



# Optimizing laboratory operations through AI/ML integration

## Laboratory Performance Optimizer Solution

The LabVantage®Analytics **Laboratory Performance Optimizer (LPO) solution** drives down costs while improving the laboratory's process efficiency.

- By bringing disparate data from different systems to the lab and leveraging AI, LPO optimizes the process and provides a complete view of the lab.
- With LPO the lab is able to achieve new performance benchmarks.
- LPO creates meaningful insights from data in order to identify the next best actions. This visibility and the optimization functions available empower modern laboratories to achieve more, and to do it faster while reducing cost and achieving smart decision-making.

With growing complexities in research methods, evolving market demands, and changes to regulations, laboratories are required to do more and in less time. It is becoming evident that the companies that will survive are those that use their data assets and artificial intelligence (AI) techniques to move faster and to be more effective.

Until now, the lab operator's relationship to his or her data was usually prescribed by preset LIMS dashboards and reports. The data itself, often unstructured and siloed from other enterprise systems, was not always accessible without an expensive and tactical data modeling exercise. It was difficult to leverage AI across the laboratory and to include data assets from around the enterprise for a 360° view of the organization's processes. This reality is fast changing as AI and machine learning (ML) are being deployed in the laboratory.

# Overview of Solutions

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## Laboratory Performance Analyzer

The solution provides a collection of pre-packaged performance dashboards. Additionally, it can analyze datasets by leveraging pre-defined metrics and data models. It can provide insights combining LIMS data with other data sources to create a single source of truth for the laboratories. Sample metrics include:

- Analysis of on-time completion and turnaround time for all requests
- Analysis of pending requests overdue and average delay statistics
- Analysis of completed tests to track on-time deliveries by client/sample or other dimensions
- Analysis of pending tests overdue and average delay statistics and trends
- Analysis of billed/un-billed costs-trends, distribution, and drill-downs
- Cost analysis and invoicing item parameters, trends, and drill-downs
- Analysis of time sheet data, time tracking, and charge-outs by employees
- On-Off specification count analysis
- Defect analysis with root cause analysis

## Quality Tracking and Management

Quality Tracking and Management includes:

- Statistical process control (SPC) analysis, charting, and reporting
- Percentage out-of-spec reporting with respect to upper and lower warning limits and specification limits
- Track process performance and process capability based on specification limits (Pp, Ppk, Cp, Cpk)
- Perform correlation and regression analysis to understand interrelationships between parameters. This includes: standard checks/normalization, outlier removal normality checks, multi-collinearity checks, and heteroscedasticity checks
- Perform quality-related analytics by combining lab data with production process data. This helps to identify drivers of poor quality and recommends real-time intervention strategies to reduce cost
- Product-lot stability studies and shelf-life prediction as described in the FDA/ICH guidelines

## Instrument Monitoring

The Instrument Monitoring solution enables laboratory personnel to connect, collect, and collate data from the laboratory instruments. In addition to processing analysis data, it also provides analysis parameters pertaining to the instrument condition. This generates insights on instrument health and pre-emptive alerts on potential instrument failure. The salient features of this module are:

- Real-time tracking of instrument data to assess and to improve OEE (overall equipment effectiveness) and TEEP (total effective equipment performance)
- Track the underlying drivers: availability, performance, productivity, quality, and loading
- Generate alerts based on configurable thresholds – user defined or statistically computed
- Condition monitoring using instrument data. Identify signals for predictive maintenance using AI/ML; thereby minimizing the cost of unscheduled maintenance and maximizing the lifespan for the instrument

## Lab Disposition Recommender

Using a recommender system, the solution enables dynamic routing of lab requests across various entities and work areas. To customers/users submitting an analysis request, the system presents suitable lab methods that are based on similarity scores of other successful requests in the past. If the request approver determines that the user-selected lab method name should be changed, then the result is written back to LIMS along with the preparation, method, balance id, instrument id, and instrument method.

## Lab Resource Optimizer

The solution focuses on better optimization of material resources and human resources. The salient features are:

- Leverages predictive insights to manage lab materials, inventory items, and consumables
- Material tracking and distribution of materials
- Traceability of test results to standards and reagents
- Inventory control for materials
- Insights from employee timesheets and charge-outs to help in better planning
- Analysis of resource and capacity utilization to drive better planning and improved utilization
- Improved work planning and allocation based on resource availability and current/predicted workload; resulting in reduced cost and TAT
- Reduced TAT by balancing work between the available resources

## Business Benefits

- Preventive maintenance of equipment to maximize utilization, availability, and performance
- Optimal usage of materials and lab resources
- Demand prediction for optimal capacity planning
- Single-window view of the entire laboratory operations
- Increased lab efficiency and throughputs
- Reduced cost associated with poor quality

### Powered by **tcg mcube**

LabVantage@Analytics is powered by **tcg mcube**. **tcg mcube** is an advanced analytics and AI Platform, which allows users to create compelling business solutions for tackling complex industry problems. With its modular architecture, **tcg mcube** handles multiple data types, and it provides an efficient "cut-and-fit" into legacy environments if needed. Its mantra: Velocity to Value.



Ingest structured and unstructured data from diverse sources



Store ingested data within big data stores and data lakes



Provide a library of algorithms for machine learning



Create stunning visualizations using a powerful BI library

## Technical Features

Seamless, bidirectional integration with LabVantage LIMS allows for easy lookup and writeback of laboratory data	Inbuilt connectors for ingesting data from external sources for additional computation
Integrated solution suite with each solution available as an independent plug-and-play module	Detailed audit trail management and logging features for every user action performed
Self-service business intelligence capabilities allowing generation of custom dashboards and reports	Access to hundreds of statistical algorithms for performing additional computations
Export features for computed data in all standard formats for downstream consumption	Configurable workflow-based approval process for each analysis task
Centralized privilege access management and single sign-on through LIMS	Configurable alerts and notifications for individual roles and users



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### ABOUT LABVANTAGE SOLUTIONS

A recognized leader in enterprise laboratory software solutions, LabVantage Solutions dedicates itself to improving customer outcomes by transforming data into knowledge. The LabVantage informatics platform is highly configurable, integrated across a common architecture, and 100% browser-based to support hundreds of concurrent users. Deployed on-premise, via the cloud, or SaaS, it seamlessly interfaces with instruments and other enterprise systems – enabling true digital transformation. The platform consists of the most modern laboratory information management system (LIMS) available, integrated electronic laboratory notebook (ELN), laboratory execution system (LES), scientific data management system (SDMS), and our advanced analytics solution (LabVantage Analytics); and for healthcare settings, a laboratory information system (LIS). We support more than 1500 global customer sites in the life sciences, pharmaceutical, medical device, biobank, food & beverage, consumer packaged goods, oil & gas, genetics/diagnostics, and healthcare industries. Headquartered in Somerset, NJ., with global offices, LabVantage has, for four decades, offered its comprehensive portfolio of products and services to enable customers to innovate faster in the R&D cycle, improve manufactured product quality, achieve accurate record-keeping, and comply with regulatory requirements. For more information, visit [labvantage.com](http://labvantage.com).

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