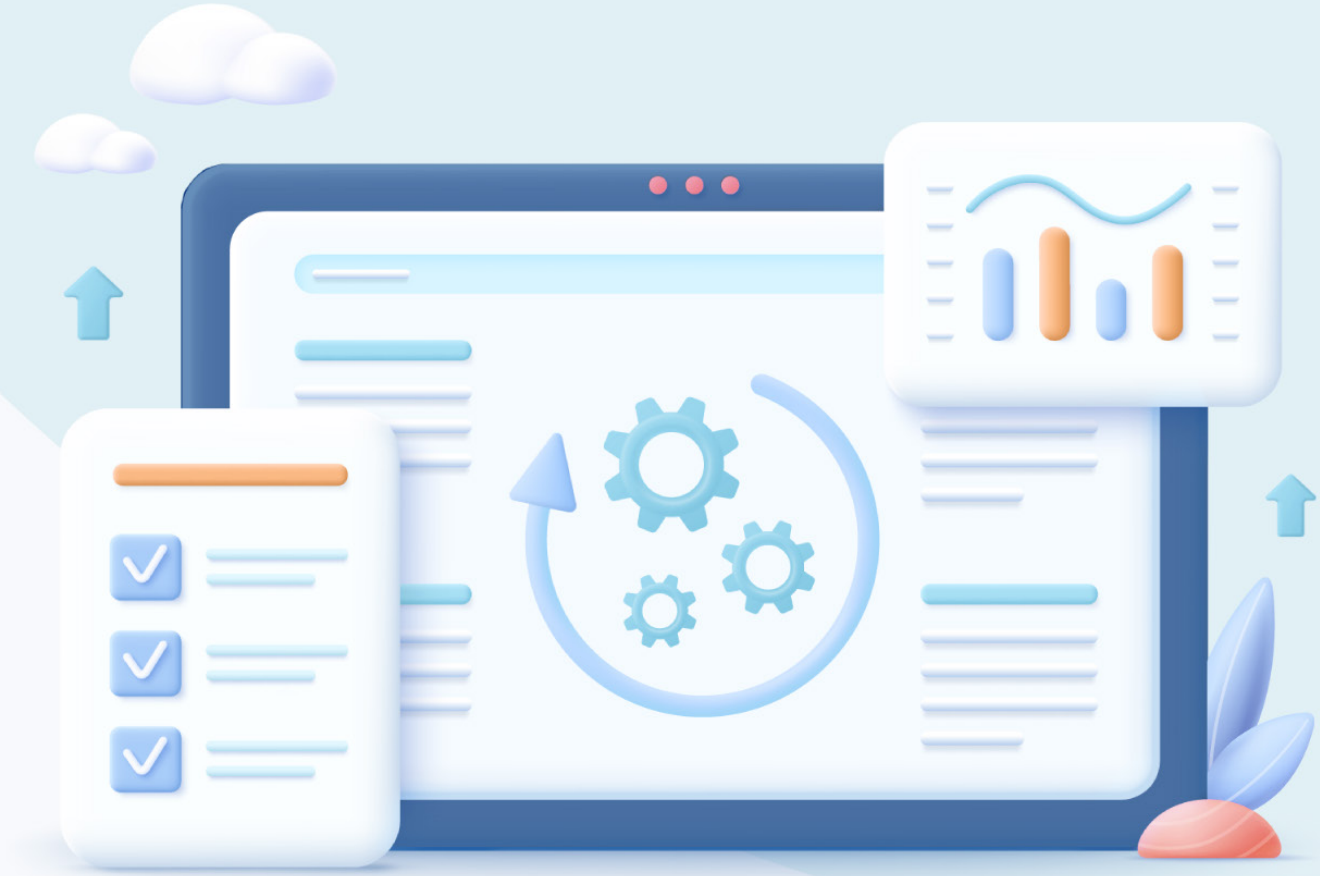


Optimize Lead Times with Data Mining & Data-Driven Workflows

Apply real-time data mining and automated workflows to increase profits, free-up cash, and eliminate waste

elementum™

Introduction to Lead Time Optimization

>80%
of companies

000's
of lanes

+25%
inaccuracy

$MMs
of waste

> "Turn complexity into a competitive advantage with the right technology"
>
> **- Nader Mikhail, CEO Elementum**

