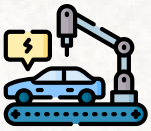
daffodil

SUCCESS STORY

Developing An IoT-Enabled Laboratory Management System For An Automobile Manufacturer

Customer	A Leading Automobile Manufacturing Firm
Country	India
Industry	Manufacturing

ABOUT THE CLIENT



The client is India's largest automobile manufacturer. It is credited with having ushered in the automobile revolution in the country. The company is engaged in the business of manufacturing and sale of passenger vehicles in India. The client has a vast portfolio of 16 car models with over 150 variants.

SERVICES DELIVERED

- IoT Integration
- Software Development

TECH STACK

React | Java

BUSINESS SITUATION

The company's quality department operated several testing and research laboratories across its manufacturing plants. These laboratories are responsible for conducting mechanical, material, and durability testing on various automobile components such as steel rods, tires, and metallic parts before they are approved for production.

Despite having modern machinery and a skilled workforce, the lab operations relied heavily on manual data recording, offline test management, and limited visibility into ongoing testing activities. This dependency on manual processes created a range of operational inefficiencies that affected both accuracy and productivity.

Since the readings from machines were recorded by hand, there was a persistent risk of human error and data inconsistency. The absence of a centralized digital system also made it challenging for supervisors to monitor ongoing tests, evaluate progress, or identify performance bottlenecks in real time.

Additionally, coordination between test requests, machine allocation, and resource availability was slow and prone to delays, which extended the overall testing cycle. Over time, these challenges not only reduced operational efficiency but also limited the ability of the quality team to make data-driven decisions and maintain a standardized testing workflow across different facilities.

To overcome these challenges, client engaged Daffodil Software to develop a comprehensive digital solution that could automate, integrate, and centralize its lab operations.

KEY REQUIREMENTS

1. Eliminate manual intervention and reduce human errors by creating a system that records, validates, and processes results automatically.
2. Integrate IoT connectivity with diverse testing machines to enable automatic reading capture and cloud synchronization.
3. Develop a Laboratory Management System that would provide real-time visibility into all ongoing tests, requests, and approvals.
4. Optimize resource allocation by intelligently assigning testing requests to available personnel and machines.
5. Enable seamless communication between devices, users, and the cloud, even for machines that lack internet connectivity.
6. Deploy the solution at an enterprise scale across multiple labs and plants while ensuring data security, reliability, and scalability.

THE SOLUTION

Daffodil Software designed and implemented a custom IoT-enabled Lab Management System that completely transformed the client's testing and quality management process. The system integrated IoT devices, automated workflows, and a powerful Laboratory Management System dashboard to create a connected, data-driven testing environment.

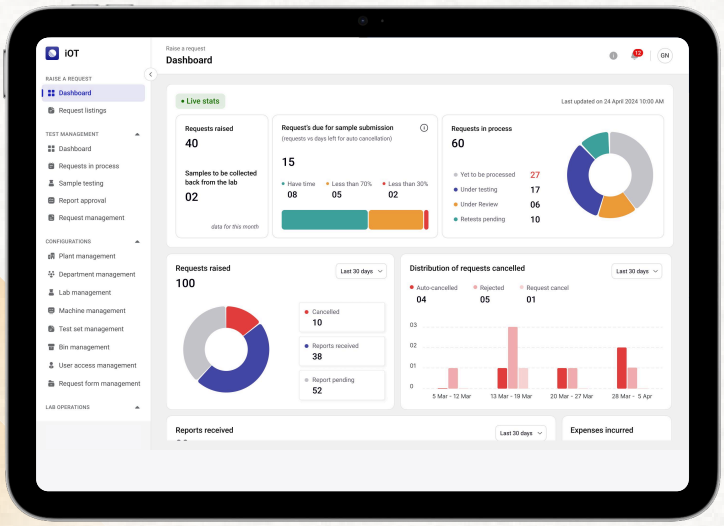
The platform architecture was designed with scalability and modularity in mind, enabling seamless future integrations and performance optimization across the client's multiple manufacturing units.

The platform comprised several interdependent modules, each addressing specific operational needs.

