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POLIKU PARCEL SYSTEM: AN INTELLIGENT APPROACH TO PARCEL SORTING AND DELIVERY.

Noraimi Mahran[1*],
Jamaah Suud[2], and
Ahmady Solong[3]

[1] Department of Information Technology and Communication, Politeknik Kuching Sarawak
[2] Department of Electrical Engineering, Politeknik Kuching Sarawak
[3] Department of Mechanical Engineering, Politeknik Kuching Sarawak

*corresponding author: noraimi@poliku.edu.my

ABSTRACT: *Managing parcels in academic settings has become more challenging with the increase in deliveries and the necessity for effective tracking systems. It's important to ensure that students and staff receive their packages quickly and accurately, which helps reduce administrative work and improves overall efficiency. To tackle these issues, the Poliku Parcel System was created at Politeknik Kuching Sarawak. This system offers a comprehensive and easy-to-use platform specifically designed for the unique needs of academic environments. It was developed using Agile methodology, focusing on iterative and user-centered design. The process involved several phases, including planning, design, development, testing, deployment, review, and launch. Initially, student interviews were conducted to gather requirements, which informed the design phase where wireframes and prototypes were developed with user input. The development phase utilized tools like Visual Studio Code, along with VR and AR technologies. Rigorous testing was conducted to identify and resolve issues, and the deployment phase allowed for the immediate release of new features. Continuous improvement was ensured through regular user feedback during the review phase. The system provides several key benefits which are users can easily track their parcels through a user-friendly homepage, reducing the time spent on inquiries and increasing satisfaction. Staff members experience streamlined operations with features like the Total Parcel Calculation Dashboard and dynamic status updates, minimizing manual errors. Enhanced security measures for parcel pickups help reduce theft risks. Administrators can efficiently manage parcel operations using comprehensive metrics and staff management tools, improving communication and engagement. The implementation of the Poliku Parcel System represents a significant advancement in campus logistics, providing practical solutions to streamline parcel management and improve the user experience. This project highlights notable improvements in operational efficiency and user satisfaction, setting a standard for future innovations in educational logistics.*

Keywords: *Parcel management, Academic Settings, Agile Methodology, Tracking Systems, Operational Efficiency*

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1. Introduction

Managing parcels in academic institutions has become increasingly challenging due to the rising number of deliveries and the necessity for efficient tracking and handling systems. Effective parcel management is vital to ensure that students and staff receive their packages on time and without errors, which helps reduce administrative burdens and enhance overall operational efficiency (Abualrejal, H. M., 2022).

Poliku Parcel System was developed to address these challenges by offering a comprehensive and user-friendly platform for managing parcel deliveries at Politeknik Kuching Sarawak. This system is particularly significant in the context of modern educational institutions, where the timely and accurate delivery of parcels is essential for maintaining smooth daily operations (Smiota, 2024). Despite the importance of parcel management, there is a notable lack of integrated systems tailored to the unique needs of academic environments, revealing a significant gap in existing research and practice (Ma, B., 2022).

Previous studies have explored various aspects of parcel management and logistics, emphasizing the need for automation and efficient tracking mechanisms. Research has demonstrated that integrating technology into parcel systems can significantly improve accuracy and reduce manual workloads. However, these studies often focus on commercial or industrial applications, with limited attention to the specific requirements of academic institutions (Udoh, D. E, 2024). This study aims to bridge that gap by developing a tailored parcel management system that caters specifically to the unique environment of Politeknik Kuching Sarawak.

The primary objective of this research is to design and implement a parcel management system that enhances the efficiency and reliability of parcel handling within the institution. Specific goals include reducing parcel processing time, improving tracking accuracy, and increasing user satisfaction among students and staff. By achieving these objectives, the Poliku Parcel System aims to provide a model that can be adopted by other educational institutions facing similar challenges.

The rest of the paper is divided into four parts after this introduction. In Section 2, the literature review is presented examines existing research on parcel management systems and identifies gaps. In Section 3, the methodology section details the system block diagram and system design. Results and discussion of the design system are presented in Section 4. Lastly, the conclusion is outlined in Section 5.

2. Literature Review

With the growing trend of online shopping, managing parcel deliveries at academic institutions has become crucial. Effective parcel management systems not only streamline operations but also improve the user experience for students, staff, and administrative personnel. This review examines the current landscape of parcel management systems, specifically focusing on J&T Express, Parcelhub, and Pos Malaysia. It discusses their features, methodologies, and innovations, and identifies gaps in the existing literature, suggesting future research areas for developing an optimized parcel management system for Politeknik Kuching Sarawak (Poliku).

