PROJECT

TITLE : Develop a smart damage / leakage system for oil and gas pipelines integrated with a mobile SMS app to alert and display the issue, including time and location of leakage.

- Collage Name- Lamrin Tech Skills University Punjab
- Course Name- Critical Thinking & Design Thinking
- Branch Name- Btech (Electrical Engineering)
- Batch Number- 07
- Project number- 01

SUBMITTED BY:

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SUBMISSION DATE- 27/12/2024

Business Model Canvas

KEY PARTNERSHIPS

- #IOT Sensor Manufacturers: Partners who supply the sensors and hardware components necessary for the system.
- #Telecommunication Companies: To ensure seamless SMS alert services and network infrastructure.
- #Pipeline Infrastructure Providers: Collaborating with companies that provide pipe line monitoring technology to integrate with our solution.
- #Research institutions: Partners for R&D, especially for predictive maintenance features.
- #Government Regulatory Bodies: For regulatory approvals and to align the system with industry standards.
- #Mobile App Development Agencies: Specialized companies for creating and maintaining the mobile app.

KEY ACTIVITIES

- #Product Development: Designing, developing, and testing the smart detection system, sensors and mobile app.
- #Sensor Integration And Calibration: Ensuring that sensors are installed and properly calibrated to detect pipeline damage or leaks.
- #Software Maintenance & Updates: Regularly updating the mobile app and SMS alert system to add features and improve reliability.

KEY RESOURCES

- #IOT Sensors And Hardware: Smart sensors that can detect leaks or damages in pipeline, integrated with data transmission unit.
- #Software Development Team : Engineers and developers to build and maintain the mobile app, system backend, and SMS integration.
- #Cloud Infrastructure: Cloud services for data storage, processing and transmission of alert.

VALUE PROPOSITIONS

- #Real Time Leak Detection: Immediate identification of leaks and damage in pipelines, minimizing the impact of undetected failure.
- SMS Alerts: Instant mobile notifications about location, severity, and timing of leaks, improving response time.
- #Prevent Environmental Damage: Prevent and minimize environmental pollution, saving ecosystem and resources.
- #Cost Efficiency: Reduced maintenance cost and emergency response due to proactive alerts.
- #Regulatory Compliance: Helping clients stay compliant with environmental and safety operations.
- #Integration With Existing Infrastructure: A system that integrates easily with current pipeline monitoring technology.

CUSTOMER RELATIONSHIPS

- #Dedicated Support And Training: Offering training program and using the system, ensuring smooth implementation.
- #Customer Service: 24/7 technical support for trouble shooting, system updates and repairs.
- #User communities: Creating forums and groups for companies to share insights and feedback.

CHANNELS

- #Direct Sales: Sales team to approach oil and gas companies, pipeline maintenance services, and regulatory bodies.
- #Mobile App Stores: Distribution of the SMS app through IOS and Android stores for easy download and access.
- Industry Conferences & Expos: Participation in events to showcase the technology to industry professionals.

CUSTOMER SEGMENTS

- #Oil And Gas Companies: Major pipeline operators, oil refineries and gas transportation companies needing to monitor pipeline conditions.
- #Pipeline Maintenance Companies: Service providers who manage the maintenance of pipelines.
- #Enviromental Agencies: Organizations focused on preventing environmental disasters due to leaks or damages.
- Government Regulators: Regulatory bodies that require compliance with safety standards and risk mitigation measures.

COST STRUCTURE

- #Hardware Sensors Cost: The cost of procuring and maintaining the sensors that detects pipeline damage and leaks.
- #Software Development Cost: Development an Maintenance cost for the mobile app.
- Cloud Hosting & Data Storage: Infrastructure to store and process data from sensors.
- Marketing & Sales Expenses: Costs associated with marketing campaigns, attending industry events, and customer acquisition.
- Customer Support: Expenses related to providing customer service, training and system troubleshooting.
- R&D Costs: Investment in research and development to continually improve the system and provide advanced analytics

