

MOBILE-BASED LAUNDRY ORDERING SYSTEM WITH OPENSTREETMAP INTEGRATION FOR CUSTOMER COORDINATE CAPTURE

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ABSTRACT

Advances in information technology have driven digital transformation across various service sectors, including the laundry industry. Conventional laundry services still face a number of challenges, such as inefficient ordering processes, difficulties in accurately determining customer locations, and the lack of an integrated service monitoring system. This study aims to develop a mobile-based laundry ordering information system that utilizes OpenStreetMap to obtain accurate, real-time customer coordinates. The developed system allows customers to place orders online, specify pickup locations via a digital map, and monitor service status in real time. Meanwhile, service providers can optimize pickup and delivery processes based on location data obtained from the system. The results indicate that the developed system enhances operational efficiency, location accuracy, and service quality. The integration of OpenStreetMap provides flexibility in managing open geospatial data and supports the development of large-scale systems. Additionally, this system adopts the concept of location-based services, which aligns with current mobile technology trends.

Keywords: Laundry service, Customers, OpenStreetMap, Digital map, Customer coordinates

SISTEM PEMESANAN LAUNDRY BERBASIS MOBILE DENGAN INTEGRASI OPENSTREETMAP UNTUK PENYIMPANAN KOORDINAT PELANGGAN

ABSTRAK

Perkembangan teknologi informasi telah mendorong transformasi digital pada berbagai sektor layanan, termasuk industri laundry. Layanan laundry konvensional masih menghadapi sejumlah kendala, seperti proses pemesanan yang belum efisien, kesulitan dalam menentukan lokasi pelanggan secara akurat, serta belum tersedianya sistem monitoring layanan yang terintegrasi. Penelitian ini bertujuan untuk mengembangkan sistem informasi pemesanan laundry berbasis mobile dengan memanfaatkan OpenStreetMap guna memperoleh koordinat pelanggan secara akurat dan real-time. Sistem yang dikembangkan memungkinkan pelanggan melakukan pemesanan secara online, menentukan titik lokasi penjemputan melalui peta digital, serta memantau status layanan secara langsung. Di sisi lain, penyedia layanan dapat mengoptimalkan proses penjemputan dan pengantaran berdasarkan data lokasi yang diperoleh dari sistem. Hasil penelitian menunjukkan bahwa sistem yang dikembangkan mampu meningkatkan efisiensi operasional, akurasi penentuan lokasi, serta kualitas pelayanan. Integrasi OpenStreetMap memberikan fleksibilitas dalam pengelolaan data geospasial terbuka serta mendukung

pengembangan sistem yang berskala luas. Selain itu, sistem ini mengadopsi konsep layanan berbasis lokasi (location-based service) yang sejalan dengan perkembangan teknologi mobile saat ini.

Kata kunci: *Layanan laundry, Pelanggan, OpenStreetMap, Peta digital, koordinat pelanggan*

INTRODUCTION

In recent years, the laundry business has grown rapidly along with the increasing need of urban communities for practical and efficient clothing washing services. Customer groups such as office workers, college students, and young professionals generally seek convenience and speed when using laundry services. However, the majority of small to medium-scale laundry providers still use traditional ordering systems, such as through text messages, phone calls, or manual record-keeping in books. These methods often create various operational obstacles that ultimately lead to customer dissatisfaction. The most critical obstacle in laundry operations is the poor coordination between customers and business operators. Information regarding washing status, estimated completion time, and pick-up or delivery schedules is often not communicated properly. Customers usually have to contact the laundry multiple times just to confirm whether their clothes are ready to be picked up. On the other hand, laundry providers face difficulties in managing order priorities, recording specific customer instructions (such as prohibitions on using fabric softener or requests for color separation), and providing timely notifications. This situation leads to miscommunication, information delays, and even the potential loss of orders, which is detrimental to both parties.

Furthermore, the manual approach does not provide direct information transparency. Customers cannot know in real-time the stages of their clothes' processing, whether they are being washed, dried, ironed, or are already in ready-to-pick-up status. This uncertainty can reduce customer loyalty and encourage them to switch to competitors who already use application-based systems. From the business owner's perspective, without an integrated data system, it is difficult to monitor employee performance, manage delivery routes optimally, or analyze customer preferences. As a solution, a mobile ordering system is needed that is capable of facilitating two-way communication between customers and laundry service providers. The Just-in-Time Operational and Service Management (JOSM) approach is considered appropriate because it emphasizes timeliness, workflow efficiency, and real-time service synchronization. By adopting JOSM, every change in order status can be sent automatically to customers via notifications,

estimated completion times become more precise, and coordination of pick-ups or deliveries can be done instantly. This study aims to design and implement a Mobile-Based Ordering Information System Using JOSM for Customer Coordination for laundry businesses. This system is expected to improve transparency, minimize communication errors, accelerate response to orders, and provide greater convenience for customers while helping business owners manage operations more systematically and efficiently.