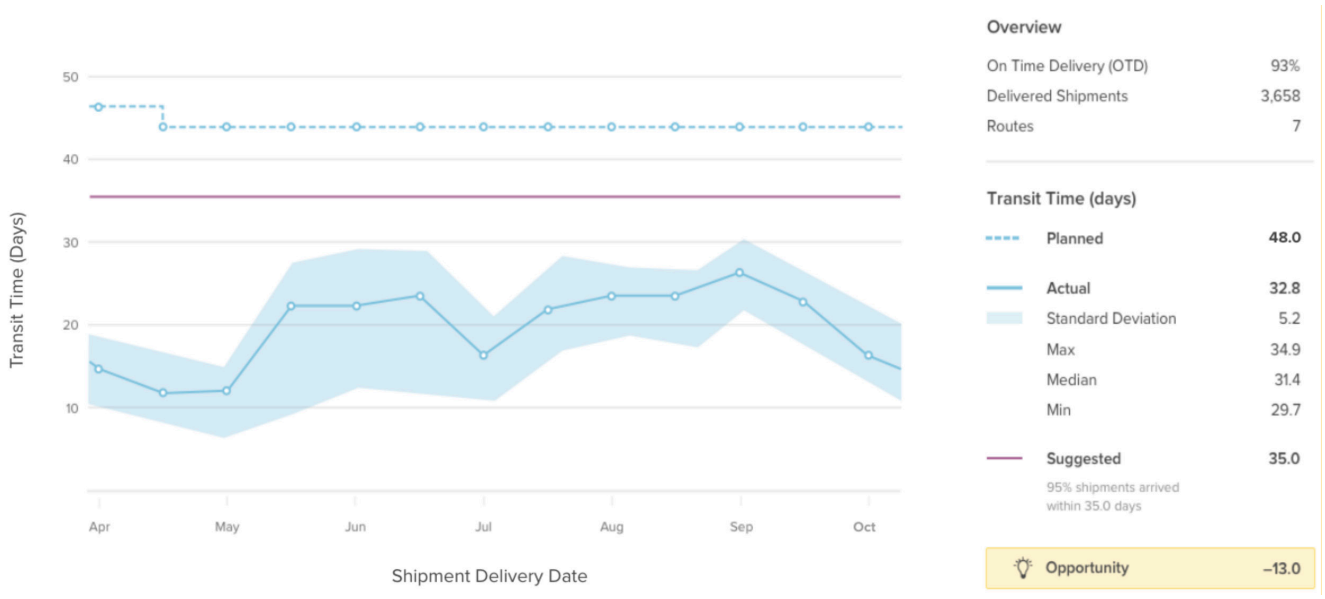
In shipping, lead times refer to the period of time between when an order is first received and when it reaches its customer. Lead times include the processing of the order and then the time spent delivering a package to its final destination.

The main components of lead time planning include:

- The number of shipments and routes (ie lanes)
- The planned delivery time
- The actual delivery time

As you can see in the figure below, there's often a significant gap between planned lead times and actual lead times (ie the "Suggested" lead time), which creates the opportunity for optimization and significant financial benefits.

Measuring Lead Times

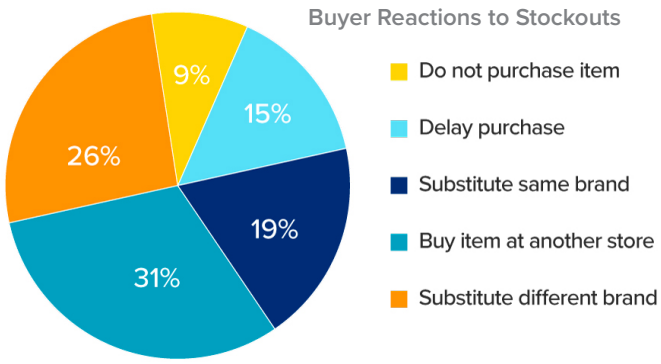


In this white paper, we'll discuss the importance of lead time planning, why it's traditionally been challenging, and how new technology is finally making lead time optimization a reality.

Lead Time Optimization Has Been Overlooked

Predicting lead times is a fundamental part of supply chain management and is important for several reasons:

- **Customer satisfaction**: Accurate lead times are necessary for providing customers with correct delivery dates. This helps to manage customer expectations and prevent disappointment or frustration. According to a *Rakuten study,* 66% of consumers said that accurate delivery dates were a top consideration for online purchases.
- **Better inventory management**: By having an accurate understanding of when products will arrive, companies can optimize to avoid stockouts while minimizing waste and reducing holding costs.
- **Increased efficiency**: When companies can accurately predict shipment lead times, they can coordinate their operations more effectively and reduce the risk of bottlenecks or delays.
- **Competitive advantage**: Companies that can accurately predict shipment lead times are better able to respond to market demands and compete more effectively against other firms. 87% of consumers make their decisions in accordance with delivery time (Dotcom Distribution, 2016). 40% of customers say that on-time shipping increases their loyalty to the company, and 47% won't buy from a retailer again because of bad shipping experience.



