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Design of Travel Ticket Booking Application with Web-Based Chatbot Using Dialogflow Natural Language Processing (NLP)

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Abstract. *The rapid development of information technology and telecommunications has driven companies and MSMEs to adopt desktop, mobile, and web-based applications to enhance operational performance. PT HPS Painan Padang, previously relying on manual ticket bookings, faced challenges in efficiency and susceptibility to brokering practices. To address this, a web-based travel ticket booking application was developed, enabling customers to book tickets online more practically, quickly, and conveniently, anytime and anywhere. The integration of Natural Language Processing (NLP) technology in the form of a chatbot further enhances service efficiency and responsiveness. This feature provides real-time information on departure schedules, seat selection, and payment transactions while also supporting sentiment analysis and swift responses to customer feedback, ultimately improving service quality. The application, built using PHP, MySQL, and CodeIgniter with a Prototype development approach, adapts to changing market demands. Testing via GTmetrix on the https://desistravel.xyz/backend page demonstrated excellent performance with an 88% Performance score, 95% Structure score, and optimal Web Vitals metrics, indicating a fast, responsive, and stable platform. The final product is a user-friendly web-based ticket booking application supported by an intelligent chatbot, offering a seamless user experience, enhancing customer satisfaction, and streamlining the travel booking process efficiently.*

Keywords: *Information Technology, Web Application, Natural Language Processing (NLP), Chatbot, HPS Painan Padang*

Abstrak. Perkembangan teknologi informasi dan telekomunikasi yang pesat telah mendorong perusahaan dan UMKM untuk mengadopsi aplikasi berbasis desktop, mobile, dan web untuk meningkatkan kinerja operasional. PT HPS Painan Padang yang sebelumnya masih mengandalkan pemesanan tiket secara manual menghadapi tantangan dalam hal efisiensi dan kerentanan terhadap praktik percaloan. Untuk mengatasi hal ini, dikembangkanlah aplikasi pemesanan tiket perjalanan berbasis web yang memungkinkan pelanggan memesan tiket secara online dengan lebih praktis, cepat, dan nyaman, kapanpun dan dimanapun. Integrasi teknologi Natural Language Processing (NLP) dalam bentuk chatbot semakin meningkatkan efisiensi dan daya tanggap layanan. Fitur ini menyediakan informasi real-time mengenai jadwal keberangkatan, pemilihan kursi, dan transaksi pembayaran serta mendukung analisis sentimen dan respon cepat terhadap masukan dari pelanggan, yang pada akhirnya dapat meningkatkan kualitas layanan. Aplikasi yang dibangun menggunakan PHP, MySQL, dan CodeIgniter dengan pendekatan pengembangan Prototype ini dapat beradaptasi dengan perubahan permintaan pasar. Pengujian melalui GTmetrix pada laman https://desistravel.xyz/backend menunjukkan performa yang sangat baik dengan skor Performance 88%, skor Structure 95%, dan metrik Web Vitals yang optimal, mengindikasikan platform yang cepat, responsif, dan stabil. Produk akhir dari penelitian ini adalah aplikasi pemesanan tiket berbasis web yang mudah digunakan dan didukung oleh chatbot yang cerdas, menawarkan pengalaman pengguna yang lancar, meningkatkan kepuasan pelanggan, dan merampingkan proses pemesanan tiket secara efisien.

Kata Kunci : Teknologi Informasi, Aplikasi Web, Natural Language Processing (NLP), Chatbot, HPS Painan Padang

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1. INTRODUCTION

Current technological developments have had a huge impact on the world of information technology and telecommunications. The emergence of various applications provides options in improving the performance of a company or MSME, both desktop, mobile and web-based (Chandra et al., 2020). Technology is increasingly affecting the way we do various activities, including planning trips.

Booking travel tickets is a process that people often do before carrying out a departure or a trip (Putri et al., 2020). Travel services are the main choice for people to travel between cities because they have a clear schedule and affordable costs. As happened at PT HPS Padang Painan, which was founded in 2008 and is one of the travel companies that serves the Padang-Painan route as well as package and document delivery. With a travel time of about 2 hours, the route chosen is always fast and efficient to avoid traffic jams. However, ticket booking is still done manually by visiting the company directly, which is less efficient in terms of time and cost. In addition, ticket scalpers often harm the company. To improve the quality of service PT. HPS requires information technology support in the travel ticket booking system.

