

Gear Pattern Image App (GearCare)

**By:
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22MCA009**



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Ahmedabad 382481**

May 2024

Gear Pattern Image App (GearCare)

Internship Report

Submitted in partial fulfillment of the requirements
For the degree of
Master of Computer Application

By:
Bhumik Rathod
22MCA009

Guided By:
Dr. Lata Gohil
Assistant Professor
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Ahmedabad 382481

May 2024



CERTIFICATE

This is to certify that the Internship project entitled “Gear Pattern Image App (GearCare)” submitted by Bhumik Rathod (22MCA009) towards the partial fulfillment of the requirements for the degree of Master of Computer Application of Nirma University is the record of work carried out by him under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination.

A handwritten signature in black ink, appearing to be 'Lata Gohil'.

Dr. Lata Gohil
Assistant Professor
Computer Science and Engineering Dept.,
Institute of Technology,
Nirma University,
Ahmedabad

A handwritten signature in black ink, appearing to be 'Madhuri Bhavsar'.

Dr. Madhuri Bhavsar,
Professor and HOD,
Computer Science and Engineering Dept.,
Institute of Technology,
Nirma University,
Ahmedabad

CONCERN LETTER

TO WHOM IT MAY CONCERN

This is to certify that **BHUMIK RATHOD**, Roll No. **22MCA009**, a student of **MASTER OF COMPUTER APPLICATION** at **NIRMA UNIVERSITY, AHMEDABAD**, has successfully completed his internship on the Project Title: **Gear Pattern Image App (GearCare)**, in the field of **Flutter** from **01/01/2024** to **22/05/2024** under the guidance of **Mr. Satyam Raval**, Deputy General Manager at **Tech Elecon Pvt. Ltd.**

His internship activities include successful completion of the assigned project within the given period of time, along with abiding by the company's rules and regulations.

During the period of his internship program with us, he was exposed to different processes and was found diligent, hardworking, and inquisitive.

We wish him every success in his life and career.


For Tech Elecon Pvt. Ltd.,

STATEMENT OF ORIGINALITY

I, Bhumik Rathod, Roll No.: 22MCA009, give undertaking that the Internship Project entitled "**Gear Pattern Image App (GearCare)**" submitted by me, towards the partial fulfilment of the requirements for the degree of Master of Computer Application of Institute of Technology, Nirma University, Ahmedabad, contains no material that has been awarded for any degree or diploma in any university or school in any territory to the best of my knowledge. It is the original work carried out by me and I give assurance that no attempt of plagiarism has been made. It contains no material that is previously published or written, except where reference has been made. I understand that in the event of any similarity found subsequently with any published work or any dissertation work elsewhere; it will result in severe disciplinary action.

Signature of Student

Date:

Place:

Endorsed by

Dr. Lata Gohil



ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to all those who have helped and supported me throughout the course of this project.

First and foremost, I am deeply indebted to Dr. Lata Gohil and Dr. Smita Agrawal for their invaluable guidance, insightful feedback, and continuous encouragement. Their expertise and dedication have been instrumental in shaping this project.

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My gratitude also goes to my team leader, Mr. Chirag Mehta, whose understanding, guidance, and taking updates from time to time kept me focused, which was crucial for the project.

Special thanks to my friends, Akash Adhikary, Hemang Devaliya, and Mrunal Kadam, for their unwavering support, and invaluable feedback.

Finally, I wish to thank all those who have directly or indirectly contributed to the completion of this project. Your support has been invaluable, and I am deeply grateful to each and every one of you.

Thank you.

Bhumik Rathod
22MCA009

ABSTRACT

The Gear Pattern Image App (GearCare) is a comprehensive mobile application developed to revolutionize gear maintenance processes by enhancing efficiency and reliability. The primary objective of the GearCare App is to streamline gear maintenance operations through advanced features such as simplified gear registration, real-time performance monitoring, instant notifications for service alerts, and post-service surveys conducted by field officers. This project aims to minimize downtime and optimize gear performance, thereby improving overall operational effectiveness.

The scope of work includes designing a user-friendly interface, integrating essential functionalities, and ensuring efficient processing. The Gear Pattern Image App's (GearCare) major features comprise a simplified gear registration process for easy management and tracking, real-time monitoring of gear conditions to ensure proper functioning and timely servicing, instant notifications to alert users about gear issues, and a dedicated module for field officers to conduct post-service surveys effectively.

Preliminary work involved designing the application's user interface and developing the core modules for gear registration, monitoring, notification, and field surveys. The important findings from the initial phase indicate that the Gear Pattern Image App (GearCare) significantly enhances the efficiency of maintenance processes by reducing manual tracking efforts, providing timely alerts for potential gear issues, and facilitating prompt servicing. This leads to reduced downtime and improved gear performance, ultimately contributing to better operational efficiency.

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INTRODUCTION

1.1 ABOUT THE COMPANY



1.1.1 Introduction of the Company

Tech Elecon Pvt. Ltd. is the IT division of the Elecon group of companies and has more than 25 years of experience in the fields of hardware, software, and networking solutions. Situated in the heart of Vitthal Udyognagar Industrial Estate and in the proximity of the educational town of Vallabh Vidyanagar. Tech Elecon is all set to reach new heights in the field of IT solutions.

Tech Elecon is ready with all sorts of solutions and deliver any application that is web based and further our solutions are designed to adapt your business rather than your business adapting the software. Their solutions are 100% fruitful and empower you to take control of client's business online and in real time!

Tech Elecon has extensive experience in providing IT services and has successfully adapted to technological advancements, making it the leading IT infrastructure management service provider in the region. Our cutting-edge delivery model covers all stages of the solution lifecycle, including planning, deploying, managing, maintaining, auditing, upgrading, and improving.

Tech Elecon recognize that each client has unique needs and expectations when it comes to infrastructure and service providers. Our clients have the flexibility to choose from a wide range of IT infrastructure management and performance services based on their specific requirements. They can opt for on-site services or hybrid solutions that include on-site troubleshooting and support services.

1.1.2 Quality Policy

At Tech Elecon, we are committed to delivering exceptional quality in all our IT solutions, products, and services. Our quality policy is driven by our core values, mission, and vision, ensuring that we consistently meet and exceed our customers' expectations.

1. Customer-Centric Approach: We prioritize understanding our clients' business requirements and aligning our IT solutions to support their strategic goals. Our collaborative approach ensures that our solutions adapt to our clients' needs rather than the other way around.
2. Proven Methodologies: We employ best practices and proven methodologies in all our projects, ensuring reliability, efficiency, and effectiveness. Our expert analysts and consultants provide comprehensive insights and detailed perspectives on key areas of concern, from feasibility studies to implementation and maintenance.
3. Continuous Improvement: We believe in continual staff development and regular in-house training to keep our team updated on the latest advancements in the IT industry. This commitment to learning enhances our competence and innovation, allowing us to offer state-of-the-art solutions.
4. Long-Term Relationships: We build long-term relationships with our clients by consistently delivering high-quality solutions and services. Our significant investment in technology, infrastructure, and quality work ensures mutual growth and success.

1.1.3 Resources

Tech Elecon is dedicated to providing the necessary resources to ensure the successful delivery of our IT solutions.

Human Resources:

1. Skilled Workforce: We have a team of highly skilled professionals whose expertise in various fields of IT ensures we can meet diverse client needs. Regular training and development programs help maintain and enhance their skills.
2. Collaborative Environment: We foster a collaborative work environment where every team member's input is valued. This collective effort drives innovation and excellence.
3. Employee Empowerment: We believe in empowering our employees by providing them with the tools, training, and support they need to excel in their roles. This not only enhances job satisfaction but also reduces attrition rates.

Technical Resources:

1. State-of-the-Art Technology: We invest significantly in the latest technology and infrastructure to deliver cutting-edge solutions to our clients. This includes advanced hardware, software, and networking tools.
2. Quality Assurance: Our technical resources are rigorously tested to ensure they meet the highest standards of quality and reliability. This commitment to quality ensures our solutions are effective and long-lasting.

1.2 THE SYSTEM

1.2.1 Definition of System

The Gear Pattern Image App (GearCare) is an innovative mobile application designed to streamline and enhance the gear maintenance process. The system is engineered to achieve this through the implementation of several key modules: gear registration, live performance monitoring, notification alerts, and field officer surveys. These features collectively aim to optimize gear performance and minimize downtime, thereby improving overall operational efficiency.