Some of the modules that we developed include:

Laboratory Management System With Customizable Dashboards

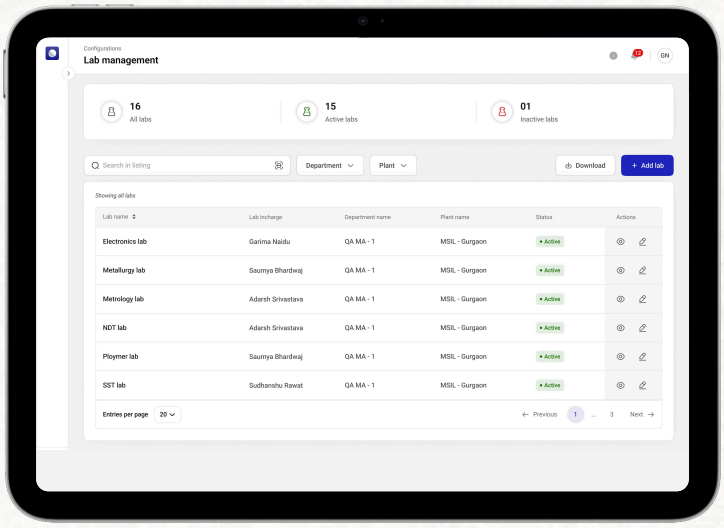
Provided a centralized, real-time dashboard that consolidated all active and pending test requests, allocated resources, and completion statuses in one unified view. Lab supervisors could easily monitor which machine or employee was assigned to each request, track the progress of ongoing tests, and oversee turnaround times to ensure timely execution. The dashboard also offered analytical insights into resource utilization, workflow efficiency, and testing bottlenecks, empowering supervisors to make data-driven decisions, optimize scheduling, and maintain smooth lab operations.



Lab Module (IoT Integration Layer)

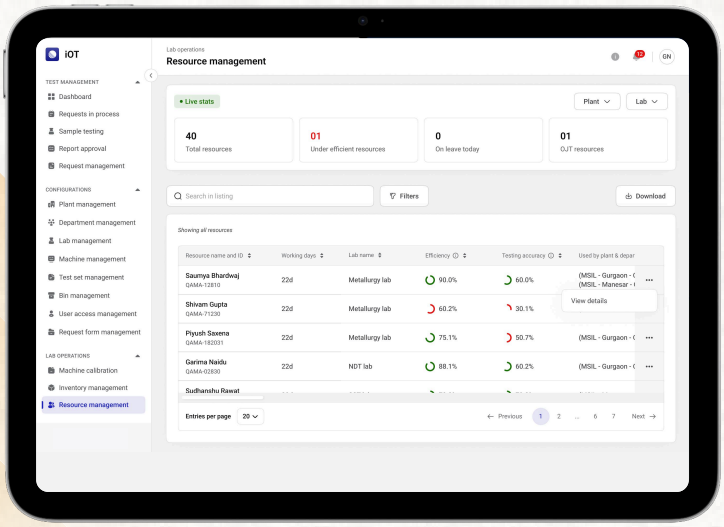
The IoT-integrated lab module served as a seamless communication bridge between on-premise machines and the cloud infrastructure, enabling unified data exchange across all testing environments. The module leveraged HTTP/REST, WebSocket, and MQTT protocols to ensure secure, real-time connectivity, even for legacy, non-Internet-enabled machines.

Built using React at frontend and Spring Boot as the backend, we deployed Elastic Search for intelligent search and filtering and PostgreSQL database for robust data management. This configuration facilitated real-time data transmission, continuous machine monitoring, and complete automation of report generation.



