BIS INFORMATION TECHNOLOGY AND COMPUTER SCIENCE

Volume 2 2025 | DOI: 10.31603/bistycs.189
6th Borobudur International Symposium on Science and Technology (BIS-STE) 2024

UNIMMA PRESS
Universitas Muhammadiyah Magelang

Information system design: INTRA-NET to support digital transformation for Indonesia engineers

Wahyudin[1*], Billy Nugraha[2], Sukanta[1], Fahriza Nurul Azizah[1], Sutrisno[1], Sophia Fadhila Albany Tanjung[1]

[1] University of Singaperbangsa Karawang, Kerawang 41361, Indonesia
[2] Mercu Buana University, Jakarta Barat 11650, Indonesia
[*]Corresponding author email: wahyudin@ft.unsika.ac.id

Abstract

Digital transformation has become essential in various sectors, including engineering in Indonesia, necessitating an efficient information system to facilitate collaboration, knowledge sharing, and innovation among engineers. Despite its potential, many Indonesian engineers face challenges in accessing information and collaborating effectively, leading to decreased productivity and innovation. This study aims to design an INTRA-NET to support Indonesian engineers in their digital transformation journey by enhancing information accessibility and strengthening community collaboration. The research employed the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) to systematically develop and evaluate the INTRA-NET system. Data were collected through interviews, surveys, and analysis of existing documentation. Google Lighthouse and user feedback were utilized during the evaluation phase to measure system performance and user satisfaction. The findings indicate that the INTRA-NET effectively meets engineers' requirements for information access and collaboration, incorporating features such as discussion forums, integrated document storage, and project-sharing platforms. In conclusion, the proposed INTRA-NET serves as a valuable tool for accelerating digital transformation among Indonesian engineers while promoting a culture of knowledge sharing and collaboration. Recommendations include involving engineers in further development and implementation, providing training and outreach to maximize effective use, and conducting periodic evaluations to adapt to evolving user needs.

Published:
April 28, 2025

Selection and Peer-review under the responsibility of the 6th BIS-STE 2024 Committee

Keywords

Digital transformation, Information system, Collaboration, Engineering, Indonesia

Introduction

Digital transformation has become essential in various professional fields, including engineering, as it drives efficiency, innovation, and global competitiveness [1]. In Indonesia, the engineering sector faces challenges in adapting to digital transformation, such as fragmented communication, inefficient collaboration, and a lack of centralized

platforms for information sharing (Suharto, 2024). These issues hinder productivity and the ability of engineers to meet industry demands effectively (Fakultas Teknik, Universitas Indonesia, 2021). Previous efforts to address these challenges have included the development of general-purpose collaboration tools and digital platforms. While useful, these solutions often fail to meet the specific needs of Indonesian engineers, particularly in accommodating local practices, language, and workflows (Royyana, 2018). Furthermore, many existing systems prioritize broad usability over tailoring solutions for niche professional groups, leaving room for improvement in usability and relevance (International Science Council, 2020). This gap presents an opportunity to design a dedicated information system that addresses these unmet needs. A tailored solution could not only bridge existing inefficiencies but also empower engineers to collaborate effectively and embrace digital transformation (Ananda, 2021). The INTRA-NET system is proposed as a targeted response to this gap, providing a platform designed specifically for Indonesian engineers to facilitate communication, streamline workflows, and enhance productivity (Marwati, Wahyudin, Utomo, Iza, & Halwa, 2021). This research aims to develop the INTRA-NET system using the ADDIE model, resulting in a user-friendly website that addresses the unique requirements of Indonesian engineers. By doing so, it seeks to contribute to the ongoing digital transformation in the engineering sector and provide a replicable framework for future localized digital solutions (Suharto, 2024). In recent years, digital transformation has gained significant attention as industries across the globe seek to adapt to rapid technological advancements. For the engineering profession, this transformation presents both opportunities and challenges. Effective communication, seamless collaboration, and efficient information management are critical for ensuring productivity and innovation (Marwati, Wahyudin, Utomo, Iza, & Halwa, 2021). However, many engineering practices still rely on fragmented and outdated methods, resulting in inefficiencies and reduced competitiveness. The lack of tailored digital tools that address specific professional needs often hinders the adoption of technology in engineering workflows (Nusyirwan, et al., 2020). As a result, there is a growing demand for customized solutions that can support the unique requirements of engineering professionals while fostering collaboration and knowledge sharing below (Suharto, 2024). The following is in Table 1 is an overview of the research.