One of the benefits of technology in ticket booking transportation, web applications for the transportation sector include easy to get information, save time and costs, expand reach and effective in ordering and sales (Purwarsih et al., 2022). Applications in a package usually have similar user interfaces that make it easier for users to learn and use each application. Often, these applications have the ability to interact with each other to benefit the user. For example, a worksheet can be embedded in a word processing document even though it was created in a separate worksheet application (Suzana, 2021).

The application of information technology with Natural Language Processing (NLP) methods has comprehensive advantages. A chatbot is a computer program that can mimic human conversation by applying 2 Artificial Intelligence methods and algorithms: Natural Language Processing and Machine Learning. Artificial intelligence has spawned or created a new branch in computer science and engineering called NLP (Natural Language Processing). The goal of NLP is to create and build applications that allow humans to communicate with machines and other devices more easily using natural language. This is one of the most important parts of artificial intelligence, hence the use of scenarios such as translators, speech recognition and others to understand human language, computers must break down a text into paragraphs, phrases, and individual words (Villasari & Wibowo, 2024). Dialogflow is a platform that provides NLP and NLU services. This service is used to make chatbots smarter and can understand the meaning of what the user is asking (Wiratama et al., 2022).

Based on previous research conducted by Albert Yakobus Chandra in 2020 on the Ordering System at Coffee Shop. In this study, a chatbot system will be built that can serve customers in providing information and making transactions automatically. This chatbot was built naturally utilizing Dialogflow tools from Google. One of them is Machine Learning - Natural Language Processing (NLP) which is a science that focuses on how computers can understand and understand human language and can provide responses. The result of the research is that Chatbot provides real-time services .

The next research on Designing Customer Service Chatbot Features Using Dialogflow.In this study, it produces feature development on the Solo Application that can help optimize customer service in the form of a Chatbot so as to minimize unanswered customer questions. Chatbot will be built in the iOS prototype application and uses the NLP (Natural Language Processing) platform, Dialogflow. Through blackbox testing, the results of application development carried out in this study by adding Chatbot features are able to overcome the problems faced by the customer service team to help answer questions from customers (Wiratama et al., 2022).

NLP is a branch of artificial intelligence (AI) that deals with training computers to understand, process, and generate language. This technology powers search engines, machine translation services, and voice assistants. Today, NLP is widely integrated into everyday life in the form of virtual assistants such as Siri, Alexa, or Google Home. In the industrial world, NLP is also very important for businesses to gain a competitive advantage. NLP applications can help in various areas of life especially analyzing and extracting value from unstructured data (Rumaisa et al., 2021).

The problem solving that will be done at PT HPS is to implement an NLP Chatbot to provide more responsive and intuitive customer service support. Basic NLP has tasks including tokenization and parsing, lemmatization/stemming, part-of-speech tagging, language detection, and identification of semantic relationships (Rosyadi et al., 2020). By using Chatbot on a website platform, the company can provide information about travel bookings and serve travel bookings for people who use travel services. The need for information about booking travel tickets and booking travel tickets is of course needed by the community in traveling, especially people in Painan City. Chatbot services that are able to provide information and serve reservations such as selecting departure schedules, selecting seats and making payment transactions. So this research will implement a chatbot on a website platform using the Natural Language Processing (NLP) method.

The main objective of this application is to provide an easy-to-use platform for users to search, book, and manage their travel tickets efficiently. The method used in this research is the Prototype method, a basic working model of developing a program (software) or software (Asda, 2024). Through this approach, it is expected that the developed travel ticket booking application can provide a satisfying user experience, improve efficiency in the travel booking process, and accommodate changes and adjustments quickly according to changing market needs.

