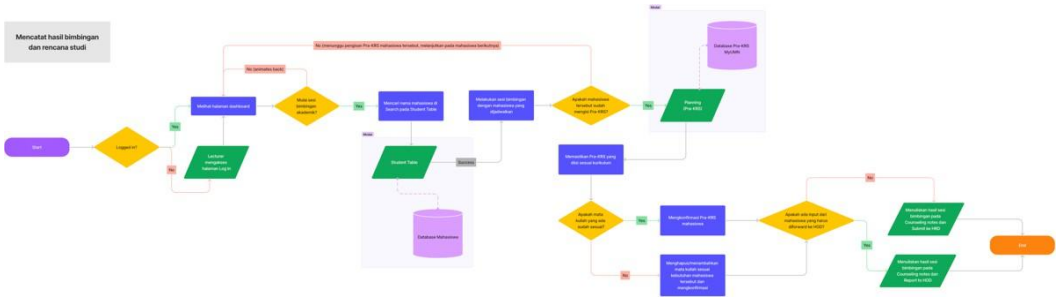

Figure 6 Academic Plan Records Flowchart
(Source: Yoliando, Wella, & Desiyanti, 2025)

The front-end design was developed by the Visual Communication Design Study Program in collaboration with faculty members and students. Meanwhile, the back-end development is handled by the Information Systems Study Program, also involving lecturers and students, in coordination with the Academic Information Department and the Information Technology Department. The design is subject to ongoing adjustments during the development phase and will be reviewed weekly by the relevant departments and study programs. The following are mockups of the user interface designs for each platform, all of which will be integrated into UMN's existing digital ecosystem at the final stage of development.

Lecturer's Dashboard

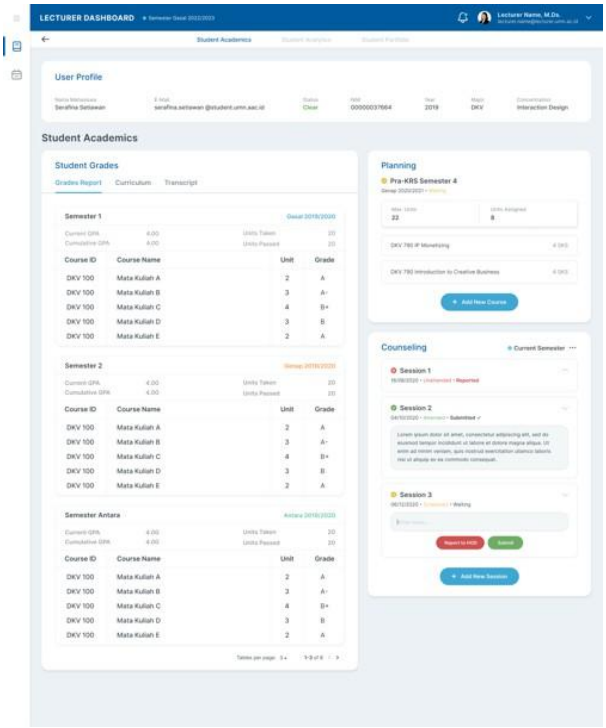

Figure 7 Lecturer's Dashboard
(Source: Yoliando, Wella, & Desiyanti, 2025)