J&T Express is a delivery service that uses advanced e-technology to support e-commerce. Their motto, "Express Your Online Business," highlights their focus on integrating technology into parcel delivery. Key features include real-time tracking, instant status updates, and a modern, user-friendly interface, all aimed at boosting operational efficiency and customer satisfaction (J&T Express, 2023).

Established in 2019, Parcelhub offers a wide range of courier and fulfillment services, both domestically and internationally. Their system emphasizes a one-stop service model and includes strong security measures like password resets via registered emails and temporary passwords sent by administrators. The user interface is intuitive and easy to navigate, with features like instant email notifications, making it a strong candidate for reference in developing Poliku's parcel management system (Parcelhub, 2023).

Pos Malaysia has evolved from a traditional postal service into a multifaceted company offering a range of services, including mail, parcels, financial services, and supply chain solutions. The system features a more traditional but functional user interface, providing comprehensive information through a menu bar. Security features include password resets through registered IDs and security questions, with notifications available via app and SMS. Although its system might not be as modern as J&T Express or Parcelhub, it offers a broad service range (Pos Malaysia, 2023).

The comparative analysis of J&T Express, Parcelhub, and Pos Malaysia reveals several key features important for developing the Poliku Parcel System. J&T Express uses phone numbers for password resets, while Parcelhub and Pos Malaysia use email and identification numbers, respectively. Parcelhub's temporary password system via

email is particularly user-friendly and robust. J&T Express and Parcelhub feature modern, user-friendly interfaces, whereas Pos Malaysia's interface is more traditional and information dense. Efficient navigation and timely notifications are critical, with J&T Express providing instant updates, Parcelhub using email, and Pos Malaysia offering notifications via app and SMS. Although all three offer real-time tracking, Pos Malaysia may experience delays in updates. Overall, Parcelhub stands out as the most suitable model for Poliku, offering a blend of strong security, user-friendly design, efficient navigation, and timely notifications.

This analysis highlights the importance of incorporating modern technology, user-focused design, and efficient operational features in parcel management systems. Parcelhub, with its comprehensive and user-friendly approach, is recommended as the best model for the Poliku Parcel System. Future research should focus on integrating these features into a customized solution for Poliku, addressing any identified gaps, and enhancing the overall efficiency and user experience of parcel management on campus.

3. Methodology

3.1 Block Diagram

The development and implementation of the Poliku Parcel System utilized an Agile framework, which emphasized an iterative and user-focused design throughout. The details of this process are illustrated in Figure 1.

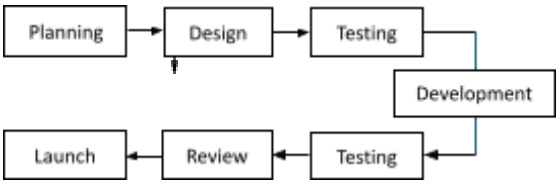

Figure 1: Block Diagram representing the Methodology for the Poliku Parcel System

The Poliku Parcel System project is divided into several key phases. In the Planning Phase, we conduct a thorough analysis to fully understand and plan out the parcel system. This involves interviewing students to gather insights about their needs and preferences, which form the basis for developing the platform.

In the Design Phase, we use an iterative approach, focusing on user needs. This includes creating wireframes and prototypes with tools like Canva and incorporating user feedback to continually improve the design.

The Development Phase centers on incrementally building the system, feature by feature, utilizing advanced tools such as Visual Studio Code, VR, and AR technologies. We emphasize teamwork and Agile principles to ensure a smooth development process.

During the Testing Phase, we implement a detailed testing strategy to quickly identify and fix issues. This includes addressing problems as they arise and using user feedback to make further improvements.

In the Deployment Phase, new features are rolled out as soon as they are ready, allowing users to immediately benefit from updates. Users receive timely notifications about parcel status, supporting ongoing enhancements.

The Review Phase involves regularly assessing the project's progress and seeking user feedback to guide further improvements. This iterative process ensures the platform continues to evolve based on user input.

Finally, the Launch Phase focuses on delivering a responsive and user-friendly experience. This includes easy navigation, personalized forms, and real-time notifications to make parcel management efficient and intuitive.

3.2 System Design of Poliku Parcel System

The Poliku Parcel System is carefully designed to streamline and automate parcel management within an organization. It caters to three main user groups: Users, Staff, and Admins, each with tailored functionalities to support efficient parcel handling, tracking, and reporting.

3.2.1 User Interactions

For general users, the system offers an intuitive homepage with various features. Users can check their parcel status, submit inquiries, create support tickets for any issues, and access organizational information, including contact details. This user-friendly interface ensures that users have all the necessary tools to manage their parcels effectively.

3.2.2 Staff Interactions

Staff members log in securely and have the option to reset their passwords. Once logged in, they access a dedicated dashboard with options to view the total number of parcels, those picked up, and their current status. They can also add new parcels, review recent additions and deliveries, and search for specific parcels. The system also allows staff to change their passwords and log out securely.

