

Digital Queue System for Academic and Lecture Services Using Design Thinking Approach

Supriyanti Ananda¹⁾, Putri Victoria Vivena Damanik²⁾, Dinda Maharani³⁾,
Annisa Nur Rahma⁴⁾, Nadya Hidayatul⁵⁾, Nani Krisnawaty Tachjar⁶⁾

^{2,3,4,5} Information System Study Program, Faculty of Information Technology,
Perbanas Institute, Jakarta, Indonesia

^{1,6} Informatics Study Program, Faculty of Information Technology,
Perbanas Institute, Jakarta, Indonesia

Corresponding author: nani.krisnawaty@perbanas.id

Abstract. *The rapid development of information technology has significantly influenced various sectors, especially higher education. Web-based academic information systems have made the delivery of information easier, faster, and more accurate for students, lecturers, and academic staff. However, several academic services in universities still use manual queue systems, resulting in long waiting times, overcrowding, and unorganized service management. This study aims to design a web-based digital queue system to improve the efficiency and effectiveness of academic services. Through this system, students can obtain queue numbers online and monitor queue status in real time using smartphones, laptops, computers, and other devices. The system is developed using the Design Thinking method to meet user needs effectively. The implementation of this digital queue system is expected to reduce waiting times, prevent queue congestion, and improve the quality of academic services in higher education institutions.*

Keywords: *Academic Services, Digital Queue System, Higher Education, Information Technology, Design Thinking,*

INTRODUCTION

Information technology is one of the phenomena experiencing very rapid development and advancement. This makes information technology have a considerable influence in various fields, especially in the field of education in higher education institutions (Nguyen et al., 2021).

The presence of information systems has brought quite significant changes, especially in academic management and services. This happens because web-based academic information systems allow the process of delivering information to become easier to access, faster, and certainly more accurate for students, lecturers, and academic staff (Lengkong et al., 2023).

However, in practice, several academic services, especially in higher education institutions, still use manual queue systems. For example, academic administration processes and other academic services often experience problems such as student overcrowding, long waiting times, and unorganized services. These problems create inconvenience for students and reduce the work efficiency of academic staff in providing services (Pauji et al., 2025).

To overcome these problems, it is necessary to implement a digital queue system specifically for academic and university services. Through this system, students can take queue numbers online and monitor queue status in real-time, which will help the service process become more organized and efficient. This system also utilizes web-based technology that can be accessed through smartphones, laptops, PCs, and other devices, allowing students to easily carry out various campus activities anytime and anywhere. The

implementation of this digital queue system is expected to reduce waiting times, prevent queue congestion, and improve the quality of academic services in universities/higher education institutions.

LITERATURE REVIEW

Information Technology

Technology is the development of hardware and software based on scientific knowledge, in line with the advancement of the times and the current needs of users. With the rapid development of technology, activities that were previously carried out manually can now be performed automatically and more efficiently through the use of digital technology (Taufik et al., 2022).

The term “technology” refers to the development and application of various tools or systems designed to solve problems encountered by humans in their daily lives. As we know, technology continues to develop rapidly in the modern era. In everyday language, the term technology is closely related to methods or procedures. Technology is also the result of human innovation in developing certain methods or systems and utilizing them to solve problems in life. Today, people enjoy various conveniences offered by information technology, such as the internet, smartphones, computerized systems, and digital applications that support daily activities.

In this digital era, the use of internet technology has a significant influence on the development of the information world. Nowadays, people can easily access information due to the advancement of modern technology. The increasing use of computer technology also supports the development of internet technology in obtaining high-quality information, which can be used in decision-making processes (Efendi et al., 2023)

Information System

According to John F. Nash, an Information System is a combination of various elements, including people, technological facilities or tools, media, procedures, and controls, aimed at managing important communication networks, routine processes or transactions, and providing support to management as well as internal and external users by supplying an appropriate basis for decision-making. The importance of an information system lies in its ability to provide information to the right individuals at the right time, in a format and quantity that meet the needs of the information recipients (Rainer & Cegielski, 2011:10). The benefits of information systems can be experienced by users, systems, organizations, and strategic levels within a company (Peterson & Kim, 2000:29). Based on their functions, information systems can be classified into several types, such as Transaction Processing Systems, Management Information Systems, Executive Information Systems, Decision Support Systems, Communication Support Systems, and Office Support Systems (Whitten & Bentley, 2007:6) (Imam et al., 2023).

Before implementing other types of information systems, companies must first have an efficient transaction processing system. Transaction Processing Systems are a type of information system responsible for capturing and recording transaction data that affect an organization, such as order transactions, payments, and other related activities (Whitten & Bentley, 2007:6).

