"Rambul: A Mobile Application Enhancing Motorcycle Transportation Services for Efficient Travel in Butuan City"

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I.   Related Works

Motorcycle taxis are an affordable, flexible, and efficient transportation option, particularly in congested urban areas, offering quick navigation through traffic, reaching specific destinations, and being more cost-effective than traditional four-wheeled transportation choices, making them accessible to a wider range of commuters (Bausch and Mesarovic, 2018). To Asvial et.al (2018) to reach their destinations faster, many people in Jakarta prefer using motorcycles due to their affordability compared to cars and their ability to navigate through narrow streets, serving as shortcuts that cars cannot access and helping them avoid congestion on main roads. Tilahun and Levinson, (2017) conducted a study exploring usage patterns, pricing mechanisms, and passenger preferences associated with Ride Hailing for motorcycle taxis in Addis Ababa's transportation system. Widjaja and Fanti's, (2020) research provides valuable insights into pricing and matching aspects of ride-hailing platforms, with potential applicability to enhance motorcycle taxi ride-hailing services through effective strategies. Lim et.al, (2018). This study enhances our understanding of the factors influencing user adoption of Ride-Hailing Apps, with perceived usefulness, subjective norms, risk, playfulness, and price level playing significant roles in adoption behavior. Ratha and Satapathy, (2020) focused on factors influencing users' intention to adopt and use ride-hailing services, including perceived usefulness,

perceived ease of use, perceived risk, price sensitivity, and social influence. Zou et.al, (2021) highlighted convenience, cost-effectiveness, reliability, service quality, and trust as significant determinants for user adoption and continued usage of ride-hailing services. Han et.al, (2020) found that perceived usefulness, perceived ease of use, convenience, efficiency, perceived risk, price sensitivity, and social influence shape users' attitudes and intentions towards ride-hailing services. Cheng et.al, (2020) revealed that perceived convenience, cost-effectiveness, service quality, social influence, and trust significantly influence users' adoption of ride-hailing services. Additionally, Chen and Zhang (2021) emphasized users' high valuation of convenience, flexibility, pricing, and service quality, with the ability to rate drivers and provide feedback contributing to overall satisfaction and perceived value. Furthermore, different countries have implemented diverse regulatory approaches, driven by conventional transportation operators' calls for a fairer regulatory environment, including the expansion of traditional transportation regulations to encompass Ride-Hailing Apps and their driver and vehicle requirements; however, there is a lack of research on how the public sector integrates Ride-Hailing Apps into broader transportation plans to promote sustainability (Chalermpong et.al, 2023).

Gaps

The existing literature gaps, comprehensive analysis of the specific challenges posed by expensive and time-consuming travel with taxi, particularly during rush hours and in congested traffic conditions. Moreover, there is a research gap concerning the limitations of the current jeepney system, which follows fixed routes and may not provide direct access to passengers' desired destinations. Unfortunately, users do not have the option to choose their desired motorcycle. Further investigation is needed to explore the potential of motorcycle ride-hailing services in addressing these gaps by offering more affordable and efficient transportation options for urban mobility.

II. Problem:

The problem in urban areas, particularly in Butuan City, is the expensive and time-consuming travel with traditional taxis, especially during rush hours when traffic congestion is prevalent. Additionally, the existing jeepney system's limitations, with fixed routes that may not cater to passengers' specific destinations, hinder effective mobility within the city. Moreover, four-wheel vehicles face limitations in reaching passengers' exact locations, particularly when it comes to navigating small access roads.

Specific Problem:

Specifically, the lack of affordable and efficient transportation options for urban mobility in Butuan City contributes to slow travel times and inconvenience, particularly when using taxis. The rigid routes of the current

jeepney system further restrict accessibility to specific locations, worsening the transportation challenges for residents and commuters.

III. Objective of the Study

The objective of this study is to create a mobile application called Rambul to place motorcycle ride-hailing services in Butuan City to address the challenges of expensive and time-consuming travel with four-wheel vehicles and the limitations of the current jeepney system. The aim is to improve urban mobility by providing a more affordable, efficient, and flexible transportation option that caters to passengers' specific destinations within the city.

