

PROBLEM STATEMENTS

1. Sales Order Module with Admin Panel (React.js Based)

In wholesale inventory and sales management, businesses often struggle with fragmented systems that separately handle product data, sales orders, suppliers, and reporting. The absence of a unified and interactive admin panel leads to inefficient workflows, manual data handling, and limited visibility across departments.

The current challenge is to develop an integrated Sales Order Admin Panel that centralizes all key operations - including user authentication, product inventory control, order management, supplier and customer tracking, and analytical reporting within a single responsive web interface. This project proposes a React.js-based solution for improved performance, maintainability, and ecosystem compatibility.

The system should incorporate:

- Secure user authentication and role-based access control (JWT) for admins, sales managers, and clerks.
- Comprehensive product and inventory management with real-time stock tracking, batch, and expiry control.
- Sales order processing capabilities (creation, editing, tracking, invoice generation).
- Supplier and customer management.
- Advanced reporting and analytics dashboards (e.g., Chart.js or D3.js).
- Real-time alerts and notifications (e.g., WebSockets or Socket.IO).
- The system must be modular, scalable, and integrate with backend services via RESTful APIs.

2. Automated Sector-Based VAPT Reporting System (HACFY)

In the current cybersecurity environment, generating Vulnerability Assessment and Penetration Testing (VAPT) reports is often a manual, repetitive, and time-consuming process. Existing solutions fail to deliver industry-specific context or automated customization tailored to an organization's sector (e.g., healthcare, finance, education).

This project proposes an Automated Sector-Based VAPT Report Generation System that intelligently creates professional, structured, and sector-relevant reports, reducing manual effort and enhancing the precision and contextual value of the VAPT reporting process.

Key Features:

1. **Sector-Specific Impact and Recommendations:** The system must dynamically generate impact analysis and remediation recommendations tailored to the organization's domain (e.g., Healthcare/HIPAA, Finance/PCI-DSS, Education/FERPA).
2. **File Upload with Vulnerability Input:** Allow testers to enter a vulnerability name (e.g., SQL Injection - OWASP A03:2021) and then upload corresponding POC evidence, which is automatically mapped and stored.

3. **Automated Report Generation:** Automatically generate a complete VAPT report including Finding Number, Title, Severity, CVSS Score, Description, Sector-Based Impact, Recommendations, and POC Evidence.
 4. **Automated CVSS and OWASP Mapping:** Automatically calculate the CVSS Score and Vector String and map each finding to its relevant OWASP Top 10 category.
 5. **Website Overview and Sector Identification:** The report's start must include an overview of the organization, its identified sector, technologies used, and the scope of the assessment.
 6. **Re-assessment Workflow Automation:** Manage the vulnerability lifecycle with status tracking (Open, Fixed, Re-tested & Closed) and audit logs.
 7. **Multi-Format Report Export:** The final report must be exportable in multiple formats (PDF, HTML, CSV, or JSON).
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3. Android Sales Order Application with VB.NET Integration

Wholesale and retail distribution businesses frequently face challenges in managing their sales order workflows. Field sales representatives often operate remotely and lack real-time access to inventory levels, order status, and customer data. The core problem is the absence of a mobile-first solution that enables sales agents to efficiently create, manage, and synchronize sales orders with the central database.

The project proposes developing an Android-based Sales Order Application using a modern hybrid framework, integrated with the existing VB.NET backend and a PostgreSQL database. The mobile app will allow sales representatives to operate seamlessly in the field.

The proposed solution emphasizes:

- Mobile accessibility for real-time sales order creation and tracking.
 - Integration with VB.NET APIs to maintain data consistency with the existing backend.
 - Using a PostgreSQL database for reliable data storage.
 - DigitalOcean cloud deployment for scalable hosting.
 - Security enhancements through HTTPS, JWT authentication, and SSL database connections.
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4. Multiple Delivery Challan (DC) Conversion using React.js

The existing retail medical inventory system efficiently manages daily pharmacy operations but lacks a unified, web-based interface for handling multiple Delivery Challans (DCs) and converting them into a single consolidated invoice. The main problem lies in bridging the gap between the legacy VB.NET desktop system and a modern React.js frontend that interacts with a PostgreSQL database through RESTful APIs.