Digital Queue System

A web-based online queue system is one of the innovations in managing public services, including in the academic field on campus. This concept allows students to register for academic services by obtaining a queue number value and helping monitor service status in real time through digital devices. With this system, classic problems such as crowding, long waiting times, and uncertainty in the service process can be minimized. According to (Gunawan et al., 2023), the implementation of the queue method in a web-based queue system has proven effective in regulating the registration flow at community health centers by increasing service validation reaching 93.33%. With the same principle, this can be adapted for campus academic services such as registration, course registration (KRS), and other academic services.

Based on the previous study, it can be concluded that a web-based campus academic service queue system is a strategic solution in improving the quality of academic services. This system not only reduces waiting

time and crowding but also supports campus digitalization oriented toward efficiency, transparency, and student satisfaction.

Web-Based System

Web-based systems are information systems that use the internet or network connections and can be accessed through browsers on various devices such as computers, laptops, and smartphones. In the field of education, web-based systems play an important role in supporting academic services because they make access to information faster, easier, and more efficient for both students and academic staff.

With the implementation of web-based systems, many academic processes that were previously carried out manually can now be done digitally. Students can access services such as taking queue numbers, filling out forms, checking academic information, and monitoring service status in real time. In addition to making information access easier, web-based systems also help reduce queue congestion and improve the organization of academic data management.

According to research conducted by (Albhantany et al., 2022), web-based academic information systems are able to improve the efficiency of data management and information delivery processes. Another study by (Salim et al., 2020) stated that web-based academic services provide convenience for students to access information anytime and anywhere. Therefore, web-based systems are considered suitable for implementing digital queue systems in higher education academic services.

Academic Services in Higher Education

Academic services are a crucial part of higher education because they directly address student needs throughout the course. Academic services encompass various activities, such as managing the Student Study Program (KRS), Student Study Card (KHS), academic letters, course administration, and campus information services. High-quality academic services can increase student satisfaction and support the effectiveness of the teaching and learning process at universities. Quality academic services must be fast, accurate, responsive, and easily accessible to students, creating effective and efficient services (Reza Saputra et al., 2021).

In the era of information technology advancements, universities are required to provide more modern and integrated service systems. The use of information technology in academic services can help speed up administrative processes, improve access to information, and increase the efficiency of campus services (Nguyen et al., 2021). Web-based academic information systems also enable students to access services more easily through smartphones, laptops, or computers without having to come directly to the service location.

The efficiency of academic services is an important factor in improving the quality of higher education services. Long queues and delays in academic administration services can reduce student comfort and hinder administrative effectiveness. Therefore, the implementation of digital queue systems and technology-based services can be a solution to create services that are more organized, transparent, efficient, and easier to monitor in real time. In addition, good academic services can also increase student satisfaction and trust in higher education institutions (Pauji et al., 2025).

METHODS

System Development Method

This study uses the Design Thinking method in designing a web-based digital queue system for academic and lecture services. Design Thinking was chosen because it focuses on user needs (*user-centered*) so that the resulting solution is more effective and suitable for problems that occur in higher education institutions. The Design Thinking method consists of five stages, namely *Empathize*, *Define*, *Ideate*, *Prototype*, and *Testing*.

Empathize

The empathize stage was carried out to understand the problems experienced by students and academic staff related to the manual queue system. Data collection was conducted through observation, interviews, and questionnaires distributed to students and academic staff to identify user needs and problems in

Perbanas International Conference on Economics, Business, Management, Accounting and IT
(PROFICIENT) 2026

“Integrity-Driven Innovation: Reimagining Business, Finance, and Digital Transformation for Sustainable Impact”

Proceedings of the Perbanas International Seminar on Economics, Business, Management, Accounting and IT
[June 2026] [ISSN 3047-0951]

academic services. Based on the observations and initial responses, several problems were identified, such as long queues, long waiting times, and poorly organized services. According to (Octavia & Andryana, 2023), the empathize stage is important to understand user needs so that the developed system is more suitable for actual user needs.

Define

The define stage was conducted to determine the core problems based on the observation results. The main problem in this study is the inefficiency of the manual queue system in academic services. Based on these problems, a solution was formulated in the form of a web-based digital queue system that can be accessed online and in real time. stated that the define stage helps determine the focus of the problem so that the designed solution becomes more targeted.

Ideate

The ideate stage was conducted by developing ideas and system solutions. The proposed solution is a web-based digital queue system with online queue number registration, queue monitoring, and an admin dashboard. At this stage, the system design was also created using:

- Use Case Diagram
- Activity Diagram
- Class Diagram

According to (Zaafira, 2023), the ideate stage in the Design Thinking method focuses on developing user interface and user experience design solutions based on the needs of academic system users through brainstorming and prototype design processes.

