

Design of Ground Side Facility Inspection Information System at Melalan Airport, West Kutai, East Kalimantan

Mochamad Nurul Muhlikin¹, Linda Winiastri², Lady Silk Moonlight³, Maulana Anifa Silvia⁴
Politeknik Penerbangan Surabaya, Indonesia

Corresponding Author: Lady Silk Moonlight^c
Aeronautical Communication Department
Politeknik Penerbangan Surabaya, Indonesia
Email: lady@poltekbangsby.ac.id

Article History

Received August 6, 2025
Accepted August 22, 2025
Published March 2026

Keywords

Android, iOS, Website, Appsheets, Inspection, 4D, Form; Airport.

Abstract

This research aims to design a ground-side facility inspection information system at Melalan West Kutai Airport based on mobile and web applications to improve reporting effectiveness. The method used is Research and Development (R&D) with the 4D model: Define, Design, Develop, and Disseminate. Data collection was done through observation, interviews, and document study of PR 11 Year 2023. The application was developed using Appsheets and Google Sheets, with main features such as inspection input, damage reporting, and report output in PDF format. The results show that the BIIFAC application can speed up the inspection process, reduce human error, and simplify documentation. The findings show that digitizing inspections greatly supports the work efficiency of non-commercial units in the airport sector. The practical implication is to increase the accuracy and speed of reporting, while the theoretical contribution is to enrich the application of information systems in the air transportation sector. The novelty of this research lies in the development of an integrated inspection system optimized for resource-constrained class III units, which has not been widely explored in previous studies.



This is an open access article licensed a Creative Commons Attribution-ShareAlike 4.0 International License.

1 INTRODUCTION

Airports serve as critical nodes in the air transportation system, especially in remote areas such as Kutai Barat Regency, East Kalimantan. One vital aspect of airport operations is the inspection of landside facilities (FSD), which includes the terminal building, parking area, and access roads (UU NO 1 Tahun 2009, 2009). Currently, the inspection process at Melalan Airport is still conducted manually using paper, which presents several challenges, such as the risk of document damage, recording errors, and delays in data processing. These issues negatively affect the effectiveness of maintenance and airport services.

Digitalizing the inspection process becomes a relevant solution to improve the efficiency and accuracy of recording and reporting (Zasmadyansyah et al., 2023). Application-based information systems are considered capable of integrating field recording processes with centralized data management, allowing inspection results to be followed up quickly and accurately (Alhafidz et al., 2022). The development of this system refers to the latest regulation, namely PR 11 Tahun 2023 concerning Guidelines for the Maintenance of Airport Landside Facilities (Direktorat Jenderal Perhubungan Udara, 2023).

Several previous studies, such as those by Winiasri et al. (2017, 2024), Elfi Husda & Wangdra (2021), and Listiani (2021), have shown the effectiveness of digital and mobile-based information systems in managing public facilities. However, their main focus has been limited to the education and health sectors, not on airport landside facilities, particularly in underdeveloped regions.

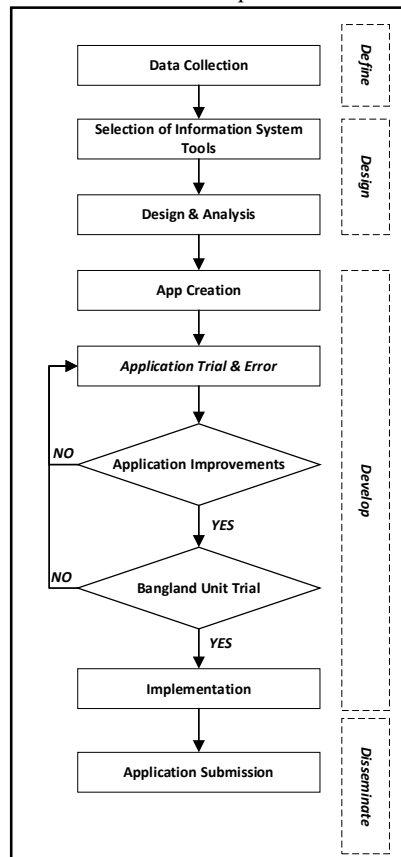
This study offers a new approach by designing an information system for FSD inspection based on mobile and web applications, customized to the operational needs of Class III Airport Operator Units such as Melalan Airport. The system is developed using Google AppSheet and Google Spreadsheet, which are practical and cost-efficient (Son, 2024). The main goal is to provide a system that can be accessed through Android, iOS, and web platforms, and to implement PR 11 Tahun 2023 in a digital format.