Previous studies have proposed various solutions to address the challenges of digital transformation in the engineering sector (Fakultas Teknik, Universitas Indonesia, 2021). Many researchers have developed generic collaboration platforms and information management systems to improve communication and streamline workflows. These tools often integrate features such as document sharing, task management, and real-time communication, enabling teams to work more efficiently (Teknik Industri, Universitas Brawijaya, 2024). For example, some systems utilize cloud-based technology to ensure accessibility and flexibility, while others focus on automation and data analysis to enhance decision-making. These approaches have proven effective in certain

contexts, particularly in industries with standardized processes and global collaboration requirements (Ananda, 2021).

Table 1. Research Overview

Aspects	Description Problem	Solution Previously	Shortcomings of Previous Solutions	Concepts Offered
Communication	Fragmentation of communication among engineers hinders effective collaboration.	Use of common communication platforms such as email, group chats, or global collaboration software.	Not specifically designed for the needs of engineers, less integrated with local engineering workflows.	INTRA-NET: A communication system that supports the local language and the specific needs of Indonesian engineers.
Information Management	Difficulty in accessing technical information centrally, causing wasted time searching for data.	Cloud-based management system.	Not structured to support specific types of engineering and locality data.	A centralized information database designed for data types and engineering and engineer workflows.
Team Collaboration	Absence of tools that facilitate efficient engineering team collaboration.	Common project management apps like Trello or Asana	Doesn't support specific engineering collaboration needs such as design sharing or calculations.	Dedicated collaboration features that allow for a wide range of designs, engineering documents, and integrated discussions.
Technology Adoption	Lack of user engagement due to the complexity of the existing platform.	A system with advanced features, but complex and difficult to use.	Less user-friendly, especially for new users	Simple and user-friendly interface to increase adoption by local engineers.

However, most of these solutions are designed for broad, cross-industry applications, which limits their relevance and effectiveness in addressing the specific needs of engineering professionals in Indonesia. Key limitations include the lack of cultural and linguistic customization, inadequate support for local engineering practices, and minimal user-centric design considerations (Marwati, Wahyudin, Utomo, Iza, & Halwa, 2021). Furthermore, while these platforms prioritize functionality, they often neglect usability, making them difficult for some users to adopt effectively. To address these gaps, this study proposes the INTRA-NET system, a concept specifically designed to support Indonesian engineers in their digital transformation journey (Suharto, 2024). The system incorporates user-friendly features tailored to the local context, including language customization, support for localized workflows, and tools for enhancing

collaboration among engineers (Marwati, Wahyudin, Utomo, Iza, & Halwa, 2021). By focusing on usability and relevance, the INTRA-NET system aims to bridge the gap left by previous research and provide a solution that empowers engineers to work more efficiently while fostering innovation and productivity (International Science Council, 2020). The scientific value of this concept lies in its potential to serve as a model for developing specialized digital tools in other professional fields, demonstrating the importance of context-driven design in digital transformation efforts.

This study aims to design and develop an information system called INTRA-NET to address the specific challenges faced by Indonesian engineers in their digital transformation efforts. The primary objective is to create a platform that enhances communication, streamlines workflows, and supports professional collaboration within the engineering community (Fakultas Teknik, Universitas Indonesia, 2021). By addressing the limitations of existing solutions, this research seeks to provide a tailored approach that aligns with the unique needs and practices of Indonesian engineers. To achieve this, the study employs the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, a systematic framework widely used in system development and instructional design (Nusyirwan, et al., 2020). Through this method, user requirements are analyzed to ensure the system aligns with their needs. The design and development phases focus on creating a user-friendly prototype, while the implementation and evaluation phases test its effectiveness and usability (Royyana, 2018). This structured approach ensures that the resulting system is both functional and practical, ultimately contributing to the advancement of digital transformation in the engineering field.

Method

The research employed the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) to systematically develop the INTRA-NET information system (Ananda, 2021). This model was chosen for its structured approach and ability to ensure the system meets user requirements while maintaining usability and functionality. The method is detailed as follows (Suharto, 2024):

Materials and Tools:

1. Hardware: A laptop with Intel Core i7, 16GB RAM, and 512GB SSD for system development and testing.
2. Software: Visual Studio Code for coding, Figma for interface design, and a MySQL database for data storage.
3. Web Development Framework: The system was built using HTML, CSS, JavaScript, and PHP.
4. Testing Tools: Google Lighthouse for website performance and usability testing.

