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Activity Diagram Modeling for Online Pedicab Ordering Information System Design

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ABSTRACT

This study addresses shifting urban mobility trends as digital platforms gain prominence while traditional transport like the becak remains essential for reaching densely populated neighborhoods. The research aims to develop an Android-based online becak booking system using UML to systematically define comprehensive functional requirements and workflows. The methodology comprised requirement analysis, a Waterfall-based SDLC, and UML Use Case and Activity Diagrams to outline interactions among administrators, customers, and drivers and to specify feature workflows. The resulting design supports user registration, authentication, seamless booking, detailed real-time location tracking, cost and time estimation, continuous feedback and reporting. Efficiency is achieved through fully automated order lifecycles and robust data security via strict login verification and authorization controls. Additionally, GPS-powered nearest-becak search and an easy-to-use UI improve inclusive mobility. Future enhancements include field testing, user-centric UX studies, and machine-learning integration for optimized driver assignment and predictive arrival-time prediction.

Keywords: *Activity Diagram, Online Pedicab Ordering System, UML Modeling*

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INTRODUCTION

In the last ten years, Indonesian urban mobility patterns have significantly changed from conventional forms of transportation to contemporary, app-based services, with ride hailing becoming the most popular option for a range of travel requirements (Tirachini, 2020). Despite their ability to transport large passenger loads and the flexibility to reach deep residential areas, traditional modes like horse-drawn becaks and pedals are becoming more and more endangered by obsolescence in the face of modernization (Maharani & Nasution, 2020). Their drawbacks include generally subpar service quality, loose safety regulations, informal, unplanned operations, and fare unpredictability—caused by the lack of standardized pricing (Poleng & Basuki, 2020; Tirachini, 2020). On the other hand, contemporary ride-hailing services like Bolt, Uber, Grab, and Go Jek provide a number of benefits (Tirachini, 2020). Customers can now rapidly request a vehicle without having to visit a terminal, use GPS to follow its arrival in real time, and use e-wallets like Go Pay to make electronic payments (Suryono & Supono, 2021). When taken as a whole, these characteristics improve consumer comfort and travel efficiency. According to Yunianti et al. (2021), comfort and cost are the two most important elements influencing how the public views online transportation services, together accounting for 71.3% of total satisfaction.

Nevertheless, flaws in both contemporary and conventional methods prevent service optimization. Weak operational management, user safety hazards, and inconsistent waiting times resulting from manual queuing systems are common obstacles to traditional modes (Poleng & Basuki, 2020). In the meantime, consumers of modern ride-hailing services face cost uncertainty due to dynamic pricing swings (Fungsiawan, 2022). The landscape is further complicated by regulatory issues: Drivers are not adequately protected by Indonesia's current online transport laws, which leave their status unclear and subject to changing regulations like mandatory vehicle inspections (KIR), general driver's licenses (SIM-A), and yellow license plates. If industry demand turns out to be elastic, driver partners may lose money (Astuti & Daud, 2023; Fungsiawan, 2022).

Scholars have argued for the creation of online booking platforms that are adapted to the features of conventional modes in order to address these issues (Mitropoulos et al., 2021). Although previous studies on motorized becak in Kotamobagu City emphasize driver safety-related behaviors (Hairil Akbar et al., 2022), they do not particularly address digital integration tactics to support driver livelihoods. On the other hand, research on other conventional public transportation systems, such as Trans Metro Bandung, shows that Android-based car position tracking apps can reduce waiting time uncertainty and information gaps, increasing ridership interest (Suhendi et al., 2023).Additionally, studies of the ride-sharing sector show how digital transformation may significantly cut wait times and boost operational efficiency when backed by an easy-to-use interface (Mitropoulos et al., 2021).

The mode's continued popularity for daily travel, especially among lower income groups, highlights the importance of creating an online becak application (Septima & Ira, 2021). By bridging the gap between individual origins/destinations and public transport nodes, the proposed application has the potential to address first-last mile challenges in urban transport networks, even though none of the sources specifically define becak as an environmentally friendly option (Kåresdotter et al., 2022). In places with inadequate public transportation infrastructure, this approach is intended to address problems including finding available becak, lengthy wait times, and the lack of trustworthy information sharing between drivers and passengers (Septima & Ira, 2021). In addition to improving availability and information flow by incorporating digital booking services into this conventional mode, the platform also promotes inclusive mobility for all social groups, which is a crucial element of sustainable urban development that guarantees equal participation for the elderly and people with disabilities (Arianto & Apsari, 2023; Kåresdotter et al., 2022).

This review makes it clear that an online booking system can be created to improve provider responsiveness and make it easier for the general public to acquire information about service availability (Paulang et al., 2022). The Waterfall methodology will be used to construct the suggested system, which will include an easy-to-use booking interface (Paulang et al., 2022). Its main objective is to increase traditional transportation modes' service quality in accordance with more general advancements in public services (Arianto & Apsari, 2023; Paulang et al., 2022). while also offering operational benefits similar to those of contemporary ride-hailing services, specifically dependability, flexibility, and convenience (Acheampong et al., 2023). In doing so, it will reinforce the role of traditional transport within the contemporary urban mobility ecosystem and contribute to the sustainability of urban transport and mobility in the future (Acheampong et al., 2023).