A study of more than 71,000 consumers by *Harvard Business Review* showed that retailers can lose nearly half of intended purchases when customers encounter stock-outs.

With majorities of both consumers and businesses demanding high performance, lead time optimization is more than a buzz-word. It's a critical business process requiring immediate action.

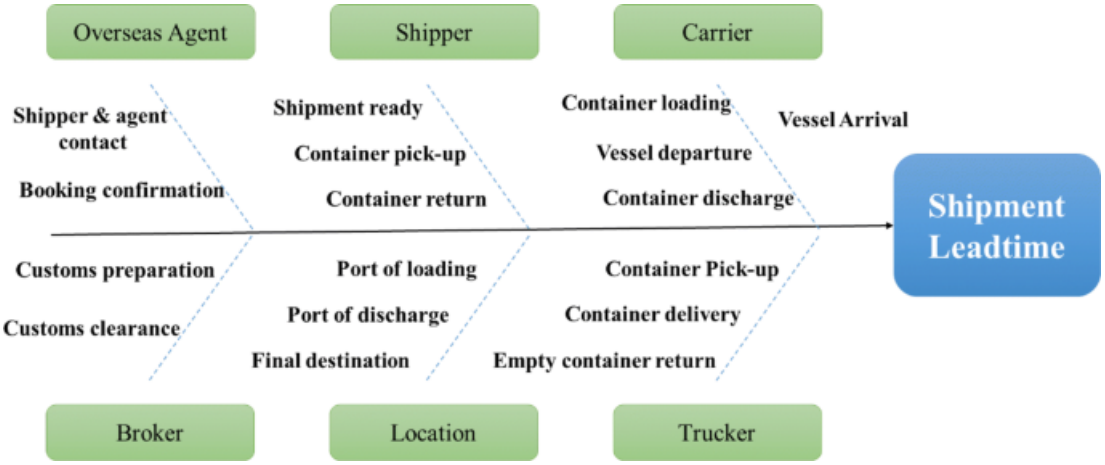
Consistently Predicting Accurate Shipment Lead Times is an Oxymoron

Predicting shipment lead times consistently and accurately can be difficult for several reasons:

1. **Multiple responsible parties**: Supply chain involves many different players: suppliers, manufacturers, logistics providers, etc. Any of these players can experience disruptions or delays that can affect the shipment lead time. For example, a supplier may experience a production slowdown, a manufacturer may face unexpected equipment failure, or a logistics provider may encounter severe weather that delays shipments. These changes need immediate response.
2. **Changing demand**: Companies often face fluctuations in demand for their products, which can make it difficult to accurately predict shipment lead times. When demand is high, lead times may increase, and when demand is low, lead times may decrease. Company-wide revenue is made and lost by managing these levels.
3. **Unpredictable events**: Unpredictable events, such as natural disasters, political unrest, or economic downturns, can have a significant impact on shipment lead times. These events can cause supply chain disruptions, reduce capacity, and increase costs, all of which can make it difficult to accurately predict shipment lead times, leading to uncertainty.
4. **Lack of data**: Many companies struggle to accurately predict shipment lead times due to a lack of data or information. For example, they may not have real-time information about the status of shipments, or they may not have access to data on supplier lead times. Often times this data already exists, but is hard to access quickly.

Inaccurate Lead Times Are Costly for the P&L and Balance Sheet

The challenges in predicting shipment lead times



Source: Hathikal, S., Chung, S.H. & Karczewski, M. Prediction of ocean import shipment lead time using machine learning methods

Predicting shipment lead times is not an enviable task. However, failing to do so has expensive consequences.