The results of this study are expected to accelerate reporting, simplify inspection tasks for personnel, and enhance data accuracy and security (Listiani, 2021). This research may also serve as a reference for the development of similar systems at other small airports across Indonesia (Ramli, 2020).

2 METHOD

This study employs a Research and Development (R&D) method with a descriptive qualitative approach (Astutik et al., 2023; Hasmia et al., 2022). The aim is to design and develop an information system for the inspection of landside facilities (FSD) based on Android, iOS, and web platforms at Melalan Airport. The model used in this research is the 4D Model (Define, Design, Develop, Disseminate) (Auriska W Pamungkas et al., 2023; Batmetan et al., 2020). Each stage of this model is designed to produce a digital inspection application that is practical and aligned with operational needs in the field (Riani Johan et al., 2023).

The conceptual framework of this study integrates four key elements in the system development cycle: needs analysis, system design, application development, and field implementation (Saffanah, 2023). The inspection data collection process is carried out by personnel using an Android/iOS-based application connected to a Google Spreadsheet-based database system (Isa, 2021). Subsequently, the data is analyzed and summarized through a web platform as a means of reporting and documentation. The following is an illustration of the research's conceptual framework:



Picture 1. Research Flow Chart
Source: Author's Preparation (2025)

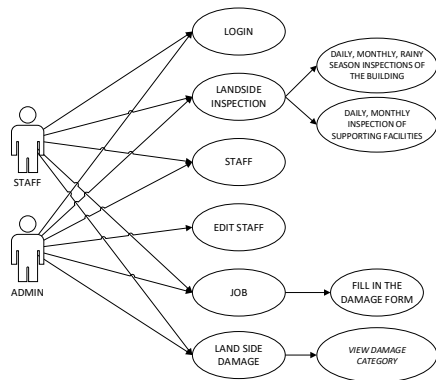
Data collection in this study was carried out through three main approaches: document study, interviews, and field observation (Putra et al., 2024; Santausa et al., 2020). The document study included an analysis of the SOP for landside facilities, manual inspection forms at Melalan Airport, and PR 11 Tahun 2023 concerning Guidelines for the Maintenance of Airport Landside

Facilities. These documents served as the foundation for designing the structure and content of the application to align with the airport's operational needs (Simamora et al., 2024; Suryan et al., 2023).

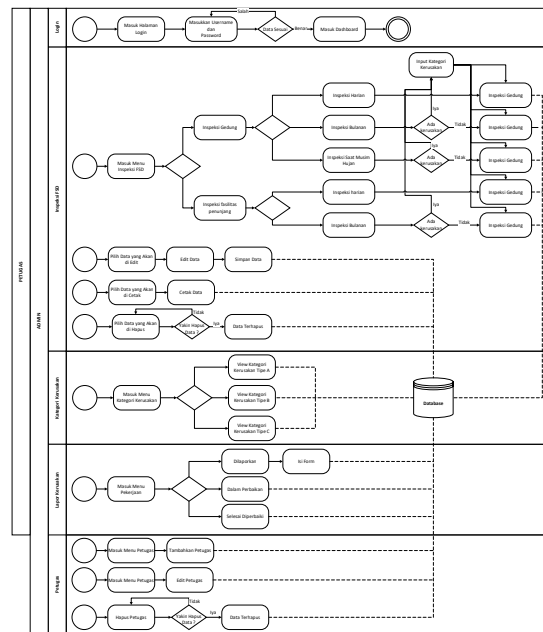
Interviews were conducted directly with personnel from the Building and Runway Unit during the author's On The Job Training (OJT) in 2024–2025. The purpose of the interviews was to identify actual problems in the field and gather input regarding the necessary features in the system (Putri & Syahril, 2022). This information served as a key reference in designing an application that is practical and effective (Yunita et al., 2023; Zainuddin et al., 2024).