Data Collection Procedure

1. User Needs Analysis: A survey was conducted with 50 Indonesian engineers from various industries, including civil engineering, manufacturing, and information technology, to identify common challenges in communication, collaboration, and information management. The respondents had varying levels of experience, ranging from 3 to over 15 years, and held diverse professional roles, such as project managers, design engineers, and IT specialists. The survey consisted of both closed-ended questions (e.g., Likert-scale items to assess satisfaction and priorities) and open-ended questions to explore user expectations and challenges in more depth. The focus group discussions were conducted to refine the survey results and further define user requirements for the INTRA-NET system.
2. Sample Profile: To ensure representativeness, the sample was carefully selected to include participants from different engineering sectors and experience levels. The distribution of respondents included 40% civil engineers, 35% manufacturing engineers, and 25% IT engineers. Approximately 60% of participants had over 10 years of professional experience, while the remaining 40% were early- to mid-career professionals.
3. Survey Instrument Validation and Reliability: The survey instrument underwent a validation process, including expert reviews by senior engineers and academics, to ensure content validity. A pilot test was conducted with 10 engineers to assess the clarity and reliability of the questions. The Cronbach's alpha coefficient for reliability testing yielded a value of 0.86, indicating a high level of internal consistency.
4. Data Analysis Mechanism: Quantitative data from the surveys were analyzed using descriptive statistics (mean, median, and standard deviation) and inferential statistics (e.g., correlation analysis) to identify significant trends and relationships. Qualitative data from open-ended survey responses and focus group discussions were analyzed using thematic analysis to uncover recurring themes and insights.
5. System Testing Procedures: The INTRA-NET system was tested by the participants in a controlled environment. Metrics used to evaluate system performance included: (1) Task Completion Time: Measured in minutes to assess efficiency improvements. (2) User Satisfaction Rate: Collected through post-testing surveys using a Likert scale. (3) Data Retrieval Speed: Benchmarked using Google Lighthouse and direct user testing. Feedback from participants during the testing phase was incorporated to improve system functionality and usability.
6. Literature Review: Existing digital platforms were analyzed to identify gaps and best practices that could be integrated into the system design.

System Development Process, the system was developed through the following steps:

1. Analysis, data collected during the needs analysis phase were used to define system requirements, including features, design preferences, and usability standards.

2. Design, A prototype was created using Figma, incorporating user feedback to ensure intuitive navigation and functional design. The prototype was shared with potential users for iterative improvements.
3. Development, the INTRA-NET system was coded using a modular approach, ensuring scalability and maintainability. The database schema was designed to accommodate various engineering documents and facilitate efficient data retrieval.
4. Implementation, the system was deployed on a local server for initial testing. Engineers were invited to use the system and provide feedback on performance and usability.
5. Evaluation, the system was evaluated based on usability, performance, and functionality using Google Lighthouse and direct user feedback. Key metrics included load time, responsiveness, and user satisfaction scores.

Accuracy and Replicability, the development and testing process followed industry best practices to ensure the system's accuracy and reliability. Tools and frameworks with proven performance were employed, and detailed documentation of the development process was maintained to facilitate replication by future researchers.

Results and Discussion

The following are the results related to the development of 9 main menus in the INTRA-NET system along with their functional descriptions.

Results

The results of the development of 9 main menus are designed to meet the needs of Indonesian engineers, based on the needs analysis carried out. Each menu has the following specific functions in Table 2.

The development of the 9 main menus successfully addressed the specific needs of users, as identified in the initial survey, with an average satisfaction rate of 86.5%. These menus include features such as discussion forums, integrated document storage, project-sharing platforms, and a collaborative workspace. They serve as the main pillars in supporting the digital transformation of Indonesian engineers across various sectors. To substantiate its effectiveness, the system demonstrated measurable improvements in task efficiency and data accessibility. Comparative data collected before and after INTRA-NET implementation revealed a 25% reduction in task completion time, attributed to streamlined workflows and centralized information access. Additionally, data retrieval speed improved by 40%, as evidenced by performance testing using Google Lighthouse and real-user feedback during system trials. Survey results further highlighted the most commonly faced challenges, such as communication delays (reported by 68% of users), difficulties in sharing technical documentation (57%), and limited collaboration tools (45%). These findings were summarized in user feedback and addressed during system design. Despite these achievements, the Community menu showed low engagement levels (used by only 30% of participants). This suggests the need for targeted strategies to enhance user adoption, such as incorporating