While accurately planned lead times can generate a sustained competitive advantage, inaccurate lead times can have major financial consequences, tying up cash and reducing profits:

- Less cash due to excess inventory
- Less revenue due to stockouts
- More costs for holding excess inventory
- More costs (and reputational damage) for dumping obsolete inventory

Financial consequences from inaccurate lead times arise from two common scenarios:

Scenarios:	Lead Times Are Too LONG	Lead Times Are Too SHORT
Result:	Too much inventory is ordered	Too little inventory is ordered
Financial Impacts:	• Cash is tied up in excess inventory • Costs go up (e.g. handling, storage) • Obsolete inventory goes up	• Lost revenue from stockouts • Lost market share to competitors • Lower customer satisfaction

When factoring in all the complexities that go into logistics and inventory management, companies generally default into one of two approaches for setting lead times:

- Set and Forget
- Brute Force
- **Lead Time Optimization**

1. **Set And Forget:**
   This is the 80/20 approach. Instead of spending significant time and energy to estimate planned lead times — which will likely be wrong — companies input a reasonable estimate and only review it as required, like when a new carrier is selected, after a major supply chain disruption, or after receiving customer complaints. This methodology has several flaws:

   a. Planners always err on the side of caution, choosing to incur extra costs than to lose revenue or upset customers
   b. New carriers are typically relied on for their lane estimates, which become contractually required in their SLAs. As a result, the carriers are motivated to incorporate as much buffer-time as possible.
   c. Collectively, major disruptions may seem to happen all the time, but in actuality, they are very rare for any given location. Instead, there are subtle changes happening all the time, such as changes to demand, operational improvements, and normal seasonality.
   d. Waiting for a major event means a lot of potential improvements are left on the table.

   The 80/20 rule is a nice heuristic, but how expensive is a laissez-faire approach? Knowing that one-third of lanes are inaccurate by at least 20% means that companies may be holding as much as 6% excess inventory. For a global company with $5B of inventory, that implies $300M of cash is lost due to excess inventory and $75M is wasted every year on related holding costs.

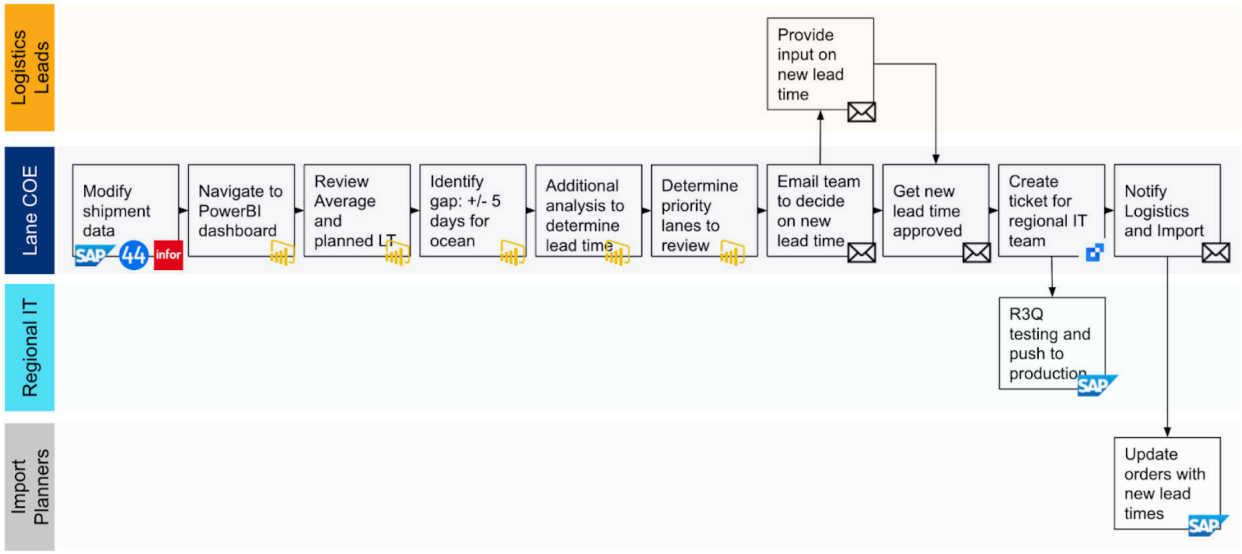
   Set it and forget it may be easy, but it sure is expensive!

2. **Brute Force**:
   Instead of turning a blind eye, some companies will tackle the problem head-on. Unfortunately, with all the challenges mentioned before, there's traditionally been no systematic or efficient way to do this. Instead, companies hire a small army of consultants and analysts to analyze and update planned lead times based on historical shipment data.

   For a typical team of analysts, this becomes a manual, multi-step process defined by number-crunching, debate, and second-guessing.

   In the figure below, you can see the 13-step process to review and update the lead-time for one lane. At best, because of the resource intensity, this process is run once-a-month on a handful of high-priority lanes. At worst, it's a boondoggle of error-prone analysis and opinions.