2. METHODS

SWOT Analysis

SWOT analysis examines internal factors such as strengths and weaknesses from the perspective of the organization itself, while external factors such as opportunities and threats are examined from the perspective of the business or market environment. Feasibility studies use SWOT analysis to assess whether the design solution has sufficient strengths to capture market opportunities and overcome potential threats. This analysis also helps identify weaknesses that need to be addressed before adopting the design solution (Asda, 2024).

In the context of the travel ticket booking application problem, SWOT analysis can be used to evaluate the strengths and weaknesses of the problems in the travel ticket booking application as well as the opportunities and threats that exist in the solution. By considering these factors, the research conducted can develop appropriate strategies to strengthen their strengths and overcome their weaknesses in solving the problem as shown in Table 1.

Table 1. SWOT Analysis

SWOT Analysis		
Strengh	*Advantages?*	The travel ticket booking application has the convenience that users can choose the schedule and seat they want.
	Uniqueness?	The travel ticket booking application provides an online ticket booking service, which makes it easy for users to book tickets without having to come to the travel counter.
	Selling Points?	Travel ticket booking app provides secure and easy-to-use online payment features.

	Skills?	This travel ticket booking application has a Chatbot service that responds to users automatically.

Prototyping Method

The method used in system development is prototype Prototyping is a software development method that uses an approach to make designs quickly and gradually so that they can be immediately evaluated by potential users/clients (Hakam, 2022). The stages of the prototype method start from Communication, Quick Plan, Modeling Quick Design, Contrusction of Prototype and Development Delivery and Feedback Analysis of system requirements.

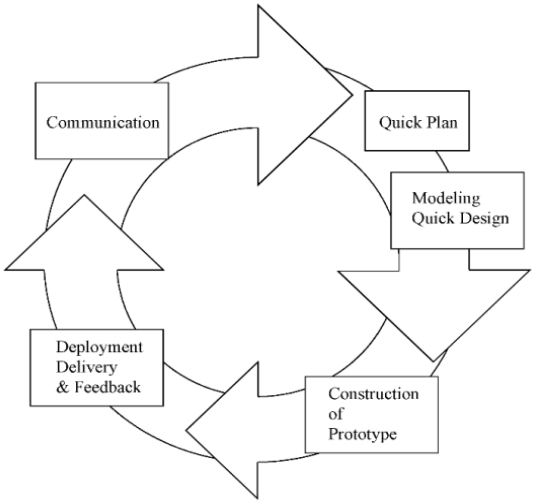


Figure 1 metode prototype

Communication is the initial stage in system design planning which aims to obtain data and specifications to analyze user and system requirements. This stage builds communication with users by interviewing members of the target group. At this stage, communication or interviews were conducted with the parties from PT HPS Painan as users or users of this ticket booking application. At this communication stage, some data and facts related to the state of travel ticket booking at PT HPS Painan were obtained.

Quick Plan

At this stage, the analysis and planning of the needs used in designing a web-based travel ticket booking application using dialogflow NLP chatbot is carried out.

Software Requirements Analysis (Software)

a. Sublime Text

Sublime Text is a text and source code editor popular among software developers for its clean and elegant user interface. Available for Windows, macOS, and Linux, Sublime Text

offers fast and responsive performance, capable of handling large text files without lag. The "Goto Anything" feature allows quick navigation to specific files, symbols or lines, speeding up the development process. Supporting various programming languages, Sublime Text can be extended with plugins via Package Control. Users can also customize this editor with snippets and macros to improve code writing efficiency.

b. XAMPP

XAMPP is free software, which supports many operating systems, is a compilation of several programs. Its function is as a stand-alone server (localhost), which consists of the Apache HTTP Server program, MySQL database, and language translators written in the PHP programming language (Rahardjo et al., 2019). The usefulness of Xampp is to create its own local network in the sense that we can create a website offline for trial and error on our own computer. So the function of the Xampp server itself is our website server for how to use it. It is called a server because in this case the computer that we will use must provide services to access the web, for that our computer must become a server..

c. MySQL

MySQL stands for My Structure Query Language, an SQL database management system that is widely used because it is free under the GNU General Public License (GPL). In addition, MySQL can run stably on various operating systems, such as Windows, Linux, Solaris, and many others. MySQL has good speed in handling security layers, such as host name, subnet mask level, and user access permissions using encrypted passwords.