The new system must allow pharmacists and managers to:

- Access and manage delivery challans from both desktop and web platforms.
- Combine multiple DCs into a single invoice with automated stock and tax updates.

- View and generate reports remotely via a secure, scalable web interface.
 - Ensure real-time synchronization between the VB.NET backend and React.js frontend.
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5. Employee Onboarding and Task Automation

Implement an automation solution that creates a streamlined employee onboarding process and automates the assignment and tracking of initial tasks for each new employee.

6. Employee Leave and Attendance Analysis

Implement an automation solution that analyzes employee leave data and attendance records for a company to identify patterns, track compliance, and generate reports for management.

7. Smart Medicine Reminder using AI Voice Alerts

- **Objective:** Develop an AI-based app that reminds elderly users to take medicines through personalized voice notifications.
 - **Use Case:** Helps senior citizens or patients manage their prescriptions without missing doses.
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8. Emergency Health Response System

- **Objective:** Create a mobile app that connects users to nearby ambulances, hospitals, and blood donors instantly during emergencies.
 - **Use Case:** Cuts response time in accident or cardiac emergency cases—users get immediate help through location sharing.
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9. Food Rescue & Donation Platform

- **Objective:** Develop an app that connects restaurants, hostels, or events with NGOs to donate surplus food in real-time.
 - **Use Case:** Reduces food wastage and ensures leftover meals reach people in need quickly.
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10. Hate Speech Detection & Evidence Preservation Tool

The Problem People post hateful comments and messages on public social media. Police receive many complaints, but it is hard to find the truly harmful content quickly. Posts are often deleted or changed before they can be preserved as evidence.

What to Build A simple, practical tool that finds public hate posts and comments, helps police decide which cases need immediate attention, and saves a secure, tamper-proof snapshot that can be used later. The tool must not attempt to identify or reveal private information about the poster.

Key Capabilities

- Detect likely hate speech in public content (text, image captions, images with overlaid text).
- Assign a clear priority or risk score for urgent attention.
- Save evidence safely by taking a snapshot, adding a timestamp, and creating a tamper-proof record.
- Explain why a post was flagged so a person can quickly review and confirm.
- Produce a clear, redacted report (PDF/JSON) with proof of evidence preservation.

Important Rules

- Use only public posts or synthetic/demo data. Do not access private chats or groups.
- Do not attempt to identify or deanonymize posters. Tracing IPs, phones, emails, etc., is not allowed.
- Include human review before any reporting or escalation.
- Keep clear logs and follow data-retention rules.

What to Deliver

- A simple demo showing detection, human review, and evidence packet creation.
- A short explanation of case prioritization and false alarm reduction.
- A sample evidence report (PDF or JSON) with a timestamp and tamper-proof record.
- A brief statement on privacy, data protection, and avoiding false accusations.

Judging Criteria

- Accuracy in finding hate posts while keeping false alarms low.
- Clarity in explaining why a post was flagged.
- Quality of evidence preservation and the tamper-proof record.
- Usability for police or moderators.
- Strength of privacy safeguards and the human-in-the-loop review.

11. Drone & UAV Technology Challenges

Airframe & Propulsion

- Improve VTOL endurance – VTOL drones struggle with long flight times due to power consumption in hover.
- High payload capacity with low weight – Develop materials/composite structures that reduce weight while increasing payload.
- Aerodynamic instability in crosswind – Fixed-wing drones face roll/yaw instability during high-wind missions.

- Modular frame design – Create a universal modular drone frame compatible with multiple payloads.
- Design a foldable, rugged tethered drone for continuous surveillance operations.
- Noise reduction – Develop low-noise propeller and motor designs for stealth operations.
- Increase multirotor flight time beyond 60–90 mins with payload.