Specific Objective

1. To develop a mobile application, Rambul, that provides efficient motorcycle ride-hailing services in Butuan City, offering an affordable and time-saving alternative to conventional four-wheel vehicle transportation options.
2. To develop a mobile application, Rambul, that provides door-to-door motorcycle ride-hailing services in Butuan City, ensuring convenient and direct transportation for users to their specific destinations within the city.
3. To assess the impact of the Rambul motorcycle ride-hailing service on urban mobility in Butuan City by analyzing factors such as travel time reduction, cost-effectiveness, and trackable riders' whereabouts.

4. To develop a ride-hailing application that empowers users to select their desired motorcycle for their transportation needs.

IV. Scope and Limitation

The Scope of this study and application development project, Rambul, is to implement motorcycle ride-hailing services in the city of Butuan. The project's geographic scope includes Butuan City due to the city's unique urban transportation issues and characteristics. With a focus on door-to-door transportation, the project seeks to create a mobile application that enables users to call Riders, monitor the arrival of motorcyclists, Real Time Location of the rider and be driven from their pickup spot to their chosen destination. A user-friendly interface must be created, efficient ride-matching algorithms must be implemented, real-time tracking, and compliance with local laws and legal requirements governing motorcycle ride-hailing services must be ensured.

Limitation

The limitation of the Rambul application is its reliance on motorcycle availability and rider participation. The effectiveness of the service is contingent upon a sufficient number of active riders using the application. However, the implementation of such a feature is subject to additional constraints, particularly the requirement for a reliable and stable internet connection. This is crucial for both users and riders to have access to real-time location

updates, ensuring a seamless navigation towards the intended destination. In areas with limited or unreliable internet connectivity, both riders and users may face challenges in accessing the application, making ride requests, and receiving real-time updates.

V. Tech Stacks

- **Android SDK:** The Android Software Development Kit provides the necessary tools, libraries, and APIs for developing Android applications.

- **Java or Kotlin**: Android Studio supports both Java and Kotlin programming languages for Android app development. You can choose either language based on your preference and requirements.

- **Android Studio IDE:** Android Studio is the official integrated development environment (IDE) for Android app development. It provides a comprehensive set of tools, including a code editor, debugging capabilities, and an emulator for testing the application.

- **XML**: XML is used for designing the user interface layout of the application. Android Studio provides a visual layout editor for creating XML-based UI designs.

- **Firebase**: Firebase is a platform provided by Google that offers various backend services, including authentication, real-time database, cloud storage, and more. It can be integrated into the Rambul application to handle user authentication, data storage, and other backend functionalities.

- **Google Maps API**: To incorporate location-based services and mapping functionality, the Google Maps API can be used. It enables features like displaying maps, getting directions, and real-time location tracking.

- **Networking Libraries**: Android Studio provides networking libraries like Retrofit or Volley, which can be used to handle network requests and communicate with APIs for various features, such as real-time tracking and ride matching.

References

Bausch, P., & Mesarovic, A. (2018). Urban motorcycle taxis: A sustainable mode of transportation in developing cities. *International Journal of Sustainable Transportation*, 12(8), 625-637.

Asvial, M., Pandoyo, M. F. G., & Arifin, A. S. (2018, October). Internet of Things Solution for Motorcycle Riders to Overcome Traffic Jam in Jakarta Using EBkSP. In *2018 International Conference on Information and Communication Technology Convergence (ICTC)* (pp. 636-638). IEEE.

Tilahun, N. Y., & Levinson, D. M. (2017). Motorcycle taxis as informal paratransit: A case study from Addis Ababa, Ethiopia. *Transport Policy*, 60, 58-68.

Widjaja, C. J., & Fanti, M. P. (2020). Pricing and matching in a ride-hailing platform. *European Journal of Operational Research*, 286(1), 254-265.

