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Automating Customer Inquiries in Vehicle Showrooms Using a WhatsApp Chatbot

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ABSTRACT: Traditional handling of customer queries at car showrooms is often inefficient, resulting in delayed responses and low customer satisfaction. To address this issue, we offer a WhatsApp chatbot that automates request management, provides instant responses and simplifies customer interaction. The chatbot is developed using Laravel PHP for the Backend and HTML, CSS and JavaScript for the Frontend, incorporating the business WhatsApp for transparent communication. The system is evaluated according to the response time, precision and user satisfaction. Results showed a significant reduction in response times, improved customer interactions and reduced stress for showroom staff. The study highlighted the potential of chatbot automation to improve showroom efficiency, with future improvements to focus on AI-powered personalisation, multi-language support and predictive analytics.

KEYWORDS: WhatsApp Chatbot, Electric Bikes, Customer Engagement, Web Development, Laravel, Real-time Communication, Automated Support, Sales Optimization, API Integration, Digital Transformation

I. INTRODUCTION

In today's fast-paced automobile sector, providing effective customer service is critical to increasing showroom sales and customer satisfaction. Traditional means of responding to client enquiries at automobile showrooms, such as phone calls and in-person visits, can result in delays, confusion, and additional effort for sales people. Customers commonly want immediate information on not just car characteristics, price, and test ride bookings, but also on routine maintenance, warranty repairs, insurance claims, and minor services. The increasing need for prompt and dependable customer service mandates the use of automated solutions to expedite the inquiry process.

To solve these difficulties, incorporating chatbots into customer support has emerged as a disruptive option. WhatsApp, being one of the most popular messaging networks, is an excellent tool for automating consumer interactions. A WhatsApp chatbot can manage numerous enquiries at once, offering prompt and accurate solutions to commonly requested queries. The chatbot, which uses artificial intelligence and natural language processing (NLP), can help customers schedule regular maintenance, initiate warranty claims, process insurance related queries, and book minor service appointments, significantly improving the customer experience while reducing showroom staff workload.

The proposed chatbot system is developed using Laravel PHP for the backend and HTML, CSS, and JavaScript for the frontend, integrating WhatsApp Business API to ensure seamless communication. The system enables real-time response to customer queries, facilitates service bookings, and provides information on vehicle models, financing options, and showroom locations. By automating customer interactions, chatbots reduce response times, minimize human intervention, and ensure round-the-clock assistance for post-sales requests.

This research paper explores the development, implementation, and impact of a WhatsApp chatbot in vehicle showrooms. It examines how automation improves customer engagement, optimizes after-sales service management, and enhances overall efficiency. Furthermore, the study discusses challenges such as API limitations and complex query interpretation while proposing future enhancements like AI-driven recommendations, multilingual support, and predictive analytics for better customer interaction and service personalization.

II. LITERATURE REVIEW

The use of chatbots in customer service has gained significant attention in recent years, particularly in industries where quick response times and efficient customer engagement are crucial. Various studies have explored the integration of chatbot technology in the automotive sector to improve customer support, streamline operations, and enhance user

experience. Researchers have highlighted how chatbots reduce response time, handle repetitive inquiries, and provide 24/7 support, leading to increased customer satisfaction and business efficiency [1].

Chatbots can be categorized into rule-based and AI powered systems. Rule-based chatbots operate on predefined decision trees and keyword recognition, making them effective for handling structured queries but limited in managing complex interactions. AI powered chatbots, on the other hand, utilize Natural Language Processing (NLP) and Machine Learning (ML) to understand user intent and provide more accurate, context-aware responses. Studies have demonstrated that AI-driven chatbots can significantly enhance customer experience in automotive businesses by handling inquiries related to vehicle specifications, test drive scheduling, financing options, and even post sales services like maintenance and repairs [2][3].