2. LITERATURE REVIEW

2.1. Mobile Ordering

Mobile-Based Ordering is a system that allows users to order products or services through mobile devices such as smartphones or tablets by utilizing an internet connection. This system is generally integrated with mobile applications or responsive web-based platforms, enabling users to conduct transactions in real-time without having to come directly to the service provider's location. According to the IEEE, mobile-based systems are part of the evolution of digital information systems that support user mobility and fast, flexible data access. Mobile ordering is one of the important implementations in improving service efficiency and user experience.

2.2. Modern Technology-Based Information System

Modern Technology-Based Information System is a development of conventional information systems that utilizes the latest technologies such as cloud computing, mobile devices, the Internet of Things (IoT), big data, and artificial intelligence to improve efficiency, flexibility, and data analysis capabilities. This system is designed to operate in real-time, be integrated, and be adaptive to user needs. According to Kenneth C. Laudon and Jane P. Laudon, modern information systems not only function as data processors but also as strategic platforms that support business innovation and data-driven decision making. Meanwhile, the IEEE states that modern information systems integrate digital technologies to improve connectivity and interoperability between systems.

2.3. OpenStreetMap

OpenStreetMap is an open-source world mapping project that allows anyone to freely create, edit, and distribute geospatial data. OSM is collaboratively developed by a global community and provides map data that can be used for various purposes such as navigation, spatial analysis, and the development of location-based systems. According to the

OpenStreetMap Foundation, OSM is an open geographic database that can be freely utilized under an open license (Open Database License), thus providing high flexibility for developers and researchers. OpenStreetMap is a highly flexible open geospatial data platform that can be used in various location-based systems. With its simple yet powerful data structure, as well as support from a global community, OSM becomes an effective solution for the development of modern information systems. In the context of this research, OSM plays an important role in supporting customer coordination and location-based laundry service tracking.

2.4. Java OpenStreetMap Operation

Java OpenStreetMap (JOSM) Operation is a Java-based desktop application used to create, edit, and validate data on OpenStreetMap (OSM). JOSM is designed for users who need more detailed control in spatial data processing compared to web-based editors. According to the OpenStreetMap Foundation, JOSM provides advanced editing features that enable precise manipulation of geographic data, including the management of nodes, ways, relations, and metadata (tags). It can be downloaded for free at <http://josm.openstreetmap.de/>



Figure 1. Java OpenStreetMap Editor

Tasking Manager is a mapping tool designed and built for collaborative mapping by HOT (Humanitarian OpenStreetMap Team). This tool can be used to divide a region into several map tiles, so that it can be worked on collectively to map an area in an organized manner. It aims to break down mapping work into smaller tasks that can be completed quickly. This approach facilitates the distribution of tasks to various mappers in emergency contexts. An overview of the OSM Tasking Manager.

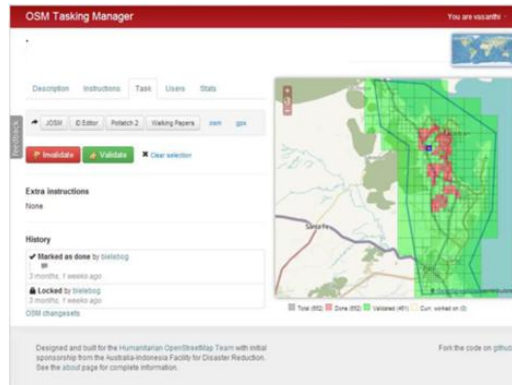


Figure 2. OSM Tasking Manager

2.5. Openstreet Map

OpenStreetMap is a collaborative web-based mapping project that aims to provide free and open geospatial data that anyone can use, edit, and distribute. According to Haklay & Weber (2008), OSM is a form of Volunteered Geographic Information (VGI), which is spatial data collected voluntarily by users (crowdsourcing).