3.2.3 Admin Interactions

Admins access a more advanced dashboard after logging in. This interface includes features such as viewing total parcels and pickups, listing and adding staff members, managing staff details and permissions, and generating various reports. Admins can also view detailed parcel information, handle user inquiries, and log out securely.

3.2.4 Flowchart Breakdown

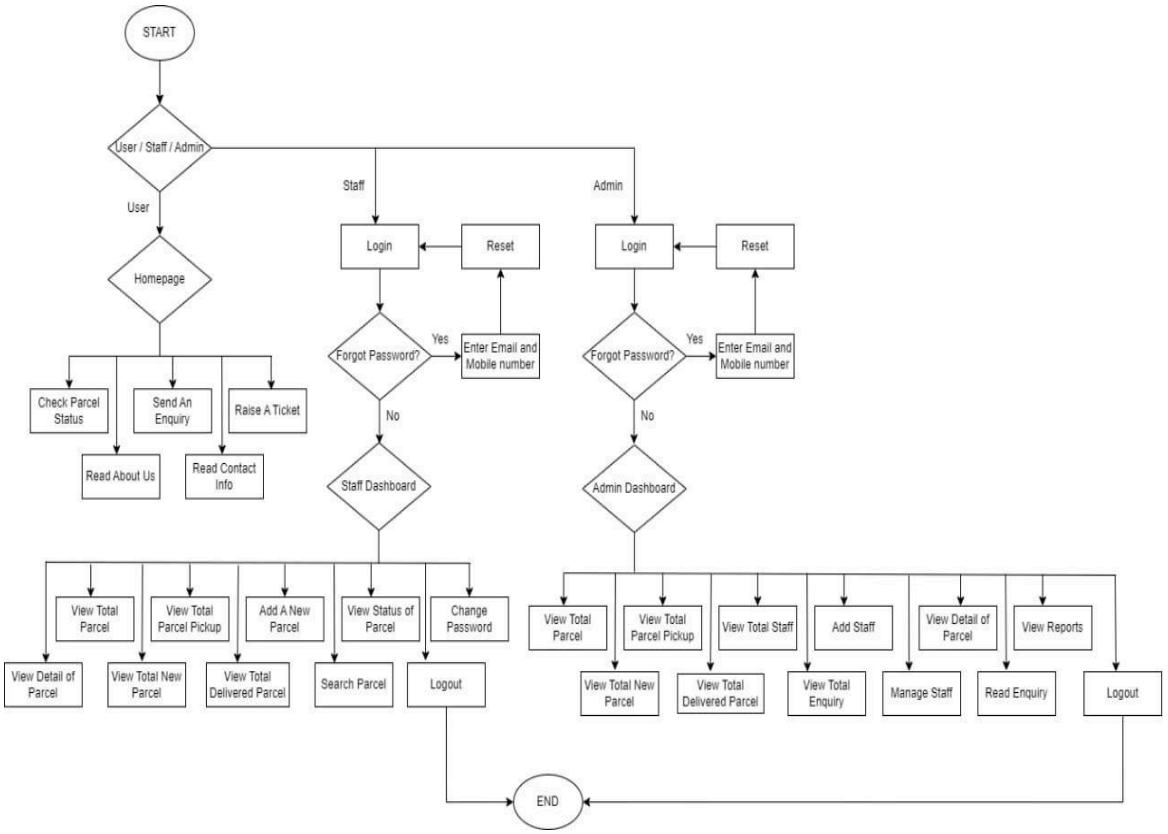

Figure 2: System Design of the Poliku Parcel System

The flowchart outlines the interactions and pathways for each user type. It starts from a common entry point for all users. The user path directs to the homepage with options for checking parcel status, submitting inquiries, and raising tickets. The staff path includes login/reset options leading to a staff dashboard with parcel management functions. The admin path also involves login/reset options, leading to a comprehensive admin dashboard with additional staff management and reporting features.

3.2.5 System Architecture

The architecture of the Poliku Parcel System is designed for easy navigation for all user types. It features secure login and password reset processes for staff and admins, and separate dashboards to meet their specific needs. This setup includes functionalities for adding, updating, and viewing parcel details, along with robust reporting tools for admins. Additionally, the system supports user inquiries and ticketing to address support needs promptly.

The Poliku Parcel System aims to deliver a smooth and effective experience for users, staff, and admins by automating parcel tracking and management, significantly improving operational efficiency and user satisfaction. The structured approach ensures all user types have access to essential tools and information, enhancing parcel management and tracking.