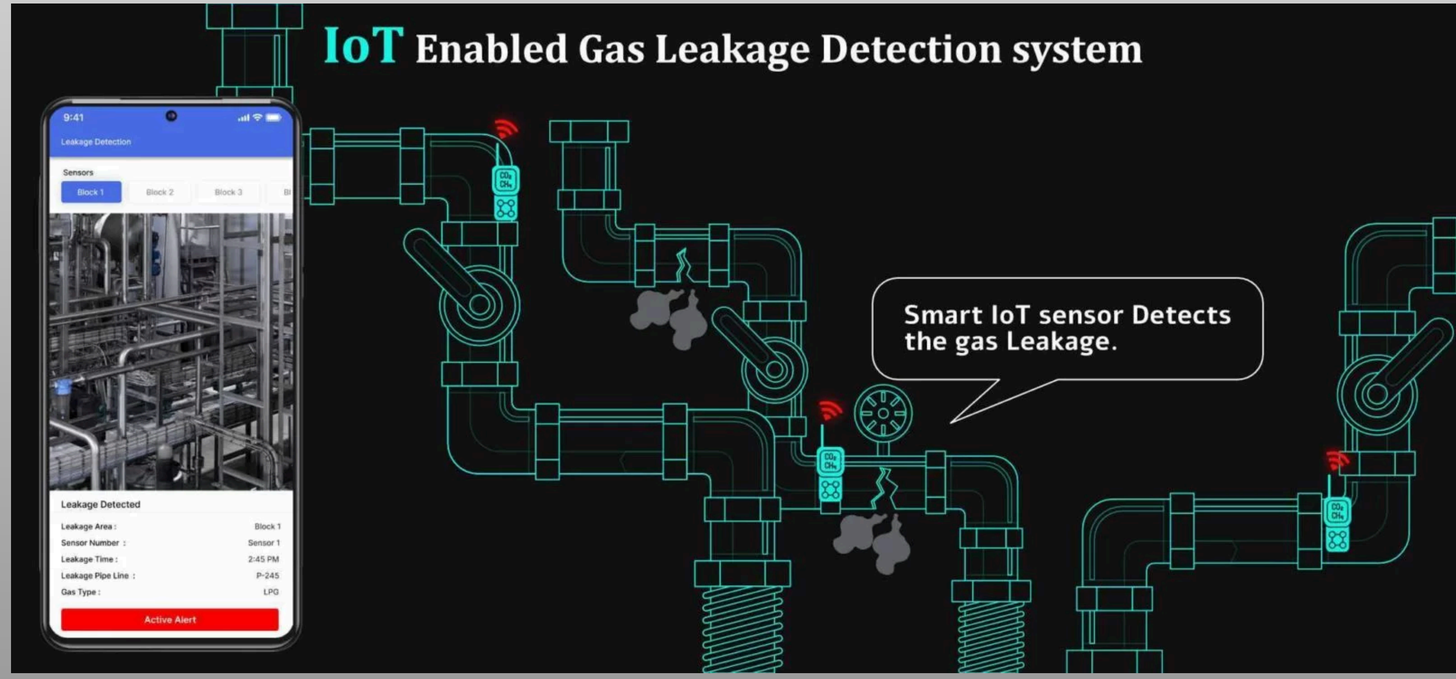
REVENUE STREAMS

- #Subscription-Based Model: Monthly or yearly subscription fee for the SMS alert system and mobile app usage.
- #Licensing Fee: Charging a fee for licensing the software to larger pipeline operators.
- #Maintenance And Support Services: Offering yearly maintenance and technical support contracts.
- #Data Analytics Reports: Charging for advanced data analytics reports to help customers predict future failures or leaks.
- #Installation Fees: Fees for installing sensors and integrating with existing pipeline systems.

Smart Damage/Leakage Detection System for Oil and Gas Pipelines

Overview:

The project aims to develop a smart detection system for damage or leakage in oil and gas pipelines. The system integrates IoT sensors, a central monitoring dashboard, and a mobile SMS app to alert and display issues, including the time and location of the leakage.



Features of the System:

1. Leakage and Damage Detection:

- IoT sensors monitor the pipeline’s structural integrity and pressure levels.
- Sensors detect abnormal changes indicating potential damage or leakage.