Standard Process for Manually Evaluating Planned Lead Times



On average, an analyst will commit 4-5 hours per lane between analysis, presentation, evaluation, and implementation. That means, for a global company with 5k lanes, it'll take 12 analysts to review each lane at least once per year. Assuming an off-shore team with $80k fully-burdened cost, that's ~$1M per year. A lot can happen in a year, however. To capture the majority of benefits, the process likely needs to be run quarterly or even monthly, increasing the costs to $4M or $12M annually. For dynamic inventory management that moves in lock-step with demand, the process should be run weekly, which would cost $52M per year.

By looking at the numbers alone, it would seem clear that brute force, while tedious and expensive in its own right, would be the better approach. Although, it should be obvious that brute force is still far from ideal. Managing offshore teams is never easy. Any manual process will be error prone, especially one with so much analysis. The estimated costs are far from comprehensive since there are many other people still being pulled into the process. And, finally, linear scaling to capture the full benefits if far from optimal, especially for a growing company.

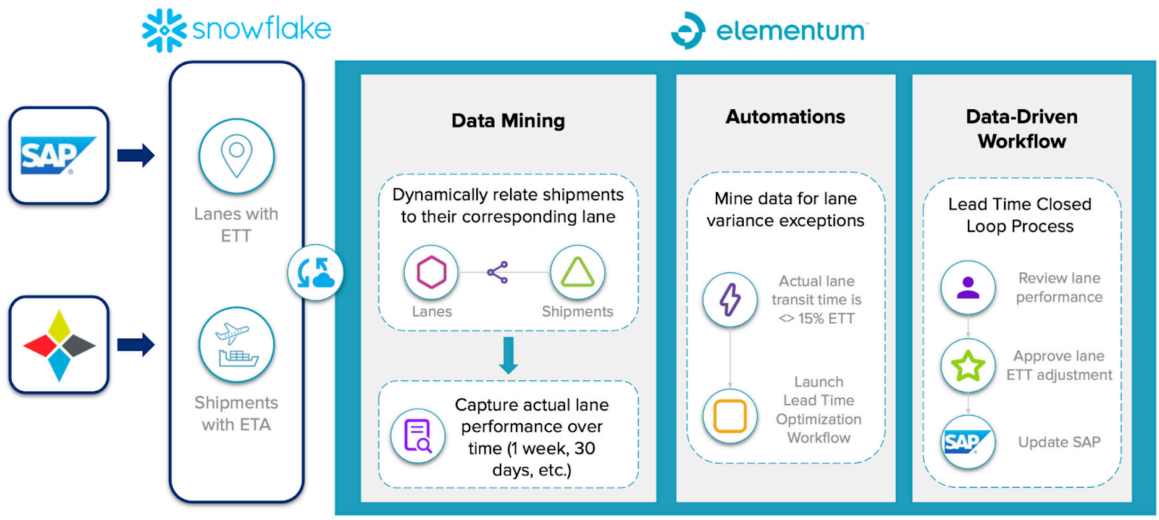
Fortunately, there is a better way!

3. **Lead Time Optimization**

Optimize Lead-Times With Data Mining and Data-Driven Workflows

Elementum has introduced the first solution that dynamically mines logistics data for lead time anomalies and then automates the evaluation and implementation of updated lead times via data-driven workflows. We can see how this works in the figure.

Lead-Time Optimization with Elementum



Elementum's solutions were architected to be cloud-native, which means they're pre-integrated with modern data lakes, (such as Snowflake, Databricks, AWS, and Azure,) and do not require any new integrations.

Within the data lake, Elementum has real time access to all the relevant logistics data (e.g. shipments, lanes, orders, etc.). From the data lake, Elementum dynamically mines the logistics data for discrete events or patterns worthy of triggering action.

In the figure above, we can see how data mining applies to lead time optimization by flagging shipments with actual lane transit times greater than or less than 15% of the expected transit times. This is a simplified analysis, and more complex triggers will include standard deviations, seasonality, and geographic or product-specific anomaly detection.

After an exception is triggered, Elementum uses data-driven workflows to convert action into automation. More specifically, as thresholds are exceeded, SLAs breached, or dates surpassed, workflows are automatically initiated to engage, escalate, and optimize. In this case, flagged lead times are escalated for review, approved for adjustment, and updated back in SAP. All of this is done directly within Elementum.