d. PhpMyAdmin

phpMyAdmin is an open-source, web-based tool for managing MySQL and MariaDB databases. This tool allows users to create, modify, delete databases, tables, columns, and rows and run SQL queries. Users can also import and export data in various formats such as CSV, SQL, and XML. phpMyAdmin provides features to manage user access rights, monitor server activity, and optimize database performance. This tool is especially useful for developers and administrators who want to manage databases without having to use the command line.

e. Hardware requirements analysis

The most important hardware requirement needed in designing this application is a computer that must be in accordance with the needs of the program and the amount of data in the computer.

Modelling Quick Design

Modeling Quick Design is a stage in software development where an initial design of the system is created quickly to provide an overview of the functionality and appearance of the system. Its purpose is to provide a rough basis of the system to be developed, allowing the development team to get initial feedback and make adjustments before investing in more in-depth details. The steps include identifying key requirements, sketching the user interface, creating architectural diagrams, and creating system workflows. Modeling Quick Design helps identify potential problems early, provides quick feedback, and forms the basis for further development.

For example, for a travel ticket booking application with a web-based chatbot, the user interface sketch will include the main page view, ticket booking form, and chat interface for the chatbot. The architecture diagram will show the web server, MySQL database, and chatbot module and their interactions. The system workflow will illustrate the ticket booking process from start to finish, including the user's interaction with the chatbot to select schedules, seats, and make payments. With Modeling Quick Design, the development team can ensure that the vision of the application is clear and get confirmation from users before proceeding to a more in-depth development stage.

Contruction of prototype

Construction of Prototype is a stage in software development where an early version of a system or application is built to validate key concepts and functions. The first step is to gather requirements from users and stakeholders, followed by a simple yet functional user interface design. After that, core features and basic business logic are implemented, then initial testing is conducted to ensure the prototype works as expected. Feedback from users and stakeholders is collected to make revisions and improvements. Prototype building helps identify early issues, get feedback, and reduce the risk of major changes in the final stages of development.

Deployement Delivery & Feddback

Deployment, Delivery & Feedback is the final stage in software development that involves deploying the application to the production environment and delivery to the end users. Deployment includes server configuration, application installation, and testing to ensure the application functions properly in the production environment. Delivery involves providing access to users, training if required, and ensuring documentation and guides are available. After launch, feedback is collected from users to identify issues and get suggestions for improvements. This process is important to ensure the application is functioning properly, meeting user needs, and is continuously improved based on the feedback received.

3. HASIL DAN PEMBAHASAN

This research is a development research to produce an attendance monitoring system. The purpose of this design is to provide services for booking travel tickets at PT HPS Painan Padang, as well as providing Chatbot services to customers who open the application. The application design process is presented in figures 2 to 8.

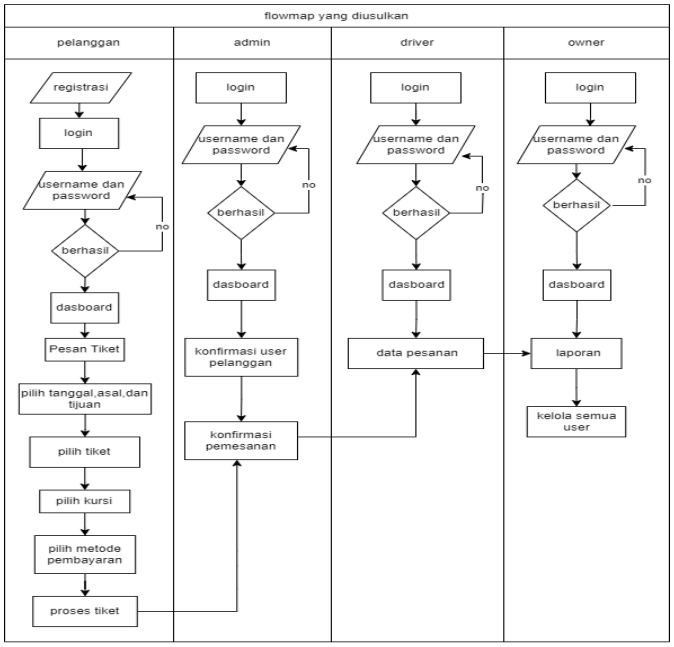


Figure 2. Proposed flowmap.