1.2.2 Purpose and Objectives

The purpose of the Gear Pattern Image App (GearCare) is to develop a robust mobile application that revolutionizes the gear maintenance process. By incorporating advanced features such as simplified gear registration, real-time performance monitoring, instant notifications for maintenance needs, and efficient post-service surveys by field officers, the project aims to enhance the efficiency and reliability of gear maintenance operations. The ultimate goal is to optimize gear performance, reduce downtime, and improve overall operational effectiveness, providing users with a comprehensive and user-friendly tool for managing gear maintenance.

The project aims to enhance gear maintenance efficiency by simplifying gear registration, enabling real-time performance monitoring, providing instant notifications for service alerts, and facilitating post-service surveys by field officers.

1.2.3 About Present System

The current system for gear maintenance is predominantly manual and heavily reliant on paperwork. This traditional approach involves several challenges and inefficiencies:

1. Manual Registration and Tracking: Gear registration and tracking are performed manually, leading to a higher likelihood of errors and omissions. This process is time-consuming and labor-intensive, requiring extensive paperwork to record and update gear information.
2. Delayed Monitoring: Monitoring gear performance is not continuous, often resulting in delayed identification of issues. Maintenance staff must physically inspect gear at scheduled intervals, which can lead to missed or late detection of problems.
3. Large Amount of Service Records: Field officers must manually fill out service records and surveys after maintenance tasks, leading to inconsistent documentation and difficulty in maintaining accurate records over time.
4. Inefficiency and Downtime: The manual, paperwork-oriented system is inherently inefficient, contributing to prolonged downtime for gear maintenance. The lack of real-time data and immediate alerts hinders proactive maintenance, resulting in increased operational disruptions.

Overall, the present system's reliance on manual processes and paperwork limits the effectiveness and efficiency of gear maintenance, highlighting the need for a more streamlined, automated solution like the Gear Pattern Image App (GearCare).

1.2.4 Proposed System

The Gear Pattern Image App (GearCare) is an advanced mobile application designed to overhaul the traditional, manual gear maintenance system by introducing a streamlined, automated solution. This proposed system aims to address the inefficiencies and challenges associated with the current manual and paperwork-oriented processes, delivering significant improvements in operational efficiency, accuracy, and reliability.

Key Features and Modules:

1. Gear Registration: The app offers a simplified and intuitive registration process for gears, enabling quick and accurate entry of gear details into the system. Users can easily manage and update gear information, ensuring a comprehensive and up-to-date gear inventory.
2. Live Monitoring: Real-time monitoring capabilities allow users to continuously track gear performance. The app provides immediate access to performance data, helping to detect issues early and reduce the risk of sudden failures.
3. Service Notifier: Instant notifications are sent to users when gear issues are detected or when maintenance is due. This feature ensures timely intervention and minimizes downtime by prompting immediate action when necessary.
4. Field Officer Surveys: Field officers can use the app to conduct post-service surveys efficiently. The app facilitates the documentation of service activities and ensures consistent and accurate record-keeping.

Benefits of the Proposed System:

1. Enhanced Efficiency: Automating the registration, monitoring, and notification processes significantly reduces the time and effort required for gear maintenance.
2. Real-Time Data: Access to real-time performance data enables proactive maintenance, helping to prevent gear failures and extend the lifespan of equipment.
3. Timely Interventions: Instant notifications ensure that maintenance tasks are performed promptly, reducing the likelihood of extended downtime.
4. Improved Record-Keeping: Digital surveys and service records improve the accuracy and consistency of documentation, making it easier to track maintenance activities and history.
5. User-Friendly Interface: The app is designed with a focus on user experience, offering an intuitive and easy-to-navigate interface for all users, including admin and field officers.

Expected Outcomes:

The Gear Pattern Image App (GearCare) is expected to deliver a fully functional mobile application that integrates all the proposed features, providing a comprehensive solution for efficient gear maintenance management. By transitioning from a manual, paperwork-oriented system to an automated, digital platform, the Gear Pattern Image (GearCare App) aims to enhance the overall effectiveness of gear maintenance operations, ultimately leading to reduced downtime, optimized gear performance, and improved operational efficiency.

1.3 PROJECT PROFILE

1.3.1 Project Title

Gear Pattern Image App (GearCare)

1.3.2 Scope of Project

The scope of the Gear Pattern Image App (GearCare) encompasses the following key areas:

1. User Interface Design: Develop a user-friendly and intuitive interface that ensures ease of use for all users, including maintenance staff and field officers. Incorporate clear navigation, responsive design, and accessibility features to enhance user experience.
2. Gear Registration Module: Implement a streamlined registration process that allows users to quickly and accurately input gear information. Enable easy management and updating of gear data, ensuring a comprehensive and current gear inventory.
3. Live Monitoring System: Develop a real-time monitoring system to track gear performance continuously. Integrate sensors and data collection mechanisms to provide immediate access to performance metrics and detect potential issues early.
4. Notification System: Create an instant notification feature that alerts users about gear issues, maintenance due dates, and other critical updates. Ensure notifications are timely, actionable, and customizable based on user preferences.
5. Field Officer Survey Module: Design a module for field officers to conduct post-service surveys efficiently using the mobile app. Enable digital documentation of service activities, ensuring accurate and consistent record-keeping.
6. Backend Development: Develop a robust backend infrastructure to support data storage, processing, and retrieval. Ensure the backend system is scalable, secure, and capable of handling real-time data transactions.
7. Integration and Testing: Integrate all modules seamlessly to create a cohesive and functional application. Conduct thorough testing to ensure the app performs reliably under various conditions and meets all specified requirements.
8. Deployment and Maintenance: Deploy the application on appropriate mobile platforms (e.g., iOS and Android). Provide ongoing maintenance and updates to address any issues, implement improvements, and ensure the app remains up-to-date with the latest technology standards.

1.3.3 Project Team

Team Size: 1

Team Members: Bhumik Rathod

1.3.4 Hardware/Software Environment in Company

Hardware:

| Sr. No. | Title | Details |
|---------|------------|---|
| 1 | RAM | 16 GB |
| 2 | Processor | Intel® Core™ i5-7500 CPU @ 3.40 GHz 3.40 GHz |
| 3 | Hard Drive | Minimum 50 GB |

Software:

| Sr. No. | Title | Details |
|---------|-------------------|--------------------------------------|
| 1 | Operating System | Windows 10 Pro |
| 2 | Designing Tool | Figma (Student Ver.) |
| 2 | Front End | Flutter |
| 3 | Back End | Flutter |
| 4 | Database | Firebase |
| 5 | Development Tools | Android Studio Visual Studio Code |
| 6 | Web Browser | Google Chrome |
| 7 | Testing Devices | Emulator based |

Technology:

| Sr. No. | Title | Details |
|---------|------------|--|
| 1 | Flutter | Cross Platform SDK(Dart) |
| 2 | Firebase | NoSQL Realtime Database |
| 3 | Web Socket | Real-time data fetching from IoT sensors |

SYSTEM ANALYSIS

2.1 FESIBILITY STUDY

2.1.1 Operational Feasibility

The operational feasibility of the Gear Pattern Image App (GearCare) is assessed based on the ability to integrate the app into existing maintenance workflows, the ease of use for intended users, and the anticipated impact on operational efficiency.

➤ **Integration with Existing Workflows:**

- Compatibility: The GearCare App is designed to seamlessly integrate with existing gear maintenance workflows, requiring minimal changes to current practices.
- Data Migration: The app will include features to import existing gear data, ensuring a smooth transition from paper-based records to the digital system. This minimizes disruption and allows users to retain historical maintenance data.

➤ **Ease of Use:**

- User-Friendly Interface: The app features an intuitive and user-friendly interface, making it accessible to users with varying levels of technical proficiency. Maintenance staff and field officers will find the app easy to navigate and operate.

➤ **Impact on Operational Efficiency:**

- Real-Time Monitoring and Notifications: By providing real-time monitoring and instant notifications, the app ensures timely detection and resolution of gear issues, reducing downtime and enhancing operational efficiency.
- Streamlined Processes: The app automates many manual tasks, such as gear registration, tracking, and service documentation, significantly reducing the time and effort required for these activities.
- Accurate Record-Keeping: Digital records eliminate the inconsistencies and errors associated with paper documentation, ensuring accurate and reliable maintenance logs.