Electronics & Power

- Smart Battery Management System (BMS) for safe charging/discharging and accurate SoC/SoH.
- High-efficiency BLDC motors optimized for endurance and heavy lift.
- Thermal management for high-amp ESCs and motors during continuous operation.
- Hybrid propulsion (engine + battery) for long-range delivery drones.
- In-flight battery swapping/docking mechanism.

Navigation & Control

- GNSS-denied navigation – Vision-based or LiDAR-based navigation without GPS.
- Redundant flight control system to avoid crashes due to sensor failures.
- Miniature multiband GNSS antenna for high-precision navigation.
- Detect-and-avoid system for mid-air collision prevention.
- Low-latency FPV systems for tactical missions in dense RF environments.
- Compact autopilot hardware design with integrated IMU, barometer, and connectivity.

Communication & Security

- Long-range encrypted communication resistant to jamming/spoofing.
- Mesh networking for swarm drones.
- High-bandwidth video transmission for real-time 4K streaming.
- Fail-safe communication switching between LTE/5G/RF/SATCOM.
- Anti-jamming & anti-spoofing algorithms for secure missions.

AI & Software

- Real-time object detection with low compute hardware on drones.
- AI-based autonomous landing on moving platforms/vehicles.
- Obstacle avoidance in dense environments (forest, urban canyons).
- Digital Twin simulation software for drone prototyping & testing.
- Predictive maintenance system using sensor telemetry.
- Autonomous swarm operations with mission-level AI.

- Terrain mapping and autonomous path planning with machine learning.

Manufacturing & Testing

- Composite manufacturing repeatability for high-strength UAV airframes.
- Automated assembly line for multirotor drones.
- Drone testing rigs (3 DoF / 6 DoF) for real-time calibration and stability evaluation.
- Environmental test chamber for validating temperature, humidity, vibration.
- Precision jigs and fixtures for drone assembly at scale.

Safety & Compliance

- Emergency parachute system for drones above 4kg.
- Geo-fencing & no-fly zone integration with real-time updates.
- Fail-safe algorithms for power failure, motor failure, or lost communication.
- Self-diagnosing pre-flight system for checking all hardware components.

Application: Agriculture

- Uniform spraying system – constant flowrate with varying battery voltage.
- Anti-drip, clog-free pump design for agri drones.
- Multispectral/thermal camera calibration for accurate crop health analysis.
- Ultra-light survey drone with 90–120 mins endurance.
- Automated mission planning for irregular agriculture fields.

Application: Delivery

- 20–50 kg payload VTOL delivery drone with optimized flight dynamics.
- Autonomous docking & charging hub for delivery drones.
- Package-release mechanism with safety & precision.
- Urban navigation with obstacle-rich environments.
- Cold chain delivery drones with temperature-controlled payload boxes.

Application: Defense & Tactical

- Kamikaze drone with terminal guidance (FPV + GPS + optical lock).
- Loitering munition with modular warhead.
- High-speed surveillance FPV drone with >150 kmph capability.
- Silent reconnaissance drone with low thermal/noise signature.
- Anti-drone interceptor UAV for disabling enemy drones.
- Electromagnetic shielding for tactical drones in combat zones.

Application: Inspection

- Crack detection AI for bridges, dams, power plants.
- Confined space inspection drone (tunnels, pipelines).
- Powerline inspection drone with ESD and EMI protection.
- Wind turbine inspection drone with auto-circling capability.