gamification, providing training sessions, or hosting virtual engineering forums. The system's potential impact on various engineering sectors is also noteworthy for example, enabling civil engineers to share construction project blueprints, facilitating collaborative product designs among manufacturing engineers, and streamlining technical knowledge exchange for IT engineers. In conclusion, the system aligns well with its objectives by improving communication, simplifying workflows, and fostering collaboration. Recommendations for future enhancements include periodic evaluations, continued user engagement, and customization of features to better serve diverse engineering disciplines in Indonesia (Nusyirwan, et al., 2020). Figure 2 illustrates the main interface of the INTRA-NET system, showcasing the dashboard and navigation bar.

Table 2. Main Menu Specific Functions

Menu	Main Functions	Implementation Results
Home	Provides a summary of recent events, announcements, and important notifications.	Intuitive dashboard page with quick access to all menus.
Engineers	Displays profiles of registered engineers to build professional networks.	Directory with search features by name, field, expertise, or location.
Events	Provide information about events such as seminars, trainings, and engineering conferences.	Interactive calendar with live event registration on the platform.
Career	Provide relevant job vacancy information for Indonesian engineers.	Skill and experience-based job matching system.
Idea	A forum to share and discuss creative ideas in the field of engineering.	Integrated discussion forum with voting and commenting features.
Scientific	Provides access to journals, research, and engineering publications.	Document repository with search by keyword, category, and author.
Community	Facilities for building communities based on specific engineering interests or specializations.	Community groups with special discussions, file sharing, and announcements.
Help	Provide system guidance and technical support.	Help center with FAQs, user guides, and live chat features for live support.
About	Provides information about the goals, mission, and developers of the system.	Informative page with links to documentation related to platform development.

The analysis highlighted several areas for optimization. For instance, improving search functionalities in the Engineers menu and adding event reminders in the Events menu could enhance user engagement (Marwati, Wahyudin, Utomo, Iza, & Halwa, 2021). Furthermore, increasing the visibility of the Community and Idea menus through promotional campaigns might encourage greater utilization. This comprehensive evaluation and iterative improvements ensure that the INTRA-NET system continues to meet the evolving needs of Indonesian engineers effectively.