de-lite
Vol. 5, No. 1

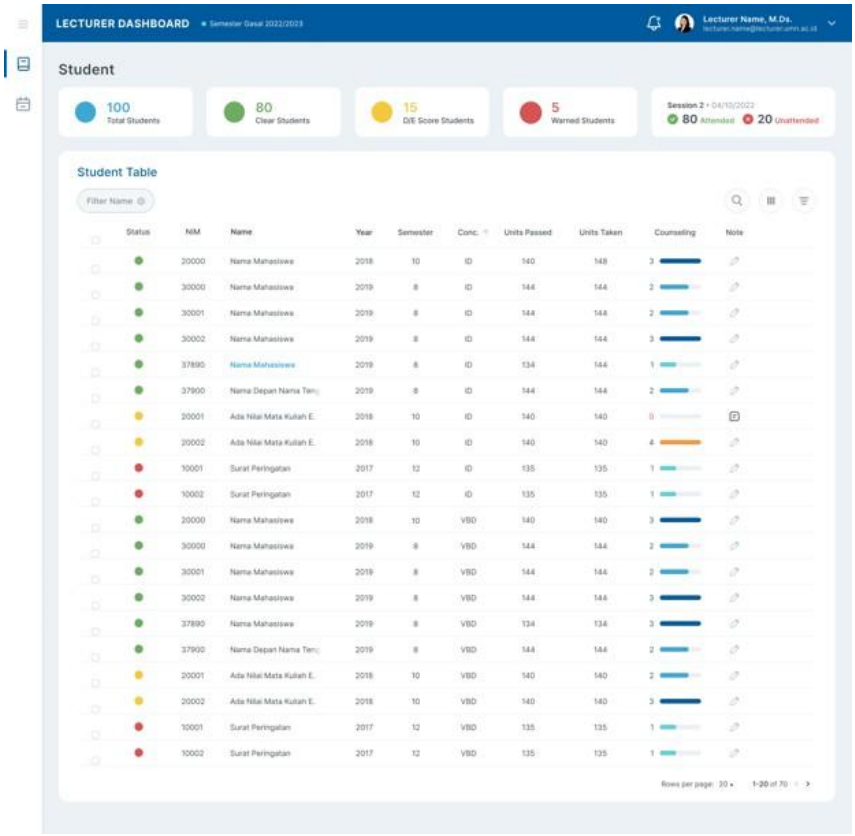

Figure 8 Lecturer's Dashboard
(Source: Yoliando, Wella, & Desiyanti, 2025)

Student's Dashboard

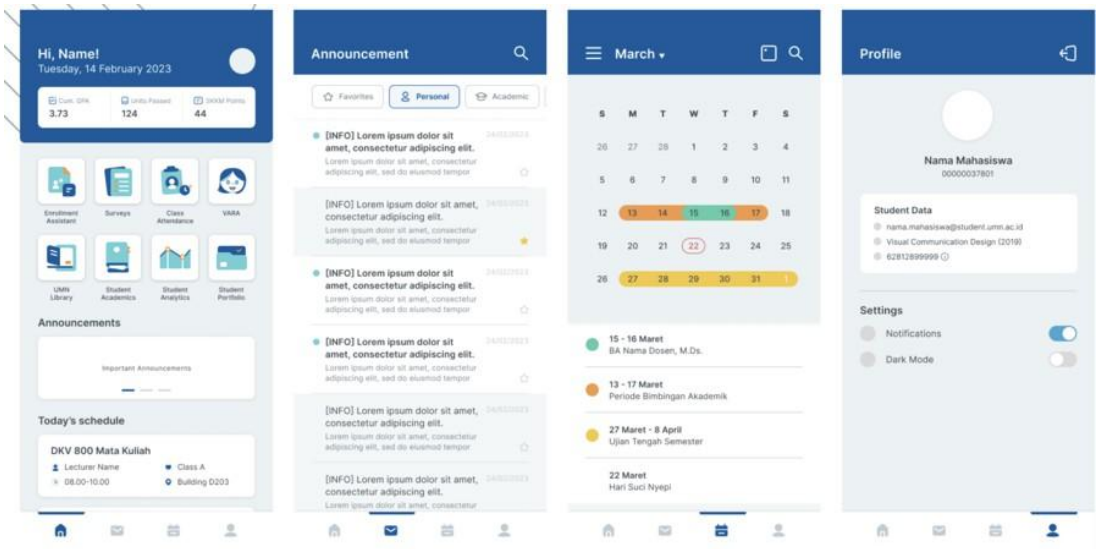

Figure 9 Student's Dashboard Interface
(Source: Yoliando, Wella, & Desiyanti, 2025)

DISCUSSION AND FUTURE WORK

At this final stage, the team, in collaboration with the relevant departments, conducted an in- depth evaluation of the user interface (UI), user experience (UX), features, and integration potential of the developed information system with existing systems already in use at the university. To ensure the smooth implementation of the system, an internal alpha test was conducted by the project team to evaluate its usability and core functionalities. Subsequently, a beta test was carried out with direct end users, specifically lecturers and students, through a demonstration followed by an online survey. The survey consisted of 12 statements measured on a ten-point scale, structured around the POUR (Perceivable, Operable, Understandable, and Robust) framework, and was administered to 35 program representatives.

