LibotTana: A Travel Guide Application for Commuters in Pampanga

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Abstract

This study presents *LibotTana*, a travel guide application designed for commuters in Pampanga, focusing on Angeles City, Mabalacat City, and the City of San Fernando. The application aims to help users navigate local transportation, access fare matrices for jeepneys and tricycles, and avoid getting lost. Key features include user registration and login, real-time location tracking, chat support, and an admin panel for monitoring users. The system also provides a fare rate calculator and a user manual for easy operation. Developed using HTML5, CSS3, Bootstrap 5, JavaScript, Laravel 9, and MySQL, the app was tested on Android version 8 to ensure smooth functionality. While the app currently supports only English and has limited notifications, it meets ISO 25010 standards for performance, usability, and security. The study shows that *LibotTana* is a secure, user-friendly solution that addresses the commuting needs of users in the selected Pampanga cities. It offers a practical tool for enhancing urban mobility and can serve as a model for similar applications in other regions. This research contributes to the application of technology in improving commuter experiences, offering insights into the development of localized travel guide systems.

INTRODUCTION

Travelling has been one of the trends in nowadays situations, where many individuals choose traveling as one of their hobbies, where according to Reeve (2023), the benefits of traveling as a hobby can help individuals not just only to see new amazing places, understanding new cultures, as well the feeling of personal accomplishment. And for the past years, many individuals choose to travel not just only to visit new places, but also for their well-being, and it is called wellness tourism or traveling, as stated by Larner (2023), The wellness travel industry is expanding quickly. While it is common knowledge that eating a balanced diet and getting regular exercise led to a healthy lifestyle, stress reduction and mental wellness are equally crucial. In this kind of traveling, most individuals choose traveling from different places to reduce their stress, as well it can be mental, physical, and in some cases emotional well-being matter.

For the past few years, people used maps, brochures, tour guides, or other individuals to find out where they were, and even a compass in traveling. Also, people traveled by walking, riding animals, building crude boats out of wood, and eventually creating wheeled vehicles. They traveled by using the already-existing rivers or basic roadways. People created increasingly sophisticated modes of transportation over time (LoveTheMaldives, 2023). And with the growth of technology in today's situation, traveling is also improved. According to William Padilla (2022), The development of technology has brought about changes in travel. Many times, people are reluctant to travel because they think it would be too difficult. Making travel plans takes a lot of time, and most individuals struggle to find the time to do it. People may now arrange trips more easily since technology helps with effective planning and saves time. Also, transportation is one of the areas of daily life that have been impacted by the growth of the Internet. The travel experience has been enhanced by internet connection and technical advancements, which have made it easier to get information about destinations, lodging options, transportation, food options, shopping, festivals, and other attractions. But as technology becomes more integrated into urban settings, the Intelligent Tourist Guide System concept presents additional challenges for improving the sustainability of cities. As a result, research on tourism continues to lag behind in offering pertinent data, advancements, and current conditions. (Vidhyaharini, M. et al., 2022)

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According to Tripnxt (2020), making a good travel plan is important to travel peacefully. When planning travel, a travel guide is essential to avoid unpleasant surprises in unfamiliar locations. The most common type of travel guide focuses on a specific location, such as a city, region, or country. A travel guide can include information on various sites, hotels, restaurants, transportation, and activities that a visitor might be interested in. Travel guides, also known as guidebooks, can provide information on a country's culture, currency, and language for international travelers. Many travel books include maps to assist users in navigating a new city or country. Travel guides provide pricing information so that readers can make choices that fit their budgets. Some guidebooks target budget-conscious travelers by emphasizing low-cost options or ways to save money both before and during a trip (Gale, 2023).

In the Philippines, Jeepneys are one of the modes of transportation in the country, they are mostly used for traveling to schools, works, and even for personal matter, as stated by Asia Pacific Foundation of Canada (2023), For Filipino commuters, particularly students and lower-class workers, jeepneys are a lifesaver. Thousands of independent operators rely on them for their reliable and reasonably priced transportation, and it is important for city transportation because jeepneys connect rural barrios in the provinces with nearby towns and cities. Buses and jeepneys, the basic passenger vehicles modeled after American World War II jeeps, make up the majority of long-distance road transportation. Tricycles, motorbikes with steel sidecars, are often used for short travels throughout the provinces and in some parts of cities.