METHOD

To match the method to the particular subject of study or to choose the best methodology depending on the topic and goals of the study, researchers can choose from a range of qualitative research approaches (Fadli, 2021). The researcher must fully comprehend the approach chosen to guarantee that the outcomes align with the desired objectives, as the method selection is largely influenced by the research questions, overall research strategy, and theoretical framework (Badrul, 2021). By gathering data in natural settings and employing the researcher as the main tool of inquiry, qualitative research aims to reveal phenomena in a holistic–contextual manner rather than producing findings through statistical techniques (Fadli, 2021). This type of inquiry, which is carried out in real-world settings, aims to explore and understand what happens, why it happens, and how it develops. Its ultimate goal is to obtain a profound understanding of social and human issues through comprehensive, richly descriptive analysis (Qamaruzzaman & Sam'ani, 2023).

Triangulation is the process of gathering data, and it usually includes document analysis, participant observation, and in-depth interviews. Furthermore, library research is used to collect data from a variety of sources, including books, journal articles, and previous studies, and is complemented with in-person interviews and direct field observation (Hafsari et al., 2023). Because they highlight the weaknesses of previous systems and specify the requirements that the new design must meet, the insights obtained from this needs-analysis phase serve as a crucial basis for creating a new information system (Fachri & Surbakti, 2021).

Because it makes process control and schedule management easier, the waterfall model is frequently used in system development projects to implement the System Development Life Cycle (SDLC) (Fachri & Surbakti, 2021). Software development is organized according to the waterfall model into a number of phases, each of which must be finished before moving on to the next: requirements analysis, system design, code generation, testing, and support or maintenance. Throughout the project's lifecycle, this systematic evolution guarantees distinct deliverables and review points. The waterfall model is depicted in the following figure (Badrul, 2021; Qamaruzzaman & Sam'ani, 2023).

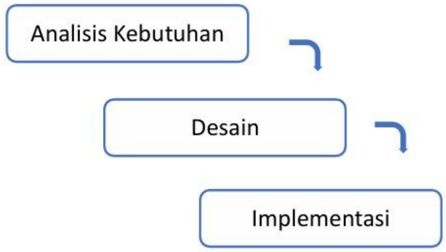

Figure 1: .Waterfall Model

FINDING AND DISCUSSION

RESEARCH RESULT

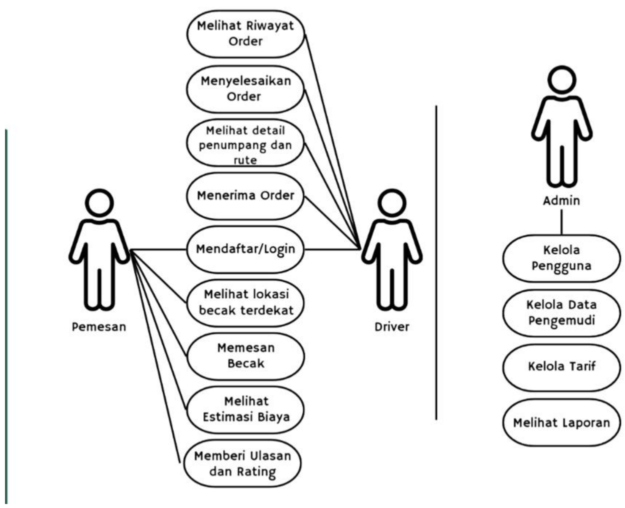

Figure 2: .Usecase Diagram

The previous analysis is the direct source of the system's architectural model. A standardized specification language for software documentation and construction is the Modeling Language (UML) (Bergström et al., 2022). According to Triandini et al. (2022), UML is more than just a notation; it is an embodiment of an object-oriented development process that gives engineers tools to enable systems engineering. Thus, UML artifacts will be used to express the design of our Android-based "Becak Online" application.

The use case diagram describes every service that the system needs to offer and highlights the main interactions. According to Sutono and Pamungkas (2021), an actor is any external entity—human or machine—that interacts with the system in order to achieve a goal. Every objective is represented as a use case, such as logging in, making a trip request, or seeing ride history. The administrator, the passenger, and the driver are the three main actors in the application's functional model, despite the fact that it is publicly available.

The activity diagram illustrates the internal business processes and the exact sequencing of actions inside them to support the use case view (Al-Fedaghi, 2021). When an actor starts an action (such making a ride request), the system has to respond by carrying out a predetermined series of actions. This flowchart-style representation gives developers a clear blueprint of how the program should behave. The activity diagram guarantees that the implementation is in line with the anticipated operational workflow by illustrating each decision point and transition.

