

S U C C E S S S T O R Y

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

Customer

A Leading Automobile Manufacturing Firm

Country

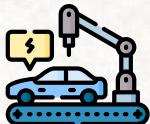
India

Industry

Manufacturing



A B O U T T H E C L I E N T



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.

S E R V I C E S D E L I V E R E D

IoT Integration



Software Development



T E C H S T A C K

 React |  Java

B U S I N E S S S I T U A T I O N

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.

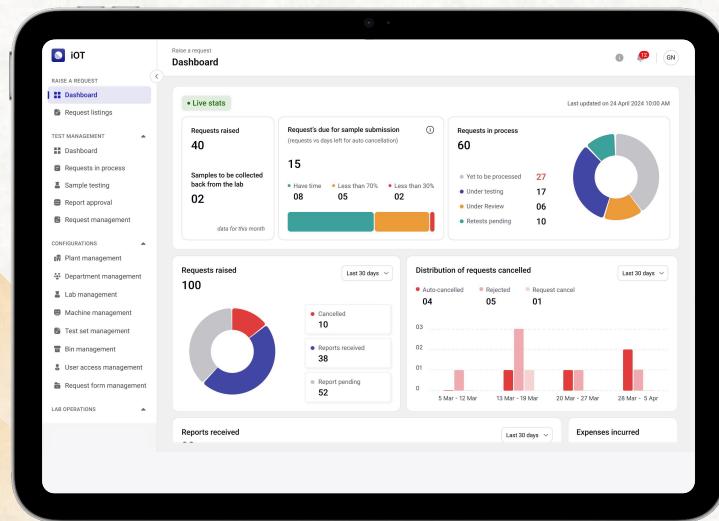
The platform architecture was designed with scalability and modularity in mind, enabling seamless future integrations and performance optimization across the client's multiple manufacturing units.

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.

Showing all labs

Lab name	Lab incharge	Department name	Plant name	Status	Actions
Electronics lab	Garima Naidu	QA MA - 1	MSIL - Gurgaon	Active	Edit Delete
Metalurgy lab	Saumya Bhardwaj	QA MA - 1	MSIL - Gurgaon	Active	Edit Delete
Metrology lab	Adarsh Srivastava	QA MA - 1	MSIL - Gurgaon	Active	Edit Delete
NDT lab	Adarsh Srivastava	QA MA - 1	MSIL - Gurgaon	Active	Edit Delete
Polymer lab	Saumya Bhardwaj	QA MA - 1	MSIL - Gurgaon	Active	Edit Delete
SST lab	Sudhanshu Rawat	QA MA - 1	MSIL - Gurgaon	Active	Edit Delete

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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.

Live stats

Total resources	Under efficient resources	On leave today	GJU resources
40	01	0	01

Showing all resources

Resource name and ID	Working days	Lab name	Efficiency	Testing accuracy	Used by plant & department
Saumya Bhardwaj (QAM-12310)	22d	Metalurgy lab	90.0%	60.0%	(MSIL - Gurgaon - C (MSIL - Manesar - I ...
Shivam Gupta (QAM-71230)	22d	Metalurgy lab	60.2%	30.1%	View details
Piyush Sareen (QAM-182031)	22d	Metalurgy lab	75.1%	50.7%	(MSIL - Gurgaon - C (MSIL - Manesar - I ...
Garima Naidu (QAM-01230)	22d	NDT lab	88.1%	60.2%	(MSIL - Gurgaon - C (MSIL - Manesar - I ...
Sudhanshu Rawat					

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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.

IOT

PAVE A REQUEST

- Dashboard
- Request listings

TEST MANAGEMENT

- Dashboard
- Requests in process
- Sample testing
- Report approval
- Request management

CONFIGURATIONS

- Plant management
- Department management
- Lab management
- Machine management
- Test set management
- Bin management
- User access management
- Request form management

LAB OPERATIONS

Machine calibration

Showing 115 machines

Machine name	Machine ID	Plant name	Lab name	Time left for calibration	...
Binocular Confocal Microscope - BC43	MET-BCM098	MSL - Gurgaon	Metallurgy lab	-14d	...
Confection Jominy End Quench Test App...	MET-JQM098	MSL - Gurgaon	Metallurgy lab	-20d	...
Scratch Hardness Tester - Hand Operat...	METH0109	MSL - Gurgaon	Metallurgy lab	40d	...
Brinell Hardness Tester For Metallurgy...	Model MET1111	MSL - Gurgaon	Metrology lab	5m 15d	...
Salt spray chamber (Corrosion tester) -	SST-263891	MSL - Gurgaon	NDT lab	6m	...
Cass cum salt spray chamber - Presto	SST-200191	MSL - Manesar	Metallurgy lab	7m 12d	...
Salt Spray Chamber - Korrox IV Magnus...	SST-KOV169	MSL - Manesar	SST lab	8m	...

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.

Test management

Sample testing

31 Requests in process

06 Requests under review

12 Contribution requests

Droping Sent for approval Closed

Priority Request ID Time left for delivery Requester name Request status Assigned tester Contributor

Priority	Request ID	Time left for delivery	Requester name	Request status	Assigned tester	Contributor
01	METR1300012	-4 days	Adarsh Srivastava	Under testing	Adarsh Srivastava	-
02	METR1400090	-2 days	Garnima Nadu	Request cancelled	Shivam Gupta	-
03	METR1300132	4 days	Garnima nadu	Request cancelled	Saumya Bhardwaj	-
04	METR1300342	5 days	Manoj kaushik	Request cancelled	Shivam Gupta	-
05	SSTR1120085	6 days	Deepika verma	Request cancelled	Benny Kaur	-
06	SSTR1120735	7 days	Manali sethi	Under testing	Shivam Gupta	Adarsh Srivastava

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%

Reduction In Manual Intervention

98%

Data Accuracy

120+

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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