Prototype

The prototype stage was conducted by creating an initial design of the web-based system interface. The prototype was created to visualize the system flow and features before implementation. The prototype includes:

- Login page,
- Home page,
- Queue status page,
- Queue number registration,
- Admin dashboard.

According to (Maulana & Voutama, 2023), prototypes help the system evaluation process before the implementation stage.

Testing

The testing stage was conducted to test the system prototype with students and academic staff. The testing was carried out to determine ease of use, information accuracy, and system effectiveness. In this design thinking-based research, questionnaires were also used as a data collection instrument to gather user feedback and measure user satisfaction regarding the developed system. The questionnaire results helped identify user needs, evaluate the prototype's performance, and support the improvement process. The testing results were used as evaluation material for system improvement. According to (Subagja & Hartono, 2023), the testing stage is important to ensure that the system meets user needs and functions properly.

RESULTS AND DISCUSSION

This chapter presents the results and discussion of the research using the Design Thinking method. The discussion is arranged based on each stage of Design Thinking, namely empathize, define, design, prototype, and testing, to explain the process of developing and evaluating the proposed academic service queue system.

Empathize Results

At the empathize stage, data collection was conducted through observations, interviews, and questionnaire distribution to students and academic service users. The questionnaire used a 1–7 Likert scale, where 1 represented “Strongly Disagree” and 7 represented “Strongly Agree.” A total of 53 respondents participated in this study.

TABLE 1. Table Questionnaire Results

No	Statement	Mean	Interpretation
Q1	The system will be frequently	6.10	Strongly Agree
Q2	The System is too complicated	2.72	Disagree
Q3	The System is easy to use	6.15	Strongly Agree
Q4	The System requires assistance from others	4.06	Netral
Q5	The system feature are well integrated	6.25	Strongly Agree
Q6	The System is inconsistent	2.91	Disagree
Q7	The System is easy to learn	6.08	Strongly Agree
Q8	The System is impractical	3.49	Tend to disagree
Q9	Users feel confident using the system	5.92	Agree
Q10	Users need to learn many things before using the system	5.17	Agree

The questionnaire results indicate that users responded positively to the development of the web-based digital queue system. The statement “The system is easy to use” obtained a mean score of 6.15, while “The system features are well integrated” achieved the highest score of 6.25. In addition, respondents agreed that the system was easy to learn, with a mean score of 6.08.

Negative statements such as “The system is too complicated” and “The system is inconsistent” received relatively low mean scores of 2.72 and 2.91 respectively, indicating that most respondents disagreed with those statements.

Overall, the questionnaire results show that users consider the digital queue system helpful in improving academic service efficiency, easy to use, and capable of reducing waiting times and queue congestion. These findings support the implementation of a web-based digital queue system to improve the quality of academic services in higher education institutions.

Define Stage

Based on the observation, interviews, and questionnaire distribution results, the main problem identified is the inefficiency of the manual queue system in academic services. The existing system causes long waiting times, queue accumulation, and limited access to queue information for students. Therefore, a web-based digital queue system is proposed to improve service efficiency by providing online queue registration, real-time queue monitoring, and better queue management for academic staff.

Ideate (System Design)

The use case diagram illustrates the interaction between students, alumni, and administration staff with the digital queue system. Students and alumni can log in, select services, fill out forms, monitor queues, and take queue numbers, while the administration staff manages the queue process through the system. The activity diagrams illustrate the workflow of a digital queue service system that begins with the login process. After successfully logging into the system, students or alumni can select an available service, fill out the required form, upload supporting documents, and submit their request. The system then validates the input data, stores the request in the database, and generates a queue number that users can monitor in real time. On the administration side, admins are able to monitor, call, and manage queues by performing actions such as call, hold, or cancel. Every queue status update is automatically processed by the system.

Perbanas International Conference on Economics, Business, Management, Accounting and IT
(PROFICIENT) 2026

“Integrity-Driven Innovation: Reimagining Business, Finance, and Digital Transformation for Sustainable Impact”

Proceedings of the Perbanas International Seminar on Economics, Business, Management, Accounting and IT
[June 2026] [ISSN 3047-0951]

and sent to users through notifications, making the service process more structured, efficient, and transparent.

The class diagram illustrates the structure and relationships between classes in the academic information system. The system consists of several main classes such as User, Student, Staff, and Request. Students can submit various academic requests, while staff process and manage these requests. The diagram also includes supporting classes such as Transcript, Course Enrollment, Student Card, Legalization, Certificate Letter, Form, Schedule, and Confirmation to support the academic service process within the system.