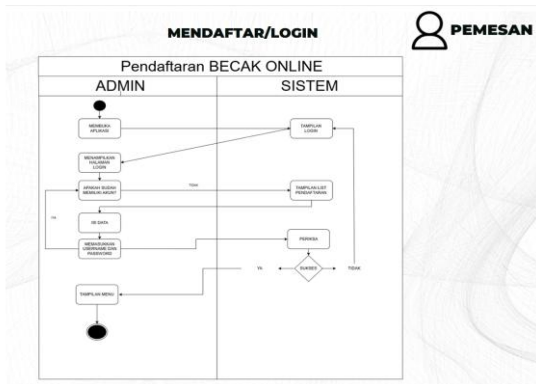

Figure 3: .Activity Diagram Login For Passenger

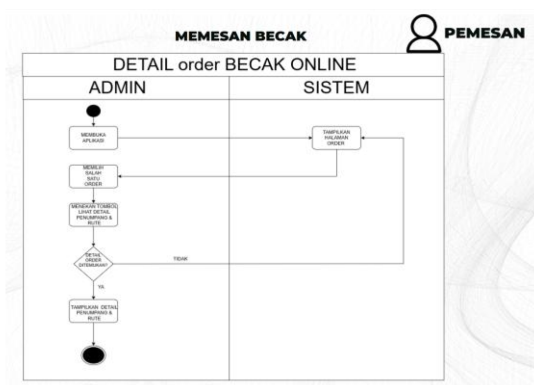

Figure 4: .Activity Diagram Order Pedicab

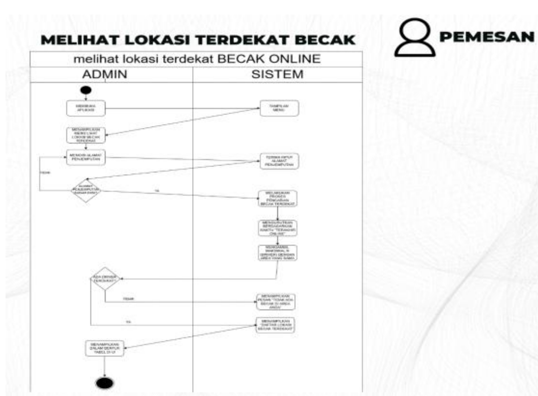

Figure 5: .Activity Diagram Nearest Pedicab Location

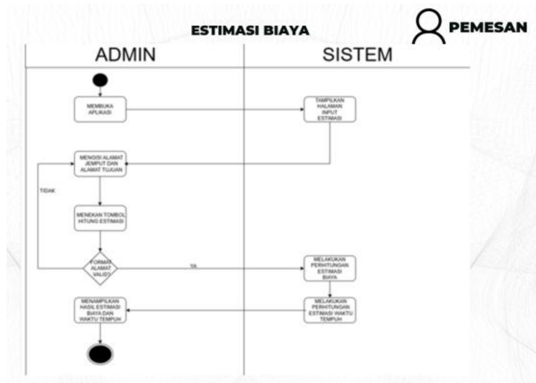

Figure 6: .Activity Diagram Estimated Costs

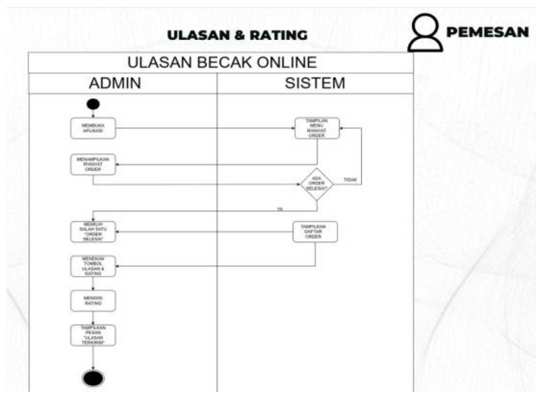

Figure 7: .Activity Diagram Reviews and Ratings

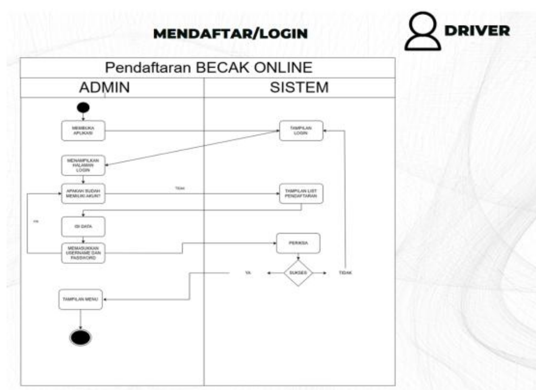

Figure 8: .Activity Diagram Login for Drivers

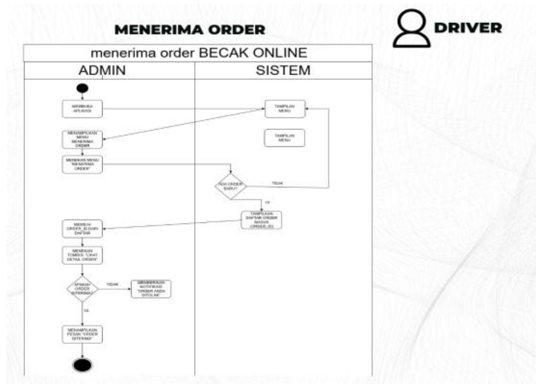

Figure 9: .Activity Diagram Accepting Orders

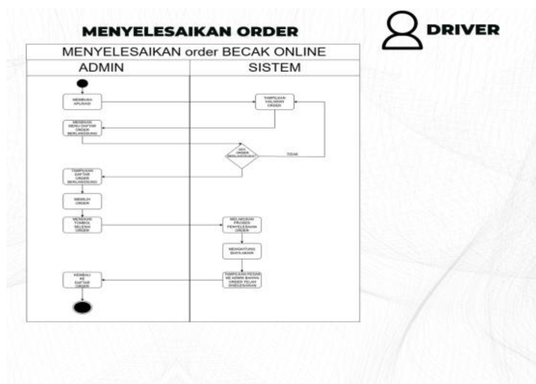

Figure 10: .Activity Diagram Completing Order

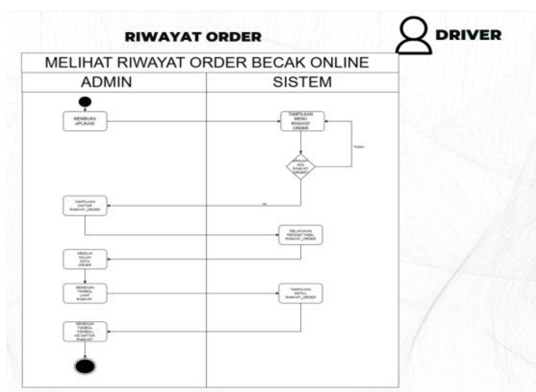

Figure 11: .Activity Diagram Order History

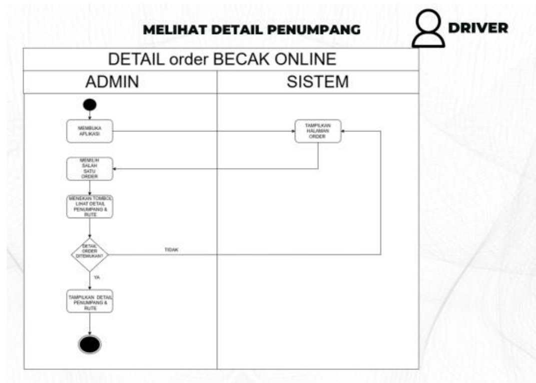

Figure 12: .Activity Diagram View Passenger Details

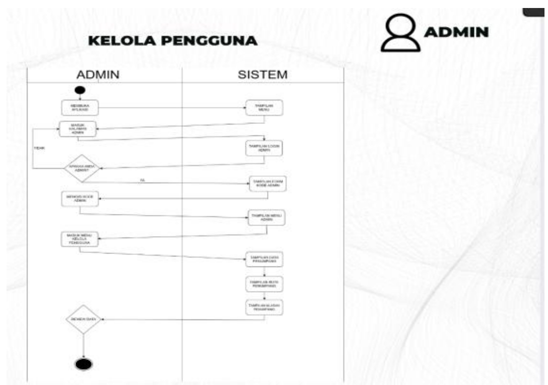

Figure 13: .Activity Diagram Manage Users

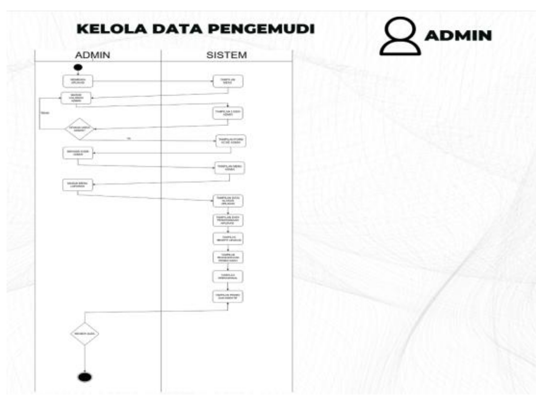

Figure 14: .Activity Diagram Manage Driver Data

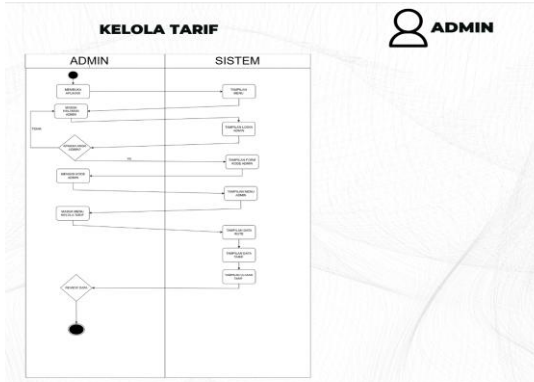

Figure 15: .Activity Diagram Manage Rates

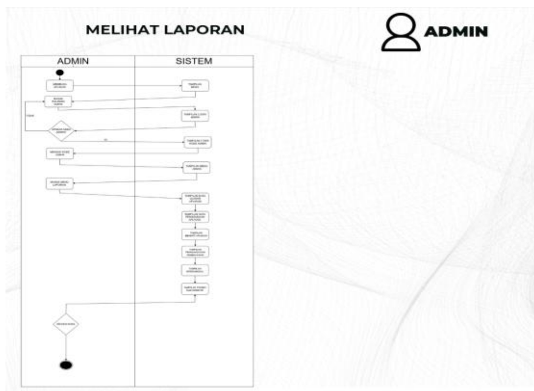

Figure 16: .Activity Diagram View Report

Visual Display

Figure 17: .Application Home Screen

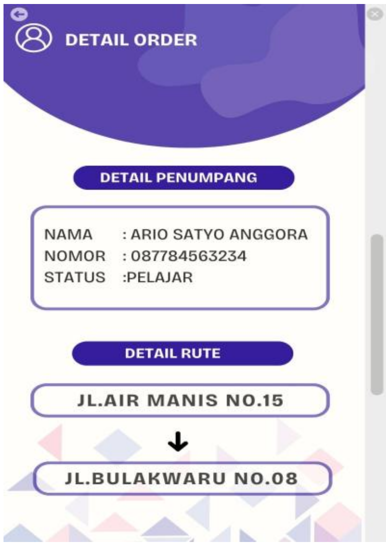

Figure 18: .Passenger Order Details Page

Figure 19: .Nearest Pedicab Location Page