➤ **Scalability and Maintenance:**

- Scalability: The app is designed to scale with the organization's needs, capable of handling an increasing number of users and gear items without compromising performance.
- Ongoing Support and Updates: Regular updates and maintenance will ensure the app remains functional, secure, and up-to-date with the latest technological advancements. A dedicated support team will address any operational issues that arise.

➤ **Cost-Benefit Analysis:**

- Initial Investment vs. Long-Term Savings: While there may be an initial investment in developing and deploying the app, the long-term benefits include reduced maintenance costs, and minimized downtime, resulting in significant cost savings over time.
- Resource Optimization: By automating routine tasks and providing real-time insights, the app allows maintenance personnel to focus on more critical activities, optimizing resource allocation and productivity.

2.1.2 Technical Feasibility

The technical feasibility of the Gear Pattern Image App (GearCare) evaluates the availability and suitability of technology, the development process, infrastructure requirements, and potential technical challenges. This assessment confirms that the project can be successfully implemented using current technology and resources.

➤ **Technology Availability:**

- Development Platforms: The app will be developed for both iOS and Android platforms using cross-platform development framework such as Flutter, which is widely supported and allow for efficient development and maintenance.
- Real-Time Monitoring: IoT sensors and data collection technologies required for real-time monitoring of gear performance are readily available and can be integrated with the mobile app using standard communication protocols like Bluetooth, Wi-Fi, or cellular networks.

➤ **Development Process:**

- Agile Methodology: The project will follow Agile methodology, allowing for iterative development, continuous feedback, and flexible adjustments based on user needs and technological advancements.
- Development Tools: Modern integrated development environments (IDEs) such as Visual Studio Code and Android Studio, along with version control systems like Git, will be used to ensure efficient and organized development.

➤ **Infrastructure Requirements:**

- Database Management: Robust database management system like: Firebase will be employed to handle the app's data needs, ensuring efficient and secure storage access.

➤ **Integration Capabilities:**

- APIs and Web Services: The app will utilize APIs and web services like (Web Socket) to integrate with external systems and IoT devices, enabling seamless data exchange and real-time updates.
- Modularity: The app's modular design will facilitate easy integration of new features and third-party services, ensuring long-term adaptability and scalability.

➤ **Technical Challenges and Mitigation:**

- Connectivity Issues: Real-time monitoring relies on stable internet connectivity. To mitigate connectivity issues, the app will include offline capabilities, allowing data to be stored locally and synchronized when the connection is restored.
- Data Accuracy: Ensuring the accuracy of data collected from IoT sensors is critical. Regular calibration and validation protocols will be implemented to maintain data integrity.
- User Adoption: Technical training and support resources will be provided to ensure users can effectively utilize the app, addressing potential resistance to adopting new technology.

2.1.3 Financial and Economic Feasibility

The financial and economic feasibility analysis of the Gear Pattern Image App (GearCare) assesses its potential costs, benefits, and returns on investment to determine its viability from a financial perspective.

➤ **Cost Estimation:**

- Development Costs: Not any as app is built as a part of internship project without stipend. But, in future if there were significant changes then, it might include expenses related to changes & add-ons in software development, design, testing, and project management. Costs may vary based on the complexity of the app, development platforms, and team composition.
- Infrastructure Costs: Cloud hosting, database management, and other backend infrastructure expenses will contribute to the total cost of ownership.
- Training and Support: Costs associated with user training, technical support, and ongoing maintenance will be factored in.

➤ **Revenue Generation:**

- Not Any: As App is Built for the Parent/Group Company.

➤ **Return on Investment (ROI):**

- Cost Savings: The app's automation and efficiency improvements can lead to cost savings by reducing maintenance labor costs, minimizing downtime, and extending gear lifespan.

➤ **Cost-Benefit Analysis:**

- Quantifiable Benefits: Tangible benefits such as labor cost savings, reduced downtime, and increased gear lifespan can be quantified and compared against development and operational costs.

2.2 REQUIREMENT ANALYSIS

2.2.1 Facts-Finding Techniques

2.2.1.1 Interview

➤ **Purpose:**

- Understanding User Needs: Interviews are conducted with maintenance staff, field officers, and other stakeholders to understand their current gear maintenance practices, pain points, and requirements for a digital solution.
- Clarifying Requirements: Through interviews, project teams seek clarification on specific features, functionalities, and workflows essential for the App's success.
- Validating Assumptions: Interviews help validate assumptions about user preferences, priorities, and challenges, ensuring that the app aligns with stakeholders' expectations.

➤ **Key Considerations:**

- Stakeholder Identification: Key stakeholders such as maintenance personnel, field officers, and gear managers are identified for interviews based on their roles and involvement in gear maintenance activities.
 - Interview Structure: Interviews are structured around topics such as current maintenance processes, challenges faced, desired features in a digital solution, and expectations from the Gear Pattern Image App (GearCare).
 - Active Engagement: Interviewers actively engage with stakeholders, asking probing questions, and encouraging detailed responses to uncover much needed requirements and preferences.
 - Documentation: Detailed notes are taken during interviews to capture stakeholders' responses, key insights, and requirements. These notes serve as a reference for requirement analysis and feature prioritization.
 - Follow-Up: Follow-up interviews may be conducted as needed to clarify ambiguous responses, validate findings, or explore additional requirements identified during the initial interviews.
- **Benefits:**
- Tailored Solution Design: Insights gathered from interviews inform the design and development of the Gear Pattern Image App (GearCare), ensuring that it addresses stakeholders' specific needs and challenges effectively.
 - Requirement Validation: Interviews help validate initial assumptions about gear maintenance processes and user requirements, reducing the risk of misalignment between the app's features and stakeholders' expectations.
 - Stakeholder Engagement: Involving stakeholders in interviews fosters a sense of ownership and collaboration.
 - Improved Communication: Interviews facilitate open communication between project teams and stakeholders, fostering a shared understanding of project objectives, timelines, and deliverables.

2.2.1.2 Questionnaire

➤ **Background Information:**

- Can you provide an overview of your role and responsibilities within the gear maintenance process?
- How long have you been involved in gear maintenance, and what are your primary objectives in this role?

➤ **Current Maintenance Practices:**

- Can you describe the current process for registering and tracking gear maintenance activities?
- What tools or systems are currently used to monitor gear performance and identify maintenance needs?
- What are the biggest challenges or pain points you encounter in the current maintenance process?

➤ **Digital Solution Requirements:**

- What specific features or functionalities would you expect from a mobile application designed to streamline gear maintenance processes?
- How important is real-time monitoring of gear performance for you in your day-to-day operations?
- What types of notifications/alerts would be most helpful to prompt timely maintenance interventions?

➤ **User Interface Preferences:**

- What are your preferences regarding the user interface of a mobile application for gear maintenance?
- Do you have any specific design preferences or accessibility requirements that should be considered in the app's development?

➤ **Integration and Compatibility:**

- Are there any existing systems or tools that the Gear Pattern Image App (GearCare) should integrate with to facilitate seamless data exchange?
- How important is compatibility with existing hardware or IoT devices in your gear maintenance operations?

➤ **Training and Support Needs:**

- What level of training or support would be necessary for you and your team to effectively use the Gear Pattern Image App (GearCare)?
- Are there any specific training materials or resources you would find particularly helpful in learning how to use the app?

➤ **Feedback and Improvement:**

- How open are you to providing feedback and suggestions for improving the Gear Pattern Image App (GearCare) during its development and after its deployment?
- What mechanisms would you prefer for providing feedback and reporting any issues or concerns with the app?

➤ **Expectations and Timeline:**

- What are your expectations regarding the timeline for the development and deployment of the GearCare App?
- Are there any specific milestones or deliverables you would like to see at different stages of the project?

➤ **Collaboration and Communication:**

- How would you prefer to collaborate with the development team throughout the project, e.g., regular meetings, progress updates, etc.?
- What channels of communication would be most effective for keeping you informed about project developments and decisions?

➤ **Future Vision:**

- Looking ahead, how do you envision the GearCare App contributing to the overall efficiency and effectiveness of gear maintenance operations?
- Are there any additional features or functionalities you would like to see implemented in future iterations of the app?

2.2.1.3 Record Review

Purpose: The record review aims to gather insights into current gear maintenance processes, document existing procedures, and identify areas for improvement that can inform the development of the Gear Pattern Image App (GearCare).

Scope: The review encompasses various records, documents, and data related to gear maintenance activities, including maintenance logs, service records, equipment inventories, and any existing digital systems or tools utilized in the process.