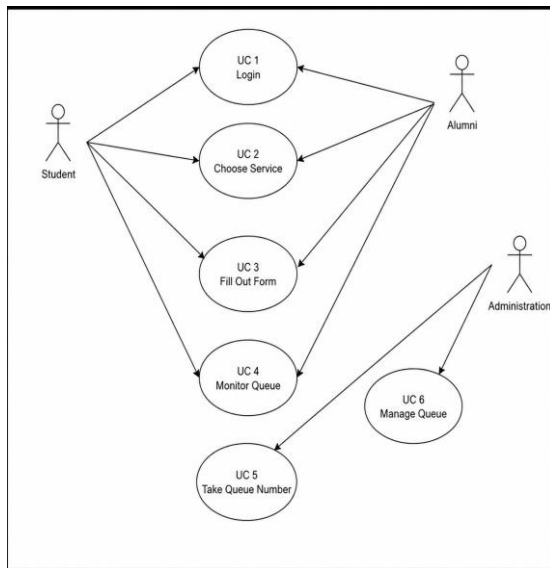


Figure 1. Use Case

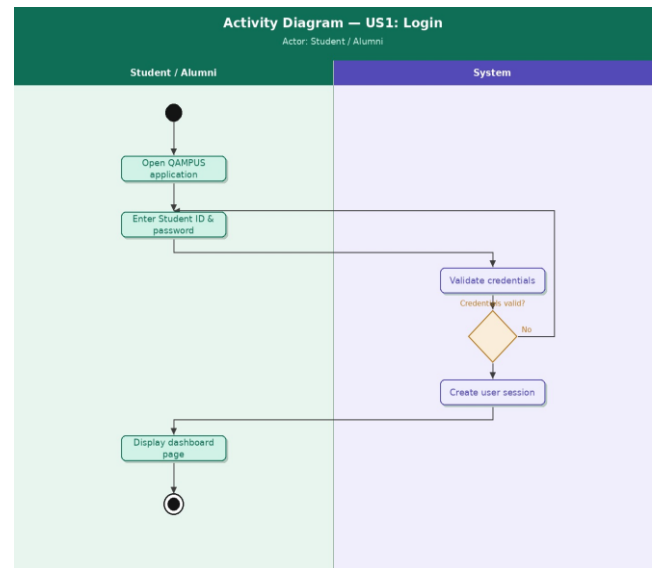


Figure 2. Activity Diagram Login

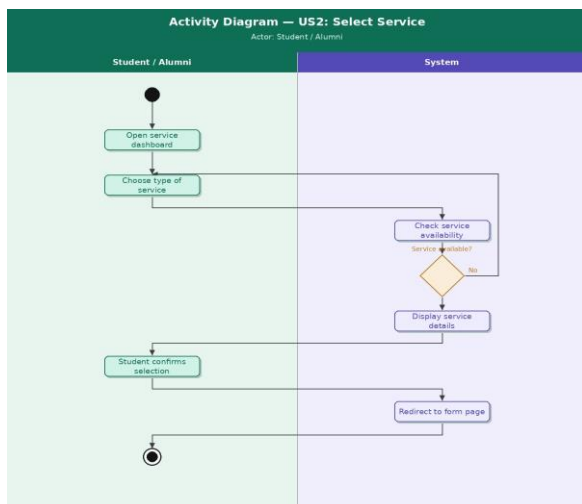


Figure 3. Select Service Activity Diagram

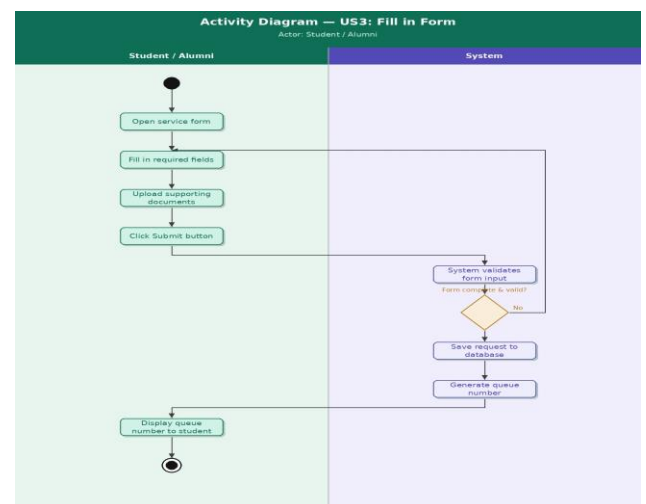


Figure 4. Fill in Form Activity Diagram

Perbanas International Conference on Economics, Business, Management, Accounting and IT
(PROFICIENT) 2026