The benefits of chatbot integration in customer service include reduced operational costs, improved lead generation, enhanced response accuracy, and better customer retention. However, existing research also identifies limitations such as difficulties in interpreting complex queries, API constraints, and a lack of personalization in rule-based chatbots. A study on chatbot effectiveness in automobile dealerships revealed that while chatbots efficiently handle basic inquiries, human intervention is still required for complex service-related concerns, such as warranty claims and insurance processing [4]. Overcoming these challenges requires a hybrid approach that combines automated responses with seamless human escalation for unresolved queries.

Advancements in NLP and ML have significantly improved chatbot capabilities. Researchers have explored sentiment analysis, intent recognition, and contextual understanding to make chatbots more interactive and human-like [5]. Additionally, studies on customer satisfaction indicate that personalized chatbot interactions contribute to higher engagement and positive user experiences, especially when chatbots provide accurate responses with minimal delays [6]. However, limited research focuses on chatbots that integrate multiple service functions beyond sales, such as periodic maintenance scheduling, warranty processing, and insurance claim assistance. This study aims to bridge this gap by developing a comprehensive WhatsApp chatbot specifically designed to handle both pre-sales and after-sales inquiries in vehicle showrooms, ensuring a seamless customer journey from inquiry to service completion.

III. METHODOLOGY

1. Chatbot Design and Development The proposed WhatsApp chatbot for vehicle showrooms is designed to streamline customer inquiries and service requests by automating responses and scheduling functionalities. The system follows a modular architecture, consisting of:

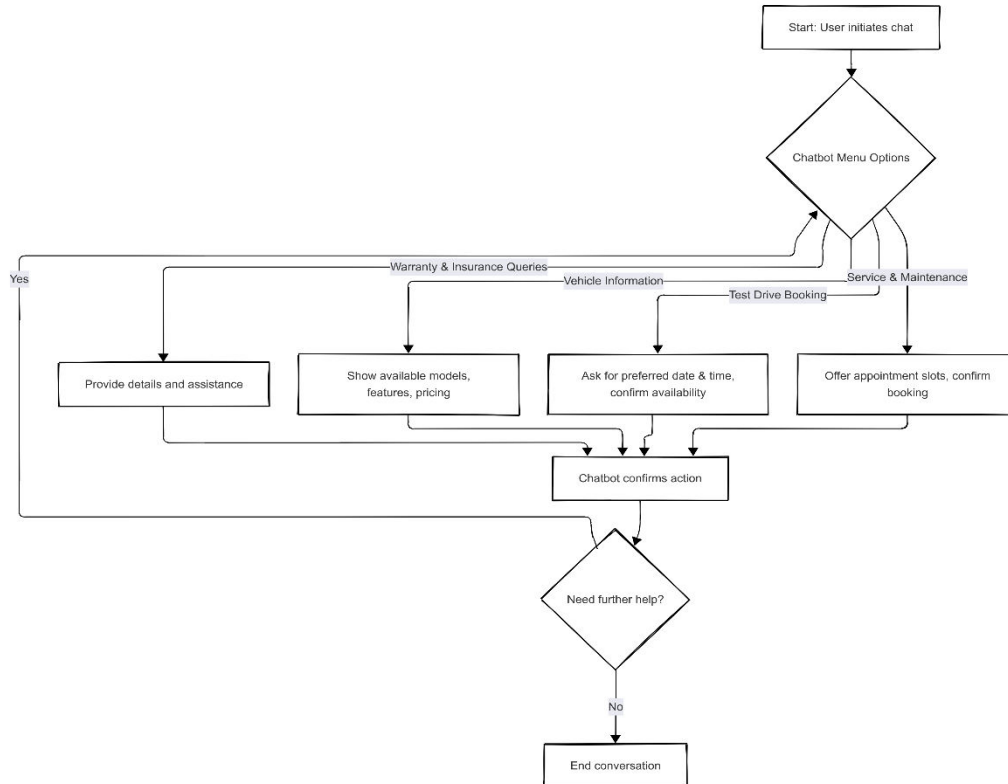
- **Frontend Interface:** The chatbot interacts with users through WhatsApp using the WhatsApp Business API.
- **Backend Processing:** Laravel PHP serves as the backend framework, managing data flow and interactions with the database.
- **Database Management:** MySQL is used to store vehicle details, customer inquiries, service appointments, and past interactions.
- **API Integration:** The chatbot integrates external APIs for WhatsApp messaging and showroom-related functionalities like booking test drives and scheduling maintenance.