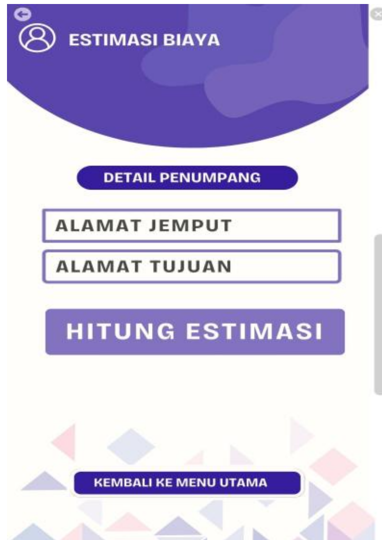

Figure 20: .Nearest Pedicab Driver Location Page

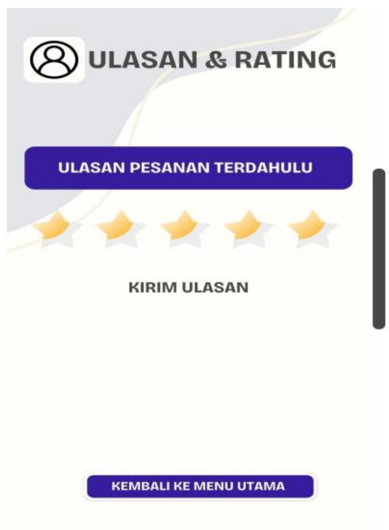

Figure 21: .User Review & Rating Page

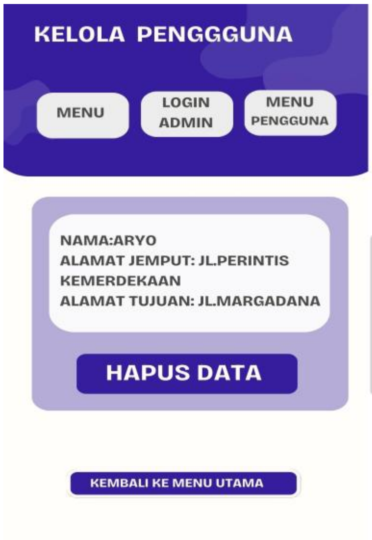

Figure 22: .User Management Page

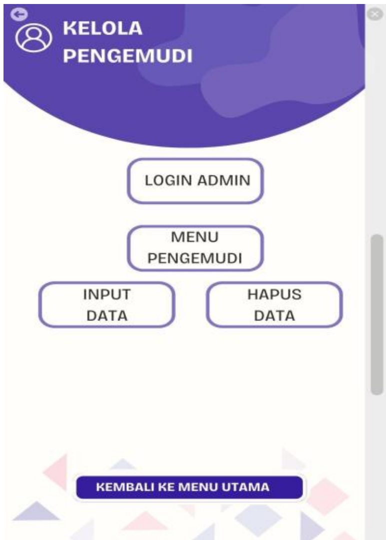

Figure 23: .Driver Management Page

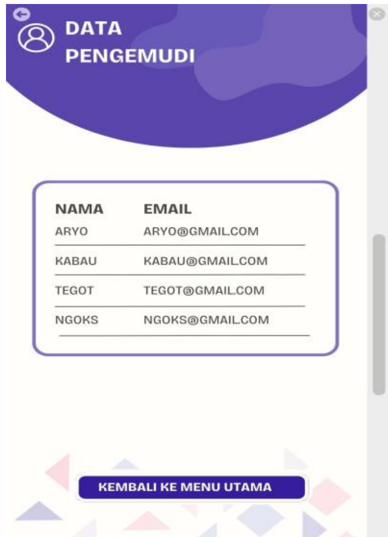

Figure 24: .Driver Data Page

Figure 25: .Admin Review Data Page

Figure 26: .Admin Transaction Details Page

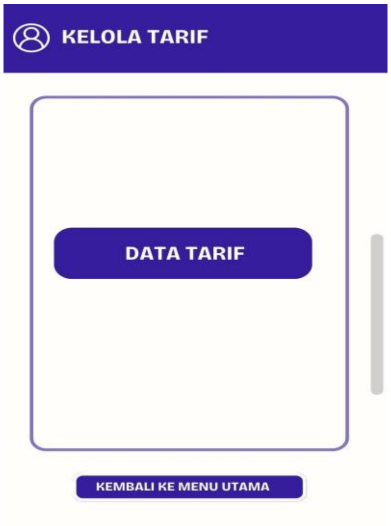

Figure 27: .Admin Fare Management Page

Figure 28: .Admin Fare Data Display Page

Figure 29: .Admin Fare Management Page

Figure 30: .Admin Report Menu Page

Figure 31: .Admin Usage Data Page

Figure 32: .Driver Order List Page

Figure 33: .Driver Order Menu Page

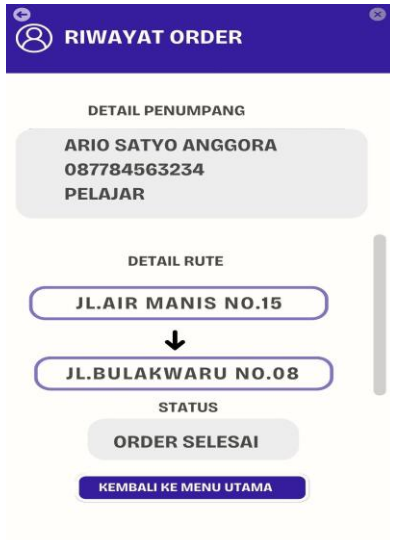

Figure 34: .Driver Order History Page

DISCUSSION

Interpretation of Findings

By integrating the visual mockups with the UML artifacts (use case and activity diagrams), the Becak Online design achieves both structural rigor and user-centered clarity (Abbas et al., 2021). The use case diagram identifies the three primary actors—administrator, passenger, and driver—as well as the services that go along with them (login, trip creation, fare prediction, and feedback submission). This high-level perspective ensures the distinct extent of each actor's privileges and interactions (Ansari & Subairi, 2020). The accompanying activity diagrams then translate these interactions into detailed processes, including decision points (such order acceptance, input validation, and authentication checks) that support backend activities and preserve system integrity.

These workflows are represented visually by the application screens. For example, the culturally appropriate login page in Figure 15 represents the "Login" activity, which not only collects login information but also communicates the system's value proposition ("TRANSPORTASI ASLI NUSANTARA, KINI DALAM GENGGAMAN!"). The "Create Trip" use case is instantly transferred to the "Order Detail" panel (Figure 16), where pickup and drop-off inputs mirror the activity diagram's data-entry and validation procedures (Setiaji & Sastra, 2021). Similarly, by dynamically updating driver icons in line with the UML flow, Figure 17's real-time mapping of available becak operationalizes the "Locate Nearby Drivers" activity. Finally, the fare calculation and feedback loops, depicted as distinct activities in Figures 18 ("Estimate Fare") and 19 ("Submit Review"), respectively, close the loop between the design aim and user experience.

Relation to Existing Literature

The synergy between structural models and visual interfaces echoes best practices in human-computer interaction and model-driven development. UML connects specification and implementation by assigning a one-to-one equivalent to each diagram's elements in the visual design (Musthofa & Adiguna, 2022). The actor-to-interface makes clear how effective use case diagrams are at communicating with stakeholders. (Suherwin et al., 2022). Meanwhile, the sequential displays (login → order information → map view → fare estimate → review).

Study Limitations

This well-considered design yet has certain flaws. Static UML models and mockups don't capture non-functional features like accessibility for people with impairments, data security measures (such encrypting user passwords), and performance during high traffic periods. For instance, even though the ethnic iconography on the login screen boosts engagement, it might not meet WCAG contrast standards for visually impaired users. Likewise, the activity diagrams lack exception branches for input errors (such invalid addresses) or network problems, which belong in sequence or exception diagrams. Rather, they assume correct user input and reliable network connection. Finally, relying too much on the waterfall SDLC may hinder iterative improvement of visual aspects (Ghumatkar & Date, 2023).

Implications and Future Research

In practice, the combined UML-visual method speeds up implementation and minimizes misunderstandings by providing developers with a clear UI design and a strict functional specification (Latipah, 2022).

