POINT OF VIEW

Predictive Supply Chain Risk Management

How Tredence helps organizations avoid getting caught in disruption's ripple effects with stringent predictive capabilities

Hemanth Holla
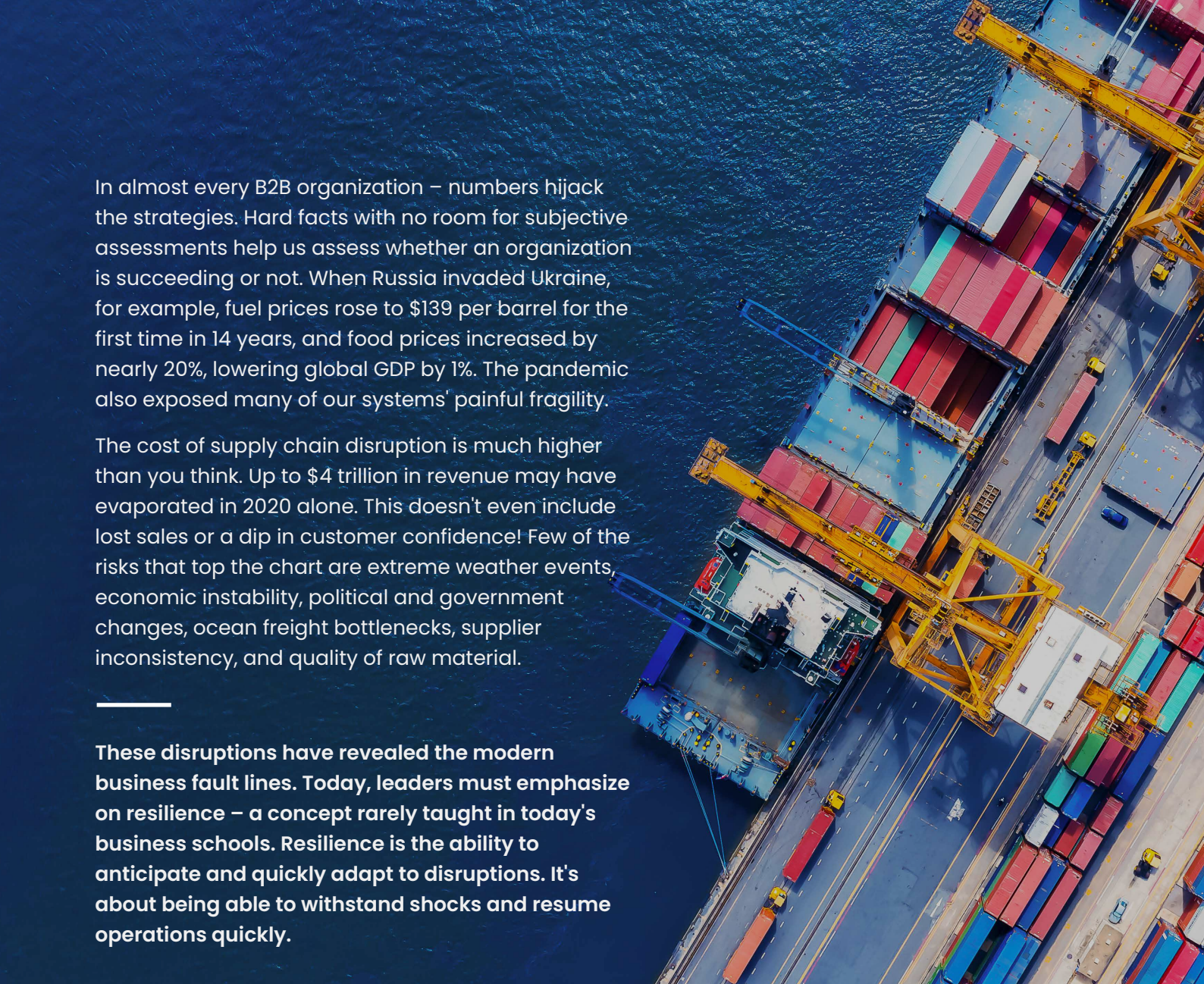Director, Supply Chain Products,
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In almost every B2B organization – numbers hijack the strategies. Hard facts with no room for subjective assessments help us assess whether an organization is succeeding or not. When Russia invaded Ukraine, for example, fuel prices rose to $139 per barrel for the first time in 14 years, and food prices increased by nearly 20%, lowering global GDP by 1%. The pandemic also exposed many of our systems' painful fragility.