Millions of Filipinos depend on jeepneys, an informal minibus service, to get to school and work, as well as to transport livestock to market. Jeepneys can operate on roads that are too narrow for regular buses, most visitors use them at least once, for many it is one of the highlights of their trip. The original jeepneys, cannibalized from vehicles abandoned by departing Americans at the end of WWII, have evolved over the past five decades into the mass-produced versions seen on the streets today, decked out with chrome trinkets, blinking fairy lights, and celebrity images. (Rough Guides, 2023)

Statement of the Problem

This study focuses on the LibotTana: A Travel Guide Application for Commuters in Pampanga, this system will guide commuters on which mode of transportation will take them to their destination, in acknowledge with the issues that commuter's encounter which are the following, and will be the focus of the study:

- Tendency to ride a wrong vehicle and chance to get lost.
- Commuters don't know the exact fare for transportation.
- Commuters are not familiar with the place.

Objectives of the Study

The study aims to develop an accessible application that helps passengers facilitate their ride in vehicles and avoid confusion for passengers, and it helps people who have never been to a place where they do not memorize the routes, they will take for this system to show the routes that the users will take. However, to meet the goal of the study, it should be aligned with the following objectives;

1. To know what they can use for transportation and where they can find it.
2. To help commuters to know the fare matrix for every transportation vehicle.
3. To avoid getting lost around the city and to have a guide.

Scope of the Study

This study will focus on the travel guide system application where customers can browse to find transportation that is suitable for the tourist's needs. The scope of this project will be until the implementation of the system becomes successful.

- Registration - users must be registered and will be asked for verification before using the application.
- Login/out - users and admin can log in/out for security.
- Profile - basic information of the users inputted in the system.
- Maps - commuters will get an update of the location from the application and the arrival of their destination.

- Chat Support - tourists can ask questions and communicate with the admin.
- Admin Module - The admin can track and monitor all the users in the application.
- Dashboard - number of active users registered to the system.
- Fare Matrix - fare rate per kilometer for Jeepney and Tricycle.
- User Manual - will give users instructions on how to use the system application.

Delimitations of the Study

The study delimits the other features of the application system as stated below:

- Multi-language support - the system will use the English language only.
- Notification - commuters will not receive notification from the system application when tourists are at their destination.
- API - the system has an API but there is only a limitation because it is a free account.
- System coverage - only in Angeles City, Mabalacat City, and City of San Fernando.

Conceptual Framework

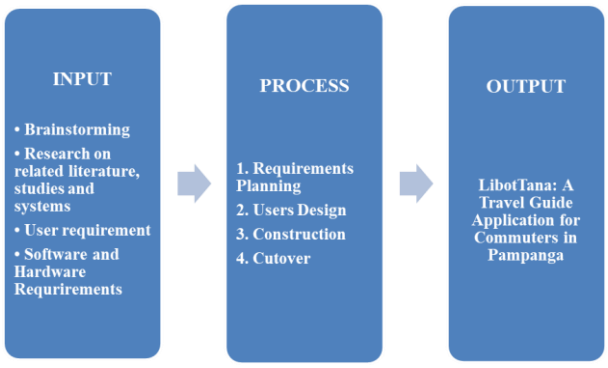

Figure 1. The IPO Framework

The conceptual framework used in this study is the IPO (Input-Process-Output) model, which shows the development of a system in three steps: input, processing, and output. Inputs are modeled as a requirement to add to the system at the start of the life cycle. Process is the development process of the system, which is used by RAD for the methodology of this study. The output shows the final output of the system, which is the LibotTana Travel Guide Application.

Significance of the Study

The researchers aimed to determine the importance of carrying out this research study. The findings of this study may be beneficial to the following:

Commuters. Commuters benefit from travel guides since they offer helpful information and resources that may enhance the quality of their routine travel experiences, making their trips more efficient, affordable, and entertaining.