4.0 Results and Discussion

4.1 Homepages/User Interface

The interface of the Poliku Parcel System is designed to facilitate efficient parcel tracking and management for users. Key components and their functionalities include Homepage, About Us Section, and Contact Form.

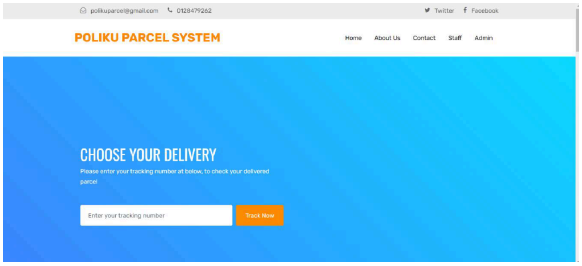

Figure 4.1: User Enter Their Parcel Tracking Number

Homepage: Users can enter their parcel tracking number in the provided textbox as shown in Figure 4.1. The "Track" button click to view the status of their parcel, including delivery or pickup updates as view in Figure 4.2. This feature directly addresses the primary issue by offering an efficient tracking solution.

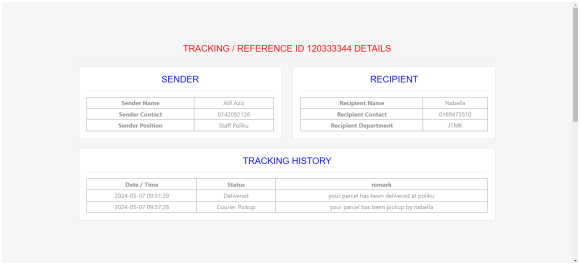

Figure 4.2: Parcel Information

About Us Section: This part offers an overview of the Poliku Parcel System, detailing its purpose and functionalities, along with an image relevant to the "About Us" content as depicted in Figure 4.3.

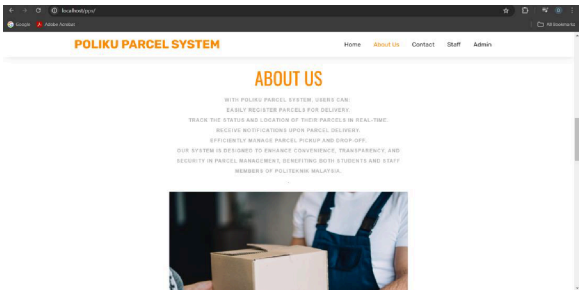

Figure 4.3: About Us Section

Contact Form: Users can contact the system administrators by filling in their details in a form shown in Figure 4.4 and clicking the "Send Message" button, facilitating seamless issue reporting and assistance requests.

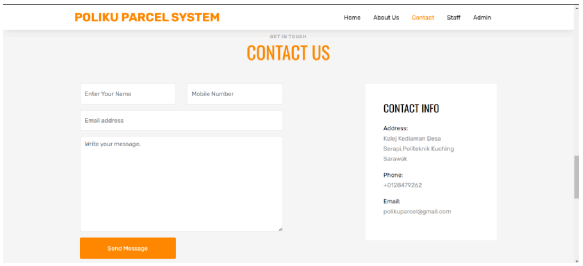

Figure 4.4: Contact Form

4.2 Staff Dashboard

The Staff Dashboard is crucial for effective parcel data management. Key components and their functionalities include Login Forms, Total Parcel Calculation Dashboard, Data Entry for New Parcels, Status Updates, Parcel Pickup Process, and Tracking and History.

Login Forms: Staff login forms as shown Figure 4.5 require registered email addresses and passwords for access. Staff who forget their passwords can reset them via the "Forgot your password?" link, ensuring secure recovery. The login page also includes a "Homepage" link for easy navigation back to the main site.

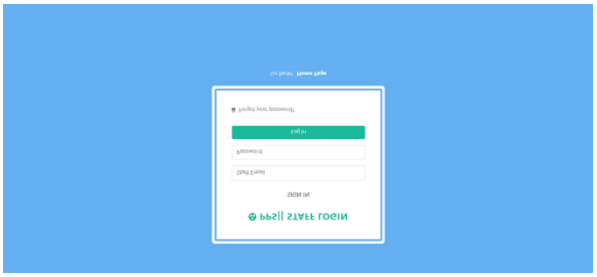

Figure 4.5:Staff Login Form

Total Parcel Calculation Dashboard: This tool allows staff to calculate the total number of new, delivered, and picked-up parcels, ensuring precise record-keeping and instant feedback on parcel statuses as shown in Figure 4.6.