The cost of supply chain disruption is much higher than you think. Up to $4 trillion in revenue may have evaporated in 2020 alone. This doesn't even include lost sales or a dip in customer confidence! Few of the risks that top the chart are extreme weather events, economic instability, political and government changes, ocean freight bottlenecks, supplier inconsistency, and quality of raw material.

These disruptions have revealed the modern business fault lines. Today, leaders must emphasize on resilience – a concept rarely taught in today's business schools. Resilience is the ability to anticipate and quickly adapt to disruptions. It's about being able to withstand shocks and resume operations quickly.

Mitigating supply chain risk should be a top priority for business leaders today, focusing on two major elements:

Supply Risk Management (or Unknown Risk Management)

Supply risks are increasing, and businesses face uncertainty regarding receiving the supplies of raw materials on time or receiving at all. This has led to a huge drop in the customer satisfaction index. However, these risks cannot be predicted much in advance and hence cannot be mitigated too; they; however, they are manageable.
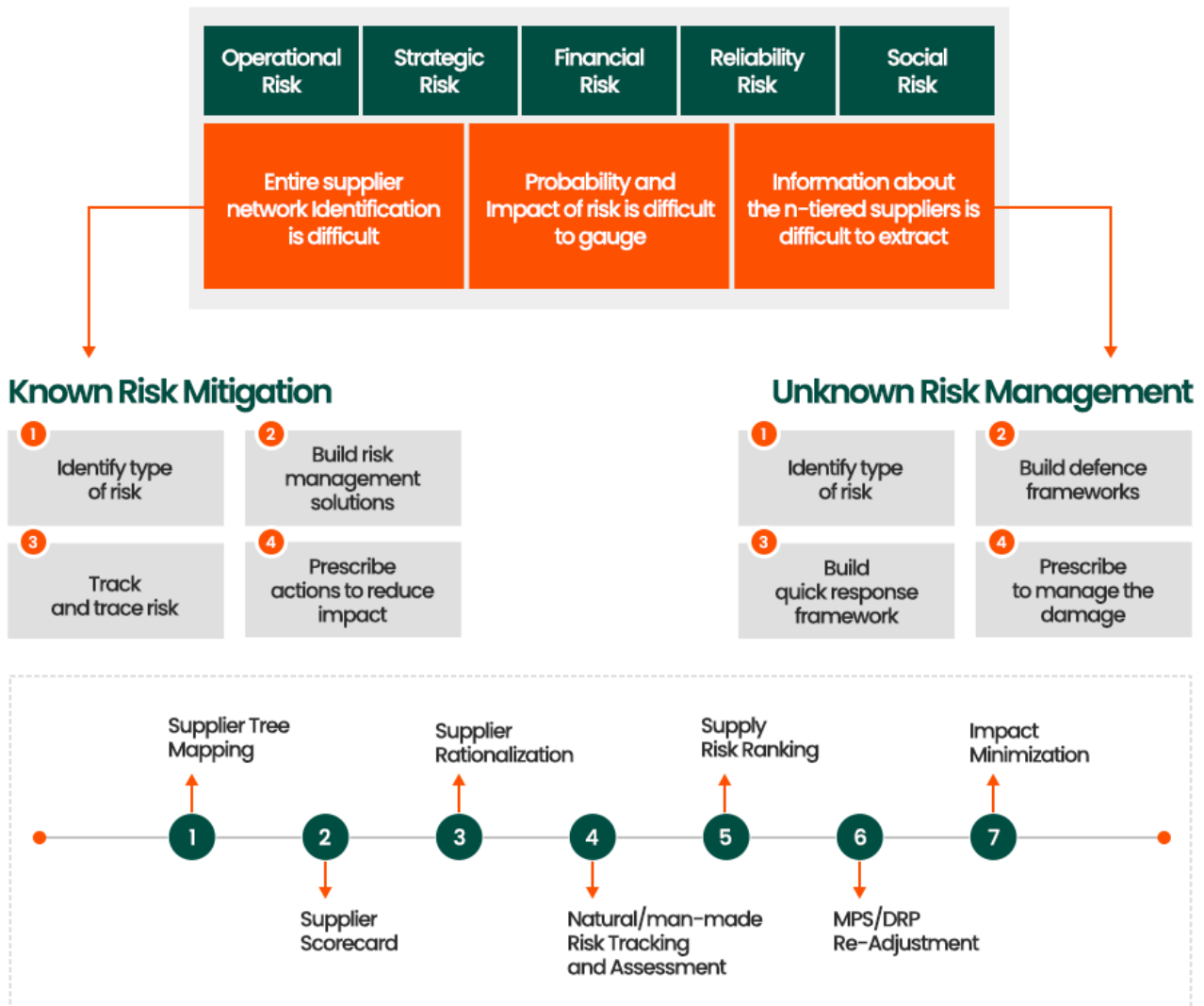
According to cips.org, supply chain disruptions in 2021 rocketed by 88% following the pandemic, with the top six disruptions being factory fires, mergers and acquisitions, business sales, factory disruptions, leadership transitions, and supply shortages. The disruption category that experienced the biggest increase was supply shortages; this increased by 452%. Other significant increases in disruption included extreme weather (up 130%), cyber-attacks (up 143%), and labor strikes (down 63%).