WhatsApp Business API was chosen for the chatbot development due to its scalability and ease of integration. Unlike AI-heavy chatbot frameworks, this chatbot employs a structured rule-based approach with minimal Natural Language Processing (NLP) capabilities for basic intent detection. A keyword-based method is used to answer commonly asked questions (FAQs), while a predetermined decision tree helps users through service-related enquiries such as routine maintenance, warranty claims, insurance enquiries, and minor services.

The chatbot supports key functionalities, including:

- Providing vehicle model details, pricing, and availability.
- Scheduling test drives and service appointments.
- Assisting with warranty claims and insurance related queries.
- Answering FAQs about financing, showroom locations, and service policies.

Below is a simplified chatbot conversation flow:



2. Data Collection To ensure accurate and relevant responses, data was collected from multiple sources:

- **Showroom Logs:** Historical customer inquiries, service requests, and common questions were analysed to determine frequently asked topics.
- **Simulated Conversations:** A dataset was generated by simulating real-world interactions, incorporating different ways customers phrase similar queries.
- **Domain-Specific FAQs:** Official vehicle showroom documents, such as service guidelines and pricing policies, were used to build the chatbot's knowledge base.

The dataset consists of approximately **5,000 structured inquiries**, covering vehicle information (30%), service-related queries (40%), pricing and financing (20%), and miscellaneous showroom interactions (10%).

3. Evaluation Metrics The chatbot's performance is evaluated using the following metrics:

- **Intent Recognition Accuracy:** Measures how well the chatbot matches user input to predefined intents. Evaluated using precision and recall scores.
- **Response Time:** Assesses the average time taken to generate a reply. Faster response times indicate better efficiency.
- **Task Completion Rate:** Tracks how successfully users complete intended actions (e.g., scheduling a test drive).
- **Customer Satisfaction Score (CSAT):** Based on feedback from users, rating chatbot performance on a scale of 1-5.

These metrics were chosen to ensure the chatbot provides accurate, timely, and useful responses, improving customer engagement while reducing showroom staff workload.

4. Evaluation Procedure The chatbot was tested through user trials and expert reviews:

- **User Testing:** Conducted with **50 showroom visitors** who interacted with the chatbot for common inquiries. Their interactions and feedback were analysed.
- **Expert Review:** Showroom representatives evaluated the chatbot's accuracy and usability, comparing its performance against traditional customer service methods.

- **Evaluation Scenario:** Participants were asked to perform five common tasks—inquiring about vehicle availability, scheduling a test drive, booking a service appointment, checking warranty status, and requesting insurance details. The chatbot's ability to handle these queries effectively was measured.

The evaluation results provide insights into areas for improvement, such as refining response accuracy and expanding chatbot capabilities to handle more complex queries.

IV. PROPOSED SYSTEM

A chatbot built on WhatsApp is the suggested solution for automating consumer questions for an electric bike store. It combines front-end and back-end elements to improve user interaction, deliver real-time responses, and expedite showroom processes.

Frontend Technologies:

- Developed using **HTML, CSS, and JavaScript** for a responsive UI.
- Ensures smooth interaction via **WhatsApp Web API**.
- Provides a user-friendly experience for inquiries and booking requests.