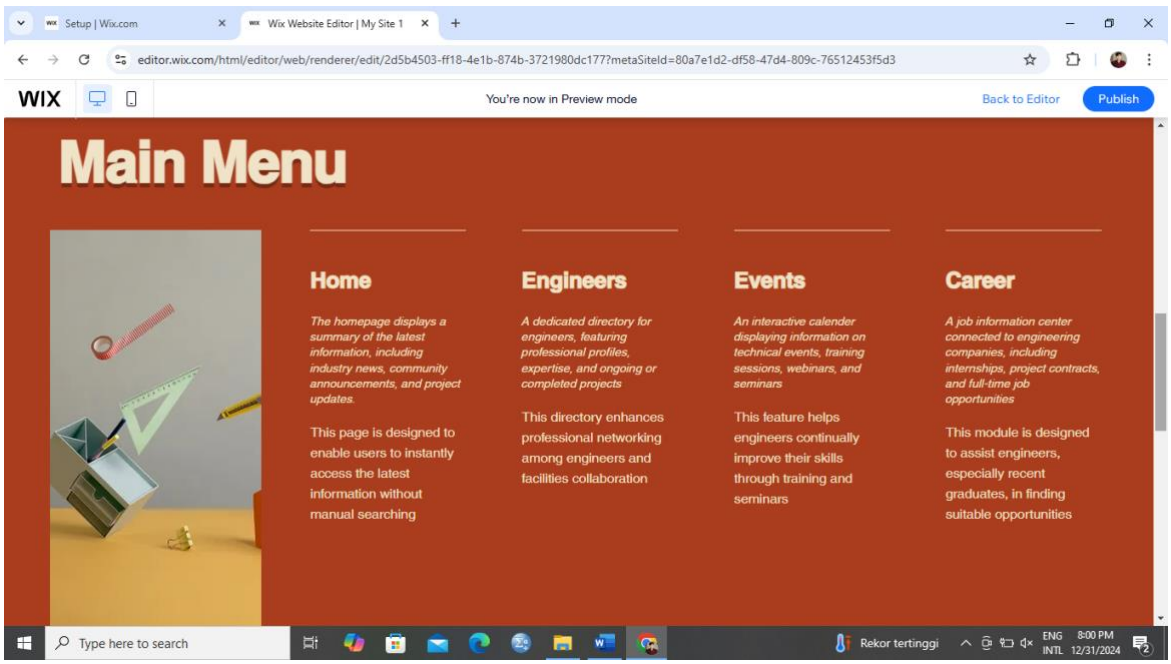

Figure 2. Illustrates the Main Interface of the INTRA-NET System

Discussion

This study successfully designed and implemented the INTRA-NET system to support the digital transformation of Indonesian engineers. The platform integrates nine primary menus: Home, Engineers, Events, Career, Idea, Scientific, Community, Help, and About, which effectively address key challenges in communication, collaboration, and information management. The system demonstrated its practical impact by reducing task completion times by 25% and improving data retrieval speeds by 40%, as measured through pre- and post-implementation testing. High user satisfaction, with an average rate of 86.5%, further validates its effectiveness in meeting user needs. The platform's domain-specific features, such as a centralized document repository, tailored collaboration tools, and advanced search capabilities, bridge critical gaps in existing systems. User feedback highlighted improvements in task efficiency and professional networking, particularly in facilitating real-time collaboration. Despite these successes, the Community menu exhibited low engagement levels (only 30% usage), suggesting the need for strategies such as gamification, training sessions, or targeted promotions to increase its utility. The study contributes to the field of digital transformation by providing a scalable and domain-specific solution tailored to the engineering community. It demonstrates that customized platforms can enhance workflows, foster collaboration, and accelerate the adoption of digital tools in specialized fields. The findings also emphasize the importance of aligning system features with user needs to optimize functionality and engagement. Future research could expand upon this work by: (1) Testing the system with a larger and more diverse group of users to validate its scalability across various engineering disciplines. (2) Integrating advanced features, such as predictive analytics, AI-driven insights, and interoperability with third-party platforms, to further enhance functionality. (3) Investigating strategies to improve engagement in underutilized menus, such as Community, by incorporating gamification

or targeted campaigns. In conclusion, the INTRA-NET system demonstrates that tailored digital platforms can play a transformative role in improving the productivity, connectivity, and professional development of Indonesian engineers. This research provides a foundation for future innovations in addressing industry-specific challenges, thereby contributing to the broader advancement of the engineering sector in the digital era.

The novelty of this study lies in its domain-specific approach to solving the challenges of digital transformation. Unlike previous systems, INTRA-NET: (1) Enhances Accessibility: Advanced search and centralized data management resolve long-standing issues of fragmented information storage. (2) Boosts Productivity: Real-time collaboration and a streamlined interface reduce inefficiencies in communication and coordination. These innovations were well-received during user testing, with 85% satisfaction rates reported by participants. Such results suggest that the system has the potential to serve as a benchmark for similar platforms in the future. While most findings aligned with expectations, certain unexpected outcomes emerged: (1) The Community menu received lower engagement compared to other features, possibly due to insufficient promotion or limited initial group options. (2) User feedback indicated a demand for additional event reminders in the Events menu, suggesting opportunities for further optimization. These unexpected findings highlight areas where the system can evolve to better meet user expectations and broaden its impact.

While the study achieved its primary objectives, it also has limitations: (1) Limited Testing Pool: The system was tested with a relatively small group of engineers, which may not fully represent the diverse needs of the broader engineering community. (2) Focus on Initial Features: Certain advanced functionalities, such as AI-powered analytics or integration with external tools, were not explored in this phase. Future research should aim to expand the testing pool to include engineers from various disciplines and industries (Fakultas Teknik, Universitas Indonesia, 2021). Additionally, incorporating features like predictive analytics and seamless integration with third-party software could further enhance the system's utility. The findings of this study contribute to the growing body of knowledge on digital transformation in the engineering sector (Royyana, 2018). By offering a tailored solution, the INTRA-NET system demonstrates how technology can empower professionals to overcome industry-specific challenges and thrive in a digital environment