Risk assessment helps us identify our vulnerabilities so we can better deal with potential setbacks when they happen, but a **short-term tactical resolution is required to reduce the overall loss.**

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Supplier Risk Mitigation (or Known Risk Mitigation)

Risks can build up over time and be identified through historical patterns. It should be handled strategically by changing the mix of suppliers, diversifying the supplier base, or thoughtfully adding or removing a supplier.

A third (34%) of firms in a recent survey had no idea how well their suppliers were functioning; three quarters (73%) cited a lack of evaluation of the situation as a reason for not assessing suppliers. The top reasons for not assessing suppliers were a lack of time (37%), lack of software (24%), and not feeling the need to do so (18%).

Operational Risk	Strategic Risk	Financial Risk	Reliability Risk	Social Risk
Entire supplier network Identification is difficult		Probability and Impact of risk is difficult to gauge	Information about the n-tiered suppliers is difficult to extract	

Known Risk Mitigation

1. Identify type of risk
2. Build risk management solutions
3. Track and trace risk
4. Prescribe actions to reduce impact

Unknown Risk Management

1. Identify type of risk
2. Build defence frameworks
3. Build quick response framework
4. Prescribe to manage the damage

1. Supplier Tree Mapping
2. Supplier Scorecard
3. Supplier Rationalization
4. Natural/man-made Risk Tracking and Assessment
5. Supply Risk Ranking
6. MPS/DRP Re-Adjustment
7. Impact Minimization

What is the need for an end-to-end supply chain risk management solution in the market today?

Many solution providers and product innovators have attempted to build a supply chain risk management solution. However, the majority of them are merely risk-sensing systems. These systems provide insight into the business's risks but do not quantify the downstream impact on revenue or provide recommendations to minimize financial exposure.

The need of the market is to have a solution that can:

- **Map end-to-end supply chain** with all the nth tier suppliers

- **Identify the risks,** both long-term and short-term

- **Evaluate the downstream cross-functional impact** on the supply chain

- **Provide AI-based smart recommendations** to minimize the impact

- **Provide a collaboration platform** to react quickly

- **Provide approval workflow** across the hierarchy

In today's fast-paced business environment, it's critical for businesses to be prepared with a solid plan for dealing with both known and unknown risks. Tredence stands out when it comes to mitigating supply-chain disruptions while capturing the end-to-end value of your supply chain strategy. Here are a few points to consider when choosing between our Supply Chain Risk Management solution and others:

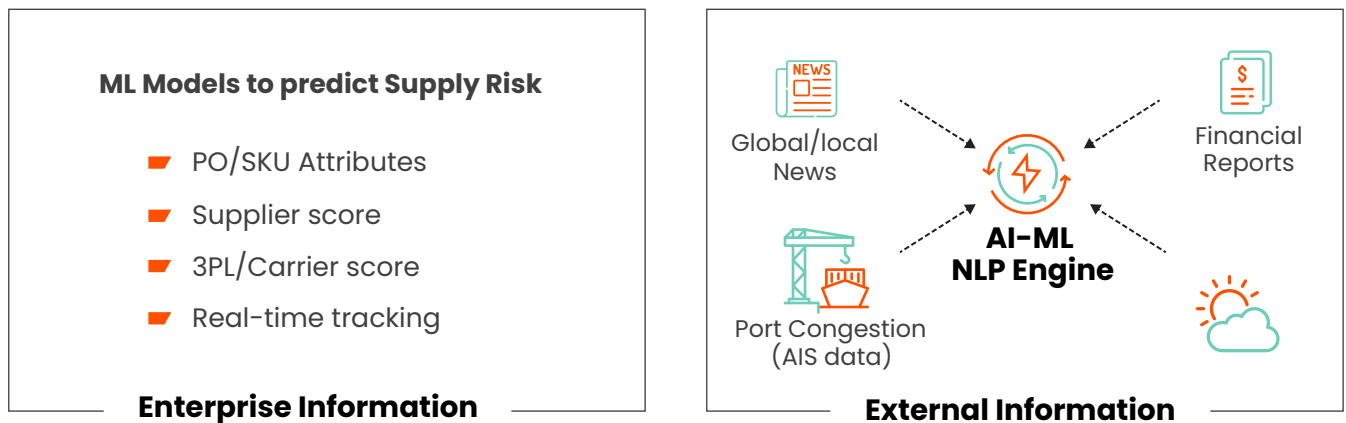| Solution Elements	Tredence's Supply Chain Risk Management Solution	Most other Risk Management Solutions
E2E Supply Chain Mapping	✓	✓
Global Risk Identification and Prediction	✓	✓
Risk Assessment	✓	✓
Cross-Functional downstream impact of risk on supply chain	✓	✗
Prioritization of risk to be managed - Immediate Vs. Distant, High Vs. Low Impact	✓	✗
Simulation Workbench - AI recommendations to minimize the dollar impact	✓	✗
Platform to collaborate with various stakeholders and take corrective decisions	✓	✗

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Introducing Tredence Predictive Supply Risk Management Solution

Tredence's predictive supply risk solution has the below key components:

1. ML-driven engine to predict delays to inbound orders/shipments
   - Predict ETA against every shipment
   - Highlight potential root cause for at-risk shipments
2. Near real-time visibility to all inbound shipments with delay alerts
3. Use of various external as well as internal data to predict delays accurately
4. Quantify and qualify the downstream impact on the supply chain
5. Prescriptive models and simulation layers to mitigate the supply chain risks

## 1. ML-driven engine to predict delays to inbound orders/shipments

The predictive supply risk management engine uses ML algorithms and various internal and external datasets to accurately predict delays in upcoming in-transit raw materials & SKUs so businesses can have the agility to mitigate supply chain risks based on the predicted arrival date.

ML Models to predict Supply Risk

- PO/SKU Attributes
- Supplier score
- 3PL/Carrier score
- Real-time tracking

Enterprise Information

Global/local News

Financial Reports

Port Congestion (AIS data)

AI-ML NLP Engine

External Information

Predict Supply Risk at PO Level

PO ID	Shipped From	Shipped To	ETA	Predicted LT	Potential Revenue Loss	Delay Reason	Score
OID-27282	SUP-01	DC-01	2022-05-09	23	$43.11 K	Weather Event	3
OID-6582	SUP-02	DC-01	2022-05-08	22	$32.14 K	Carrier Delay	5
OID-24282	SUP-01	DC-02	2022-05-12	15	$22.12 K	Cargo Rollover	7