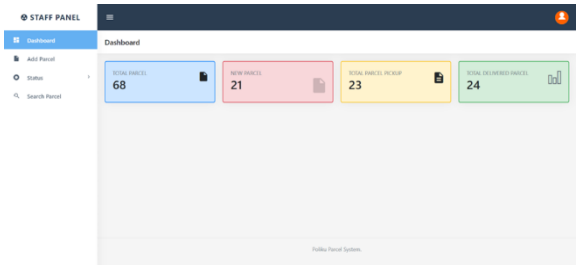

Figure 4.6: Total Parcel Calculation Dashboard

Data Entry for New Parcels: Staff members can enter details for new parcels, including tracking numbers, and sender and recipient information, which is then displayed in the "New Parcel" section for review and updates as shown in Figure 4.7.

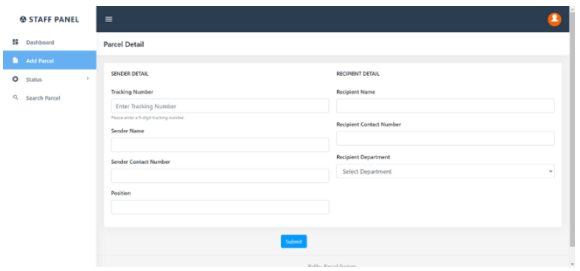

Figure 4.7: Data Entry for New Parcels

Status Updates: Staff can update parcel statuses by marking them as "delivered" and add remarks to inform users about the delivery status. Figure 4.7 illustrates this functionality. Additionally, Figure 4.8 shows the status update for a "New Parcel," Figure 4.9 displays the "Delivered" status, Figure 4.10 highlights the "Parcel Pickup" status, and Figure 4.11 provides a detailed view of the parcel information. These updates help ensure users are well-informed about the current status and any relevant details of their parcels.

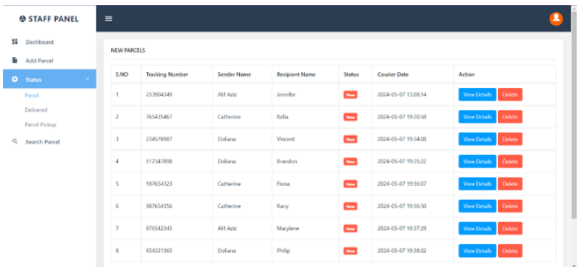

Figure 4.8: Parcel Status Updates: New Parcel

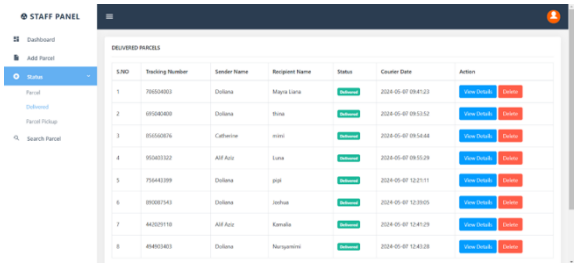

Figure 4.9: Parcel Status Updates: Delivered

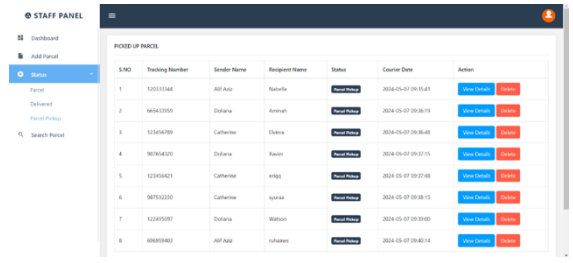

Figure 4.10: Parcel Status Updates: Parcel Pickup

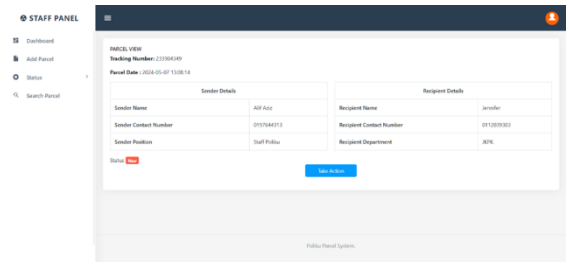

Figure 4.11: Detail View of the Parcel Information

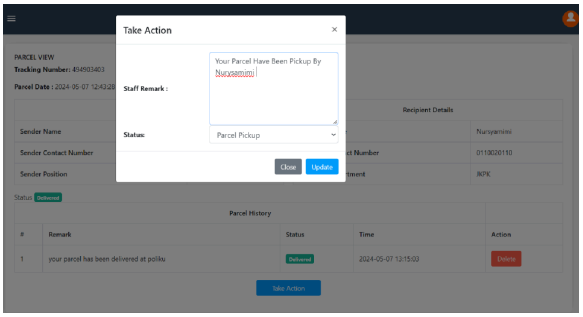

Figure 4.12: Staff member remark parcel recipient collection confirmation

Parcel Pickup Process: When a user intends to pick up a parcel, the staff member can update the status to "parcel pickup" and add a confirmation remark to ensure secure and verified collection as illustrated in Figure 4.12.