Elementum offers out of the box automations, but users can also build their own. In addition, users can pre-program recommendations to execute immediately from the automations. The below figure shows a sample of the different combinations of triggers, automations, and recommendations.

Because Elementum is connected directly to the data, both the data mining and automations are continuously performed. As a result, updates are being constantly analyzed and refined as needed. This reduces risk and speeds up the review process because any update will be immediately reevaluated as soon as it misses the mark. This also gives teams the confidence to set tighter thresholds to maximize savings.

Sample Combinations of Triggers, Automations, and Recommendations

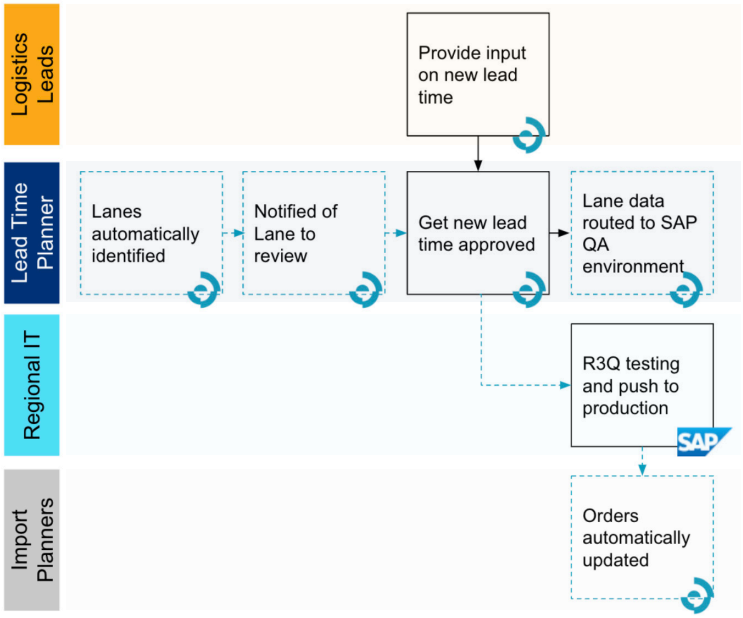
Relationships	Data Mining	Automations	Recommendations
Shipments aggregated by lane (OD pair)	Ave Transit Time > Estimated Transit Time	Create Lead Time Optimization workflow	Recommend Non-conformance if repeated lane delay
Late shipments aggregated by carrier	Ave Transit Time < Estimated Transit Time	Assign work based upon the lane's region	Recommend RFQ to contract with new carrier
	Ave Transit Time < Contracted SLA	Set priority based on the % under/over ETT	Recommend price reduction to deplete inventory
		Notify carrier when actual is greater than contracted time	
		Request approval from manager to approve reduction	
		Update SAP with new estimated lead time	

When compared to the standard, manual process, you can see the striking differences. Spreadsheets and BI are replaced with real-time data mining. Emails and tickets are replaced with data-driven workflows.

To recap, with Elementum, the process for lead time optimization goes from weeks to minutes with several notable benefits:

- Lead time improvements are proactively identified
- Manual calculations are replaced with autonomous data mining
- Multiple data sources can be mined for maximum accuracy
- Approvals are automatically routed based on predefined workflows
- There's a single source of truth for all lead time data and changes
- The process scales efficiently across thousands or tens-of-thousands of lanes
- The system is self-learning, adjusting up or down based on the latest data

Evaluating Planning Lead Times with Elementum



Step-by-Step Guide to Optimizing Lead Times with Data Mining and Data-Driven Workflows

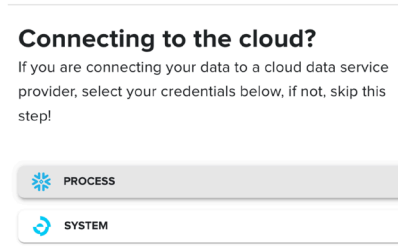
Elementum is a no-code solution designed for simple implementation and rapid adoption. Below is a step-by-step guide on how to use Elementum to improve lead time planning. The process has been broken down into three phases:

1. Data preparation
2. Lane analysis
3. Update lead times

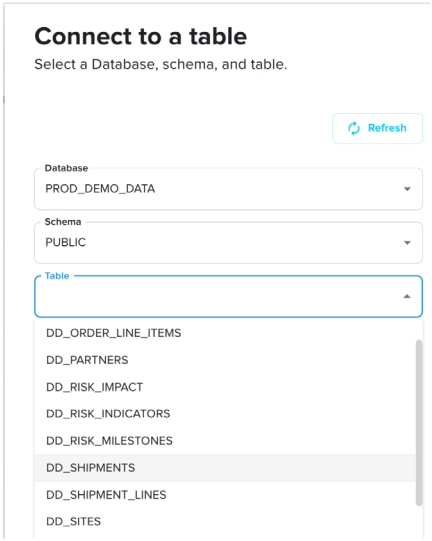
At the end of each phase, we've provided a sample RASCI to illustrate specific responsibilities by team.