● 1-3 : On-Time   ● 4-5 : Potential Risk   ● >=6 : Risk Alert
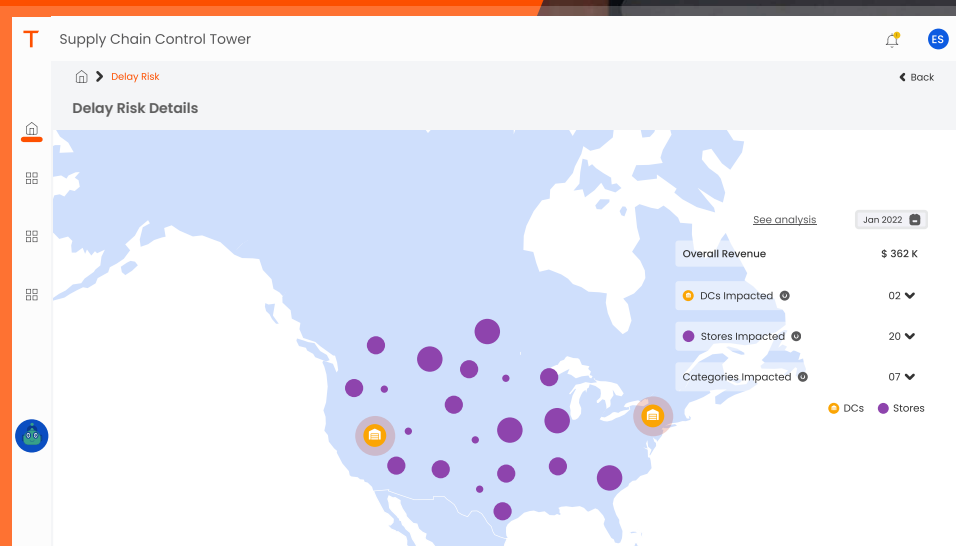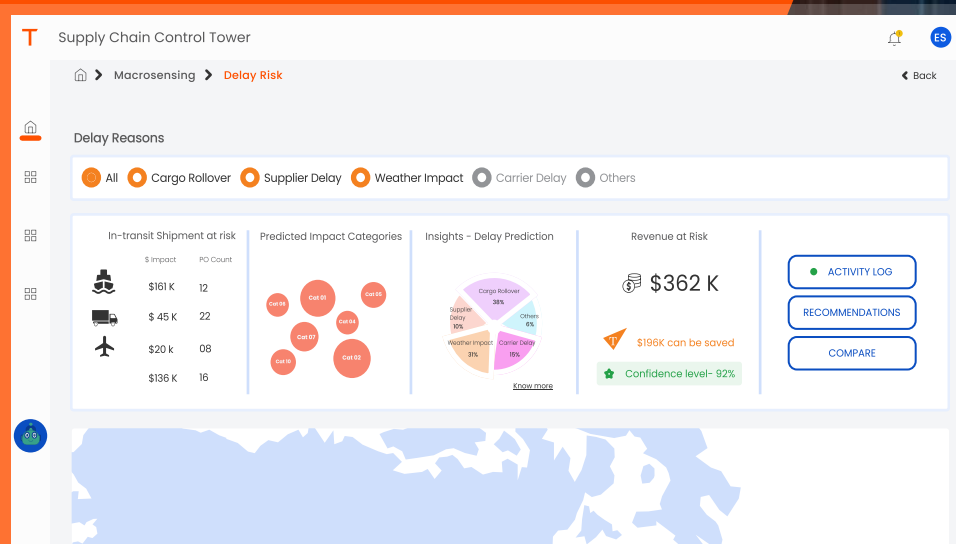
2. Near real-time visibility to all inbound shipments with alerts to flag the potential delays