2. Location Tracking:

- The system uses GPS to pinpoint the location of the issue.
- Information is relayed to the mobile app in real-time.

3. Mobile SMS Alerts:

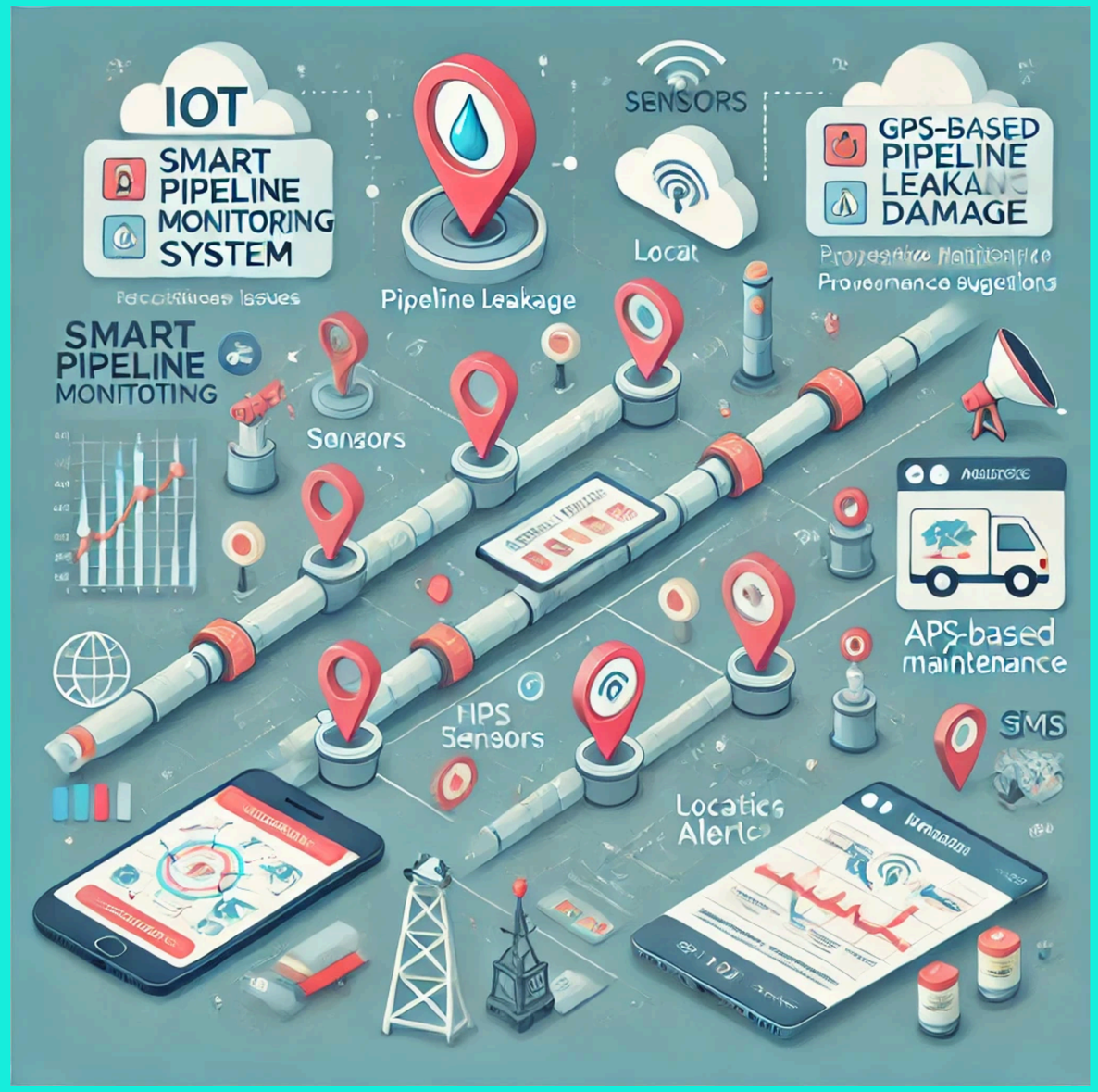
- Immediate SMS notifications with details about the issue.
- Includes time, location, and severity of the damage.