Figure 2 is a form of system flow diagram proposed to build a travel ticket booking application in Painan city.

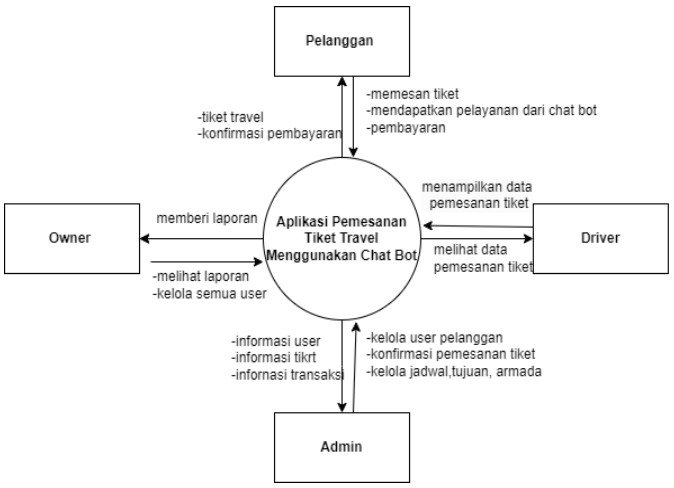


Figure 3. Context diagram of travel ticket booking application.

Figure 3 explains the system receives data to be processed and generates information according to user requests. Admin manages bookings, can delete accounts, and receives fleet data. Owner manages all users and receives reports. Drivers view booking data for operations, while customers book tickets and interact through chat bots or AI assistants.

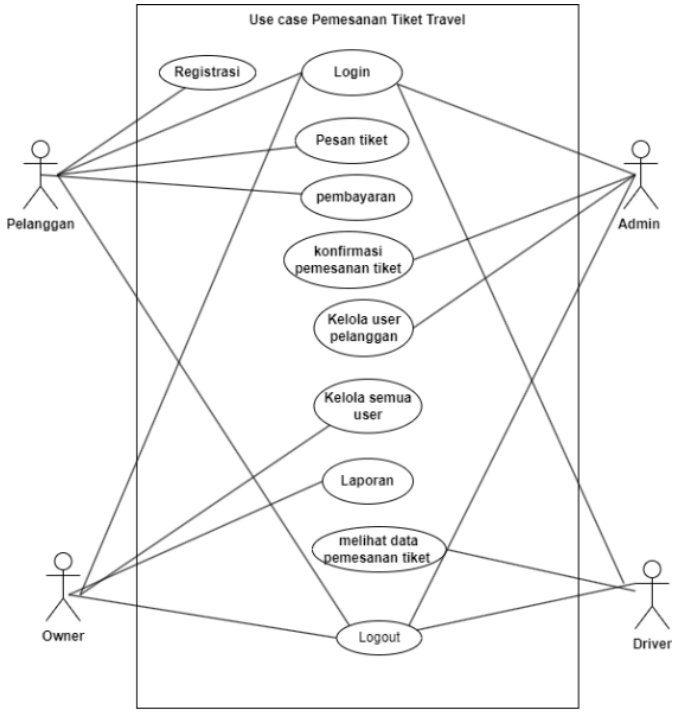
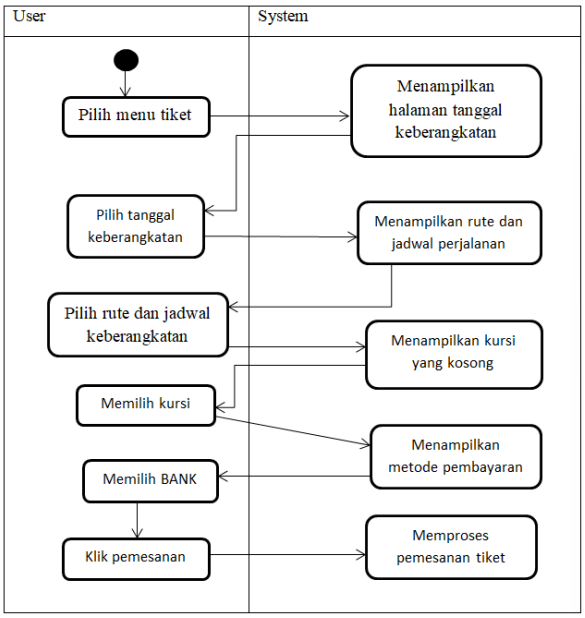