Field observations were conducted to understand the real workflow during inspection activities (Lukman & Rahmanto, 2020; Mansattha et al., 2023). By directly observing the on-site processes, the researcher was able to adapt the application design to actual conditions, thereby increasing the effectiveness of the system being developed (Suryani et al., 2022; Syamsudin & Ali, 2024).

All data were analyzed using a descriptive qualitative approach. The analysis began with data reduction to filter relevant information, which was then presented in the form of a flowchart in Figure 1, use case diagrams, and business process models (BPMN) as follows:



Picture 2. Use Case Diagram
Source: Author's Preparation (2025)



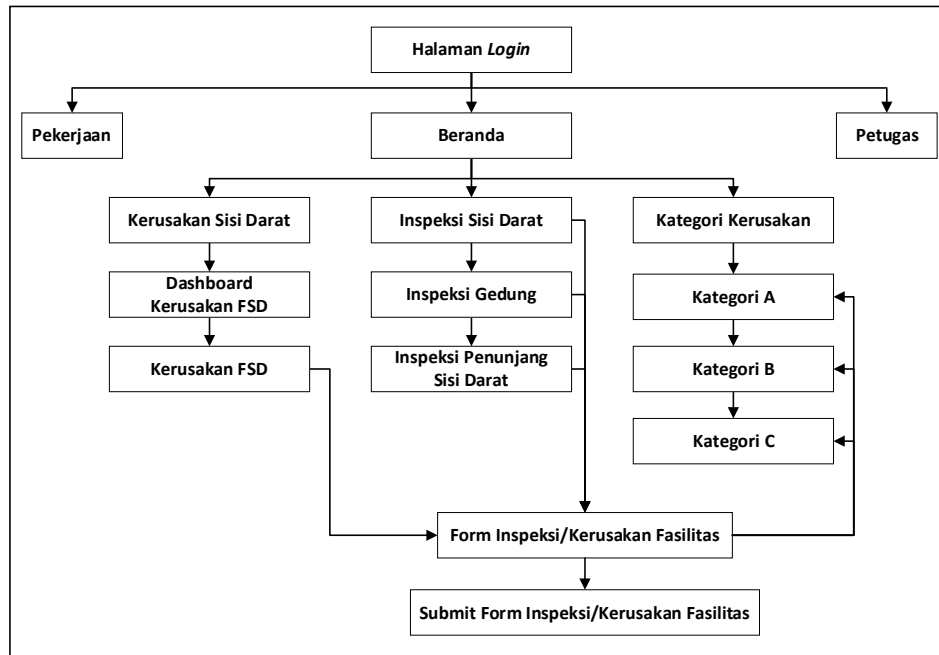
Picture 3. BPMN
Source: Author's Preparation (2025)

The visual representation above helps illustrate the system design both technically and conceptually (Dijkman et al., 2011; Elfi Husda & Wangdra, 2021). The next stages—testing, deployment, and conclusion—were carried out by comparing user requirements with the results of system design and implementation (Moonlight, Rochmawati, Fatmawati, et al., 2022). Testing was conducted using the black box testing method to evaluate the system's functionality without examining the internal code structure (Raihan & Voutama, 2023). Evaluation based on user feedback regarding the application's interface and workflow was used as the basis for system refinement before official implementation (Sukardi et al., 2021).

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer rutrum dictum leo, nec vestibulum ex ultricies posuere. Aenean placerat eget lectus vel sodales. Fusce viverra quam lorem, ac egestas ante tincidunt non. Phasellus laoreet, velit et semper placerat, orci tortor eleifend neque, non gravida arcu erat vel diam. Fusce ultrices massa metus, nec vehicula lorem molestie at. Vestibulum at suscipit ante. Nulla at feugiat nisl. Etiam et pretium libero. Pellentesque quis purus at lacus pretium tristique sed et ipsum. Aliquam erat volutpat. Phasellus viverra nibh neque, non dignissim nulla ultrices ut. Morbi pulvinar facilisis leo eu auctor. Nulla rutrum risus est, at egestas dolor tempus id. Ut dapibus tortor in ultrices pulvinar. Phasellus ut porta libero. Nulla semper euismod aliquam.