➤ **Data Collection Methods:**

- Review of Maintenance Logs: Examine maintenance logs and records to understand the frequency and types of maintenance activities performed on gears. Document the dates of maintenance tasks, descriptions of work performed, and any issues or concerns noted during inspections.
- Analysis of Service Records: Analyze service records to identify patterns or trends in gear performance, maintenance needs, and recurring issues. Document details of past maintenance interventions, including the nature of repairs, replacement parts used, and associated costs.

- Inventory Assessment: Review equipment inventories to gain insights into the types, quantities, and condition of gears being maintained. Document gear specifications, serial numbers, and other relevant identifiers to facilitate tracking and management.
- Evaluation of Existing Systems: Assess any existing digital systems or tools used for gear maintenance, such as software applications or IoT platforms. Document features, functionalities, and limitations of these systems, as well as user feedback and satisfaction levels.
- **Data Analysis:**
 - Identify Maintenance Patterns: Identify common maintenance tasks performed on gears, such as inspections, lubrication, calibration, and repairs. Analyze the frequency and distribution of maintenance activities to identify areas of high or low maintenance demand.
 - Highlight Maintenance Challenges: Document recurring issues or challenges encountered during gear maintenance, such as equipment failures, downtime, or resource constraints. Identify root causes of maintenance issues and potential opportunities for improvement.
 - Assess Data Integrity: Evaluate the accuracy and completeness of maintenance records and service logs to ensure data integrity. Identify any discrepancies or inconsistencies that may require further investigation or correction.
 - Review User Feedback: Consider feedback from maintenance staff and other stakeholders regarding the usability, effectiveness, and limitations of existing maintenance systems or procedures. Document user preferences, pain points, and suggested improvements for future enhancements.
 - Recommendations: Based on the findings from the record review, the following recommendations can be proposed to inform the development of the Gear Pattern Image App (GearCare):
 - Introduce real-time monitoring capabilities to enhance proactive maintenance and minimize downtime.
 - Implement instant notification features to alert maintenance staff about gear issues and service needs promptly.
 - Enhance user interface design to improve usability, accessibility, and user satisfaction.
 - Integrate inventory management functionalities to streamline gear tracking and management processes.
 - Provide comprehensive training and support resources to ensure successful adoption and utilization of the GearCare App.
- **Conclusion**: The record review provides valuable insights into current gear maintenance processes, highlighting areas for improvement and opportunities for innovation. By leveraging these findings, the development of the Gear Pattern Image App (GearCare) can be tailored to address the specific needs and challenges identified, ultimately leading to improved efficiency, effectiveness, and reliability in gear maintenance operations.