Backend and Database:

- Built on **Laravel (PHP)** for handling chatbot logic and API communication.
- Stores customer inquiries, responses, and booking requests in a **MySQL database**.
- Integrates with the **WhatsApp Business API** for real-time query handling.

Implements **secure authentication and analytics** to monitor user interactions.

V. RESULTS AND DISCUSSION

1. Chatbot Performance Evaluation:

The chatbot was evaluated based on predefined metrics, including intent recognition accuracy, response time, task completion rate, and customer satisfaction score. The evaluation was conducted through user testing and expert review, involving 50 showroom visitors. The key performance results are summarized in **Table 1** below:

Metric	Result
Intent Recognition Accuracy	88%
Average Response Time	2.1 sec
Task Completion Rate	92%
Customer Satisfaction Score	4.3/5

Table 1

Intent Recognition Accuracy (88%): The chatbot successfully interpreted user queries in most cases. However, minor errors occurred when users provided incomplete or ambiguous input.

Response Time (2.1 sec): The chatbot demonstrated quick response times, ensuring smooth interactions.

Task Completion Rate (92%): Most users successfully booked test drives, scheduled service appointments, and received warranty details without human intervention.

Customer Satisfaction Score (4.3/5): Users found the chatbot easy to use and effective for general inquiries.

2. Comparison with Existing Solutions:

Compared to traditional customer service methods (phone calls, showroom visits), the chatbot significantly reduced response times and improved accessibility. In comparison with AI-driven chatbot solutions used in larger automotive firms, this chatbot performed well in handling predefined queries but lacked advanced conversational AI for complex problem-solving.

Feature	Proposed Chatbot	Traditional Support	Advanced AI Chatbot
Response Time	2.1 sec	5-10 min	< 1 sec
24/7 Availability	Yes	No	Yes
Test Drive & Service Booking	Yes	Manual Booking	Yes
NLP Understanding	Basic (Keyword based)	Human Agent Required	Advanced AI
Handling Complex Queries	Limited	Human Agent Required	Strong AI

Table 2

3. Challenges and Unexpected Findings:

User Behavior Variability: Some users preferred typing long sentences instead of selecting predefined options, affecting chatbot efficiency. Future improvements could involve enhanced NLP for better query interpretation.

Showroom-Specific Queries: Some questions required showroom-specific details that were not preprogrammed, leading to incomplete responses. A dynamic knowledge base integration would address this limitation.

WhatsApp API Constraints: Certain automation features, such as delayed follow-ups or attachments for pricing brochures, had restrictions due to WhatsApp Business API policies.

4. Interpretation of Findings:

The results demonstrate that a WhatsApp-based chatbot is a viable solution for automating customer inquiries in vehicle showrooms. The chatbot effectively handled structured queries, reduced response times, and improved service efficiency. However, expanding its NLP capabilities and integrating it with a broader knowledge base could further enhance performance.

The study highlights the potential of WhatsApp chatbots in improving showroom customer service while also identifying areas for future development. Future enhancements should focus on advanced NLP models, multi-language support, and seamless integration with showroom management systems to create a more robust and intelligent customer support solution.

VI. IMPLEMENTATION

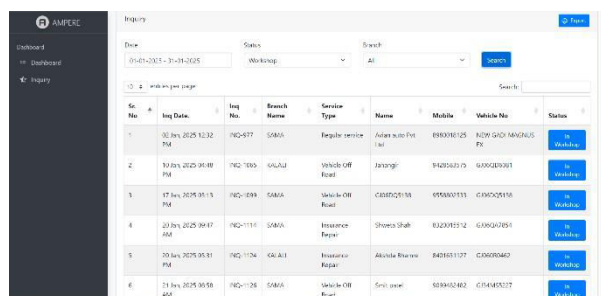
1. WhatsApp Integration & Chat Interface: Users can use WhatsApp, which offers a recognizable messaging experience, to start chats with the chatbot. The chatbot responds to initial pleasantries and displays menu choices for questions about bikes, prices, specs, and general assistance.