1. **Data Preparation: Set up Automated Data Mining**
    a. Load Shipment data into your company's cloud data lake. The data should include both
        i. shipments with an actual ship date and actual delivery date, and
        ii. shipments in transit with Expected Times of Arrival. Shipments should have a reference ID associated with the code for the lane that is to be optimized. This data likely already exists in your database, Elementum helps you interpret it
    b. Connect the Elementum platform to the data cloud solution to allow Elementum to view data in the data cloud. This is different from connecting solutions via API which will copy and move data. When Elementum connects to a cloud data lake, no data is moved or copied.

Logging Elementum Into Your Cloud Data Lake



Connecting to Data Tables



    c. Grant access for Elementum to view the Shipments, Lanes, and Purchase Orders.
    d. Create an Automation that defines the parameters for when a lane should be reviewed. An automation is a natural language condition that will trigger an action in the platform. A common example would be: "create a ticket when, on the lane, the average transit time for shipments delivered within the last 45 days is more than 20% different than the planned lead time."
    e. Once the Automation has been created, Elementum will begin to continuously mine the shipment data based on the pre-defined trigger in the Automation

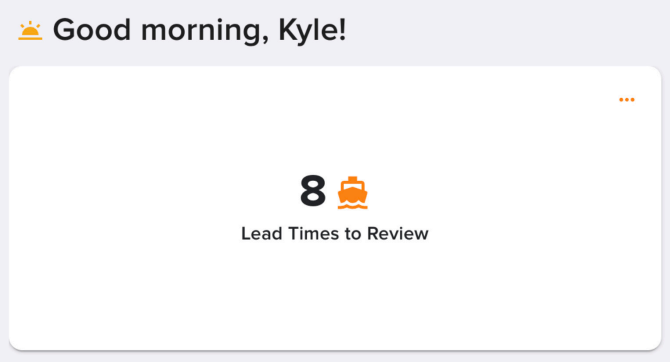
Data Being Mined in Elementum

Roles and Responsibilities

Process steps	IT	Business	Elementum
A	A/ R	C	I
B	C	A/ R	C
C	C	A/ R	C
D	I	A/ R	C
E	I	I	Automated

2. **Lane Analysis: Manage optimization opportunities**
    a. Exceptions in flagged lanes will automatically trigger data-driven workflows that initiate tickets and assign them to project managers.

Homescreen for a Project Manager to Review Lead Time Exceptions

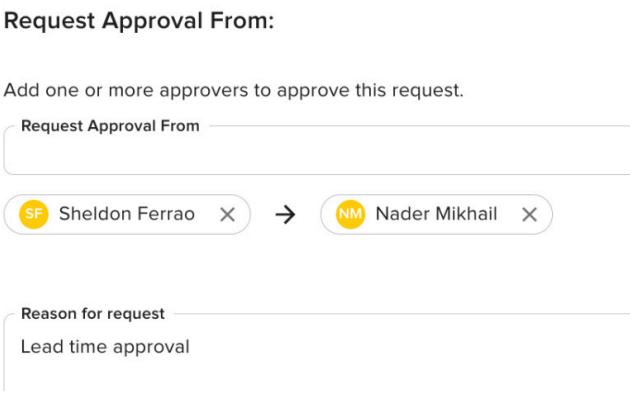


Data Being Mined in Elementum

handle	Lane ID	Stage	Priority	Assignee	Current Lead Time	Average Transit Ti...	New Lead Time
LTO-74	5279	2 / 3	High	Kyle Westwood kwestwood@elementum.com Supply Chain Manager	98	58	70

    b. Logistics Leads provide Input on the new proposed planned lead time.
    c. Import Planners and Inventory Managers are automatically notified that a lead time is being reviewed.
    d. The proposed lead time is automatically routed for approval. SLAs are defined for each step, escalations are included if an SLA is missed, and there is a fully populated audit log.