Drivers. Travel guides created expressly for drivers can enhance their experience on a road trip, ultimately making it more relaxed and enjoyable, by providing navigational assistance, safety tips, and information on resources and attractions along the way.

Future Researchers. It can be a useful resource for future researchers on the topic, giving them crucial context and insights. They could also use whatever datasets you've produced for their own research and benefit from your research methods. Additionally, the theoretical frameworks, policy suggestions, and emerging trend results from your study might provide a solid platform for their future research.

Definition of Terms

Jeepney - a typical form of shared transportation within Philippine cities and towns, characterized by brightly adorned mini buses or extended jeeps.

Travel Guide Application - Travelers can access this software solution via a mobile application for real-time information and support, which includes specifics on available local transit alternatives, lodging, tourist attractions, maps, and other pertinent information.

Travelers - Individuals who frequently travel within the study's geographic area, including locations such as Angeles City, Mabalacat City, and the municipality of San Fernando, for various purposes, which may include daily work-related commuting and leisure or exploration activities

Maps - Visualizations of the geographical structure of the study area, including the locations of streets, landmarks, and important areas of interest, are crucial for helping users go around in their immediate surroundings.

Tricycle - Term used to describe a tiny motorized vehicle that is used for short-distance transportation, usually for the purpose of

transporting people throughout urban, rural, and suburban areas. Typically, it comprises a motorcycle with a sidecar attached that seats people or holds stuff.

Fare matrix - Set of measurable indicators and data used to understand the pricing and passenger satisfaction.

METHODS

Research Design

The researchers chose the quantitative research method as their design for the said study, as they are aiming to find solutions for the challenges of passengers and tourists using jeepneys and tricycles as transportation in Pampanga. Quantitative research aims to generate knowledge and improve comprehension of the social world. Observed or measured data are used in quantitative research to answer questions about the sample population stated by Allen, M. (2017).

System Development Methodology

The system development methodology of this study will use Rapid Application Development. A software development methodology called Rapid Application Development (RAD) places a high priority on quick prototyping and quick user feedback. RAD enables iterative development and speedy adjustments in response to user feedback, in contrast to traditional waterfall methods, which involve a more linear progression of development stages.

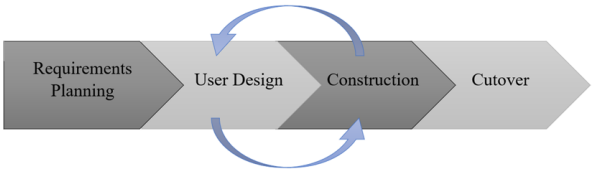

Figure 2. RAD Methodology Diagram

- Requirements Planning - By working with users, the initial stage involves gathering requirements. The needs of the system are clearly understood as a result of this phase.
- User Design - During this stage, users participate in a series of organized workshops to jointly design the application. The features and functions of the application are visualized and interacted with using prototyping tools.
- Construction - During the User Design phase, developers gather user feedback and use that information to build the application, constantly improving it. Programming, testing, and integration are all part of this phase.
- Cutover - The application moves from development to production at this point in the process. Final system testing, user onboarding, and application deployment are all part of this phase.

Participants

In choosing the participants of this study, the researchers used the convenience sampling technique, where convenience sampling is a non-probability sampling technique that collects data from a population that is readily available and accessible. The people in the sample are chosen for the researcher's convenience, not because they are most representative of the overall community (Simkus, 2023). This sampling technique is the best choice for this study, for the convenience of the chosen participants.

The researchers need 50 commuters, and 3 IT experts as their participants for the testing of the proposed application. The said participants will evaluate the system based on their availability.

Procedure

This part of the study shows how the researchers gather the data that is needed to the study.

Web Research. Web research is the process of gathering information from the internet using a variety of search engines, databases, and online resources (Sahaba, 2023). In order to strengthen the paper's credibility, the researchers frequently used this strategy to look for relevant literature and literary works. Additionally, fresh points were investigated using the web.