Figure 3. OpenStreetMap

3. RESEARCH METHOD

3.1. Research Location

The case location for this research is Villa Mutiara Jaya Housing Complex Blok M67 Cibitung. The very rapid development of new housing in the Cibitung area by 2025 will drive the entry of micro, small, and medium enterprises (MSMEs), including laundry businesses. A common complaint expressed by customers is that they have to go to the nearest laundry store to service their items. After that, customers must pick up their items again when they receive a call that their items are ready for collection. In their opinion, this is very inefficient. One effort to improve service for customers who have busy schedules is that laundry business owners will provide a delivery feature. The laundry service management application created for customers is

mobile-based, so it can only be accessed through the browser on each mobile device. Meanwhile, laundry staff can access it via a laptop or PC available at the laundry service.

3.2. Equipment Used

This research uses various instruments for data processing, report writing, and field surveys, including: (a). Hardware such as Android Smartphones, laptops/PCs, and internet networks, (b). Software such as OpenStreetMap as a map service, JOSM for map data editing, Android Studio, and CodeIgniter 4 (Backend).

3.3. Research Data

The research data in this system includes customer data, order data, and geospatial-based location data integrated with OpenStreetMap. This data serves as the basis for developing a system capable of providing efficient and accurate location-based laundry ordering services. Field survey data is data obtained through field surveys where researchers conducted direct surveys to obtain these data. The field survey data includes: (a). Customer coordinates as observation/research objects, (b). Customer attribute data (name and address). Meanwhile, the supporting data in this research is data obtained from agencies or other sources used as references and as support for field survey data in the data processing process. This data includes: (a). OpenStreetMap Map Dataset, (b). Lowokwaru District boundary from the official website of the Geospatial Information Agency (BIG).

3.4. Collecting Customer Locations

Based on a field survey, we successfully collected data from 10 laundry service customers in the Bekasi area. The following is the partner data we successfully recorded, as shown in the table below.

Customers list table		
Mitra	Latitude	Longitude
LUBIS	-6218819	106754407
MUKHUS	-6185470	106732144
NUMANTO	-6133348	106830535
NUNUNG	-6170673	106721564
PRIO	-6225174	106623383
PURNOMO	-6306001	106827642
RATNA	-6238596	107818773
SITI	-6170878	106909488
SRI LESTARI	-6268920	106753921
SULISTIOWATI	-6171003	106823401
SWASONO	-6170753	106867021
TAMTO	-6171724	106742307
TATAG	-6217674	106852332

3.5. Data Validation

Data validation is an important stage in this research to ensure that the data used has a high level

of accuracy, consistency, and reliability. Location data validation is carried out by comparing the coordinates obtained from the Global Positioning System (GPS) device on a smartphone with the digital map display in the system. Each customer location point is visually verified on the map to ensure the suitability between the actual position and the coordinates stored in the database. Additionally, re-checking of latitude and longitude values is performed to avoid input errors or coordinate deviations. With a systematic data validation process, it is expected that the data used in this system has a high level of accuracy, thereby supporting decision-making and improving the quality of mobile-based laundry ordering services optimally.

4. RESULTS AND DISCUSSION

The results of this study indicate that the integration of mobile and geospatial technology can improve the quality of location-based services. The use of OpenStreetMap provides an efficient alternative solution compared to paid map services. To be able to access it, users must first be connected to an internet connection. Unlike the process of editing spatial and attribute data on the OpenStreetMap (OSM) website or using JOSM (Java OpenStreetMap) software, website visitors who wish to access are not required to have an account on the OSM website. The OSM website itself can be accessed through any internet browser software (Mozilla Firefox, Google Chrome, Safari, Opera, and others).

4.1. Interface Display

The system interface display is certainly the same as and represents the display of the OpenStreetMap website itself (because it uses the same/existing system). The OpenStreetMap website displays a slippy interface built with a JavaScript library. Slippy generally refers to a term for modern web maps that allow map users to zoom in, zoom out, and navigate the map (the map will shift following the direction of the mouse pointer if the user drags the map layer with the mouse). The OpenStreetMap website itself is actually a medium for displaying rendered results of OpenStreetMap data.