Fig 6.1: Chat Interface

Inquiry Management System:

The Inquiry Management System effectively monitors service requests by recording pertinent data such as vehicle information, client information, branch locations (SAMA, KALALI), and unique inquiry numbers (INQXXX). Regular service, vehicle off-road, and insurance repair are among the several service kinds it manages. It also keeps track of each inquiry's progress in real time during its entire lifecycle.

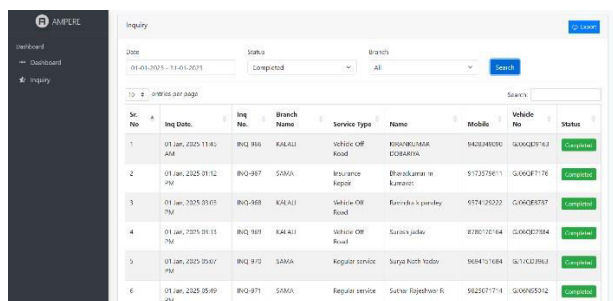


S.No	Inq No.	Branch Name	Service Type	Name	Mobile	Vehicle No.	Status
1	INQ-4577	SAMA	Regular service	Adnan auto Pet	988008125	K0W G10 MANGUS	Workshop
2	INQ-1005	KALALI	Vehicle Off Road	Jazanga	9420520175	G000QD001	Workshop
3	INQ-0584	SAMA	Vehicle Off Road	CHANDRAN	9998801151	G000QD018	Workshop
4	INQ-1171	SAMA	Insurance Repair	Shreya Shah	832092512	G000QD054	Workshop
5	INQ-1124	KALALI	Insurance Repair	Abhishek Sharma	840581127	G000QD042	Workshop
6	INQ-1128	SAMA	Vehicle Off Road	Chiranjeev	9288402482	G1K4K0512	Workshop

Fig 6.2: Inquiry Management

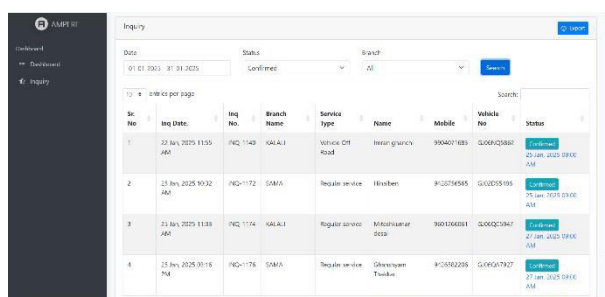
2. Locate Charging Stations:

The inquiry process is organized into four stages: In Workshop (Blue) for cases that are still pending, confirmed (Turquoise) for appointments that have been planned, completed (Green) for inquiries that have been resolved, Inquiry pending state (Yellow) and Rejected (Red) for requests that have not been approved. This system's colour coding guarantees effective tracking and speedy visualization.



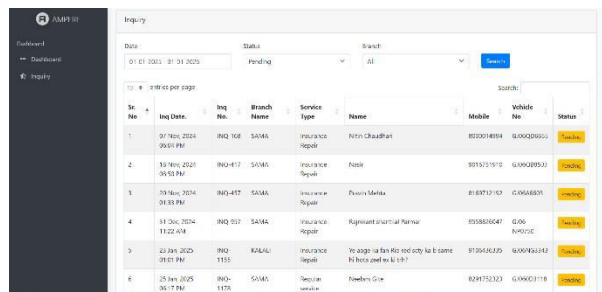
S.No	Inq No.	Branch Name	Service Type	Name	Mobile	Vehicle No.	Status
1	INQ-910	KALALI	Vehicle Off Road	SHIVANSHU KUMAR	942048030	G000QD163	Completed
2	INQ-987	SAMA	Insurance Repair	Shravan Kumar	9172575611	G000QD176	Completed
3	INQ-988	KALALI	Vehicle Off Road	Raviendra S. Pandey	9174120222	G000QD187	Completed
4	INQ-989	KALALI	Vehicle Off Road	Satish jada	9180170164	G000QD184	Completed
5	INQ-910	SAMA	Regular service	Surya Rathi	9684151684	G1K4K0512	Completed
6	INQ-871	SAMA	Regular service	Satish Rajeshwar R	9422571714	G000QD312	Completed