ISO 25010 Evaluation Tool. Software quality is governed by ISO 25010, or "Systems and Software Engineering Systems and software Quality Requirements and Evaluation (SQuaRE) - System and software quality models". It provides practical advice on how to apply the quality models and describes the models, which include

characteristics and sub-characteristics for both software product quality and software quality in use (Britton, 2021). The quality characteristics associated with ISO 25010 are as follows:

Functional suitability is the degree to which a system or product can do certain tasks that satisfy both explicit and implicit needs.

Reliability describes how successfully a system, product, or component carries out specific tasks under specific circumstances.

Performance efficiency is the relationship between performance and resource usage.

Usability relates to how easily, successfully, and satisfactorily a system or product can be used to accomplish specific goals.

Security is the degree to which a system or product shields data and information from security flaws.

Compatibility refers to the ability of a system, product, or component to exchange information and carry out its necessary duties in the presence of a shared hardware or software environment.

Maintainability is the ability of a system or product to be improved, corrected, or adjusted to requirements as well as environmental changes.
Portability describes how well a product, system, or component may be moved from one environment to another.

Data Analysis

This part of the study will show how data to be collected are interpreted, and as well as the formula used on how data are analyzed, which will serve to create the information that the researchers need to meet the objectives or the main goal of the study, and for the research's findings.

For the interpretation of the rating that participants will give, the researchers used the five-point ordinal scale.

Table 1. Five-point Likert Rating Scale

Numerical Rating	Equivalent
5	Excellent
4	Very Good
3	Good
2	Fair
1	Poor

In finding the general weighted mean for the data collection, the researchers used the formula below to interpret the data that were presented and analyzed.

$$Gwm = \frac{\sum wx}{N}$$

Where:
Gwm = General Weighted Mean
∑wx = Sum of all criteria weighted values
N = The total number of values

Table 2. Scale for Interpreting the Evaluation Result

Weighted Mean	Interpretation
4.30 – 5.00	Excellent
3.50 – 4.29	Very Good
2.70 – 3.49	Good
1.80 – 2.69	Fair
1.00 – 1.79	Poor

Design and Implementation

Hardware Specification

This section of the study shows what are the hardware specifications in developing the system, as well as the recommended specifications for users in using the system application that is proposed.

Table 3. Hardware Specification for Developer

Developing		Testing	
Hardware Specification	Recommended Requirement	Hardwar Specification	Recommended Requirement
Processor	AMD Ryzen 5 2500U with Radeon Vega Mobile Gfx 2.00 GHz	Android Version	Android 8
RAM	8 GB	RAM	6 GB
Storage	237 GB	Storage	128 GB
Monitor	Led Monitor		

Table 4. Hardware Specification for Users

Hardware Specification	Recommended Requirement
Android Version	Android 8 to latest version
RAM	2 GB
Storage	32 GB

Software Specification

This part of the study shows software tools that were used in developing the proposed system.

- HTML 5 - HTML5 is a markup language used for structuring and presenting content on the World Wide Web. It is the fifth and final major HTML version that is a World Wide Web Consortium recommendation.
- CSS 3 - CSS3 is used with HTML to create and format content structure. It is responsible for colors, font properties, text alignments, background images, graphics, tables, etc. It provides the positioning of various elements with the values being fixed, absolute, and relative.
- Bootstrap 5 + Materialize CSS - A custom framework with unique approaches of two different CSS frameworks.
- JavaScript - JavaScript is a text-based programming language used both on the client side and server side that allows you to make web pages interactive.
- jQuery - jQuery is a fast, small, cross-platform, and feature-rich JavaScript library. It is designed to simplify the client-side scripting of HTML.
- Axios - Axios is a JavaScript library used to make HTTP requests from nodes. js or XMLHttpRequests from the browser and it supports the Promise API that is native to JS ES6. It can be used to intercept HTTP requests and responses and enables client-side protection against XSRF.
- Laravel 9 - Laravel is an open-source PHP web application framework known for its elegant syntax. It's an MVC framework for building simple to complex web applications using the PHP programming language, and it strictly follows the MVC (model–view–controller) architectural pattern.
- MYSQL - MySQL is a relational database management system (RDBMS) developed by Oracle that is based on structured query language (SQL).