2.3 CONTEXT DIAGRAM

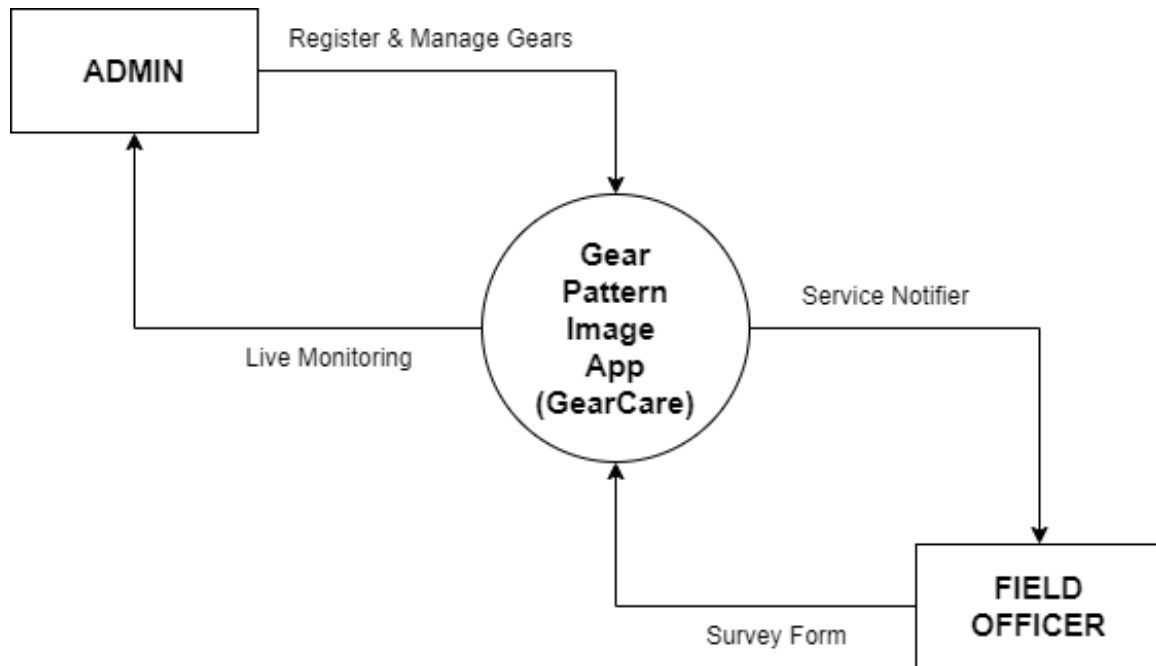


Fig. 2.1

2.4 DATA FLOW DIAGRAMS

2.4.1 First Level DFD

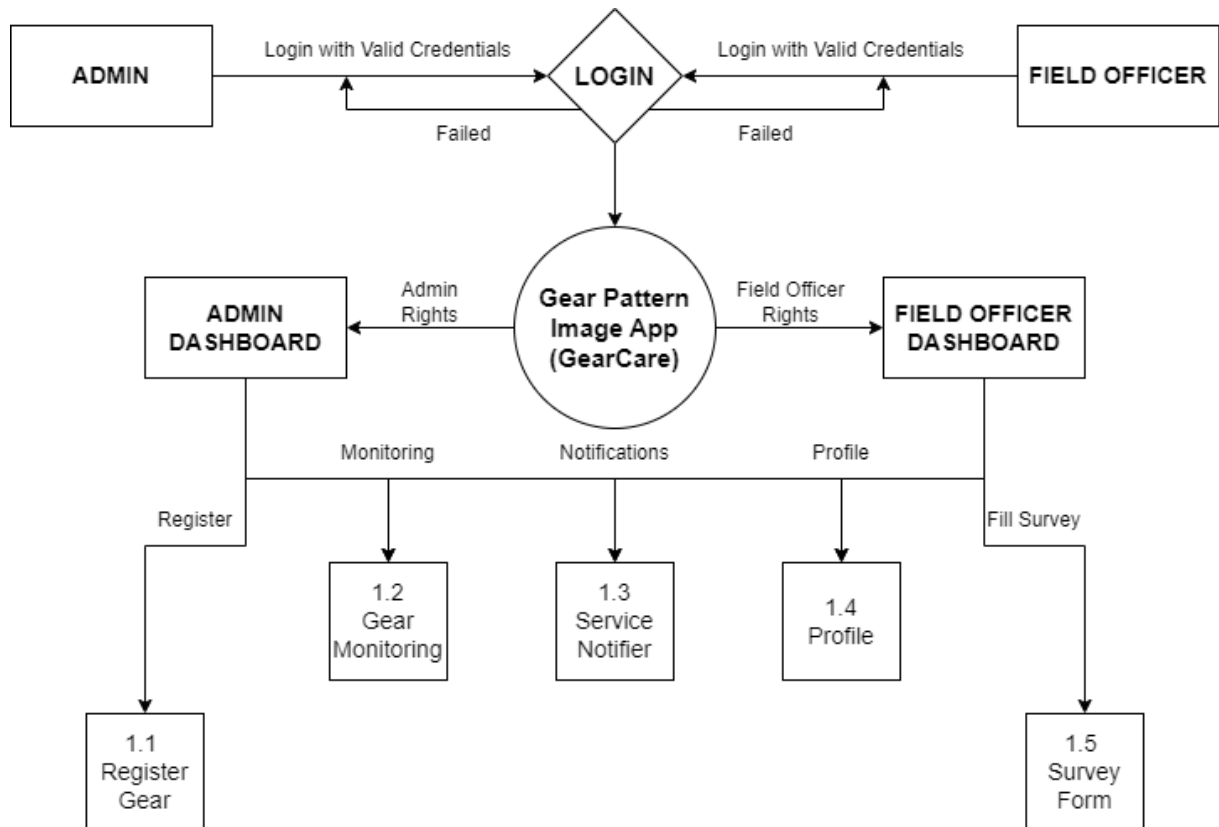


Fig. 2.2

2.4.2 Second Level DFD

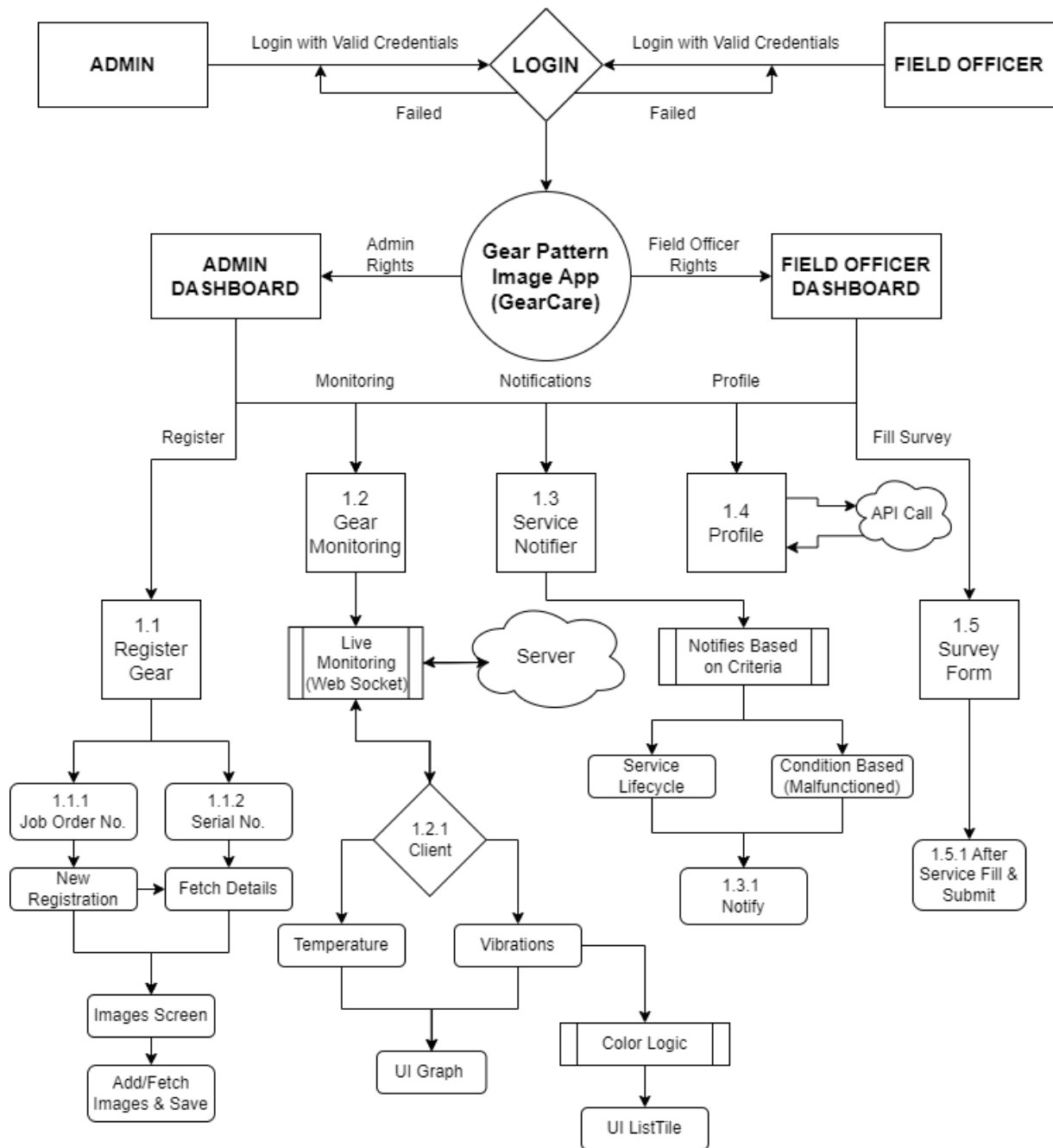


Fig. 2.3

SYSTEM DESIGN

3.1 SYSTEM FLOW

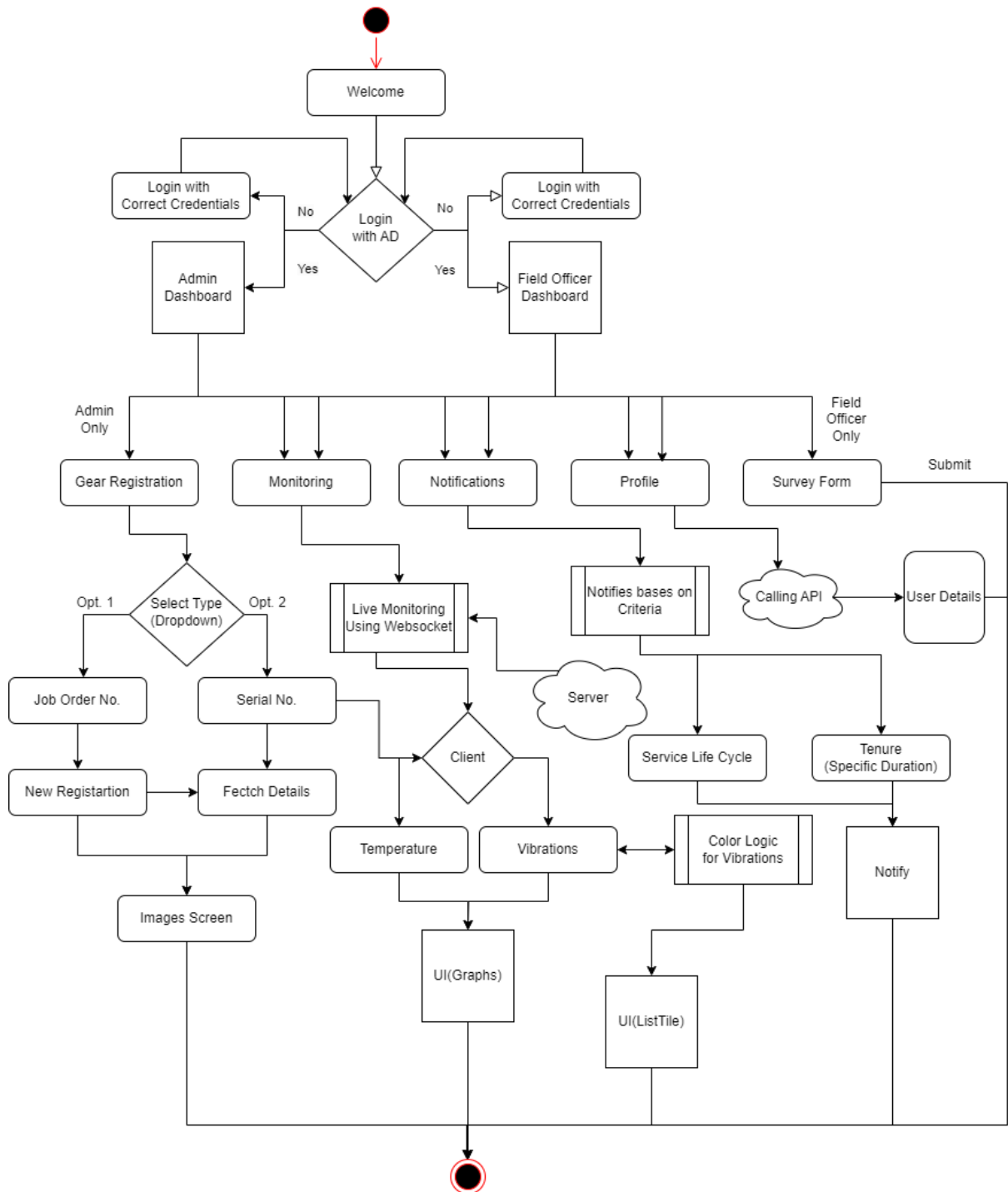


Fig. 2.4

3.2 USE-CASE DIAGRAM



Fig. 2.5

3.3 DATA DICTIONARY

In this Project there are mainly three collections/tables are used which are as follows:

Collection Name:

1. user_logins
2. jobOrders
3. survey_forms

Collection Name: user_logins

Description: User Login Tracking with Timestamp

| Sr. No. | Field Name | Data Type | Description | Example |
|---------|-----------------|-----------|--------------------------|----------------------|
| 1 | Document Id | String | Auto Generated Doc. Id's | 2QKODadvTwzi5BD1b4zh |
| 2 | email | String | Email Id of User | user@techelecon.com |
| 3 | login_timestamp | String | Date and Time Log | 2024-04-20 – 10:35 |