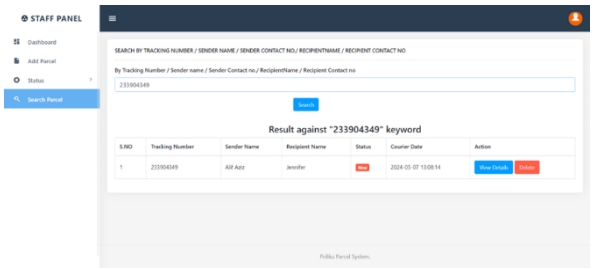

Figure 4.13: Staff Search Parcel

Tracking and History: Users can check detailed parcel information, including sender and recipient details, and tracking history, ensuring transparency and efficient tracking of the parcel journey as displayed in Figure 4.13.

4.3 Admin Dashboard

The Admin Dashboard provides comprehensive tools for overseeing parcel management. Key components and their functionalities include Login Forms, Metrics Tracking, Staff Management, Parcel Details Access, Content Management, and Enquiry Section.

Login Forms: Admin login forms, as shown in Figure 4.14, require registered email addresses and passwords for access. Admin who forget their passwords can reset them via the "Forgot your password?" link, ensuring secure recovery. The login page also includes a "Homepage" link for easy navigation back to the main site.

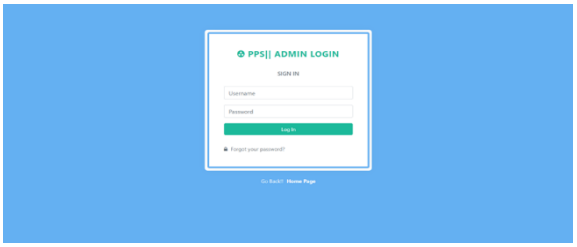

Figure 4.14: Admin Login Form

Metrics Tracking: The dashboard tracks key metrics, including the total number of new parcels, delivered parcels, pickups, staff members, and user inquiries, offering administrators valuable insights to optimize operations provides in Figure 4.15.

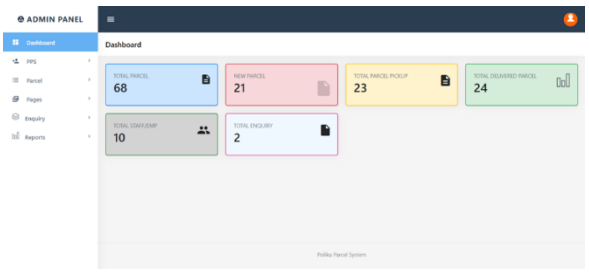

Figure 4.15: Admin Metrics Tracking

Staff Management: Administrators can register new staff, edit existing staff details, deactivate or delete staff accounts, ensuring accurate staff records and efficient communication. Figures 4.16 and 4.17 illustrate these operations, with Figure 4.16 focusing on specific staff management tasks and Figure 4.17 providing an overview of the entire staff management process.

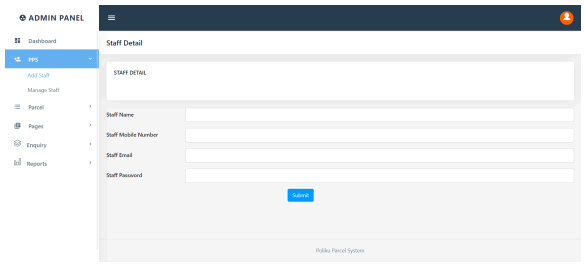

Figure 4.16: Staff Management Operations

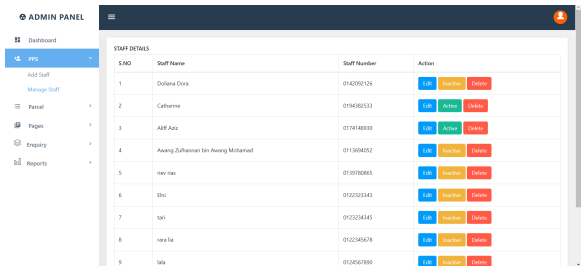

Figure 4.17: Staff Management Operations Overview

Parcel Details Access: Administrators have access to crucial parcel-related details, enabling them to monitor new parcels, deliveries, and scheduled pickups effectively. Figures 4.18, 4.19, and 4.20 illustrate these processes: Figure 4.18 shows the status of new parcels, Figure 4.19 depicts the status of delivered parcels, and Figure 4.20 focuses on the status of parcels scheduled for pickup.