User Interface Design

The user interface design visualizes the content of the proposed system. The UI design creates and gives ideas to users on what the system is, for better understanding, and in this part of the study, the researchers present some screenshots of the UI design of the proposed system. (See appendix(H))

Entity Relationship Diagram

An entity relationship diagram (ERD), also known as an entity-relationship model, is a graphical depiction of the relationships between people, things, locations, concepts, or events in an information technology (IT) system (Biscobing, 2019). Entity relationship diagrams serve as a visual starting point for database architecture and may also be used to assess information system requirements throughout an organization. This part of the study presents the ERD of the proposed system. (See appendix(C))

Data Flow Diagram

Data Flow Diagram is abbreviated as DFD. DFD represents the data flow of a system or process. It also provides information on the inputs and outputs of each entity as well as the process itself (GeeksforGeeks, 2023).

A data flow diagram, also known as a DFD, is a graphical depiction of how data flows through an information system. It demonstrates how information is input and output from the system, as well as the sources and destinations of information and where it is kept (Data Flow Diagram, 2022). This part of the paper will present the study's developed DFD diagrams, which are the context-level diagram or level 0 and the DFD level 1, which will outline how data will be handled within the system as well as the system's functionality.

Use Case Diagram

A use case diagram is a graphical depiction of use cases that includes their connections to the environment and to other use cases. Thus, it specifies in high abstraction the functions and services that a system delivers to a user (t2informatik, 2023). This diagram portrays the aspects of the system, and how it communicates within and outside the system, see the use case diagram of this study in the appendix B

RESULTS

This chapter contains the study's findings, as rated by the participants, which are the commuters in Pampanga and the IT experts. The aforementioned result will serve as the foundation for this study, determining whether or not the study fits the user criteria, system features, and primary research objectives.

System / Application Outputs

This section of the chapter describes the system application's inputs and outputs. Inputting the commuter's destination up to showing all possible routes, fares, and transportation vehicles that the user will ride. See the appendix I for better visualization and understanding of the inputs and outputs of the system.

Evaluation Results

This section contains all of the findings from the ISO 25010 Evaluation tool's evaluation of the study's participants. The participants of this study are 53, including the 3 IT experts. The system was rated by the respondents on the basis of functionality, security, usability, reliability, maintainability, portability, and efficiency.

Table 5. Assessment of Evaluation of Non-IT Experts

Criteria	Mean	Interpretation
Functional Suitability	4.51	Excellent
Performance Efficiency	4.35	Excellent
Compatibility	4.45	Excellent
Usability	4.42	Excellent
Reliability	4.46	Excellent
Security	4.48	Excellent
Overall Mean	**4.45**	**Excellent**

Shown above is the summary of the results of the evaluation of the Commuters.

Functional Suitability got a rate of 4.51 which is equivalent to Excellent. This means the user meets the requirements in the system and the specified task and user objectives.

When it comes to Performance Efficiency, it was rated 4.35 which is equivalent to Excellent. This means that the user meets the requirements of the system, when performing its functions, meets requirements.

Compatibility got a rate of 4.45 which is equivalent to Excellent. This means that the system meets the expectations of the users in terms of exchanging information.

For Usability, it was rated 4.42 which is equivalent to Excellent. This means that the user meets the requirements of the system attributes that make it easy to operate and control.

When it comes to Reliability, it got a rating of 4.46 which is equivalent to Excellent, which means that the system can function under different circumstances.

Security got a rate of 4.48 which is equivalent to Excellent. This means that the system protects the data that the users input.

With the results given by the commuters, it concludes that the system is helpful, especially for those commuters who don't know what they are going to use as transportation to their desired destination.

Table 6. Assessment of Evaluation of IT Experts

Criteria	Mean	Interpretation
Functional Suitability	4.56	Excellent
Performance Efficiency	4.11	Very Good
Compatibility	4.17	Very Good
Usability	3.56	Very Good
Reliability	4.08	Very Good
Security	4.33	Excellent
Maintainability	4.27	Very Good
Portability	4.22	Very Good
Overall Mean	**4.16**	**Very Good**

Table 6 presents the summary of the results from the assessment of the three IT experts.