"Integrity-Driven Innovation: Reimagining Business, Finance, and Digital Transformation for Sustainable Impact"

Proceedings of the Perbanas International Seminar on Economics, Business, Management, Accounting and IT
[June 2026] [ISSN 3047-0951]

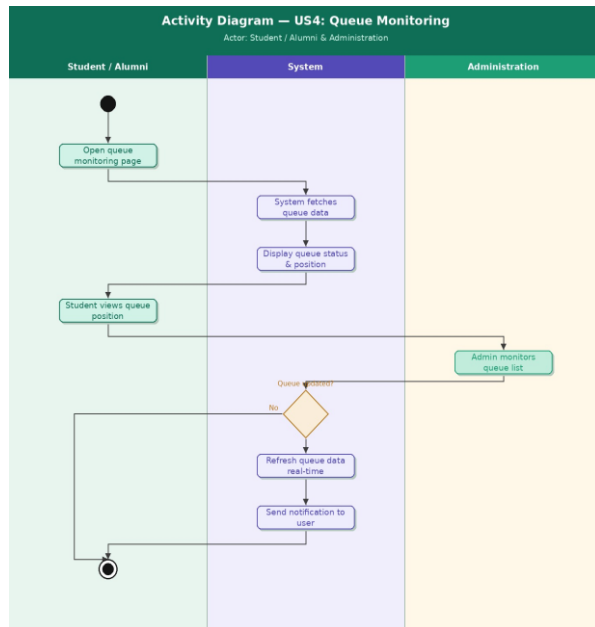


Figure 5. Queue Monitoring Activity Diagram

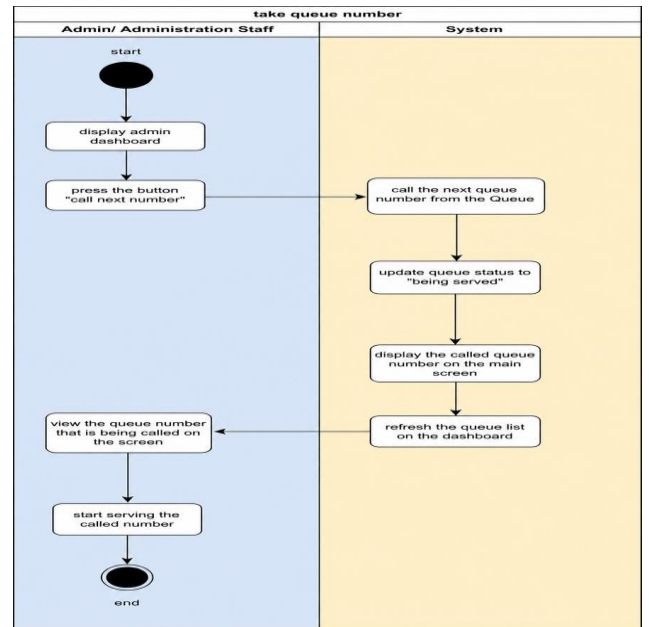


Figure 6. Take Queue Number Activity Diagram

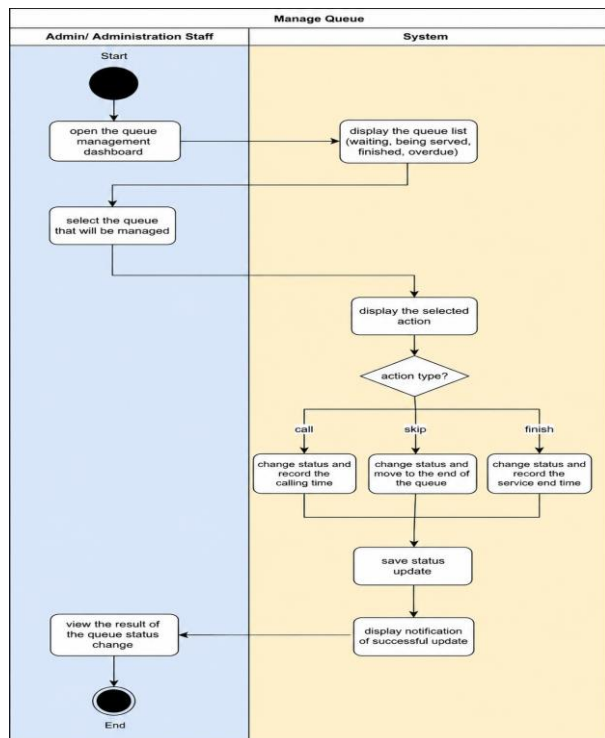


Figure 7. Manage Queue Activity Diagram

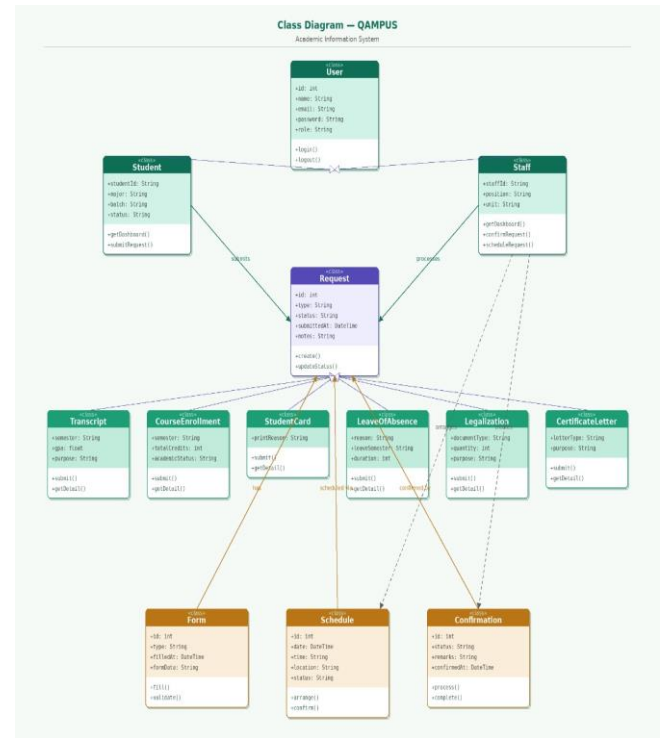


Figure 8. Class Diagram

Perbanas International Conference on Economics, Business, Management, Accounting and IT
(PROFICIENT) 2026

“Integrity-Driven Innovation: Reimagining Business, Finance, and Digital Transformation for Sustainable Impact”

Proceedings of the Perbanas International Seminar on Economics, Business, Management, Accounting and IT
[June 2026] [ISSN 3047-0951]

Prototype UI Design

- Login page,
The page displays the login interface of the Qampus application, which is used by students to access the digital academic queue service system by entering their student ID/username and password.
- Home page