Lim, K. B., Yeo, S. F., Goh, M. L., & Gan, J. A. X. (2018). A study on consumer adoption of ride-hailing apps in Malaysia. *Journal of Fundamental and Applied Sciences*, 10(6S), 1132-1142.

Ratha, P., & Satapathy, J. K. (2020). Analyzing factors affecting user adoption of ride-hailing services: A case study of Ola Cabs. *Transportation Research Part A: Policy and Practice*, 139, 85-103.

Zou, B., Yang, Z., & Zhou, J. (2021). Assessing the effectiveness of motorcycle taxi service using a stated preference survey: A case study of Hanoi, Vietnam. *Transportation Research Part A: Policy and Practice*, 146, 291-308.

Han, S., Li, X., & Liu, S. (2020). Exploring the factors influencing the use intention of ride-hailing services: Evidence from Chinese users. *Transportation Research Part F: Traffic Psychology and Behaviour*, 69, 56-70.

Cheng, Y., Tang, Y., & Huang, J. (2020). Factors influencing the adoption of ride-hailing services: An empirical

investigation in China. *Journal of Transport Geography*, 82, 102570.

Chen, C., & Zhang, Y. (2021). Exploring users' perceived value of ride-hailing services: A study based on Uber in China. *Transportation Research Part A: Policy and Practice*, 147, 258-272.

Chalermpong, S., Kato, H., Thaithatkul, P., Ratanawaraha, A., Fillone, A., Hoang-Tung, N., & Jittrapirom, P. (2023). Ride-hailing applications in Southeast Asia: A literature review. *International Journal of Sustainable Transportation*, 17(3), 298-318.

"Bronxder: Enhancing Order Management Efficiency and Customer Experience through a Tablet-Based Ordering System at Bronx Cafe"

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I.   Related Works

Several studies have examined the adoption and impact of tablet-based ordering systems in restaurants. Huang et.al (2019) found that customers' adoption of mobile self-ordering systems was influenced by factors such as perceived usefulness, ease of use, social influence, and perceived risk. Gao and Bai (2014) developed a tablet-based prototype system that improved the efficiency of the order-taking process. Raza et al. (2019) discussed the advantages and challenges of implementing mobile-based ordering systems, including improved order accuracy and customer experience. Xiao et.al (2018) highlighted that customers' intentions to use tablet menus were influenced by perceived usefulness, enjoyment, ease of use, and perceived risk. Ryu and Jang (2017) investigated how different aspects of tablet menu design affected customers' intentions and behaviors. Hasan et.al (2019) found that mobile-based food ordering apps positively impacted customer satisfaction. Tu and Chen (2019) integrated the unified theory of acceptance and use of technology to identify factors influencing consumers' intention to use tablet-based menu systems. Cho et.al (2016) explored the impact of tablet menus and self-ordering systems on various aspects of restaurant performance. Wang and Park (2019) studied the influence of tablet-based menu ordering systems on customer satisfaction and service quality. Go and Lee (2017) examined the effect of different tablet menu types on customers' behavioral intentions, considering variations across restaurant types.

Gaps

Based on existing studies, the adoption of table-based ordering systems is already being implemented in some establishments within cities. However, a common practice is for waiters to carry the ordering device with them, requiring customers to call them in order to place their orders.

Problem of the Study

The current manual order management system at Bronx Cafe relies on pen-and-paper methods, leading to inefficiencies in the order-taking process. This traditional approach results in longer wait times, potential errors in order by the staff, and difficulty in tracking and prioritizing orders. Furthermore, the absence of a built-in digital solution poses challenges for the waiters who are required to carry the ordering device with them. This inconvenience often necessitates customers to call the waitstaff in order to place their orders, adding to the overall inefficiency of the system.

Specific Problem

Limited Order Visibility and Communication. Bronx Cafe lacks a digital ordering system, causing a lack of real-time order visibility and effective communication between different stakeholders. The absence of a tablet-based

ordering system results in challenges such as delays in order transmission, potential mistakes in order fulfillment, and limited tracking of order status. This specific problem highlights the need for a solution that can streamline order management, enhance communication, and optimize the overall ordering process for improved customer satisfaction and operational effectiveness.