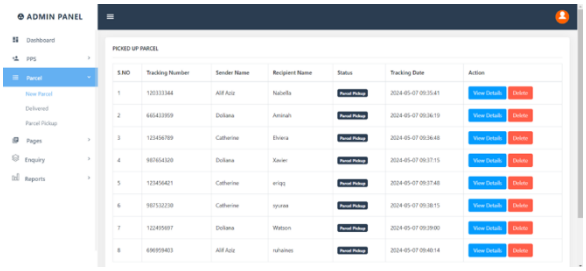

Figure 4.18: Admin Check Status: New Parcel

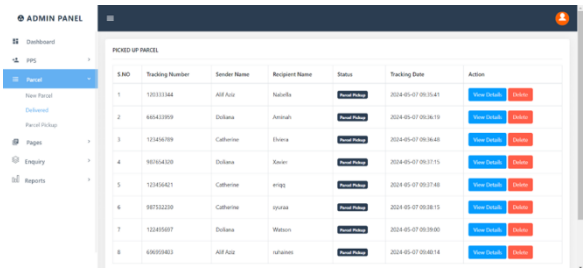

Figure 4.19: Admin Check Status: Delivered Parcel

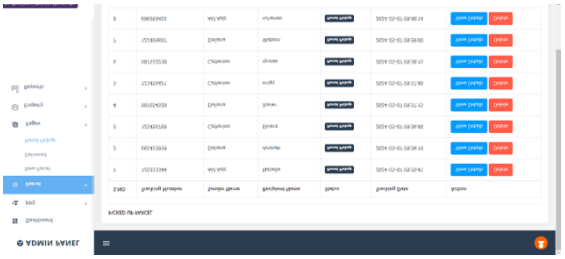

Figure 4.20: Admin Check Status: Parcel Pickup

Content Management: Administrators can update the delete function action, the "About Us" and "Contact Us" pages, ensuring that all public-facing content is accurate and up to date. Figures 4.21, 4.22, and 4.23 provide a visual representation of these administrative functions: Figure 4.21 shows the delete functionality for admin parcel actions, while Figures 4.22 and 4.23 illustrate the processes involved in managing the "About Us" and "Contact Us" pages, respectively.

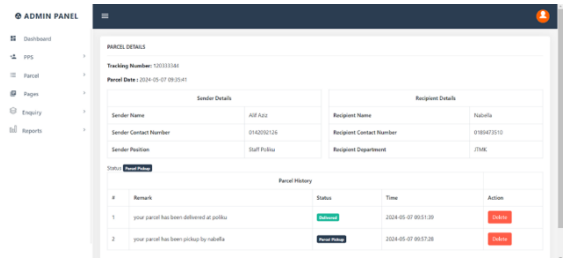

Figure 4.21: Admin Parcel Actions - Delete Functionality

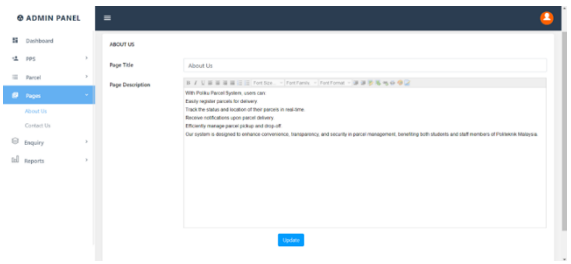

Figure 4.22: Admin Content Management-About Us

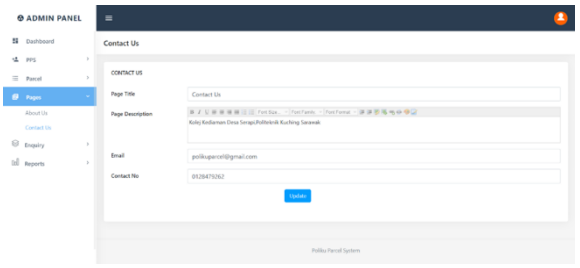

Figure 4.23: Admin Content Management-Contact Us

Enquiry Section: Administrators can access and review user messages in the Enquiry section, categorized into "Unread" and "Read" inquiries, ensuring timely and efficient responses to user concerns. Figure 4.24 illustrates the layout of the Enquiry Section, while Figure 4.25 provides a detailed view of the Enquiry interface, highlighting how messages are managed and reviewed by the administrators to maintain effective communication with users.