The page displays the main interface of the Qampus application, which is used by students to access available academic services, view queue information, and navigate the digital queue system easily.
- Queue status page,
The page displays the queue status interface of the Qampus application, which is used by students to monitor their current queue number, estimated waiting time, and service progress in real time.
- Queue number registration,
The page displays the queue registration interface of the Qampus application, which is used by students to select a service schedule and obtain a digital queue number automatically.
- Admin dashboard.
The page displays the admin dashboard interface of the Qampus application, which is used by administrators to manage queue data, monitor student services, and control the digital academic queue system efficiently.



Figure 9. Design Login Page



Figure 10. Design Home Page

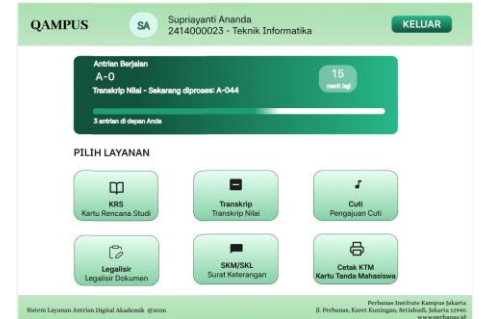


Figure 11. Design Queue Status Page

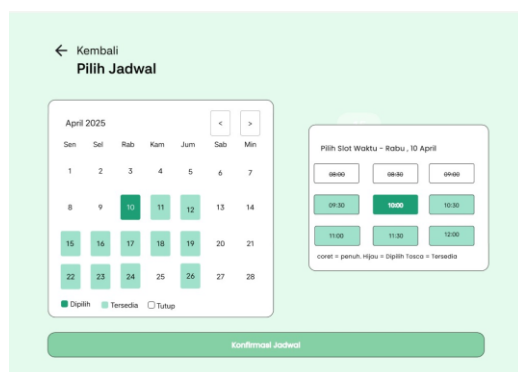


Figure 12. Design Queue number registration

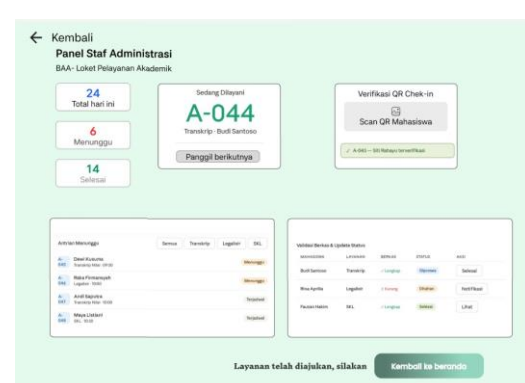


Figure 13. Design Admin Dashboard

Perbanas International Conference on Economics, Business, Management, Accounting and IT
(PROFICIENT) 2026