III. Objective of the Study

The objective is to develop and implement the Brxder tablet-based ordering system at Bronx Cafe. The system aims to automate the order management process, enhance communication, and improve the overall efficiency of the restaurant's operations. The goal is to provide a seamless and convenient ordering experience for customers while enabling effective order tracking and integration with the cashier system.

Specific Objective:

1. Develop the Brxder tablet-based ordering system: Create a user-friendly and intuitive tablet application that allows customers to browse the menu, select items, customize orders, and submit them digitally.

2. Improve operational efficiency: Increase the efficiency of the order management process, reducing wait times, minimizing errors, and optimizing resource allocation.

3. To propose the tablet-based ordering system to be built-in: To solve the problem of staff bringing the device that tends the customers to call them to make an order.

IV. Scope and Limitation

The scope of this project includes the development and implementation of the Brxder tablet-based ordering system at Bronx Cafe, focusing on streamlining the order management process and enhancing customer experience. The project encompasses the creation of a user-friendly tablet application that enables customers to browse the menu, customize their orders, and submit them digitally. It also involves the integration of the system with the existing cashier display system to relay order details and table numbers for efficient order processing. The scope further includes testing, training of staff members, and deployment of the system within the premises of Bronx Cafe.

Limitation

One limitation of this project is that it does not encompass the integration of the ordering system with the payment processing system. While the Brxder system facilitates the order placement and transmission, the actual

Also, the need for stable network access is very important for the application to work. Additionally, the project does not cover advanced features such as inventory management, as it primarily focuses on optimizing the ordering process. Furthermore, the system's performance may be subject to limitations related to the hardware and software capabilities of the tablets used. Also, the device can only be used inside the store because of some modifications. Lastly, the project assumes that the provided cashier display system is capable of receiving and displaying the order information, and any necessary modifications or adjustments to the system are outside the project's scope.

V. Tech Stack

1. React Native is a popular framework for developing cross-platform mobile applications. It allows you to build native-like applications for iOS and Android using a single codebase, which can significantly expedite the development process. With React Native, you can leverage a wide range of pre-built UI components and libraries to create a visually appealing and user-friendly tablet ordering app.

2. Node.js is a JavaScript runtime environment that enables server-side development. Combined with Express.js, a

lightweight web application framework, you can build a robust backend for handling order management, communication with the cashier system, and real-time updates. Node.js and Express.js provide a scalable and efficient solution for managing the server-side components of the Brxder system.

3. Firebase is a comprehensive cloud-based platform that offers a suite of tools and services to support various aspects of your application development. It provides features such as real-time database, authentication, and cloud messaging, which can be utilized to enable real-time order transmission, user authentication, and push notifications. Firebase's ease of use and integration capabilities can simplify the development process and accelerate the implementation of crucial features.

References

Huang, L., Duan, Y., & Zhang, Y. (2019). Mobile Self-Ordering Systems in Restaurants: Consumer Adoption, Determinants, and Implications. International Journal of Hospitality Management, 76(Part A), 67-77.

Gao, L., & Bai, X. (2014). Tablet-based menu ordering system: A prototype. In 2014 IEEE 18th International Conference on Computer Supported Cooperative Work in Design (CSCWD) (pp. 348-353). IEEE.

Raza, S., Khalid, H., Raza, S. M., & Raza, M. M. (2019). Implementation of mobile-based ordering system in

restaurants. International Journal of Information Management, 49, 490-499.

Xiao, L., O'Neill, M., & Mattila, A. S. (2018). Factors influencing customers' intention to use tablet menus in restaurants. International Journal of Hospitality Management, 70, 131-140.Mekawy, M. A., Nassar, E. M., & Rabie, M. (2018). Mobile app-based restaurant ordering and payment system: A customer-focused approach. Journal of Retailing and Consumer Services, 44, 355-365.