The quantitative data obtained from the survey were analyzed using JASP's descriptive analysis tools. For each item, measures of central tendency and variability were calculated to assess overall user perceptions. Frequency distributions and percentage scores were also examined to identify patterns of agreement or disagreement across the statements. This approach provided a clear overview of the participants' evaluations, highlighting both strengths and potential areas for improvement in the system's design and functionality. The insights generated from this phase serve as evidence-based input for refining the platform and enhancing its overall quality in the subsequent development stage. The descriptive analysis results are presented in the following section.

Table 2 POUR Framework Test

Perceivable Criteria	Median	Mean	Std. Deviation
The interface makes it easy find what I am looking for.	9.000	8.471	1.155
The use of text, icons, and color codes is easy to distinguish.	9.000	8.543	1.120
The instructions and flow of this system are easy to follow.	8.000	7.629	1.416

Operable Criteria	Median	Mean	Std. Deviation
All features can be accessed and used without confusion.	8.000	7.882	1.558
All buttons and menus provide results as expected.	8.000	7.771	1.262
All information is presented in a way that is easy to read.	8.000	8.000	1.372

Understandable Criteria	Median	Mean	Std. Deviation
This makes the academic counseling scheduling easier.	9.000	8.294	1.724
This makes monitoring students' performance more practical.	9.000	8.431	1.460
This makes the discussion of study plans more effective.	8.000	8.200	1.232

Robust Criteria	Median	Mean	Std. Deviation
I can use the system smoothly and stably.	8.000	8.057	1.392
I can access all features without errors or crashes.	8.000	7.943	1.514
I receive access to information that is suited to my role.	8.000	8.114	1.409

The results of the POUR framework test indicate that the system performs strongly in several areas, particularly in the clarity of its visual design and its usefulness for academic performance monitoring. Under the Perceivable criteria, participants rated the distinction between text, icons, and color codes highly (M = 8.54, SD = 1.12), suggesting that the interface supports quick recognition and navigation. However, the lower score for the ease of following instructions and flow (M = 7.63, SD = 1.42) highlights a need for clearer onboarding and navigation guidance. For the Operable criteria, information readability was rated positively (M

= 8.00, SD = 1.37), yet there was a slightly lower agreement regarding the consistency of buttons and menus producing expected outcomes (M = 7.77, SD = 1.26). The Understandable criteria showed that the system is particularly effective in making academic performance monitoring more practical (M = 8.43, SD = 1.46), though opportunities remain to improve features for study plan discussions (M = 8.20, SD = 1.23). Under Robust criteria, role- appropriate access to information received strong agreement (M = 8.11, SD = 1.41), while some respondents noted occasional errors or crashes (M = 7.94, SD = 1.51). Overall, the findings suggest that while the platform is generally effective, targeted improvements in instructional clarity, functional consistency, system stability, and collaborative features could further enhance its quality and user experience.

This is further reflected in the final statement regarding the overall experience of using the system, which received positive feedback and performance ratings (M = 8.14, SD = 1.37). Several respondents also emphasized the need for a tutorial and deeper integration with other existing platforms. Based on these findings, further enhancements are necessary for long-term improvement. From the project process, the following recommendations are proposed:

1. Conduct focus group discussions (FGDs) with multiple stakeholders at the outset of the project, as this step is considered essential.

2. The POUR framework has also proven to be an effective and reliable approach for evaluating multi-user academic systems that integrate interface design, user experience, and system interoperability.

3. Conduct thorough manpower planning to ensure output delivery aligns with expectations, considering the workload of lecturers and staff involved in the program.

4. Allocate dedicated time for integration, review, and testing of weekly outcomes, particularly those contributed by student interns, to maintain an effective timeline.

5. Given the complexity of integrating different existing systems, it is crucial to plan ahead for future platform development and system interoperability.

CONCLUSION

All of the initially planned features have been developed, though several still require refinement in terms of both functionality and user interface, along with further evaluation. Once these improvements are completed, the next critical step will be the integration of the academic counseling system with other existing university applications. This integration stage is highly dependent on coordination with the Information Technology Department. Key challenges encountered during the design process included limited time and resources, as well as the complexity of integrating with the university's existing platforms. As a result, continued system development will be necessary in the following year to complete additional features that address the complex needs of each user type.

Overall, the core functions of the academic counseling system, such as monitoring student and lecturer engagement each semester, have been successfully implemented. The system also facilitates scheduling academic counseling sessions and tracking student academic performance and outcomes. Additionally, it allows documentation of counseling discussions and student study plans each semester. However, due to project limitations, final integration with other university information systems has not yet been completed and is expected to be continued in the next development phase.

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