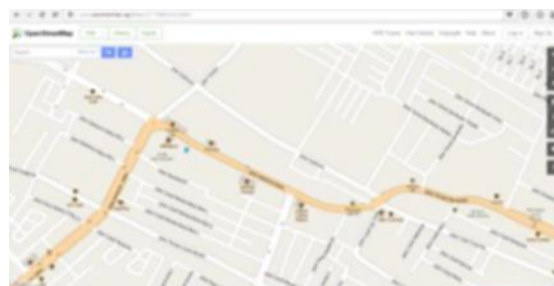


Figure 4. System Interface Display (OpenStreetMap Slippy Map)

The rendering process itself is a process of converting vector map data into raster map data. The resulting raster map displayed on the web browser page is built/created from many small square images called "tiles"

4.2. Editor Menu

In this research, the process stages from editing/adding data to displaying it on the OpenStreetMap website are approximately as follows:

- a. Data is downloaded and edited or added using JOSM software in vector format, which then, after the uploading process, is stored in the OpenStreetMap database.
- b. When accessing via a browser, there is a rendering process where JavaScript runs in the browser that dynamically requests maps from the server in the browser's background (without reloading the entire HTML page) to provide a smooth slippy map browsing experience.
- c. The map is displayed on the browser's HTML page as an image (raster) along with previously added changes.

In this research, adding the Cibitung District boundary data into the OpenStreetMap database is important. The reason this is important is that this boundary dataset is a keyword that makes it easier for website visitors or users to access data regarding the location of customer distribution that is spread and located within the Cibitung District area.

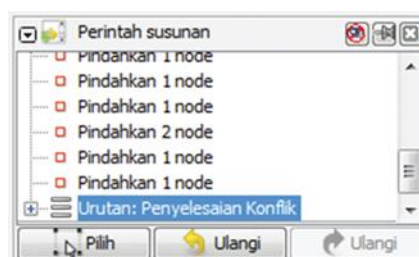


Figure 5. Conflict Resolution

In the menu window, you have the Conflict List Dialog. This window displays a list of conflicts. The number of unresolved conflicts is shown in that window. You can select and resolve a conflict by clicking on one of them. This is very useful when you are dealing with many conflicts.

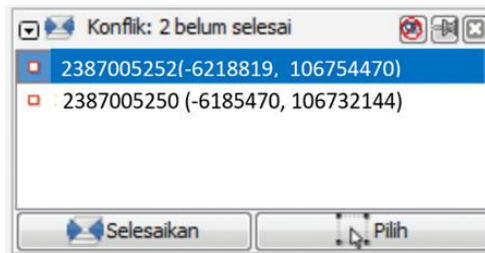


Figure 6. Conflict Resolution Sequence

4.3. Customer Location Data Access

In this research, adding the Cibitung District boundary data into the OpenStreetMap database is important. The reason this is important is that this boundary dataset is a keyword that makes it easier for website visitors or users to access data regarding the location of customer distribution that is spread and located within the Cibitung District area and its surroundings. For example, when the map layer is at or in a full extent zoom condition for the Cibitung District area.

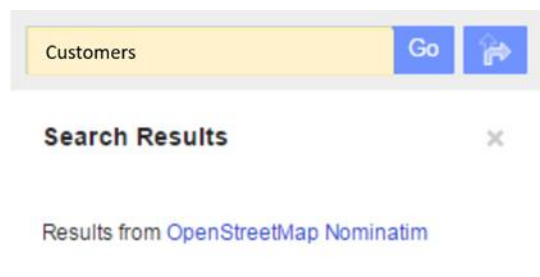


Figure 7. Customer Location Access Using the Customer Keyword

The image above shows that if you only type "customers" as a keyword, the results that appear are customers that are even located outside of Indonesia. Even if there are any, they would likely be listed very far down the search results list. This is very different if we add the words "Cibitung District" as a keyword after it.



Figure 8. Customer Location Access Using the Keyword "Customers in Cibitung"

4.4. Accessing the System on the Application

1. Login Menu

To be able to use this system, the user must log in first. The login implementation result is shown in the image below.

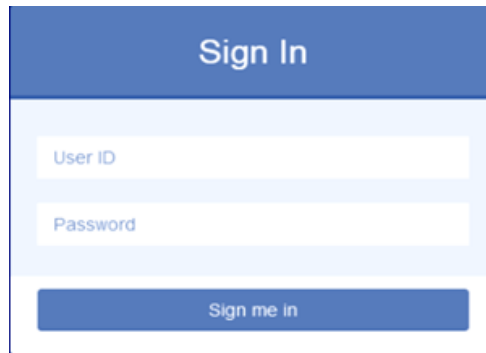


Figure 9. Login Menu

2. Customer Module

The following is the implementation of the Customer Module as shown in the image below. The admin can add, edit, and delete customer data.