Ryu, K., & Jang, S. (2017). The influence of tablet menu design on customers' behavioral intentions. International Journal of Hospitality Management, 61, 58-67.

Hasan, B., Mahmud, S., & Rehman, M. A. (2019). Impact of mobile-based food ordering apps on customer satisfaction: A structural equation modelling approach. International Journal of Electronic Marketing and Retailing, 10(1), 33-54.

Tu, Y. H., & Chen, T. H. (2019). Examining the factors influencing consumers' intention to use tablet-based menu systems in restaurants. Journal of Hospitality and Tourism Management, 40, 108-117.

Cho, M., Bonn, M. A., & Han, I. (2016). The effects of tablet menu and self-ordering system on restaurant performance. International Journal of Hospitality Management, 53, 139-150.

Wang, D., & Park, S. Y. (2019). The impact of tablet-based menu ordering systems on customer satisfaction and service quality in restaurants. Journal of Hospitality and Tourism Technology, 10(2), 249-265.

Go, E., & Lee, H. (2017). The influence of tablet menu type on customers' behavioral intentions: The moderating role of restaurant type. International Journal of Hospitality Management, 67, 160-169.

Traffic Sign Quiz: A Mobile Game Application with Image Recognition for TL Mabuhay Driving Lesson Academy Inc.

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II. Related Works

According to Nagar (2022), proper knowledge and adherence to traffic signs and regulations are crucial for all individuals, particularly those obtaining a driving license, as it significantly reduces the likelihood of accidents occurring. Furthermore, Hussain and Shi (2019) highlight that the lack of professional driver training in Pakistan, with drivers relying on non-professional instruction, increases the likelihood of road traffic accidents (RTAs), motivating the need for professional training. The study by Purnamasari (2019) reveals that, on average, 77.11% of drivers understood 32 traffic signs correctly, with variations between male and female respondents, but violations were observed despite good understanding. Additionally, an analysis by Hassan et.al (2022) demonstrates that road users exhibit a relatively low level of awareness (43%) of traffic signs, with age, education, and years of driving experience influencing comprehension. Borrego-Jaraba et al. (2020) emphasize the significance of road sign recognition skills and propose a gamified approach, while Tran and Tran (2020) propose a mobile-based system combining deep learning algorithms and game-based learning principles for traffic sign recognition. Barmpounakis et.al (2019) implement a mobile-based serious game utilizing CNN models for real-time traffic sign recognition, enhancing learning and understanding. Similarly, Li et.al (2017) integrate traffic sign recognition technology into a game-based application for interactive and engaging

learning. Lastly, Ertan (2020) trains a CNN model with annotated data for real-time traffic sign recognition on a mobile device.

Gaps

Existing studies have already delved into and suggested a gamified approach to underscore the importance of traffic signs. However, there remains a pressing need to enhance knowledge and training concerning traffic signs and regulations among individuals. To address this gap, the inclusion of pre-assessments can have a significant impact on improving users' understanding and retention of traffic sign-related knowledge.

II. Problem of the Study

Traditional methods of studying traffic signs, such as reading manuals or attending classroom sessions, may not be engaging or effective for everyone. It is important to bridge this knowledge gap and provide an accessible, enjoyable, and interactive learning experience that caters to individuals with varying learning styles.

Traffic signs play a crucial role in ensuring road safety. However, many individuals face challenges in obtaining their driver's license due to a lack of knowledge about various traffic signs. Without proper understanding and recognition

of these signs, individuals may fail their exams and be unable to acquire their license, which can limit their mobility and access to opportunities.

Specific Problem

The specific problem addressed is the lack of knowledge and understanding of traffic signs among individuals, leading to difficulties in passing the LTO licensing exam and potential risks to road safety. Traditional learning methods are not engaging or effective for everyone, highlighting the need for an interactive tool to help individuals memorize and comprehend traffic signs, improving their exam success and promoting road safety. Furthermore, there is a growing need for tools that can assess and enhance the teaching process on an individual level.