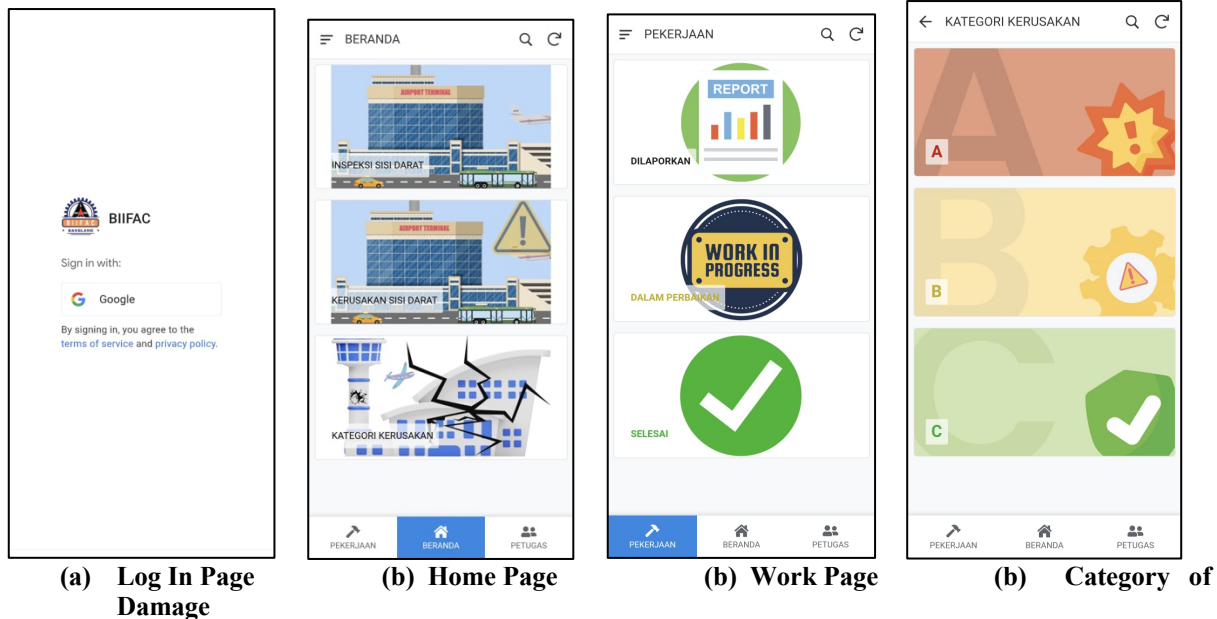
3 RESULTS

This study resulted in an information system for the inspection of landside facilities (BIIFAC) at Melalan Airport, Kutai Barat, which is mobile- and web-based, built using Appsheet and utilizing Google Sheets as the main database (Pratama et al., 2022). Below is the flowchart view of the BIIFAC application:



Gambar 4. Information System Menu Structure
 Source: Author's Preparation (2025)

The purpose of this system development is to simplify the process of reporting, recording, and monitoring inspection activities and facility damage, as well as increasing transparency and accountability in the maintenance of land-side facilities.



Picture 5. App Main Menu
 Source: Author's Preparation (2025)

The application structure consists of several main menus, such as the login page, homepage, tasks, personnel, and damage categories. The application is designed with a simple and intuitive interface, allowing users (inspectors) to input daily, monthly, and special inspection data during the rainy season for both building facilities and landside support facilities. In addition, the system also provides features for damage reporting, task categorization based on status (Reported, Under Repair, Completed), and a dashboard for damage progress tracking.

Testing results using the black-box method indicate that all features function according to the expected scenarios, both in terms of user interface and data integration with the database (Google Sheets) (Moonlight, Rochmawati, Suhanto, et al., 2022). The application has been tested across various devices and operating systems, and the results show consistent and stable performance.

Relevance Of Results To Research Objectives

The main objective of this study is to create a digital system that can facilitate the inspection and damage reporting process for landside facilities in an efficient and structured manner. The results of this research show that the BIIFAC application successfully meets this objective. Through the developed features, users are able to carry out inspection and reporting processes in real time, document the results in PDF format, and automatically store data both in the cloud and on local devices.