The application can provide near real-time visibility of shipments considering tracking data across first-party TMS systems, carrier TMS, vehicle GPS systems, and aggregators like P44/4Kites, etc. The insights are available both at a granular level, and aggregate levels to answer questions like how many shipments & SKUs would be delayed at my plants/DCs in the next seven days.
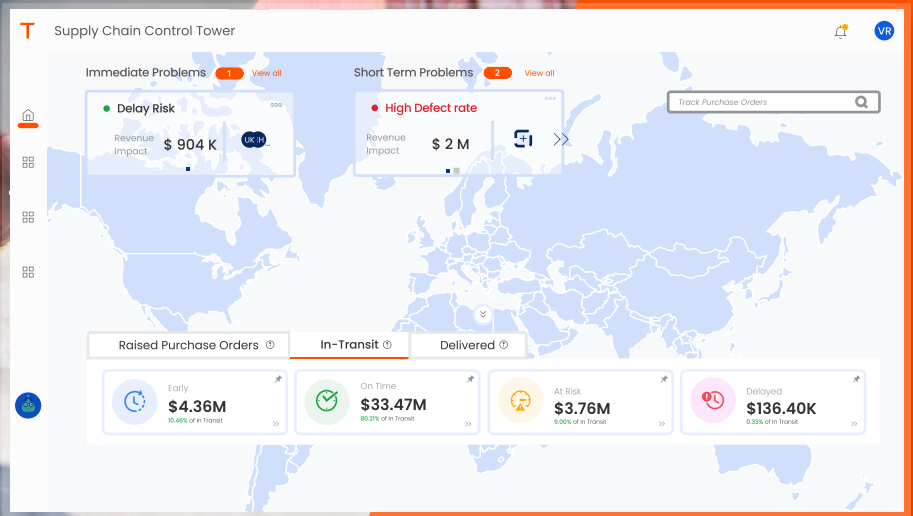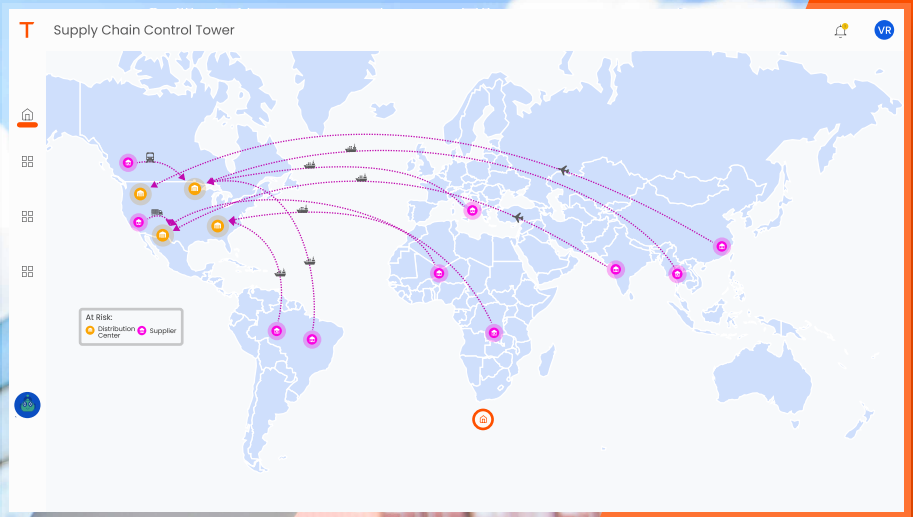
3. Use of various external as well as internal data to predict delays accurately

External data from multiple sources such as government websites, social media, news, etc. are analyzed using AI/ML techniques:

Weather reports in supplier geography and shipment's planned route

Traffic data: This is massive data fetch exercise. Refreshed weekly for more than a million data points for the route used for commute

Financial magazines for financial information about the supplier

AIS data to track the movement of ocean shipment (in case of multi-modal)

Social media data: Download all the tweets, reports, and alerts from the select news handles and articles. It generates more than 200k data points from all the different handles