Functional Suitability got a rate of 4.56 which is equivalent to Excellent. This indicates that the user satisfies the system's criteria as well as the task and user objectives.

When it comes to Performance Efficiency, it was rated 4.11 which is equivalent to Very Good. This means that the user meets the requirements of the system, however there is a minimal need to improve when it comes to performing its functions.
Compatibility got a rate of 4.17 which is equivalent to Very Good. This suggests that the system fulfills user expectations. When it comes to information sharing, there is, nevertheless, a slight room for growth. Examples of this type of sharing include information sharing between two or more products, systems, or components that can utilize the information shared.

Usability got a rate of 3.56 which is equivalent to Very Good. This implies that the system encounters user expectations, but it makes very little indication that the product or system can be used by particular users to accomplish particular objectives, such as learning how to use it effectively, efficiently, risk-free, and satisfactorily in a particular usage context.

Reliability got a rate of 4.08 which is equivalent to Very Good. This suggests that although the system satisfies user expectations, there are certain areas that still require development. For example, in the event of a disruption or failure, a product or system should be able to recover the immediately affected data and restore the system to its intended condition.

Security got a rate of 4.33 which is equivalent to Excellent. This shows that the user meets the requirements set forth by the system for accountability, confidentiality, integrity, and non-repudiation.

Maintainability got a rate of 4.27 which is equivalent to Very Good. This shows that despite the fact that the system meets user expectations, there are still certain features that might be improved. It is possible to modify a system or product effectively and efficiently without creating new flaws or lowering the quality of an already-existing product.

Portability got a rate of 4.22 which is equivalent to Very Good. This suggests that the system meets user expectations, but it doesn't really explain how one product can take the place of another specifically designed software product in the same setting or for the same purpose.

With the results given by the I.T Experts, It comes to the conclusion that commuters and even tourists who are unfamiliar with Pampanga's transit system will find the system useful and efficient. However, there are still certain enhancements in the system that require attention.

DISCUSSION

Summary of Findings

The aim of LibotTana, a travel guide application for commuters in Pampanga is to aid passengers with their travel in vehicles and avoid confusion for passengers, and it helps individuals who have never been to an area where they do not remember the routes they will take since this system will indicate the routes that the users will take. Developing this application is a significant factor for every commuter, as it gives reliable, accessible, and accurate information for travel guides.

- LibotTana is an application that guides commuters on their journey.
- This application is designed to help commuters lessen the worry and feelings of getting lost, by guiding the commuters to their destination with accurate information.
- The participants of this study consist of fifty (50) commuters and three (3) IT Experts.

In developing the application, the researchers used the following applications, languages, and frameworks: Front-end, HTML 5, CSS 3, Bootstrap 5 + Materialize CSS, JavaScript, jQuery, Axios, for the back-end, Laravel 9, MySQL. Visual Code, for the designing of the system. For the testing of the system, the researcher used Android version 8. Testing the developed system ensures that the said application meets the requirements needed to run smoothly, as well as meets the goal of the study.

Information gathered from different sources and studies has been significant to the researchers, as it gives the researchers a basis that will support this study to ensure the credibility and reliability of information. This travel guide application that was developed met the requirements and criteria set by ISO 25010 (functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability), with those outcomes, the application demonstrates as an easy-to-use, secure, user-friendly, and beneficial application for users.

Conclusions

The LibotTana application, a travel guides for commuters in Pampanga ensured all the requirements need were followed, and addresses all the issues encountered by the users. The system that was developed contained different features or modules which is useful to the users in terms of travelling.

1. The researchers developed an accessible and reliable system that helps users find the route to their destination.
2. An application was created to give users the necessary trip guide information services.
3. The LibotTana application provides live chat support, which enables users to interact with the admins with regards in using the system.

Recommendations

The recommendations listed below are meant to help the application be improved in the future.

1. Use of Identity Providers like Gmail or Facebook Account to reduce registration friction.
2. Improve application's UI and UX design for better experience.
3. A live tracking feature so user can navigate where they are.
4. A "Para po" notification feature so that the user know that they have arrived at their destination.