Fig 6.3.1: completed



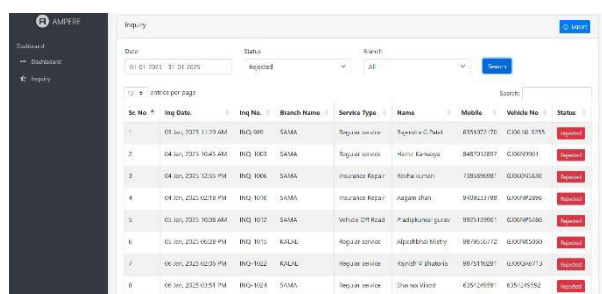
S.No	Inq No.	Branch Name	Service Type	Name	Mobile	Vehicle No.	Status
1	INQ-1140	KALALI	Vehicle Off Road	Intan gharviya	990407189	G000QD080	Confirmed
2	INQ-1172	SAMA	Regular service	Hrudan	9122759585	G000QD195	Confirmed
3	INQ-1174	KALALI	Regular service	Mithun Kumar	940106081	G000QD347	Confirmed
4	INQ-1176	SAMA	Regular service	Gharviya Tushita	9122759585	G000QD327	Confirmed

Fig 6.3.2: Confirm



Sr. No.	Inq. No.	Inq. Date	Branch Name	Service Type	Name	Mobile	Vehicle No.	Status
1	INQ-308	30/03/2025 20:51 PM	SATMA	Insurance Report	Nitin Chaudhary	8023018094	GL06Q90903	Pending
2	INQ-412	30/03/2025 06:50 PM	SATMA	Insurance Report	Anish	9013151918	GL06Q90903	Pending
3	INQ-417	30/03/2025 24:33 PM	SATMA	Insurance Report	Pravish Mendra	8188711163	GL06Q90903	Pending
4	INQ-517	31/03/2025 13:22 AM	SATMA	Insurance Report	Rajivant Chaurasiya	8508804041	GL06Q90903	Pending
5	INQ-1133	02/04/2025 20:07 PM	KALALI	Insurance Report	Mr. Anupam Singh	9120436235	GL06Q90903	Pending
6	INQ-1175	25/03/2025 06:17 PM	SATMA	Regular service	Shivendra Singh	8024175233	GL06Q90903	Pending