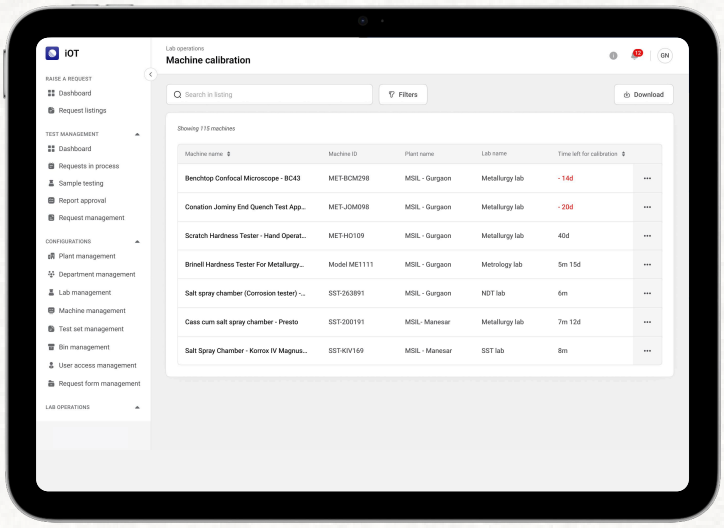
Resource Management Module

Effectively managed employee resources, credentials, and role-based access across the organization to ensure optimal utilization and accountability. The system streamlined workforce allocation by mapping employees to specific projects, tasks, and operational hierarchies based on skill sets and availability. With clearly defined access levels and permissions, only authorized personnel could create, assign, or validate tests, ensuring secure and efficient resource deployment. This structured approach helped improve productivity and coordination across teams while minimizing administrative overhead and safeguarding operational integrity.



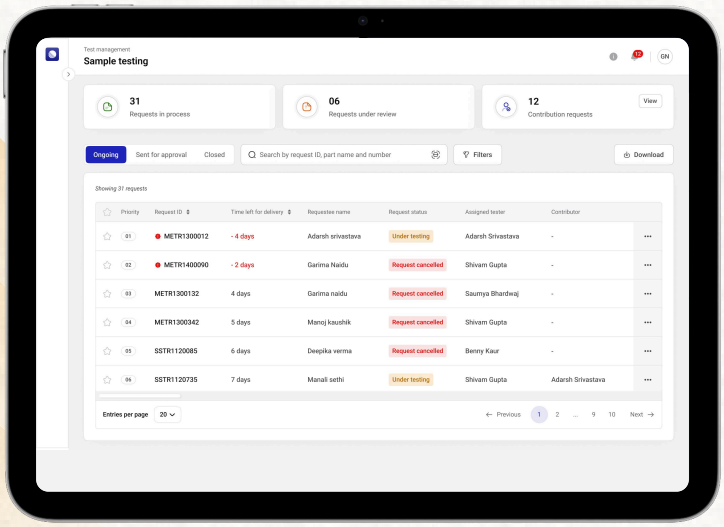
Configuration Module

Allowed administrators to precisely define and manage machine parameters, calibration settings, and testing protocols, ensuring consistency and reliability in every testing process. The system offered flexible customization options to accommodate various component types and testing standards, enabling seamless adaptation to evolving operational requirements while maintaining high levels of accuracy and compliance.



Testing Module

Automated the complete testing lifecycle, from test request creation and scheduling to final evaluation and approval, eliminating manual dependencies and reducing turnaround time. The system seamlessly retrieved real-time readings from IoT-connected machines, automatically populated test data fields, and generated comprehensive validation and compliance reports. This end-to-end automation enhanced accuracy, traceability, and operational efficiency while ensuring that every test adhered to predefined quality and safety standards.



IMPACT

The IoT-driven Lab Management System marked a transformative milestone in the client's quality assurance operations, setting a new industry benchmark for automation and smart manufacturing. Through this collaboration, Daffodil Software conceptualized and implemented a fully IoT-integrated Lab Management Solution that digitized every phase of the client's testing and validation process.

The platform seamlessly connected machines, personnel, and data, building a unified ecosystem that fostered efficiency, accuracy, and transparency across operations. With real-time data acquisition, automated analysis, and end-to-end visibility into lab activities, the solution empowered the client to make faster, data-driven decisions and maintain uncompromised product quality.

KEY PERFORMANCE INDICATORS

96%	98%	120+
Reduction In Manual Intervention	Data Accuracy	Product Testing Cycles Automated

HAVE A SOFTWARE PRODUCT VISION IN MIND?

Set up a personalized consultation with our technology expert

Let's Talk ↗

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