REFERENCES

Reeve (2023). 9 Benefits of travelling as a hobby [+ tips list]. Reeves Roam. https://reevesroam.com/benefits-of-travelling-as-a-hobby/

Larner (2023). Wellness tourism is booming but what's behind the trend? Euronews. https://www.euronews.com/travel/2023/08/27/wellness-tourism-is-booming-but-whats-behind-the-trend#:~:text=Wellness%20tourism%20aims%20to%20reduce,wellness%20activities%20into%20a%20trip.

LoveTheMaldives (2023). How did people travel in the past? https://lovethemaldives.com/faq/how-did-people-travel-in-the-past#:~:text=In%20ancient%20times%2C%20people%20crafted,more%20complex%20means%20of%20transportation.

William Padilla (2022). How technology has changed the way you travel. Brand TD. https://traveldailymedia.com/how-technology-has-changed-the-way-you-travel/

Abana, E.C. (2019). Usability of "Traysi": A Web Application for Tricycle Commuters. https://pdfs.semanticscholar.org/c3a6/036ddf48e5eec5669628e4470e7772ef2857.pdf

Gale (2023). Travel Guides Travel Resources & Travel Publications https://www.gale.com/travel-guides#:~:text=A%20travel%20guide%20can%20include,and%20language%20for%20international%20travelers

Asia Pacific Foundation of Canada (2023). Jeepneys, backbone of public transport in Philippines, face modernization by government. https://www.asiapacific.ca/publication/jeepneys-backbone-public-transport-philippines-face#:~:text=Jeepneys%20are%20a%20lifeline%20for,of%20thousands%20of%20independent%20operators.

Ghose et al. (2019). Seizing the Commuting Moment: Contextual Targeting Based on Mobile Transportation Apps https://pubsonline.informs.org/doi/abs/10.1287/isre.2018.0792

Ngo, E.M. et al. (2021). TARA APP: A MOBILE-BASED HABAL HABAL BOOKING SYSTEM with Route Navigation for Cotabato City. https://www.studocu.com/ph/document/notre-dame-of-marbel-university/foreign-language/capstone-documentation/35224134

Pelonia, A., (2022). PhilSTAR Life. TripTips: 5 must-have apps for commuters to navigate Metro Manila. https://philstarlife.com/living/247681-apps-commuters-navigation-metro?page=3

Rough Guides (2023). Philippines Travel Guide. https://www.roughguides.com/philippines/

Tripnxt (2020). Importance of a travel guide for travelers. https://tripnxt.com/blog/importance-of-a-travel-guide-for-travellers/#:~:text=A%20Tour%20Guide%20is%20important,leave%20everything%20else%20on%20them.

Vidhyaharini, M. et al. (2022). Intelligent Tourist Guide System. https://www.ijraset.com/research-paper/intelligent-tourist-guide-system#copyright

Simkus (2023). Convenience Sampling: Definition, method, and examples. Simply Psychology. https://www.simplypsychology.org/convenience-sampling.html

Sahaba (2023). WHAT IS WEB RESEARCH AND ITS BENEFITS? www.linkedin.com.https://www.linkedin.com/pulse/what-web-research-its-benefit-sahaba-sultana

Britton (2021). What is ISO 25010? Perforce Software. https://www.perforce.com/blog/qac/what-is-iso-25010#:~:text=the%20quality%20models.-,ISO%2025010%20Standard%20Overview,a%20particular%20context%20of%20use.

Biscobing (2019). Entity Relationship Diagram (ERD). Data Management. https://www.techtarget.com/searchdatamanagement/definition/entity-relationship-diagram-ERD

Geeks for Geeks (2023). What is a DFD Data Flow Diagram? GeeksforGeeks. https://www.geeksforgeeks.org/what-is-dfddata-flow-diagram/

Dataflowdiagram (2022). https://www.computerhope.com/jargon/d/data-flow-diagram.htm

Thomas (2023). What is user interface design? Built-In. https://builtin.com/design-ux/user-interface-design

t2informatik (2023). What is a Use Case Diagram? - Smartpedia - t2informatik. T2informatikGmbH (EN). https://t2informatik.de/en/smartpedia/use-case-diagram/