“Integrity-Driven Innovation: Reimagining Business, Finance, and Digital Transformation for Sustainable Impact”

Proceedings of the Perbanas International Seminar on Economics, Business, Management, Accounting and IT
[June 2026] [ISSN 3047-0951]

Testing / System Evaluation

The evaluation was conducted on the Qampus digital queue system prototype involving 53 respondents from students and academic staff at Perbanas Institute. Data were collected via an online questionnaire based on the System Usability Scale (SUS) using a 7-point Likert scale. Of the 53 respondents, only 50 completed all questionnaire items and were included in the SUS analysis. Of the total respondents, 50 provided complete data, yielding a response rate of 94.3%.

Instrument Validity and Reliability

All variables demonstrated Cronbach's Alpha > 0.80, Composite Reliability > 0.70, and AVE > 0.50, confirming high internal consistency and convergent validity of the measurement instrument.

TABLE 2. *Reliability and Validity Test Results*

Variabel	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
X1	0,920	0,924	0,932	0,555
X2	0,894	0,896	0,917	0,612
X3	0,920	0,921	0,935	0,642
Y	0,898	0,900	0,920	0,621

SUS Score Results

The SUS score was calculated using the standard formula adapted for a 7-point scale: positive items minus 1, negative items subtracted from 7, and the total multiplied by 100/60. The system achieved a mean SUS score of 71.53, corresponding to Grade B (Good).

Table 3. *SUS Score Summary*

Metric	Value
Number of Respondents (complete)	50
Mean SUS Score	71.53
Standard Deviation	15.64
Median SUS Score	70.83
Minimum Score	46.67
Maximum Score	100.00
Grade / Category	B (Good)

SUS Score Distribution

44% of respondents rated the system as Excellent, while 42% placed it in the OK/Marginal to Poor range. This substantial proportion of lower ratings warrants critical attention. Analysis of individual item scores reveals that Q10 (Need to Learn Many Things First, $M = 5.17$) and Q4 (Need for Assistance from Others, $M = 4.06$) were the weakest-performing items, suggesting that users less familiar with digital platforms found the system’s onboarding process insufficiently guided. The relatively high standard deviation ($SD = 15.64$) further confirms heterogeneous user experiences, likely reflecting differences in digital literacy levels among respondents. These findings indicate that while the system’s core functionality is well-received, improvements are needed in user onboarding, interface intuitiveness, and the provision of in-system guidance or tutorials to improve usability for all user segments.

Table 4. *Distribution of SUS Scores by Category (N = 50)*

SUS Score Range	Category	n	%
≥ 85	Excellent / Best Imaginable	22	44.0%
70 – 84	Good	5	10.0%
50 – 69	OK / Marginal	17	34.0%
< 50	Poor / Not Acceptable	4	8.0%

Key Findings

The highest-scoring items were Q5 — Feature Integration ($M = 6.25$), Q3 — Ease of Use ($M = 6.15$), and Q1 — Frequency of Use Intention ($M = 6.10$). However, Q10 — Need to Learn Many Things First ($M = 5.17$) and Q4 — Need for Assistance ($M = 4.06$) indicate that users less familiar with digital platforms may require additional onboarding support.

CONCLUSIONS

This study successfully designed a web-based digital queue system called QAMPUS for academic and lecture services in higher education institutions using the Design Thinking method.

Based on the research findings, several conclusions can be drawn:

1. The main problem
Identified was the inefficiency of the manual queue system in academic services, which caused queue congestion, long waiting times, and limited access to queue information for students.
2. The proposed solution
Is a web-based digital queue system that enables students to take queue numbers online, monitor queue status in real time, and access services through various devices such as smartphones, laptops, and computers.
3. Testing results

The System Usability Scale (SUS) involving 50 respondents from students and academic staff at Perbanas Institute yielded a mean score of 71.53, classified as Grade B (Good), indicating that the system is considered user-friendly and effective.

4. Questionnaire results
Showed positive responses from users, where system feature integration received the highest score (6.25) and ease of use scored 6.15 out of a 7-point scale.
5. The implementation of
This system is expected to reduce waiting times, prevent queue congestion, and improve the quality, transparency, and efficiency of academic services in higher education institutions.

Acknowledgments

The authors would like to express their sincere gratitude to Perbanas Institute for the support and facilities provided during this research. The authors also thank the lecturers, academic staff, and all respondents who participated in the questionnaire and system testing process for the QAMPUS digital queue system. Special appreciation is extended to all team members for their cooperation, contributions, and commitment throughout the completion of this research and paper.