Figure 4. use case Diagram of Travel Ticket Booking Application.

From the use case diagram of the application in Figure 4, actors have their respective responsibilities that describe the actor's relationship with the process processes that are their responsibility such as admins who manage travel ticket bookings, such as being able to confirm ticket bookings, manage users and manage customer users.



Figur 7. Activity Diagram of ticket booking by user

Figure 7 explains how the activities carried out by the system on the frontend. If the user accesses the website page, the system will display a home page that contains menus for login,

register, view information, place orders, and chat bots that can help answer questions about travel. If the user clicks on one of the menus, the system will display the requested page.

Figure 8. main page view.

Figure 8 displays the main page of the screen that appears the first time we open an application. This page displays a background image that shows HPS travel. At the top, there are Home, Book Tickets, Check Tickets, Register and login menus. Here customers can

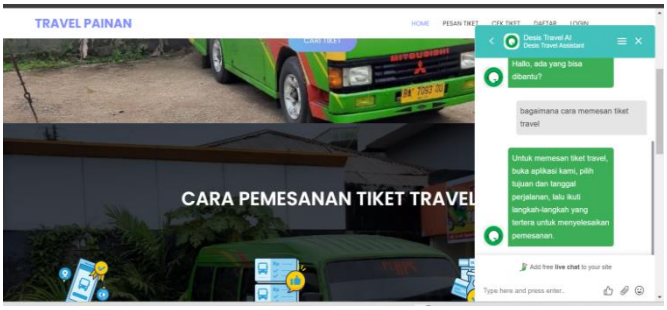


Figure 9. Customers can ask about information about booking HPS Padang Painan travel tickets.

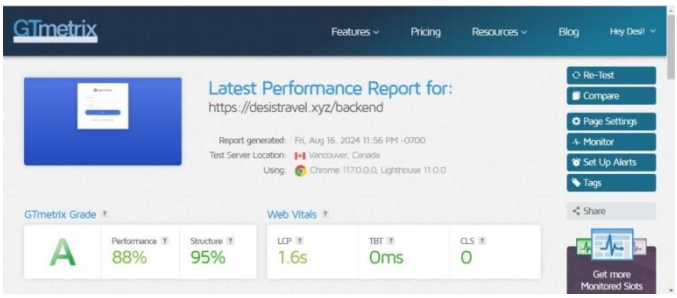


Figure 10. Application testing using GTmetrix.

Figure 17 shows the results of the `https://desistravel.xyz/backend` website performance test using GTmetrix. The site received a total score of A from GTmetrix Grade, with a Performance Score of 88% assessing the site's speed and responsiveness, and a Structure Score of 95% assessing the site's technical quality. Specific metrics include Largest Contentful Paint (LCP) of 1.6 seconds, Total Blocking Time (TBT) of 0 ms, and Cumulative Layout Shift (CLS) of 0, indicating the site loads content quickly, there is no interruption in user response, and the layout remains stable.

4. CONCLUSIONS

The implementation of an NLP-based chatbot at PT HPS Padang Painan improves ticket booking efficiency and accuracy, reduces costs and the risk of operational errors, and improves customer service quality by providing a fast, easy, and convenient booking process. Chatbot technology reduces administrative costs and the risk of booking errors, improves the company's operational efficiency, and enables the use of customer data for more effective analysis and development of business strategies. The use of NLP-based chatbots improves customer experience by providing an easier, faster, and more convenient ordering process online, without the need to visit a physical agent, thereby increasing satisfaction and service quality.

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