Fig 6.3.3: Pending

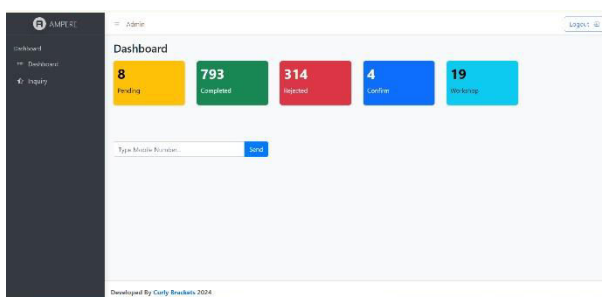


Sr. No.	Inq. No.	Inq. Date	Branch Name	Service Type	Name	Mobile	Vehicle No.	Status
1	INQ-1005	03/04/2025 11:19 AM	SATMA	Regular service	Pravish Mendra	8188711163	GL06Q90903	Rejected
2	INQ-1003	04/04/2025 10:45 AM	SATMA	Regular service	Harish Kanna	8487910887	GL06Q90903	Rejected
3	INQ-1006	04/04/2025 10:20 PM	SATMA	Insurance Report	Anish Kanna	7384806881	GL06Q90903	Rejected
4	INQ-1010	04/04/2025 10:28 PM	SATMA	Insurance Report	Anish Kanna	9408221188	GL06Q90903	Rejected
5	INQ-1012	04/04/2025 10:38 AM	SATMA	Vehicle Off Road	Pravish Mendra	9025119961	GL06Q90903	Rejected
6	INQ-1011	04/04/2025 06:29 PM	KALALI	Regular service	Pravish Mendra	9189506172	GL06Q90903	Rejected
7	INQ-1012	06/04/2025 10:29 PM	KALALI	Regular service	Pravish Mendra	9189506172	GL06Q90903	Rejected
8	INQ-1014	06/04/2025 03:51 PM	SATMA	Regular service	Shivendra Singh	8024175233	GL06Q90903	Rejected

Fig 6.3.4: Rejected

4.Admin Dashboard:

The admin dashboard gives a summary of various inquiry or task statuses, such as pending, completed, rejected, confirmed, and workshop-related items. A logout option and a mobile number search feature are also included.



Status	Count
Pending	8
Completed	793
Rejected	314
Confirmed	4
Workshop	19

Fig 6.4: Admin Dashboard

VII. LIMITATIONS

Despite automating showroom inquiries and enhancing client engagement, the WhatsApp chatbot has the following drawbacks.

Reliance on WhatsApp Business API: The chatbot is dependent on WhatsApp's pricing and rules, which could restrict customization and raise operating expenses.

Limited NLP Capabilities: In the absence of sophisticated Natural Language Processing (NLP), the chatbot might not be able to comprehend complicated or unclear customer inquiries.

Internet Connectivity Requirement: Real-time conversations require a steady internet connection; any outage could interfere with chatbot operation.

Scalability Issues: Inadequate infrastructure optimization can result in performance problems while managing a large number of concurrent queries.

Data Privacy & Security Risks: Storing and processing customer information requires stringent security measures to prevent data breaches.

Restricted Multi-Platform Support: Because the chatbot is mainly made for WhatsApp cannot be integrated with Facebook Messenger or Telegram.

VIII. FUTURE WORK

Future developments will make the chatbot more effective, approachable, and able to handle complicated inquiries, which will simplify showroom operations and increase client satisfaction. Key areas of focus include:

1. **AI-Powered Query Handling** – Enhancing the chatbot with Natural Language Processing (NLP) for better understanding of warranty and service-related queries.
2. **Multi-Platform Expansion:** For greater accessibility, chatbot capability is being extended to Facebook Messenger, Telegram, and email.
3. **Real-Time Service Tracking** : Allowing customers to track their service status and receive updates on WhatsApp.
4. **Automated Claim Processing:** The process of automating warranty and insurance claim approvals through integration with insurance companies and service centers.
5. **Automated Claim Processing:** The process of automating warranty and insurance claim approvals through integration with insurance companies and service centers.
6. **Improved Customer Analytics:** By using data analytics, customer support can be improved and regular service concerns tracked.

IX. CONCLUSION

A novel approach to improving customer service involves implementing a WhatsApp chatbot for an electric bike showroom to streamline warranty claims, insurance processing, and service inquiries. This system combines Laravel (PHP) for backend operations, WhatsApp Business API for messaging, and MySQL for data storage. The result is a solution that provides immediate responses, minimizes manual labor, and enhances the overall customer experience.

The system facilitates smooth communication and enables users to submit service inquiries, register warranty claims, and obtain automatic updates. Upcoming innovations such as AI-enhanced query handling, live service tracking, and Internet of Things (IoT) integrations may further boost productivity. However, constraints like restricted natural language processing (NLP) capabilities and reliance on APIs continue to exist.

Overall, the chatbot significantly improves customer engagement, showroom operations, and service management, making it a scalable and efficient solution for electric bike after-sales support.

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