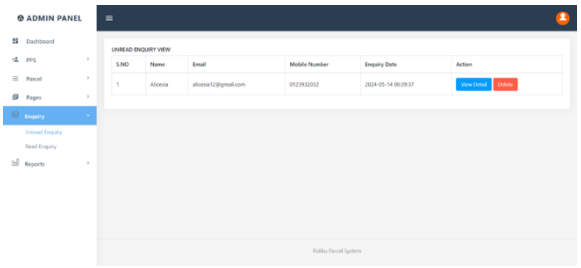

Figure 4.24: Enquiry Section

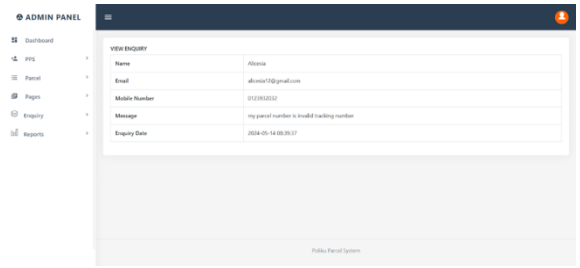

Figure 4.25: Enquiry View

The Poliku Parcel System at Politeknik Kuching Sarawak (Poliku) has greatly enhanced how parcels are managed on campus, making the process more efficient and transparent. This system, designed with users in mind, offers several notable improvements. For instance, its easy-to-navigate interface allows users to track their parcels by simply entering tracking numbers on the main page, which speeds up the process and boosts user satisfaction. Additionally, the system's Total Parcel Calculation Dashboard simplifies staff tasks by maintaining accurate records and reducing errors with real-time updates on parcel statuses. Enhanced security features, such as improved verification for parcel pickups, have also helped reduce theft risks and ensure that only authorized individuals receive their parcels (REVANTH, S., 2021).. Furthermore, the admin dashboard provides detailed metrics and management tools that help administrators efficiently handle parcel operations, update content, and respond to inquiries, thus improving overall communication and user engagement (EGBE, A., 2022).

The Poliku Parcel System has tackled the main challenges of managing parcels at Politeknik Kuching Sarawak (Poliku) through its thoughtfully designed and feature-rich platform. A few key aspects contribute to its success. The system's development was guided by Agile principles, which meant it could be continuously refined based on user feedback. This iterative approach led to a highly efficient and user-friendly platform that adapts to users' needs over time (Othman, N. A. et al., 2021). Security is another strong point, with features like secure logins, password resets, and verification processes for parcel pickups enhancing both safety and system integrity. These measures ensure that only authorized individuals can access the system and handle parcels securely (THETU, E. L., 2021). Additionally, the system has improved transparency by providing detailed tracking histories and

comprehensive parcel information, which keeps users well-informed about their shipments. The inclusion of a contact form and inquiry section also ensures smooth communication between users and administrators, enabling quick resolution of issues (Pennekamp, J., 2023). Moreover, by automating tasks such as calculations and status updates, the system has lightened the manual workload for staff, allowing them to focus on more critical responsibilities and boosting overall efficiency (Yeoh, S. Y., 2023). Overall, the Poliku Parcel System has made parcel management at Poliku more secure, transparent, and user-friendly. Ongoing feedback and development will continue to enhance its effectiveness and user satisfaction.

The introduction of the Poliku Parcel System has greatly enhanced both the efficiency of handling parcels and overall user satisfaction. Notable improvements include shorter wait times for parcel pickups, better tracking through real-time notifications, and a more intuitive interface that has simplified administrative tasks (Ivanets, I., 2022). These benefits highlight the system's potential impact on broader campus logistics and administrative functions. By streamlining parcel management, Poliku is better positioned to allocate resources efficiently and boost operational effectiveness. Additionally, similar systems could be valuable in other educational or corporate environments, offering improved logistical processes and user experiences (Lagorio, A., 2022). However, the system does rely on a stable internet connection for its real-time features and requires regular updates to stay functional, which could affect its reliability and increase reliance on digital infrastructure.

5.0 Conclusion

This study aimed to create and implement a highly effective parcel management system called the Poliku Parcel System at Politeknik Kuching Sarawak (Poliku). Since its introduction, the system has markedly enhanced parcel handling efficiency and user satisfaction. Notable improvements include shorter wait times for parcel pickups, better tracking with real-time notifications, and a more intuitive interface that has streamlined administrative tasks. These advancements have broader implications for managing campus logistics and administrative operations. By refining parcel management processes, Poliku has been able to allocate resources more efficiently and boost overall operational effectiveness. Additionally, similar systems could be beneficial in other educational institutions or corporate environments, enhancing logistical workflows and user experiences. However, the system's reliance on stable internet connections for real-time updates and the need for regular updates pose limitations that could affect its reliability and users' dependence on digital infrastructure. Future research might explore using predictive analytics for forecasting parcel volumes in educational settings and integrating the Poliku Parcel System with wider campus management systems. Studying user adoption trends and preferences could also help further refine the system’s design and functionality. Overall, the development and rollout of the Poliku Parcel System represent a significant step forward in campus logistics, providing practical solutions that improve operational efficiency and user satisfaction, and paving the way for future innovations in educational logistics.

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