Thus, the system developed has addressed the research question raised in this study: how to design an information system for landside facility inspection that is user-friendly, well-documented, and widely accessible to field personnel?

Scientific Interpretation of Research Results

This application was developed based on applicable technical regulations, particularly PR 11 Tahun 2023, which serves as the reference for inspection forms and damage classification. In this context, the study has integrated information system theory and maintenance regulation practices into a single applied system.

The simplification of damage classification input (Type A, B, and C) without directly including technical parameters is a valid strategy to ensure consistency among users, as suggested by Ramli (2020). This approach aligns with the principles of a decision support system, in which the system functions as a data recorder and manager, while the analysis remains the responsibility of the user, based on technical regulatory guidelines.

Comparison with Other Research Results

A similar study by Nugroho et al. (2021), which developed an inspection system for port facilities, demonstrated a comparable approach in the use of digital forms and cloud-based reporting. However, the advantage of this study lies in the integration of different inspection forms tailored to each condition and type of facility (daily, monthly, rainy season), as well as a damage and maintenance progress visualization dashboard that facilitates decision-making management.

Compared to conventional paper-based inspection systems that are separate from database systems, the BIIFAC system has proven to enhance the efficiency of personnel work and the integration of information within a single platform. This is also in line with the findings of Zainuddin et al. (2024), who emphasize the importance of integration between the user front-end and the database back-end in digital inspection systems.

DISCUSSION

The development of the BIIFAC system demonstrates how the use of low-code technology, such as Appsheet, can significantly simplify the airport facility inspection process. With a digital form-based approach and simple cloud integration, this system addresses the inefficiencies and data loss risks commonly found in manual inspection processes. Moreover, the application's cross-platform capability facilitates field adaptation without the need for specialized devices or complex technical training.

From an implementation perspective, the adoption of BIIFAC is not merely a transition from paper to digital media, but also strengthens audit trails, visibility of repair progress, and damage documentation. This reflects the added value of information systems in supporting operational management and technical decision-making in the field.

However, the system design has not yet included predictive data processing, spatial-based inspection area segmentation, or direct integration with central regulatory systems. The next challenge is how to make the system adaptable to the needs of various airport scales and enhance data security layers. These findings open up further exploration toward a more comprehensive and integrated smart inspection platform.

CONCLUSIONS

This study resulted in an application-based information system named BIIFAC (Bangland Inspection Interface for Airport Facilities) to support the inspection process of landside facilities at Melalan Airport, Kutai Barat. The system was successfully developed using the Appsheet and Google Sheets platforms and can be accessed via Android, iOS, and web devices. The implementation of this application has shown improvements in the efficiency of inspection data recording, damage reporting, and digital data recap, replacing the previous manual method that posed risks of errors and data loss. The use of the application also facilitates documentation and tracking of work progress.

However, this study has a limitation in that it focuses solely on landside facilities and does not include airside inspections, which are also important. In the future, system development can be directed toward expanding features to support airside facility inspections, real-time data integration with central systems, as well as enhancing security and user scalability to better accommodate use in other airports with similar needs.

REFERENCES

- [1] Alhafidz, W., Akbar, D., & Surabaya, P. P. (2022). Pembuatan Aplikasi Inspeksi Harian Unit. 1–84.
- [2] Astutik, L. S., Dwinata, A., Oktaviarini, N., & Jadmiko, R. S. (2023). Sosialisasi Pentingnya Penelitian Research And Development (R&D) Untuk Meningkatkan Karir Guru Di SD Kecamatan Ngunut. *Jurnal Pengabdian Masyarakat Bangsa*, 1(10), 2596–2601. <https://doi.org/10.59837/jpmba.v1i10.566>
- [3] Auriska W Pamungkas, Z., Silk Moonlight, Lady, & Hariyanto, D. (2023). E-Apron Movement Control (AMC) Course Module Based Web Using 4D RND Model. *Proceeding of International Conference of Advance Transportation, Engineering, and Applied Social Science*, 2(1), 1006–1012. <https://doi.org/10.46491/icateas.v2i1.1774>
- [4] Batmetan, J. R., Komansilan, T., & Mamonto, J. (2020). Pengukuran Usability Sistem Operasi Android Menggunakan Use Questionnaire Di Universitas Negeri Manado. *Jurnal Pendidikan Teknologi Informasi*, 01(01), 1–5.