In order to handle non-functional needs, future work should incorporate sequence and exception diagrams into the UML suite to depict error handling and performance constraints. By including accessibility and linguistic assistance into the mockups through language-toggle controls, screen-reader labels, and high contrast themes, the application's inclusivity will be increased. Quick prototyping of user interface flows, usability testing with a range of users (including elderly passengers or non-technical drivers), and ensuring that enhancements to screens and diagrams satisfy practical requirements are all made possible by using an agile or iterative SDLC (Fitria Anisa et al., 2024). Finally, empirical data on system dependability, user satisfaction, and the effect on traditional becak livelihoods produced by pilot deployments in specific urban areas can be used to inform scalable roll-out strategies.

CONCLUSION

Through well-structured Use Case and Activity Diagrams, the Unified Modeling Language (UML) approach successfully captured every essential function of the Becak Online application,from user registration, authentication, and ordering to real-time location tracking, time and cost estimation, and rating reviews. This approach was founded on a comprehensive requirements analysis and system design. By mapping intricate activity flows and outlining the interactions between important actors (admin, passenger, and drivers), these models simplify the implementation and functional testing procedures.

By automating the order lifecycle in real time, the service workflow's design guarantees both operational efficiency and strong data security. User information is protected by a strict authorization and login verification process, and integrated review tools provide ongoing input for system enhancement. Furthermore, an intuitive user interface and a GPS-based nearest-becak search facilitate accessible mobility, which benefits both the elderly and those with impairments, as well as the objectives of sustainable transportation.

But in fact, the system's performance in real-world scenarios has not been verified, despite its extensive design. We suggest implementing machine-learning algorithms to intelligently assign the nearest driver, conducting user experience (UX) studies through satisfaction surveys and interface optimization, and field testing to confirm response times, estimation accuracy, and GPS accuracy.

REFERENCES

Abbas, M., Rioboo, R., Ben-Yelles, C. B., & Snook, C. F. (2021). Formal modeling and verification of UML Activity Diagrams (UAD) with FoCaLiZe. Journal of Systems Architecture, 114. https://doi.org/10.1016/j.sysarc.2020.101911

Acheampong, R. A., Agyemang, E., & Yaw Asuah, A. (2023). Is ride-hailing a step closer to personal car use? Exploring associations between car-based ride-hailing and car ownership and use aspirations among young adults. Travel Behaviour and Society, 33. https://doi.org/10.1016/j.tbs.2023.100614

Al-Fedaghi, S. (2021). Validation: Conceptual versus Activity Diagram Approaches. International Journal of Advanced Computer Science and Applications, 12(6). https://doi.org/10.14569/IJACSA.2021.0120632

Ansari, R., & Subairi, N. (2020). IMPLEMENTASI UML PADA SISTEM PENJADWALAN MATA KULIAH. Jurnal Teknologi Informasi Universitas Lambung Mangkurat (JTIULM), 5(1). https://doi.org/10.20527/jtiulm.v5i1.47

Arianto, D., & Apsari, N. C. (2023). Gambaran Aksesbilitas, Inklusivitas, dan Hambatan Penyandang Disabilitas Dalam Memanfaatkan Transportasi Publik: Studi Literatur di Berbagai Negara. Focus : Jurnal Pekerjaan Sosial, 5(2). https://doi.org/10.24198/focus.v5i2.42633

Astuti, B., & Daud, M. R. (2023). KEPASTIAN HUKUM PENGATURAN TRANSPORTASI ONLINE. Al-Qisth Law Review, 6(2). https://doi.org/10.24853/al-qisth.6.2.205-244

Bergström, G., Hujainah, F., Ho-Quang, T., Jolak, R., Rukmono, S. A., Nurwidyantoro, A., & Chaudron, M. R. V. (2022). Evaluating the layout quality of UML class diagrams using machine learning. Journal of Systems and Software, 192. https://doi.org/10.1016/j.jss.2022.111413

Fitria Anisa, Fauzi Syahputra Harahap, Harits Al Khosyi, Intan Permata Sari, & Yahfizham. (2024). Pengembangan Software Menggunakan Model SDLC Guna Mencapai Keselarasan dengan Kebutuhan Pengguna. Journal Of Informatics And Busisnes, 01(04).

Fungsiawan, F. (2022). Kenaikan Tarif Ojek Online Berdampak Inflasi dan Penurunan Pendapatan Domestik Bruto (PDB). CEMERLANG : Jurnal Manajemen Dan Ekonomi Bisnis, 2(3). https://doi.org/10.55606/cemerlang.v2i3.321

Ghumatkar, R. S., & Date, A. (2023). Software Development Life Cycle (SDLC). International Journal for Research in Applied Science and Engineering Technology, 11(11). https://doi.org/10.22214/ijraset.2023.56554

Hairil Akbar, Syamsu A. Kamaruddin, & Arfan Nur. (2022). Faktor-Faktor yang Berhubungan dengan Perilaku Tidak Aman pada Pengendara Ojek dan Becak Motor di Kota Kotamobagu. Promotif : Jurnal Kesehatan Masyarakat, 12(1). https://doi.org/10.56338/pjkm.v12i1.2443