New Lead Times Are Approved



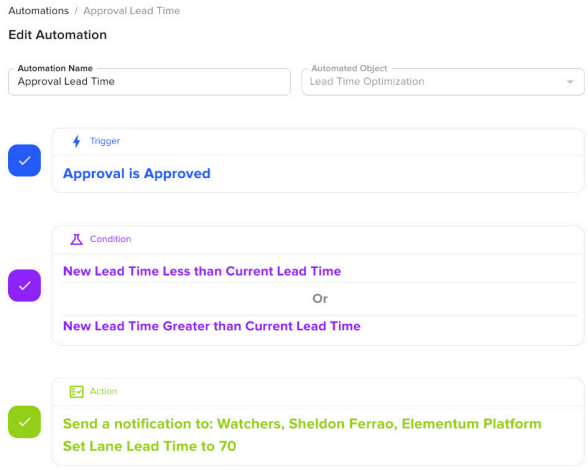
Roles and Responsibilities

Process steps	IT	Business	Elementum
A	N/A	I	Automated
B	I	A/ R	N/A
C	I	A/ R	N/A
D	I	A/ R	Automated

3. **Update new lead times**

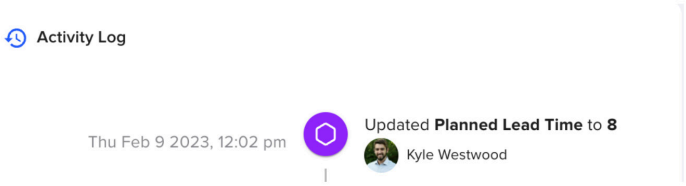
   a. Create an Automation to update new lead times automatically

Automation for Updating Lead Times



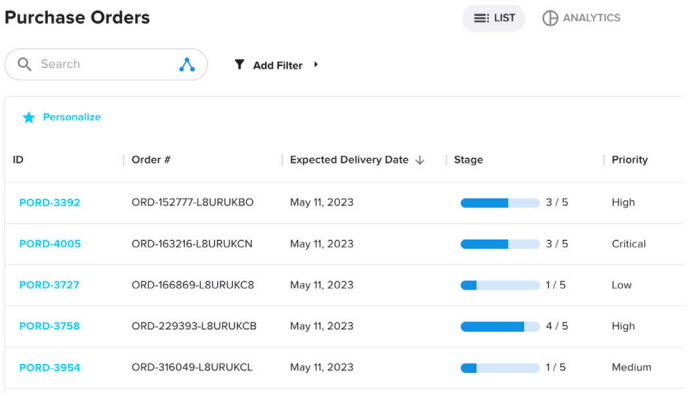
   b. Upon approval from Phase 2, the Automation will automatically update the Lanes table in the cloud data lake with the updated lead time value.

All Changes are Tracked in an Audit Log



   c. The new lead time will be pushed back into the source system table or to a QA queue for an initial check before pushing to production.
   d. Once the lead time in the source system updates, an Automation will run in Elementum updating the lead times on all planned Purchase Orders related to that Lane.

New Lead Times are Automatically Updated on Purchase Orders



Roles and Responsibilities

Process steps	IT	Business	Elementum
A	C	A/ R	C
B	I	I	Automated
C	I	I	Automated
D	I	I	Automated

Example: Value of Optimizing Lead Times

Before we close, let's walk through an example of how lead time optimization with Elementum can have significant financial benefits.

General Assumptions:

- Manufacturing company
- $2B in inventory
- 100 Days of Supply (DoS)
- 5,000 lanes

Lead Time Assumptions:

- 35% of lanes can be optimized per year
- 3 days average optimization
- 25% inventory holding costs

Sizing the Opportunity:

- $20M inventory per day ($2B / 100 DoS)
- $4k of inventory per lane / day ($20M / 5k lanes)
- 1,750 Lanes can be optimized (5k lanes x 35% optimizable)

Calculating the Savings:

- $21M inventory reduction ($4M inventory / lane / day x 3 days x 1,750 lanes)
- $5.3M lower holding costs (25% of inventory reduction)

In this scenario, the company returns $21M of cash and saves $5.3M of expenses annually. Of course, not all Lanes will have equal volumes, but this analysis uses averages to illustrate the point.

Learn More

Elementum provides a reliable and efficient solution to managing lead times, allowing companies to optimize their operations, reduce waste, and improve margins and cash flow.

If you're interested in evaluating Elementum for your logistics or inventory operations, we'd be happy to discuss or arrange a demonstration.

To request more information, email *info@elementum.com*.
You can also read customer success stories at *www.elementum.com/customers*.