III. Objective of the Study

The main objective of this thesis is to develop an image recognition game, "Traffic Sign Quiz," designed to assist individuals with limited knowledge of traffic signs in improving their understanding and recognition of these signs. By creating an enjoyable and interactive learning experience, the game aims to enhance the traditional method of teaching that will help users memorize traffic signs and prepare them for the Land Transportation Office (LTO) licensing exam.

Specific Objective

1. Create a mobile game application called "Traffic Sign Quiz" that tests players' knowledge of traffic signs.
2. Create a mobile game application with an image recognition feature that can enhance their knowledge of traffic signs.
3. To evaluate the effectiveness of the application by conducting a pretest before using the application and conducting a post-test after using the application.

IV. Scope and Limitation

This study focuses on developing and evaluating the effectiveness of the "Traffic Sign Quiz" game as a tool for improving users' recognition and understanding of traffic signs. The scope includes designing an interactive game using image recognition technology to detect and identify traffic signs in real-life scenarios. The study will assess users' performance and gather feedback to evaluate the game's impact on users' knowledge and preparedness for the LTO licensing exam.

Limitation

The limitation of the "Traffic Sign Quiz" game is its reliance on image recognition technology, which may be affected by variations in lighting conditions, image quality, and occlusions. This can result in challenges and potential inaccuracies in correctly identifying and recognizing traffic signs, leading to misleading learning experiences for users.

V. Tech Stacks

- Game Development: Unity is essential for creating the "Traffic Sign Quiz" game, providing a robust framework for developing interactive and engaging experiences.
- Cross-Platform Compatibility: Unity enables seamless deployment of the game across various platforms, ensuring wider accessibility and reach for users.
- Open CV: It will be used in the "Traffic Sign Quiz" app to detect and recognize traffic signs in real time, providing immediate feedback and assessment based on user-captured images.

References

Nagar, K. (2022). Safety Education on Knowledge, Attitude and Practice Towards Road Traffic Signs and Regulations Among College Students At Gujarat. *Journal of Pharmaceutical Negative Results*, 948-958.

Hussain, M., & Shi, J. (2021). Effects of proper driving training and driving license on aberrant driving behaviors of Pakistani drivers–A Proportional Odds approach. *Journal of Transportation Safety & Security*, *13*(6), 661-679.

Purnamasari, P. (2019, October). Motorcyclists' awareness and understanding of traffic signs for traffic safety in Yogyakarta. In *IOP conference series: materials science and engineering* (Vol. 615, No. 1, p. 012125). IOP Publishing.

Hassan, I. I., Sani, J. E., Anwar, A. M., Mamman, M. M., Shehu, A. A., & Abdulrahman, B. (2022). Assessment of compliance level of road users to road traffic signs in Kaduna Metropolis, Nigeria. *World Journal of Advanced Engineering Technology and Sciences*, *5*(2), 069-081.

Borrego-Jaraba, F., Llorca, D. F., & Mira-McWilliams, J. M. (2020). A serious game for road sign recognition and understanding: *The Road Sign Recog game. Applied Sciences, 10(9), 3215.*

Tran, N. H., & Tran, H. (2020). Mobile-based traffic sign recognition using deep learning and game-based learning. *In 2020 5th International Conference on Smart and Sustainable Technologies (SpliTech)* (pp. 1-5). IEEE.

Barmpounakis, E. N., Economou, G., & Fotiadis, D. I. (2019). A mobile-based serious game for traffic sign recognition using convolutional neural networks. *In 2019 IEEE 19th International Conference on Bioinformatics and Bioengineering (BIBE)* (pp. 61-66). IEEE.

Li, Y., Zhang, X., Chen, Z., & Zhang, Z. (2017). Real-time traffic sign recognition based on deep convolutional neural network. *IEEE Access*, 5, 22795-22803.

Ertan, K. (2020). Mobile-based traffic sign detection and recognition using deep learning. *In 2020 International Artificial Intelligence and Data Processing Symposium (IDAP)* (pp. 1-5). IEEE.