SMART INDIA HACKATHON 2024

COAL DIGGERS - For Every Miner, Every Shift, Every Life—Safe and Strong

- Problem Statement ID - 1645
- Problem Statement Title- An app and web based software for Productivity and safety management of coal mines.
- Theme- Smart Automation
- PS Category- Software
- Team ID- Coal Diggers
- Team Name - Coal Diggers
- Institute code (AISHE): (C-32855)

A systematic approach to ensuring coal mine workers' health and safety, using monitoring and reporting tools.

The efficiency of coal mining processes, measured by output per unit of input, optimized through the software.

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Coal Setu: Revolutionizing Shift Handover & Safety Management in Coal Mining

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Detailed Explanation: Coal Setu is a robust app and web-based platform designed to transform coal mining operations by **digitalizing Shift Handover Logs** and implementing a **Safety Management Plan (SMP) as per DGMS guidelines.** Our solution streamlines critical communication, safety monitoring, and hazard management through seamless integration of technology with coal mining workflows.

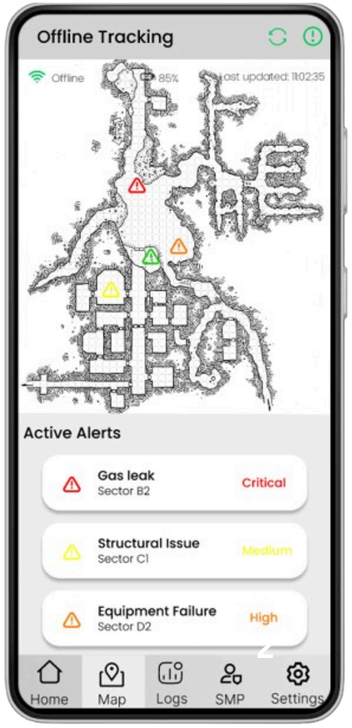
PROBLEMS BEFORE COAL SETU

1. Manual Shift Handovers
2. Paper-based Safety Logs
3. Limited Communication
4. Lack of Immediate Medical Response
5. Geographical and Linguistic Barriers
6. Data Security Concerns
7. Delayed Response to Emergencies
8. Lack of Offline Tracking

INNOVATIVE FEATURES IN OUR APP

1. Digital Shift Handover
2. Safety Management Plan
3. Offline Tracking System
4. SOS Emergency Feature
5. Mine Maps
6. Multi-language Support
7. AI Chatbot
8. Real-time Alerts
9. Biometric Monitoring
10. Incident Reporting System
11. Daily Shift Summary Reports

PROTOTYPES



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TECHNICAL APPROACH

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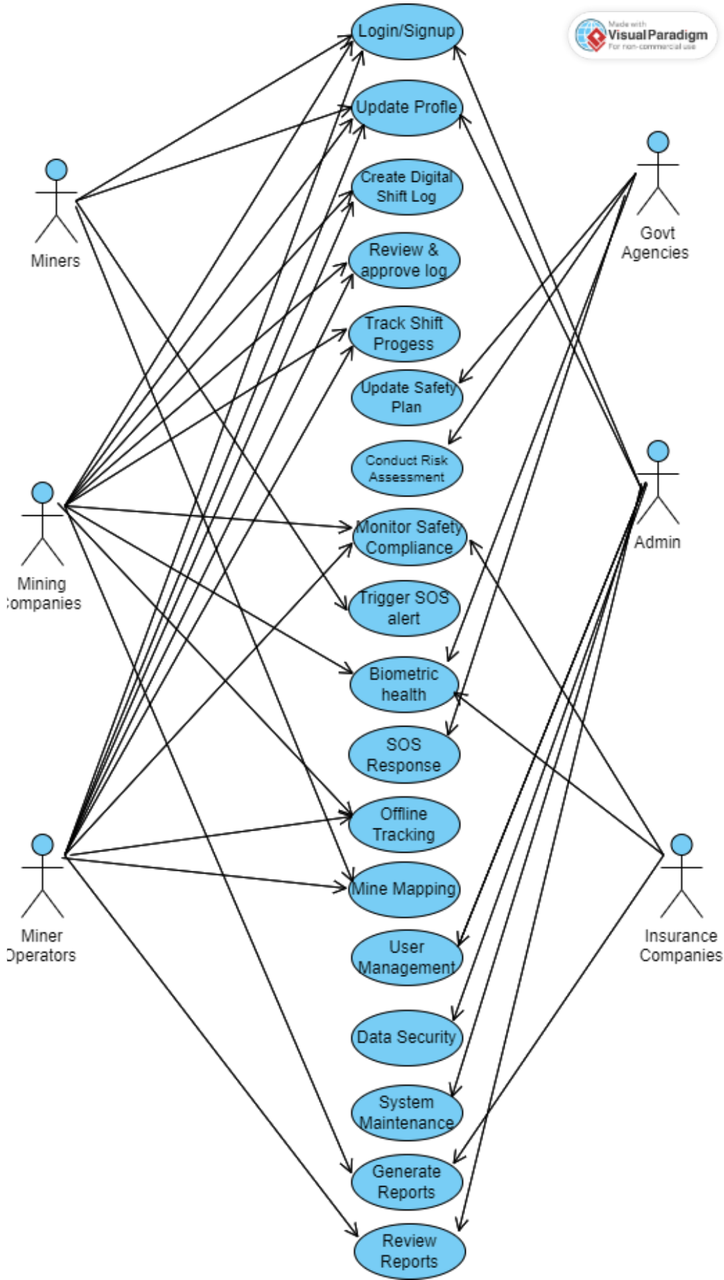
Technologies Used:

- Frontend: Flutter (Dart) – Cross-platform development for iOS, Android, and web from a single codebase.
- Backend: Python (Django) – Manages server-side operations and data handling.
- Database: MySQL – Stores data related to performance, tasks, and safety.
- Design: Figma – Create UI/UX and Prototyping.
- AI Integration: LangChain and OpenAI Assistant API – Powers Coal AI for real-time assistance.

Methodology and Process:

- AI Integration: Leverages LangChain and OpenAI Assistant API to integrate gpt-4o with the app data
- Cross-Platform Development: Uses Flutter for a unified codebase across mobile (iOS, Android) and web platforms.
- Location Tracking: Employs GPS where available; sets up LAN for tracking in GPS-limited areas.



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FEASIBILITY AND VIABILITY

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Feasibility Analysis

- Technical Feasibility: Integration with ERP systems and offline capabilities.
- Economic Feasibility: Cost savings and improved ROI.
- Operational Feasibility: User-friendly design and minimal training required.

Potential Challenges and Risks

- Technical Risks: Integration issues and data security concerns.
- Operational Risks: Resistance to adoption and system reliability.
- Regulatory Risks: Compliance with DGMS guidelines.

Strategies for Overcoming Challenges

- Technical Solutions: Extensive testing and advanced encryption.
- Operational Solutions: Comprehensive training and robust offline features.
- Regulatory Solutions: Regular audits and active engagement with regulators

Value Proposition for Coal Setu

- Improved Mine Worker Safety
- Efficient Shift Handover Management
- Real-time Emergency Response
- Offline Functionality in Remote Areas
- Enhanced Worker Communication
- Compliance with Mining Regulations

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IMPACT AND BENEFITS

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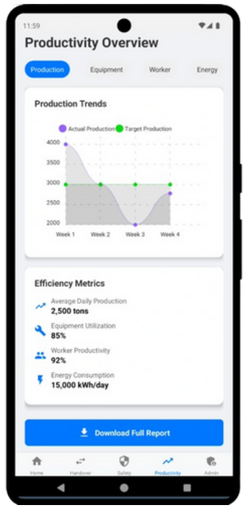
Stakeholders

1. Miners
2. Mine Supervisor
3. Mining Companies
4. Govt. & Ministry (DGMS)
5. Insurance Companies



APP LOGO

COAL सेतु

Business Model (Revenue Sources)

1. Sensor Installation & Network Setup: Fees for deploying sensors and setting up local networks.
2. Insurance Commissions: Earnings from insurance partnerships for miner coverage.
3. Marketplace Affiliations: Revenue from affiliate sales in the app's marketplace.
4. Subscription Fees: Charges for premium app features and enhanced services.
5. Training & Consultancy: Fees for providing expert training and advice on safety and technology.

Benefits of the Coal Setu Solution

1. Social Benefits: Enhanced safety and well-being of miners.
2. Economic Benefits: Reduced downtime and improved productivity through efficient shift management.
3. Environmental Benefits: Optimized resource usage, minimizing wastage and reducing environmental impact.
4. Operational Benefits: Streamlined communication for smoother operations.
5. Regulatory Compliance: Easier adherence to mining safety regulations and reporting standards.
6. Technological Benefits: Introduction of digital tools, AI, and offline tracking in traditionally manual environments.

Detailed Prototypes Of Coal Setu

Video Explanation Of Coal Setu

Future Scope & Conclusion

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RESEARCH AND REFERENCES

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- Illegal Mining in Meghalaya: Unsafe working conditions in illegal coal mines have led to numerous fatalities, often due to lack of safety protocols, toxic gas exposure, and untrained laborers. Child labor is also a significant issue in this region. IAS Gyan(UPSC Guru).
- Rat-Hole Mining Disasters: Despite bans on unsafe mining methods like rat-hole mining, many mines in India, particularly in the Northeast, continue to operate under dangerous conditions, leading to deaths and environmental degradation. IAS Gyan(UPSC Guru).
- Fatal Accident in Dhanbad, Jharkhand (2022): An accident in an illegal coal mine in Dhanbad resulted in the deaths of five workers. Unsafe mine conditions and improper closure of abandoned mines contributed to this tragedy. India Today(India Today).
- Coal Mining Death Statistics (2022): Coal India reported 20 deaths from mining-related accidents in 2022. While this represents a reduction from prior years, the industry remains hazardous.(Free Press Journal.)
- Jharkhand's Illegal Mines: Illegal coal mining in Jharkhand, with miners working under dangerous conditions, continues to result in frequent accidents, fatalities, and health risks, despite efforts to curb the practice. India Today(India Today).