Table. 3.1 user_logins

Collection Name: jobOrders

Description: Gear Registration Recording and Fetching already added.

| Sr. No. | Field Name | Data Type | Description | Example |
|---------|--------------------|-----------|----------------------------|---------------------------|
| 1 | Document Id | String | Auto Generated Doc. Id's | FZAoJk0DUk2UNWIm0K |
| 2 | assemblyDetails | String | Details of Assembly Parts | Gear Shafts or Bearings |
| 3 | class | String | Class of Gear (A, B, C, D) | Class B |
| 4 | descriptionDetails | String | Gear/ Part Description | Spur Gear or Helical Gear |
| 5 | jobOrderNo | String | Unique Id no. for Tracking | 531256 |
| 6 | serialNo | String | No. of the part registered | SN654 |

Table. 3.2 jobOrders

Collection Name: survey_forms

Description: Survey form for Record Purpose (Filled After Servicing Gear/Parts).

| Sr. No. | Field Name | Data Type | Description | Example |
|---------|-----------------|-----------|--|---|
| 1 | Document Id | String | Auto Generated Doc. Id's | HZAoJk0DUk2UcWIm0y |
| 2 | answers | Map | Options / Checkboxes selected in survey form are treated as answers here | { temperature: "no", vibrations: "yes", rotations: "na", sound: "yes", condition: "yes" } |
| 3 | notes | String | Class of Gear (A, B, C, D) | "Rotation/Minute isn't Ok." |
| 4 | serialNo | String | No. of the part registered | SN446 |
| 5 | login_timestamp | String | Unique Id no. for Tracking | 531256 |
| 6 | serialNo | String | Date and Time Log | 2024-04-20 – 10:35 |

Table. 3.3 survey_forms

RESULT AND DISCUSSION

4.1 RESULTS

Enhanced Gear Registration: The Gear Pattern Image App (GearCare) has streamlined the gear registration process, allowing for quick and accurate entry of new gear into the system. This has significantly reduced the time and effort required for manual registration.

The use of unique identifiers and detailed gear specifications has improved the accuracy of inventory management.

Real-Time Monitoring: The real-time monitoring feature has enabled maintenance teams to track the performance of gear continuously. This proactive approach has led to early detection of potential issues, preventing major failures and reducing downtime.

Field officers can now access up-to-date information on gear status, performance metrics, and maintenance history, enhancing their decision-making capabilities.

Timely Notifications: The notifier feature has provided instant alerts and notifications about gear issues and upcoming maintenance tasks. This has ensured timely interventions, reduced the risk of gear failures and extended the lifespan of the equipment.

Users have reported higher satisfaction with the prompt notifications, which help them stay informed and take immediate action when necessary.

Efficient Field Officer Surveys: Field officers have found the survey module user-friendly and efficient for conducting post-service surveys. The ability to log survey data directly into the app has improved data accuracy and reduced paperwork.

The survey results have provided valuable feedback for continuous improvement of maintenance practices and overall gear performance.

Improved Maintenance Planning: The app's comprehensive data collection and reporting capabilities have enhanced maintenance planning and scheduling. Maintenance teams can now prioritize tasks based on real-time data and historical trends.

The shift from reactive to preventive maintenance has resulted in fewer emergency repairs and more efficient use of resources.

User-Friendly Interface: The intuitive user interface of the Gear Pattern Image App (GearCare) has received positive feedback from users, who appreciate the ease of navigation and the accessibility of key features.

The training and support resources provided have ensured a smooth transition to the new system, with users quickly adapting to the app's functionalities.

Operational Efficiency: Overall, the GearCare App has significantly improved the operational efficiency of gear maintenance processes. The streamlined workflows, real-time monitoring, and timely notifications have contributed to a more organized and proactive maintenance approach.

The reduction in gear downtime and maintenance-related disruptions has led to increased productivity and cost savings for the organization.

4.2 DISCUSSION

Implementation and Impact of the Gear Pattern Image App (GearCare)

Objective Achievement:

The primary objective of the GearCare App project was to enhance the efficiency and reliability of gear maintenance processes. This was to be achieved through modules for gear registration, live monitoring, notifications, and field officer surveys. The results indicate that these objectives have been successfully met, with significant improvements observed in the overall maintenance operations.

Impact on Maintenance Processes:

Streamlined Gear Registration: The app has simplified the gear registration process, making it quicker and more accurate. This has eliminated the cumbersome manual processes and reduced the likelihood of human error.

The inclusion of detailed gear specifications and unique identifiers has enhanced inventory management, allowing for better tracking and maintenance planning.

Real-Time Monitoring: One of the most transformative features of the GearCare App is its real-time monitoring capability. This allows maintenance teams to continuously track gear performance and detect issues before they escalate.

The availability of real-time data has empowered maintenance teams to make informed decisions, prioritize tasks, and allocate resources more effectively.

Proactive Maintenance through Notifications: The instant notification feature has played a crucial role in shifting from reactive to proactive maintenance. By alerting users to potential issues and upcoming maintenance tasks, the app ensures timely interventions.

This has reduced the incidence of unexpected gear failures and extended the operational lifespan of the equipment.

Field Officer Efficiency: The app's survey module has streamlined the process of conducting and logging post-service surveys. Field officers can now easily record survey data directly into the app, improving data accuracy and reducing the reliance on paper-based records.

The feedback gathered from these surveys has been instrumental in identifying areas for improvement and enhancing overall maintenance practices.

User Experience and Adoption:

User-Friendly Interface: The intuitive design of the GearCare App has received positive feedback from users, who appreciate its ease of use and accessibility. This has facilitated quick adoption and effective utilization of the app's features.

Training and support resources provided during the rollout have further ensured a smooth transition for users, minimizing disruptions and maximizing the benefits of the new system.

USER MANUAL

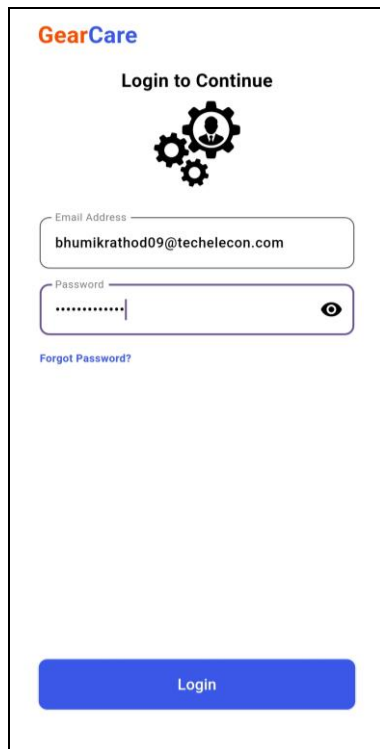
5. MENU SCREENS ALONG WITH DESCRIPTION



Img 5.1 – Splash Screen



Img 5.2 – Welcome Screen



Img 5.3.1 – Login Screen



Img 5.4 – Admin Dashboard

GearCare

Select Your Type

Job Order No. ▼

Job Order No.

Serial No.

Next

Home

Img 5.5.1 – Dropdown

GearCare

Select Your Type

Job Order No. ▼

Select Job Order

Select Job Order No. ▼ +

Select Class Select Serial No.

Select Class ▼ Select Serial No. ▼

Assembly Details

Enter Assembly Details

Description Details

Enter Description Details

Next

Home

Img 5.6 – Job Order No.

GearCare

Select Your Type

Job Order No. ▼

Select Job Order

Select Job Order No. ▼ ✕

Enter Job Order Number ✓

Select Class Select Serial No.

Select Class ▼ Select Serial No. ▼

Assembly Details

Enter Assembly Details

Description Details

Enter Description Details

Next

Home

Img 5.6.1 – Job Order No.

GearCare

Select Your Type

Job Order No. ▼

Select Job Order

649876 ▼ +

Select Class Select Serial No.