- [5] Dijkman, R., Hofstetter, J., & Koehler, J. (2011). Business Process Model and Notation. <https://doi.org/10.1007/978-3-642-25160-3>
- [6] Direktorat Jenderal Perhubungan Udara. (2023). PR 11 Tahun 2023 Tentang Pedoman Pemeliharaan Fasilitas Sisi Darat Bandar Udara (hal. 1–41).
- [7] Elfi Husda, N., & Wangdra, Y. (2021). Pengantar Teknologi Informasi.
- [8] Hasmia, Nirzal, & Jumardi, A. (2022). Rancang Bangun Aplikasi Inventaris Pada Kantor Desa Salulemo Kecamatan Baebunta Kabupaten Luwu Utara. *D'computare: Jurnal Ilmiah Teknologi Informasi dan Ilmu Komputer*, 12(1), 25–32. <https://doi.org/10.30605/dcomputare.v12i1.40>
- [9] Isa, N. M. (2021). Desain Holding Bay New Bintang Resort International Airport, Kabupaten Bintang Kepulauan Riau. 4–18.
- [10] Listiani, I. (2021). Analisis Pentingnya Sistem Informasi Manajemen dalam Teknologi Informasi dan Komunikasi Saat Ini. *Informasi, teknologi dan komunikasi*, 1, 1–15.
- [11] Lukman, A. M., & Rahmanto, O. (2020). Aplikasi Panduan Pola Hidup Sehat. *Indonesian Journal on Software Engineering (IJSE)*, 6(1), 64–70. <https://doi.org/10.31294/ijse.v6i1.7774>
- [12] Mansattha, M., Dao, H., & Jikaraji, A. (2023). Smart meter design for energy consumption monitoring of residential premises. *Journal of Applied Research on Science and Technology (JARST)*, 22(2), 250745. <https://doi.org/10.60101/jarst.2023.250745>
- [13] Moonlight, L. S., Rochmawati, L., Fatmawati, F., Furyanto, F. A., & Arifianto, T. (2022). Rancang Bangun Website Prodi D3 Komunikasi Penerbangan Menggunakan Metode Prototype. *INTEGER: Journal of Information Technology*, 7(1). <https://doi.org/10.31284/j.integer.2022.v7i1.2520>
- [14] Moonlight, L. S., Rochmawati, L., Suhanto, & Rifai, M. (2022). Sistem Informasi On Time Performance (OTP) Penerbangan di Bandar Udara Internasional Juanda Surabaya. *Warta Penelitian Perhubungan*, 34(2), 93–104.
- [15] Pratama, D., Kusumayati, L. D., & Moonlight, L. S. (2022). Pengembangan Database Dan Tampilan Website Aplikasi Data Informasi Penerbangan Wilayah Ujung Pandang Fic Balikpapan Sector Di Perum Lppnpi Cabang. 1–5.
- [16] Putra, J. D. A., Winiasri, L., Rozi, F., & Moonlight, L. S. (2024). Development of Airport Airside and Landside Facilities Inspection Application: Enhancing Safety and Efficiency. *Appisode Journal*, 2(3), 1–9. <https://doi.org/https://doi.org/10.20823/p7gysj56>
- [17] Putri, V. A., & Syahril, S. (2022). Pemeliharaan Sarana dan Prasarana Sekolah di SMK Negeri Padang. *Journal of Educational Administration and Leadership*, 3(2), 97–101. <https://doi.org/10.24036/jeal.v3i2.354>
- [18] Raihan, H., & Voutama, A. (2023). Pengujian Black Box Pada Aplikasi Database Perguruan Tinggi dengan Teknik Equivalence Partition. *Antivirus : Jurnal Ilmiah Teknik Informatika*, 17(1), 1–18. <https://doi.org/10.35457/antivirus.v17i1.2501>
- [19] Ramli, A. (2020). Manajemen infrastruktur bandar udara: Teori dan praktik inspeksi fasilitas. Prenadamedia Group.