4. Dashboard Integration:

- Displays a map view of the pipelines.
- Highlights affected areas with detailed metrics.

5. Predictive Maintenance:

- AI-based analysis of data to predict future issues.
- Suggests proactive maintenance to reduce risks.



UI/UX Design Concept created using Figma

For the Mobile App Template:

1. Home Screen:
- Summary dashboard displaying:
  - Total pipelines being monitored.
  - Number of active alerts.
  - Health status of pipelines (color-coded).
2. Alert Details Screen:
- Detailed info on the detected issue:
  - Time of detection (e.g., 12:45 PM).
  - Location: GPS coordinates and map view.
  - Severity levels: Low, Medium, High (color-coded)
3. setting screen:
- Preferences for notifications.
- Emergency reporting contact details.
4. Contact Support Screen:
- Quick-call buttons for emergency response teams.
- Option to email support.

For the Web Dashboard Template:

1. Main Dashboard:
- Visual map of the pipeline network.
- Live sensor data indicators.
- Summary panel for alerts.
2. Alerts Page:
- Tabular view of all alerts:
  - ID, location, time, severity, status.
- Filtering options (e.g., by date, severity).
3. Pipeline Health Page:
- Graphical trends of pipeline health metrics.
- Charts for predictive analysis.
4. Admin Settings Page:
- Management of users.
- Configurations for the system.

Technical Stack:

1. Hardware:

- IoT sensors for pressure, temperature, and vibration.
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- GPS modules for location tracking.

2. Software:
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- Backend: Python (Django/Flask) for server-side logic.
- Frontend: React.js for web UI; Swift/Flutter for mobile app.
- Database: PostgreSQL for storing sensor data.
- SMS Service: Twilio API for SMS notifications.

3. Integration:

- IoT devices communicate via MQTT or HTTP protocols.
- Cloud services like AWS or Azure for real-time data processing.
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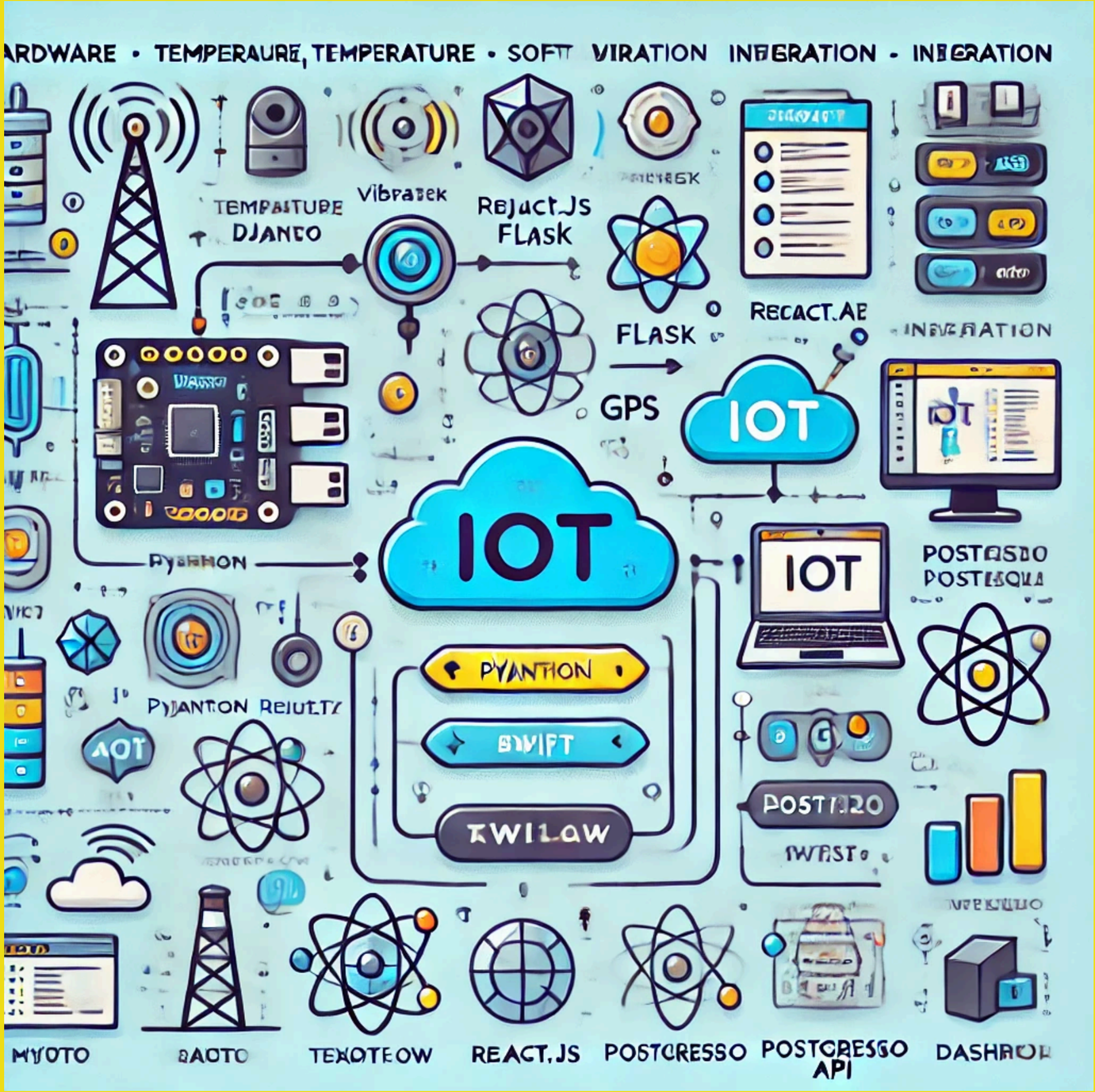
4. AI/ML:

- TensorFlow for predictive maintenance algorithms.
- Data visualization libraries for dashboard insights.



Steps to Execute the Project:

1. Research & Planning:

- Study existing pipeline monitoring systems.
- Identify required sensors and APIs.

2. UI Design:

Use Figma to design mockups for the app and dashboard.

3. Prototype Development:

Connect IoT sensors to a microcontroller (e.g., Arduino or Raspberry Pi).

Implement basic monitoring and notification functions.

4. Full System Integration:

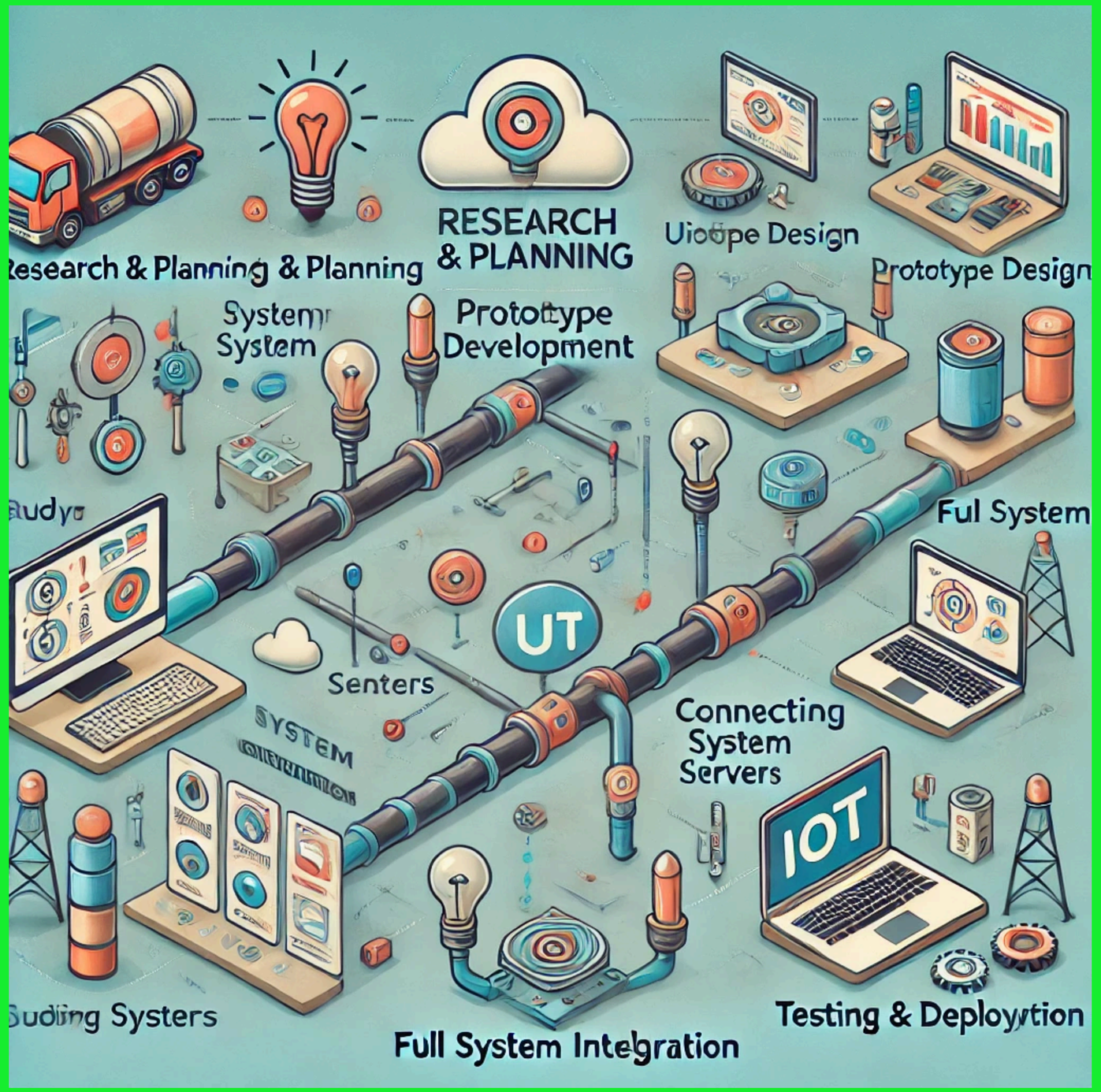
Build the backend server.

Integrate the SMS service.

5. Testing & Deployment:

Simulate pipeline scenarios for testing.

Deploy the app and dashboard on cloud platforms.



User Journey Map

Persona:
Name- Shivam Chaudhary
30 years old, Software developer

Shivam develop a smart damage / leakage detection system, for oil and gas pipelines integrated with a mobile SMS app to alert and display the issue, including time and location of leakage. By creating a user journey map, we can identify potential pain points and opportunities for improvement in the design and implementation of the smart damage / leakage detection system.

	Awareness	Consideration	Purchase	Usage	Post Purchase
User actions	Read about pipeline safety issue online (Aaron)	Attends a demo of the smart detection system (Aaron)	Discuss costs and benifits with the team (Aaron)	Recieves first leakage alert by SMS (Aaron)	Shares feedback on system performance (Aaron)
Touchpoints	Social media, ads, forums (Aaron)	Demos, case studies, reviews (Aaron)	Sales meetings, pricing plans (Aaron)	Mobile app, monitoring dashboards (Aaron)	Maintenance, feedback forms (Aaron)
Emotions	Concern, curiosity (Aaron)	Interest, doubt (Aaron)	Excitement, hesitance (Aaron)	Relief, confidence (Aaron)	Satisfaction (Aaron)
Pain points	Lack of knowledge about modern solutions (Aaron)	Skeptical about system reliability (Aaron)	High cost, unclear benefits (Aaron)	Worry about false alarms or glitches (Aaron)	Limited technical support availability (Aaron)
Opportunities	Provide engaging contents or campaigns (Aaron)	Highlight real-world use cases (Aaron)	Offer a trial period or discounts (Aaron)	Provide a reliable, user-friendly app (Aaron)	Build strong customer service channels (Aaron)