References

- Alkhalifi, Y., Rizal, K., Zumarniansyah, A., Sari Rahmadhani Fadillah, D., Pontianak Jl Abdul Rahman Saleh Bangka Belitung Laut, K., Pontianak Tenggara, K., Pontianak, K., & Barat, K. (2023). *Metode Design Thinking Pada Sistem Informasi Presensi Pegawai Kejaksaan Negeri Kota Bogor*. <http://jurnal.bsi.ac.id/index.php/co-science>
- Efendi, C., Siregar, H. M., Hutagalung, A., Pasaribu, B., Efendi, E., & Marito Siregar, H. (2023). Teknologi Sistem Informasi. *INNOVATIVE: Journal Of Social Science Research*, 3, 43–53.
- Gunawan, R., Yuana, H., Kirom, S., Balitar Blitar Jl Majapahit No, I., Sananwetan, K., Blitar, K., & Timur, J. (2023). IMPLEMENTASI METODE QUEUE PADA SISTEM ANTRIAN ONLINE BERBASIS WEB STUDI KASUS UPTD PUSKESMAS SANANWETAN. In *Jurnal Mahasiswa Teknik Informatika* (Vol. 7, Number 3).
- Imam, F., Muftin, A., & Hidayat, F. (2023). *SISTEM INFORMASI PENJUALAN* (Vol. 3).
- Lengkong, J. S. J., Jacobus, S. N. H., Dondokambey, R., Ratumbuisang, K. F., Paath, D., & Liow, E. S. (2023). Web-Based Academic Information Systems in Vocational School. In *International Journal of Information Technology and Education (IJITE) International Journal of Information Technology and Education (IJITE)* (Vol. 2, Number 4). <https://ijite.jredu.id><http://ijite.jredu.id>
- Maulana, D. F., & Voutama, A. (2023). Penggunaan metode design thinking dalam perancangan UI/UX sistem informasi penyewaan sepeda. *Jurnal Teknologi Sistem Informasi dan Sistem Komputer TGD*, 6(2), 452–462. <https://doi.org/10.53513/jsk.v6i2.8249>
- Nguyen, A., Tuunanen, T., Gardner, L., & Sheridan, D. (2021). Design principles for learning analytics information systems in higher education. *European Journal of Information Systems*, 30(5), 541–568. <https://doi.org/10.1080/0960085X.2020.1816144>
- Octavia, S., & Andryana, S. (2023). *UI/UX Design pada Platform Jobs Connect Menggunakan Metode Design Thinking* (Vol. 12, Number 1).
- Pauji, A. I., Rosidah, R., & Hanginiaina Emynorane, R. (2025). The Effect Of Web-Based Academic Information System Use On Student Satisfaction: A Quantitative Study In Islamic Higher Education. In *LPPM Institut Agama Islam Negeri (IAIN) Kediri Journal of Islamic Education Management*. JoIEM.
- Reza Saputra, U., Suwono, I., & Sholikhah, atus. (2021). IMPLEMENTASI TEORI SERVQUAL PADA LAYANAN AKADEMIK SATU PINTU. *Kajian Ilmu Administrasi*, 18(1), 63–89. <https://doi.org/10.21831/efisiensi.v17i1.32580>

Perbanas International Conference on Economics, Business, Management, Accounting and IT
(PROFICIENT) 2026

“Integrity-Driven Innovation: Reimagining Business, Finance, and Digital Transformation for Sustainable Impact”

Proceedings of the Perbanas International Seminar on Economics, Business, Management, Accounting and IT
[June 2026] [ISSN 3047-0951]

- Salim, N. A., Cahyani Putri, R., Oktavariza, D. F., & Elektro, J. T. (2020). Prototype Sistem Informasi Pelayanan Akademik Terhadap Keluhan Mahasiswa Berbasis Web. *Edu Elektrika Journal*, 9(2).
- Subagja, D., & Hartono, R. (2023). EVALUASI UI/UX PADA SISTEM INFORMASI PENDAFTARAN TNI-AD MENGGUNAKAN SYSTEM USABILITY SCALE (SUS) DAN DESIGN THINKING. *Jurnal Teknologi Informasi*, 7(1).
- Taufik, A., Kom, S., Bernadus Gunawan Sudarsono, M., & Kom, M. (2022). *Pengantar Teknologi Informasi*.
- Zaafira, N. (2023). *Perancangan user interface SIAK-NG dengan metode design thinking untuk mendukung integrasi sistem* [Skripsi sarjana, Universitas Indonesia]. Perpustakaan Universitas Indonesia.