- [20] Riani Johan, J., Iriani, T., & Maulana, A. (2023). Penerapan Model Four-D dalam Pengembangan Media Video Keterampilan Mengajar Kelompok Kecil dan Perorangan. *Jurnal Pendidikan West Science*, 01(06), 372–378.
- [21] Saffanah, K. N. (2023). Analisis Perancangan Website Museum Sebagai Sarana Informasi dan Promosi untuk Mendukung Proses Online Reservasi Penginapan di Museum Tanah dan Pertanian. *Jurnal Media Infotama*, 19(1), 95–102. <https://doi.org/10.37676/jmi.v19i1.3457>
- [22] Santausa, T., Mustaruddin, & Simbolon, D. (2020). Sistem Basis Data Produksi Ikan Berbasis Situs Web (Website) Di Kabupaten Sukabumi Jawa Barat. *Jurnal Ilmu dan Teknologi Kelautan Tropis*, 12(2), 473–485. <https://doi.org/10.29244/jitkt.v12i2.30964>
- [23] Simamora, N. H., Winiasri, L., Hariyadi, S., & Putro, S. (2024). Rancang Bangun Sistem Inspeksi dan Laporan Perbaikan Fasilitas Sisi Darat dan Udara Bandara Djalaluddin Gorontalo Berbasis Progressive Web. 156, 156–168.
- [24] Son, P. N. (2024). Nghiên cứu Appsheets, Apps Script để xây dựng ứng dụng quản lý và triển khai chương trình đào tạo ở trường đại học. *VNU Journal of Science: Education Research*, 40(1), 104–114.
- [25] Sukardi, Darmadi, E. A., & Santoso, L. H. (2021). Preferensi Konsumen Dalam Pemilihan Smartphone Berdasarkan Sistem Operasinya. *Ikraith-Ekonomika*, 4(3), 175–180.
- [26] Suryan, V., Winiasri, L., Fazal, M. R., Nur Afriyani, S. R., Septiani, V., Sari, A. N., & Fatimah, S. (2023). Aplikasi Perencanaan Perkerasan Runway Menggunakan Software Faarfield. *Jurnal Talenta Sipil*, 6(1), 61. <https://doi.org/10.33087/talentasipil.v6i1.163>
- [27] Suryani, R., Triwibowo, D. N., & Somaida, M. H. (2022). Perancangan Aplikasi Pengolah Data Buku C pada Desa Bener Menggunakan Appsheets di Kecamatan Majenang Kabupaten Cilacap. *Jurnal Ilmu Komputer dan Teknologi*, 3(1), 19–23. <https://doi.org/10.35960/ikomti.v3i1.795>
- [28] Syamsudin, S., & Ali, H. (2024). Pengaruh Sistem Operasi, Database Dan Server Terhadap Sistem Informasi. *Jurnal Manajemen Pendidikan Dan Ilmu Sosial*, 5(3), 305–311. <https://doi.org/10.38035/jmpis.v5i3.1946>
- [29] UU NO 1 Tahun 2009, Society 464 (2009).
- [30] Yunita, N., Wijaya, E. T., & Marlina, S. (2023). Desain Ui/Ux Biaya Pengiriman Barang Depo Bangunan Tangerang Selatan Menggunakan R&D Model. *Jurnal Digit*, 13(1), 9–20. <https://doi.org/10.51920/jd.v13i1.317>
- [31] Zainuddin, Z., Achmad, A., & Syahyadi, A. I. (2024). Pengembangan Aplikasi Dashboard Data Borang Akreditasi Program Studi Pada UIN Alauddin Makassar. *Jurnal Ilmiah Sistem Informasi dan Teknik Informatika (JISTI)*, 7(1), 46–54. <https://doi.org/10.57093/jisti.v7i1.191>
- [32] Zasmadyansyah, Z., Ismayanti, R., Riyayatsyah, R., Haerullah, H., & Hairah, U. (2023). Sistem Informasi Penjualan Pada Koperasi SMK Nabil Husein Samarinda Berbasis Website. *Jurnal Rekayasa Teknologi Informasi (JURTI)*, 7(2), 145–154. <https://doi.org/10.30872/jurti.v7i2.13743>