12. FarmGuard PaaS: Vision-Based Intrusion Detection for Crop Protection

- **Context:** Farmers lose significant yield to stray animals and birds damaging crops at night and early morning. Off-the-shelf CCTV systems don't provide real-time, automated responses tailored to farms.
- **Problem Statement:** Build an IoT + Vision ML platform-as-a-service (PaaS) that helps farmers detect and respond to animal/bird intrusions in near real-time.
- **Core Requirements:**
 - **Edge device (e.g., camera + MCU/SoC) that:**
 - Captures video/images.
 - Runs lightweight vision ML to detect animals/birds vs. humans/vehicles.
 - **Use any IoT PaaS of your choice to:**
 - Onboard devices securely.
 - Stream detection events (not raw video) to the cloud.
 - Maintain per-farm configuration (alert thresholds, quiet hours, types of intruders to monitor).
 - **Trigger actions based on detection:**
 - Example: siren/horn speaker, SMS/WhatsApp/Push notification, light flashing, etc.
 - **Provide a dashboard (web/mobile) to:**
 - See recent intrusion events and basic statistics (time, location, type).
 - Configure responses and schedules.
- **Evaluation Focus:**
 - Accuracy & robustness of detection (even with simple models).
 - Quality of PaaS integration: device management, topic design, scalability.
 - Practicality for rural deployment (bandwidth, power, cost).

13. CitySense PaaS: Plug-and-Play Smart Campus Infrastructure

- **Context:** Campuses (universities/tech parks/hospitals) want to deploy sensors for energy, water, and occupancy monitoring—but every new sensor type often needs custom integration, making scaling hard.
 - **Problem Statement:** Design an IoT PaaS-powered “plug-and-play” platform for a smart campus where different IoT devices (energy meters, water flow sensors, occupancy sensors, environmental sensors) can be onboarded quickly and uniformly.
 - **Core Requirements:**
 - Define a standardized data model (e.g., for sensor metadata, telemetry, units, location).
 - **Use an IoT PaaS to:**
 - Register and authenticate devices.
 - Ingest telemetry from heterogeneous sensors.
 - Store time-series data and expose APIs for apps.
 - **Build a device onboarding flow:**
 - Example: QR code or simple web-form to register new devices and map them to locations (Building X, Floor Y).
 - **Create a single dashboard to:**
 - Visualize real-time and historical data (per building, per floor).
 - Show at least one actionable insight (e.g., “Top 3 energy-wasting areas”, “Water leakage suspicion”, “Underutilized rooms”).
 - **Evaluation Focus:**
 - How generic & extensible the platform is for new device types.
 - Clean architecture for multi-tenant / multi-building support.
 - Quality of metrics & insights, not just raw charts.
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14. ColdChain PaaS: Smart Logistics for Temperature-Sensitive Goods

- **Context:** Pharmaceuticals, vaccines, and certain food products must be kept within a strict temperature/humidity range during transport and storage. Today, a lot of tracking is manual or siloed, making it hard for small logistics players or pharmacies to trust the cold chain.
- **Problem Statement:** Design an IoT PaaS-powered cold-chain monitoring and alerting platform that logistics providers and SMEs (pharmacies, restaurants, dairies) can use to ensure that temperature-sensitive goods remain within safe limits end-to-end.
- **Core Requirements:**
 - **Edge Node / Device:**

- A prototype device that measures Temperature, Humidity, and optionally Door open/close or GPS (can be simulated).
 - Periodically sends data to the cloud.
- **IoT PaaS Backend:**
 - Secure device onboarding and identity (per truck / container / fridge).
 - Time-series ingestion of telemetry.
 - Configurable rules engine (e.g., If temperature > X °C for more than Y minutes → trigger alert).
- **Multi-Party View:**
 - Separate roles:
 - **Logistics provider:** sees all trucks/containers.
 - **Client (pharmacy/restaurant):** sees only their shipments/assets.
- **Dashboard / UX:**
 - Live map or list of active shipments / storage units with current status.
 - Timeline view of temperature/humidity for a selected shipment.
 - Clear alerts: which shipment violated the cold chain, when, and for how long.
- **Bonus (Optional):**
 - Generate a “compliance certificate” (e.TOC, PDF) for a completed shipment, summarizing the temperature profile and any violations.
 - Support an offline-tolerant edge node that buffers data locally when no network is available and pushes it when back online.
- **Evaluation Focus:**
 - How well the platform models multi-tenant use.
 - Clarity of data model and topic/endpoint design in the PaaS.
 - Practicality and explainability of alerts (actionable info, not just raw numbers).