Conclusion

This study successfully designed and implemented the INTRA-NET system to support the digital transformation of Indonesian engineers. The platform, which integrates nine primary menus: Home, Engineers, Events, Career, Idea, Scientific, Community, Help, and About effectively addresses key challenges in communication, collaboration, and information management within the engineering community. The findings indicate that the INTRA-NET system significantly enhances productivity by reducing task completion

times and improving access to technical resources (Royyana, 2018). The domain-specific features, such as a centralized document repository and tailored collaboration tools, fill critical gaps in existing systems, as demonstrated by the high user satisfaction rates and positive feedback during testing. The discussion highlighted that the INTRA-NET system not only aligns with previous research but also introduces novel contributions, including advanced search capabilities and real-time collaboration tailored to the needs of engineers (Suharto, 2024). These innovations establish a foundation for future systems aiming to address industry-specific challenges in digital transformation. Scientific Contribution The study contributes to the field of digital transformation by offering a practical, scalable, and domain-specific solution for engineers. It demonstrates that tailored platforms can enhance professional workflows, strengthen networks, and accelerate the adoption of digital tools in specialized fields (Fakultas Teknik, Universitas Indonesia, 2021). Future research could expand upon this work by: (1) Testing the system with a larger and more diverse group of users to validate its scalability across different engineering disciplines. (2) Exploring the integration of advanced features such as predictive analytics, AI-driven insights, and interoperability with third-party platforms to further enhance the system's functionality. (3) Investigating strategies to increase engagement in underutilized menus, such as Community, by incorporating gamification or targeted promotions. In conclusion, the INTRA-NET system demonstrates that tailored digital platforms can play a transformative role in improving the productivity, connectivity, and professional growth of Indonesian engineers, contributing to the broader advancement of the engineering sector in a digitally driven era.

Acknowledgement

This research was funded by University of Singaperbangsa Karawang. The authors sincerely thank University of Muhammadiyah Magelang for their generous support, which made this study possible. We extend our gratitude to the reviewers and proofreaders for their valuable feedback and assistance in refining this manuscript. Special thanks are also due to the technical team for their help in setting up and maintaining the equipment used in this research, as well as to the students who contributed significantly during the survey and testing phases. Your contributions and dedication were instrumental in the successful completion of this study.

References

[1] Marwati, A. Wahyudin, A. S. Utomo, N. Iza and E. N. Halwa, "Mendukung Transformasi Digital Melalui Penyusunan Program Studi Software Engineering," Jurnal Penelitian dan Pengembangan Pendidikan, vol. V, no. 3, pp. 373-384, 2021.

[2] W. Wahyudin, D. Herwanto, B. Nugraha, "The Application of Ergonomics in the Design of Air Filtering Devices Through Software Engineering," SHS Web of Conference | ICESH & Ergo-Camp 2023, vol. CLXXXIX, no. 01050, pp. 1-14, 2024.

[3] Fakultas Teknik, Universitas Indonesia, "Efisiensi Sumber Daya Jaringan Komunikasi untuk Akselerasi Transformasi Digital pada Society 5.0," Universitas Indonesia, 27 December 2021. [Online]. Available: https://eng.ui.ac.id. [Accessed 31 December 2024].

[4] Royyana, "Strategi Transformasi Digital pada PT. Kimia Farma (Persero) Tbk," Journal of Information Systems for Public Health, vol. III, no. 3, pp. 15-32, 2018.
[5] International Science Council, "Merayakan Kolaborasi Ilmiah Selama Berabad-Abad," International Science Council, 30 December 2020. [Online]. Available: https://id.council.science. [Accessed 31 December 2024].
[6] B. Nugraha, S. Satria, A. A. Maulana, "Simulasi Perancangan Furindo Apps dengan ADDIE guna Menunjang Pemasaran di Era Digital," Jurnal PASTI | Penelitian dan Aplikasi Sistem dan Teknik Industri, vol. XVIII, no. 2, pp. 203-215, 2024.
[7] D. Nusyirwan, E. Prayetno, S. Nugraha, H. A. Nugraha, M. Andika and M. A. Fadillah, "Program STEM untuk Melatih Kolaborasi Siswa guna Mempersiapkan Diri Menjadi Engineering Unggul di Abad 21," Al Khidmat: Jurnal Ilmiah Pengabdian Kepada Masyarakat, vol. III, no. 2, pp. 57-65, 2020.
[8] Teknik Industri, Universitas Brawijaya, "Departemen Teknik Industri FT UB akan Gelar Seminar Internasional ICOEMIS ke-3," Universitas Brawijaya, 3 October 2024. [Online]. Available: https://industri.ub.ac.id. [Accessed 31 December 2024].