Kåresdotter, E., Page, J., Mörtberg, U., Näsström, H., & Kalantari, Z. (2022). First Mile/Last Mile Problems in Smart and Sustainable Cities: A Case Study in Stockholm County. Journal of Urban Technology, 29(2). https://doi.org/10.1080/10630732.2022.2033949

Latipah, S. A. (2022). PEMODELAN SISTEM INFORMASI FORM PEMBELIAN URGENT PADA PT. KALBE MORINAGA INDONESIA MENGGUNAKAN UNIFIED MODELING LANGUAGE. JIPI (Jurnal Ilmiah Penelitian Dan Pembelajaran Informatika), 7(4). https://doi.org/10.29100/jipi.v7i4.3199

Maharani, N., & Nasution, R. D. (2020). Melawan Kepunahan Becak Dengan Membentuk Becak Wisata Di Ponorogo. Jurnal Ilmiah Ilmu Sosial, 6(1). https://doi.org/10.23887/jiis.v6i1.25181

Mitropoulos, L., Kortsari, A., & Ayfantopoulou, G. (2021). A systematic literature review of ride-sharing platforms, user factors and barriers. In European Transport Research Review (Vol. 13, Issue 1). https://doi.org/10.1186/s12544-021-00522-1

Musthofa, N., & Adiguna, M. A. (2022). Perancangan Aplikasi E-Commerce Spare-Part Komputer Berbasis Web Menggunakan CodeIgniter Pada Dhamar Putra Computer Kota Tangerang. OKTAL: Jurnal Ilmu Komputer Dan Sains, 1(03).

Paulang, D. Y., Pasinggi, E. S., & Pongdatu, G. A. N. (2022). Sistem Informasi Transportasi Antar Kota Dari Toraja Berbasis Web. Infinity, 1(2). https://doi.org/10.47178/infinity.v1i2.1518

Poleng, Y. V. A., & Basuki, I. (2020). KAJIAN TARIF TRANSPORTASI TRADISIONAL DI KOTA YOGYAKARTA. Jurnal Teknik Sipil, 15(3). https://doi.org/10.24002/jts.v15i3.3732

Septima, R. S., & Ira, Z. (2021). Rancang Bangun Aplikasi Mobile Becak Online. Jurnal Ilmiah Elektronika Dan Komputer, 14(1).

Setiaji, S., & Sastra, R. (2021). Implementasi Diagram UML (Unified Modelling Language) Pada Perancangan Sistem Informasi Penggajian. Jurnal Teknik Komputer, 7(1). https://doi.org/10.31294/jtk.v7i1.9773

Suhendi, H., Ramady Devira, G., & Prasetyo Yudha, J. (2023). Aplikasi Sistem Pelacakan Lokasi Kendaraan Trans Metro Bandung Berbasis Android Dengan GPS Tracking Real Time. Smart Comp: Jurnalnya Orang Pintar Komputer, 12(2). https://doi.org/10.30591/smartcomp.v12i2.4948

Suherwin, Yusuf, M., & Syamsuddin. (2022). Implementasi Penilaian Kenaikan Jabatan Struktural Menggunakan Metode Smart (Simple Multi Attribute Retting Tech) Berbasis Android. Jurnal Teknik AMATA, 3(2). https://doi.org/10.55334/jtam.v3i2.319

Suryono, A. M., & Supono, R. A. (2021). ANALISIS PENGGUNAAN UANG NON TUNAI (CASHLESS) GO-PAY DAN PROSES BISNISNYA PADA TRANSPORTASI ONLINE GO-JEK DENGAN METODE ROOT CAUSE ANALYSIS. Jurnal Mahasiswa Sistem Informasi (JMSI), 2(2). https://doi.org/10.24127/jmsi.v2i2.1098

Sutono, S., & Pamungkas, A. P. (2021). Penerapan Metode Eksperimen Semu Pada Sistem Informasi Persediaan dan Penjualan Obat di Apotek Berbasis Web-Base. Media Jurnal Informatika, 12(2). https://doi.org/10.35194/mji.v12i2.1225

Tirachini, A. (2020a). Ride-hailing, travel behaviour and sustainable mobility: an international review. Transportation, 47(4). https://doi.org/10.1007/s11116-019-10070-2

Tirachini, A. (2020b). Ride-hailing, travel behaviour and sustainable mobility: an international review. Transportation, 47(4). https://doi.org/10.1007/s11116-019-10070-2

Triandini, E., Fauzan, R., Siahaan, D. O., Rochimah, S., Suardika, I. G., & Karolita, D. (2022). Software similarity measurements using UML diagrams: A systematic literature review. In Register: Jurnal Ilmiah Teknologi Sistem Informasi (Vol. 8, Issue 1). https://doi.org/10.26594/register.v8i1.2248

Yunianti, N. H., Hijriah, H., & Pricilia, P. (2021). Analisis Evaluasi Kinerja Ride Sourcing Dengan Persepsi Pengguna. Jurnal Ilmiah Ecosystem, 21(3). https://doi.org/10.35965/eco.v21i3.1264