15. AI-Powered Customer Review Insights Engine (Aura)

- **Context:** At Aura, we manage thousands of product SKUs, each receiving hundreds of customer reviews daily. While star ratings (1-5) give us a general idea of satisfaction, they don't tell us *why* a customer is happy or unhappy. Manually reading every review to find patterns (e.g., "battery life is poor," "screen is excellent," "delivery was late") is impossible to scale.
- **Problem Statement:** We need an AIML-powered tool that automatically ingests customer reviews for a given product and performs **Aspect-Based Sentiment Analysis (ABSA)**. The goal is to move beyond a simple "positive/negative" review score and automatically identify

which specific features or "aspects" of a product (like battery, camera, price, customer service) are being discussed and what the sentiment is for each aspect.

- **Core Requirements:**
 - **Input:** The system must accept a dataset of customer reviews (e.g., a CSV or JSON file containing the review text).
 - **Aspect Extraction:** The AI model must automatically identify the key features (aspects) being discussed in the reviews. For example, in "The phone's camera is amazing, but the battery drains too fast," the aspects are camera and battery.
 - **Sentiment Assignment:** For each extracted aspect, the model must assign a specific sentiment (e.g., Positive, Negative, Neutral).
 - **Dashboard:** The solution must include a simple web dashboard (e.g., built with Streamlit, Flask, or React) that:
 - Allows a user to upload a sample review dataset.
 - Displays a summary of the analysis, such as "Top 5 Praised Features" and "Top 5 Criticized Features."
 - Allows filtering reviews by aspect (e.g., "Show me all reviews that mention battery").
 - **Expected Deliverable:** A working web-based prototype and a brief presentation explaining the ML model used (e.g., Hugging Face Transformers, spaCy, scikit-learn) and how the insights could be used by a product manager to improve the product.
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16. Intelligent Document Processing for Claim Triage (FinSecure)

- **Context:** At FinSecure, our insurance claims process is a major operational bottleneck. When a customer submits an auto insurance claim, they upload multiple documents: a filled-out PDF claim form, photos of the vehicle damage, and sometimes a scanned PDF of the police report. Our adjusters must manually open each file, read the descriptions, look at the photos, and check for consistency. This is slow and prone to error.
- **Problem Statement:** We need an AI-powered "Triage" system that automatically processes a new claim submission. The system must use **Optical Character Recognition (OCR)** to extract data from the forms and **Computer Vision (CV)** to analyze the damage photos. The goal is to provide an instant "Triage Score" to our team so they can fast-track simple claims or flag complex/suspicious claims for immediate review.
- **Core Requirements:**
 - **File Upload:** A simple interface where a user can upload multiple files for a single claim (e.g., 1 PDF form, 3 JPEG images).
 - **OCR / Data Extraction:** The system must use an OCR model (like Tesseract) to "read" the PDF claim form and extract key-value pairs (e.g., Policy Number:, Incident Date:, Incident Description:).

- **Computer Vision Analysis:** The system must use a CV model (e.g., a pre-trained model like YOLO or ResNet) to analyze the uploaded damage photos and classify:
 - **Damage Location:** (e.g., Front Bumper, Windshield, Side Door).
 - **Damage Severity:** (e.g., Minor Scratch, Moderate Dent, Severe Collision).
- **Triage & Flagging:** The system must apply a set of rules to flag the claim. For example:
 - **FLAG (High Priority):** If the Incident Description mentions "totaled" and the CV model detects Severe Collision.
 - **FLAG (Fraud Review):** If the Incident Description says "Severe Collision" but the CV model only detects Minor Scratch.
 - **AUTO-APPROVE (Low Priority):** If the Incident Description is "minor fender bender" and the CV model detects Minor Scratch on the Front Bumper.
- **Expected Deliverable:** A working prototype dashboard that allows a user to upload claim documents. The dashboard must then display the extracted text, the damage analysis results (location/severity), and the final "Triage Score" (e.g., "Flag for Review," "Auto-Approve").