Class B ▼ SN789 ▼

Assembly Details

JC10123C - Helical Casing
GV69262A - Gear Rack

Description Details

2x Gear Rack
5x Worm Gears
3x Spur Gears
8x Screw Gears

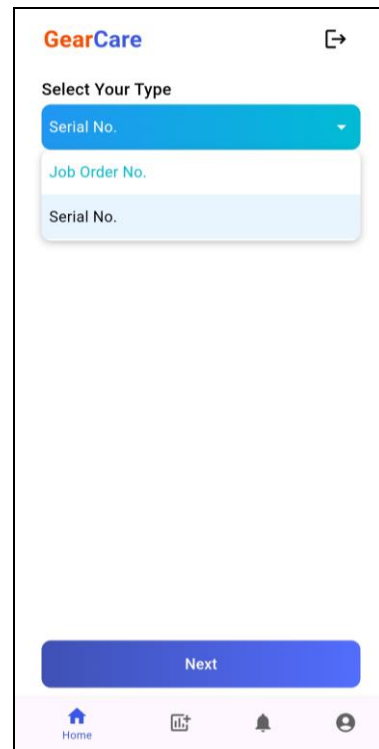
Next

Home

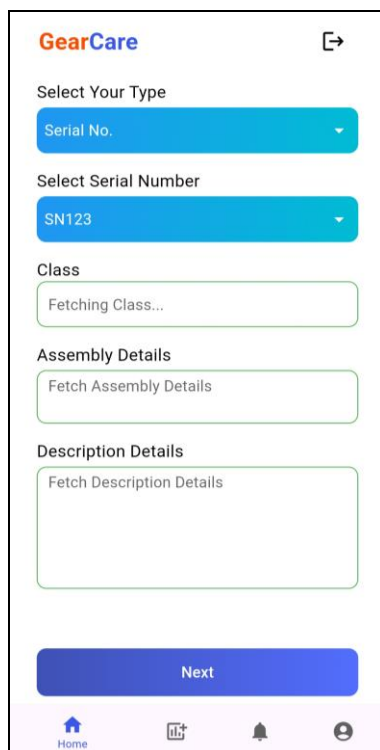
Img 5.6.2 – Job Order No.



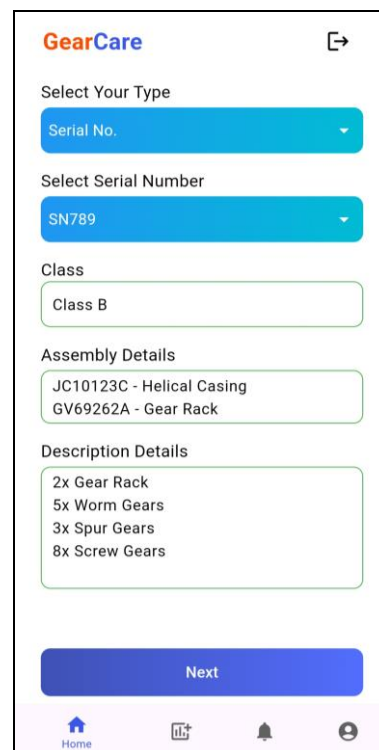
Img 5.7.1 – Images Screen



Img 5.5.2 – Dropdown



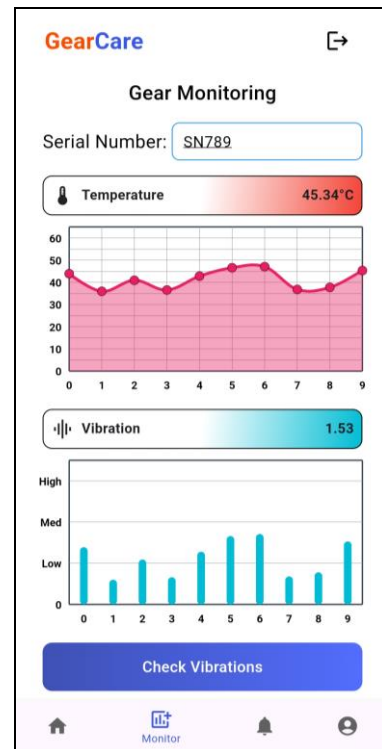
Img 5.8.1 – Serial No.