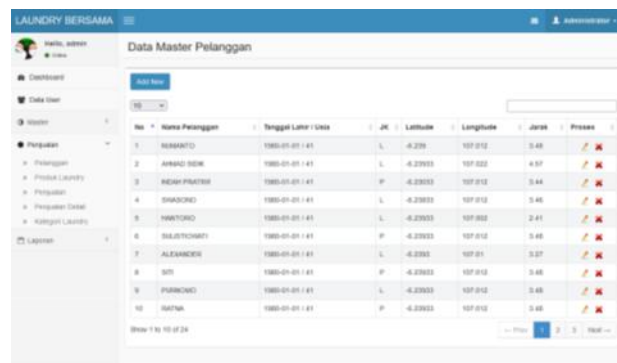


Figure 10. Customer Menu

3. Laundry Category Module

The following is the implementation of the laundry category module as shown in the image below. The admin can add, edit, and delete laundry category data.

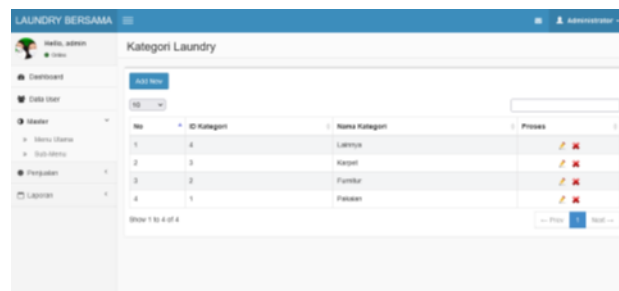


Figure 11. Laundry Category

4. Laundry Product Module

The following is the implementation of the laundry product module as shown in the image below.

The admin can add, edit, and delete laundry product data

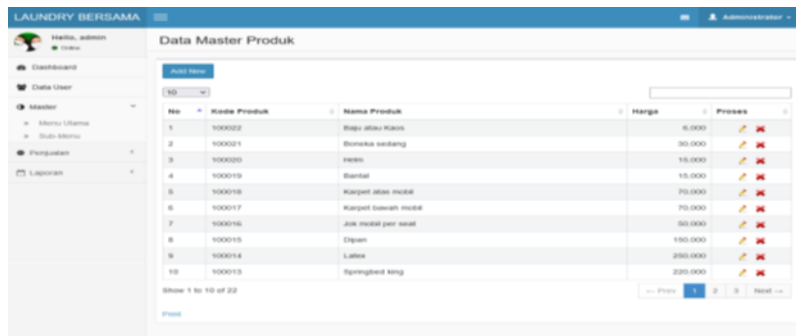


Figure 12. Laundry Product Menu

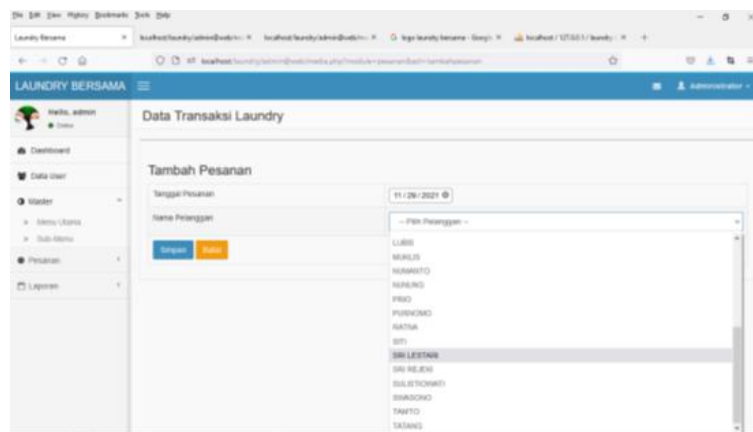


Figure 13. Add Order Module

5. CONCLUSION

Based on the results of the discussion presented above, it can be concluded that the developed system is able to simplify the process of ordering laundry services digitally and integrated with customer location mapping. The use of OpenStreetMap allows the system to obtain customer coordinates accurately, thereby facilitating the pick-up and delivery process of laundry by the service provider. The developed system provides main features including user registration, laundry service ordering, map-based customer location determination, order data management, and real-time order status monitoring. The test results show that the application runs well on mobile devices, is able to display customer location maps, and assists admins in managing order data in a more structured and efficient manner. With this system, the laundry ordering process which was previously done manually can be improved to become faster, more accurate, and more efficient. Furthermore, the integration of customer coordinates based on OpenStreetMap also helps improve service quality in terms of determining pick-up and delivery routes. Therefore, the developed information system can be used as a digital solution to improve the effectiveness of

mobile-based laundry services.

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