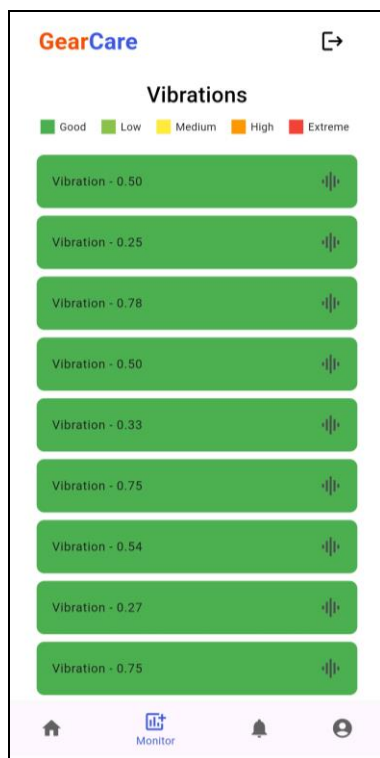
Img 5.8.2 – Dropdown



Img 5.7.2 – Images Screen



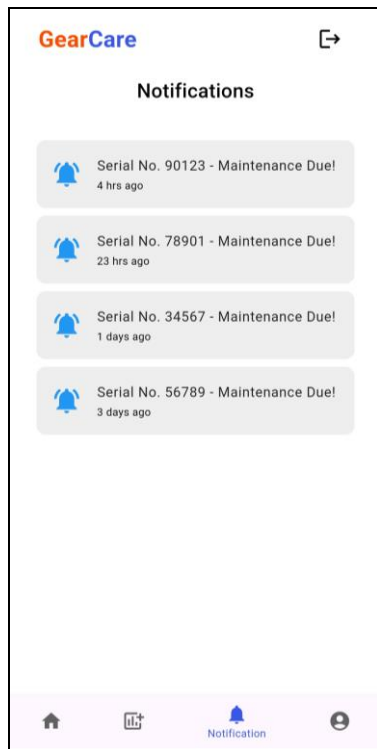
Img 5.9 – Gear Monitoring



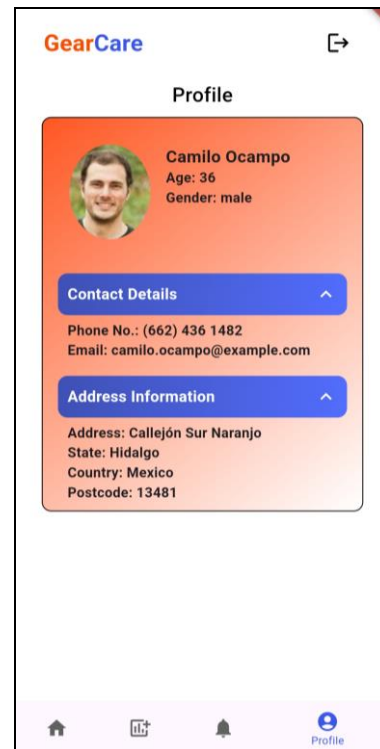
Img 5.10.1 – Vibration Monitor



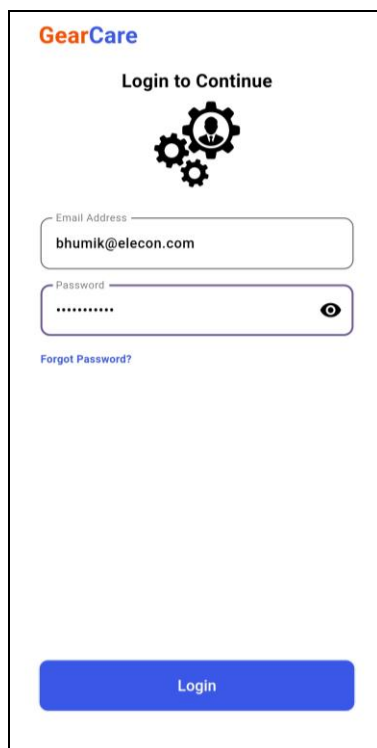
Img 5.10.2 – Vibration Monitor



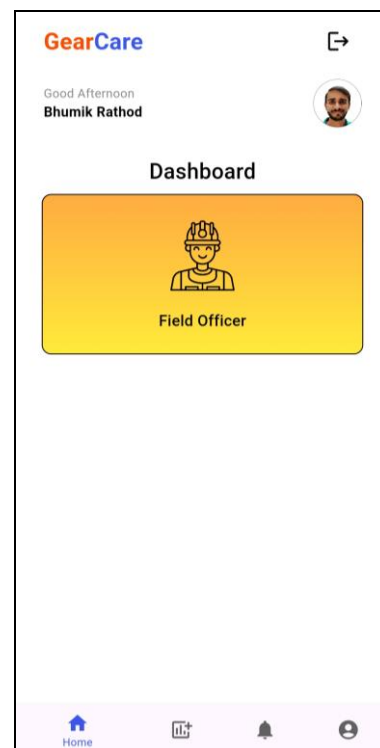
Img 5.11 – Notifications



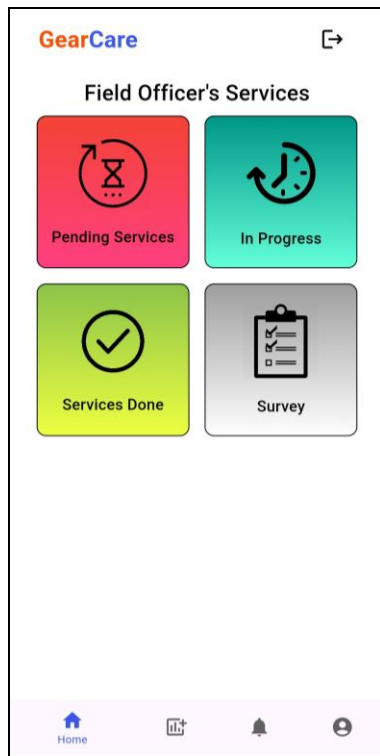
Img 5.12 – Profile Screen



Img 5.3.2 – Login Screen



Img 5.13 – Field Officer
Dashboard



Img 5.14 – Services Section

The screenshot displays the 'Survey Form' section of the GearCare app. At the top, the GearCare logo and a share icon are visible. Below the title, there is a paragraph of instructions: 'Make Sure Before Taking the Survey, You have Serviced All the Parts.' followed by legends: '*YES' - Serviced/Not Serviced and Working Fine. *NO' - Serviced But, Not Working Fine. *N/A' - Not Applicable. Below this is a 'Serial Number:' label followed by a text input field containing 'SN789'. The main part of the form is a table with three columns: 'Yes', 'No', and 'N/A'. The rows are: 'Temperature' (Yes checked), 'Vibrations' (Yes checked), 'Sound' (N/A checked), 'Rotations' (Yes checked), and 'Condition' (Yes checked). Below the table is a text field containing 'Sound is More then Regular - Oil Needed'. Underneath is an 'Add New Images' section with a camera icon and a small image of gears. At the bottom is a large blue 'Submit' button. The bottom navigation bar is the same as in the previous image.

Img 5.15 – Survey Form

TESTING

| Sr. No. | 1 | 2 | 3 | 4 |
|----------------|---|--|--|---|
| Screen | Login | Login | Home | Images |
| Description | Verify user can securely log in to the application | Test for handling invalid login attempts | Ensure users are directed to the home screen after login | Check if users can view images associated with different components |
| Condition Pre | User credentials are correctly entered | User enters incorrect credentials | User is logged in | User is on the images screen |
| Condition Post | User is directed to the home screen upon successful login | Error message is displayed | Home screen is displayed | Images are displayed |
| Input | Valid username and password | Invalid username and password | User logged in | Navigate to the images screen |
| Output | User is logged in and directed to the home screen | Error message indicating invalid credentials | Home screen displayed | Images of components displayed |
| Result | Pass | Pass | Pass | Pass |

| Sr. No. | 5 | 6 | 7 | 8 |
|-----------------------|--|--|--|---|
| Screen | Gear Registration | Gear Registration | Monitoring | Notifications |
| Description | Test the registration process for new gears or gearboxes | Verify system handles duplicate serial numbers during registration | Test real-time data visualization on the monitoring screen | Check if users receive alerts based on gear condition |
| Condition Pre | User is on the registration screen | Serial number already exists in the database | User is on the monitoring screen | Gear requires service |
| Condition Post | Gear is successfully registered | Error message is displayed | Real-time data is displayed | User/Field officer is notified |
| Input | Unique serial number for a new gear | Serial number already in use | Navigate to the dashboard | Gear condition triggers service requirement |
| Output | Confirmation message for successful registration | Error message indicating duplicate serial number | Vibration and temperature graphs displayed | Visual indicator highlighting service need |
| Result | Pass | Pass | Pass | Pass |

| Sr. No. | 9 | 10 | 11 | 12 |
|----------------|--|---|---|--|
| Screen | Notifications | Logout | Gear Registration | Monitoring |
| Description | Verify users receive reminders for upcoming service and maintenance requirements | Test if users can securely log out of the application | Check system response to invalid inputs during registration | Ensure dashboard data refreshes properly |
| Condition Pre | Scheduled service or maintenance is approaching | User is logged in | Invalid data entered during registration | Data on dashboard is outdated |
| Condition Post | User/Field Officer is reminded | User is logged out and directed to the login screen | Error message is displayed | Data is refreshed |
| Input | Time for scheduled service or maintenance | Click on logout button | Invalid serial number format | Trigger data refresh |
| Output | Notification for upcoming service/maintenance | User is logged out | Error message indicating invalid input | Updated real-time data displayed |
| Result | Pass | Pass | Pass | Pass |

| Sr. No. | 13 | 14 | 15 | 16 |
|----------------|---|---|---|--|
| Screen | Monitoring | Login | Gear Registration | Monitoring |
| Description | Test if user can navigate from the home screen to the monitoring screen | Test for failed login with blocked account | Verify failed registration due to network issue | Check if dashboard fails to load outdated data |
| Condition Pre | User is on the home screen | User account is blocked | Network is unavailable during registration | Outdated data is present on the dashboard |
| Condition Post | User is on the monitoring screen | User is not able to log in | Registration fails | Error message is displayed |
| Input | Tap on monitoring button on the home screen | Blocked account credentials | Valid serial number for registration | Attempt to load outdated data |
| Output | Monitoring screen displayed | Error message indicating account is blocked | Error message indicating registration failed due to network issue | Error message indicating data load failure |
| Result | Pass | Fail | Fail | Fail |

FUTURE ENHANCEMENT

While the app has met its initial objectives, there are opportunities for further enhancements. Future updates could include additional features such as predictive maintenance analytics, enhanced integration with other enterprise systems, and expanded IoT capabilities.

Continuous feedback from users will be crucial in identifying and prioritizing these enhancements to ensure the app evolves to meet changing needs and technological advancements.

Additionally, the field officer module should be given priority in future enhancements. This module requires further development, particularly for the pages related to pending services, in-progress services, and completed services. Enhancing these aspects will improve the efficiency and effectiveness of field operations, leading to better service delivery and user satisfaction.

APPENDICES

A. TOOLS USED

- Android Studio: Application Development Suit for Android and SDK manager for flutter.
- VS Code: Lightweight code editor by Microsoft for various programming tasks.
- Figma Desktop (Student Version): Cloud-based design tool tailored for students for UI/UX design and collaboration.

B. TECHNOLOGIES USED

- Figma: Used for UI/UX design, prototyping, and collaboration among team members.
- Flutter: Utilized for cross-platform mobile app development, ensuring a consistent user experience across different devices and operating systems.
- Web-Socket: Employed for real-time data fetching from IoT sensors, enabling instant communication between the sensors and the app.
- Firebase: Used as a backend service to store data, manage user authentication, and facilitate real-time updates across devices.

C. ADDITIONAL MATERIAL

➤ Website Links of the References Given After this Page

1. https://pub.dev/packages/flutter_local_notifications
2. https://pub.dev/packages/fl_chart
3. https://pub.dev/packages/image_picker
4. https://pub.dev/packages/flutter_dropdown
5. https://pub.dev/packages/cupertino_icons
6. https://pub.dev/packages/firebase_core
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4. flutter_dropdown: "Flutter Dropdown", Version 1.0.0
5. cupertino_icons: "Cupertino Icons", Version 1.0.8
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7. cloud_firestore: "Cloud Firestore for Flutter", Version 4.17.3
8. firebase_storage: "Firebase Storage for Flutter", Version 11.7.5
9. firebase_database: "Firebase Database for Flutter", Version 10.5.5
10. http: "HTTP: A Composable, Future-Based Library for Making Requests", Version 1.2.1
11. intl: "Intl: Internationalization and Localization Support", Version 0.19.0
12. rxdart: "Rx Dart: Reactive Extensions for Dart", Version 0.27.7
13. timezone: "Timezone: A Flutter Package for Timezone Management", Version 0.9.2

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