Internal data such as purchase order data, in-transit shipments, BOM, master datasets (plant, material, carrier), tracking data, ERP, and TMS is considered as well.
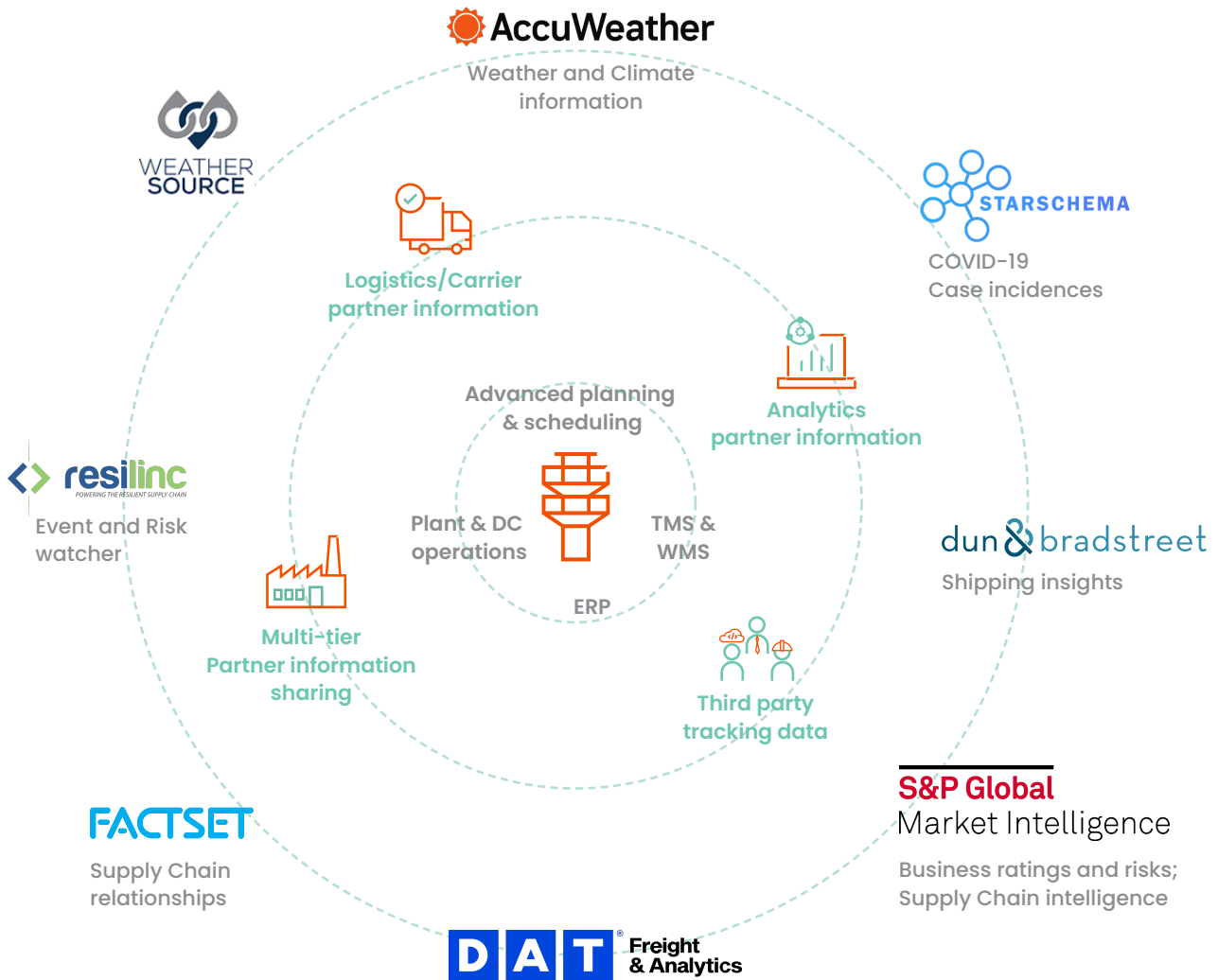
Representative set of first party, third party, and external data

4. Quantify and qualify the impact on the downstream supply chain

In case of both planned or unplanned events (like weather disruptions and geo-political instability), the solution provides connected insights into the impact of supply chain disruptions (across areas like transportation, store operations, DC operations, fulfillment, and more), providing a holistic idea of the impact and the monetary values involved.
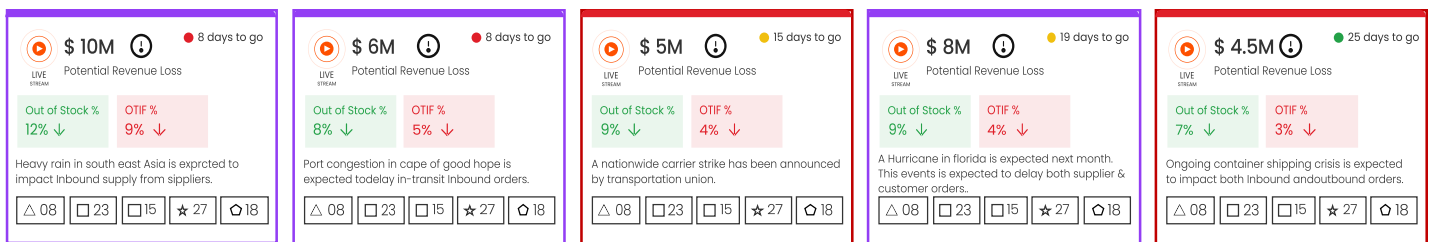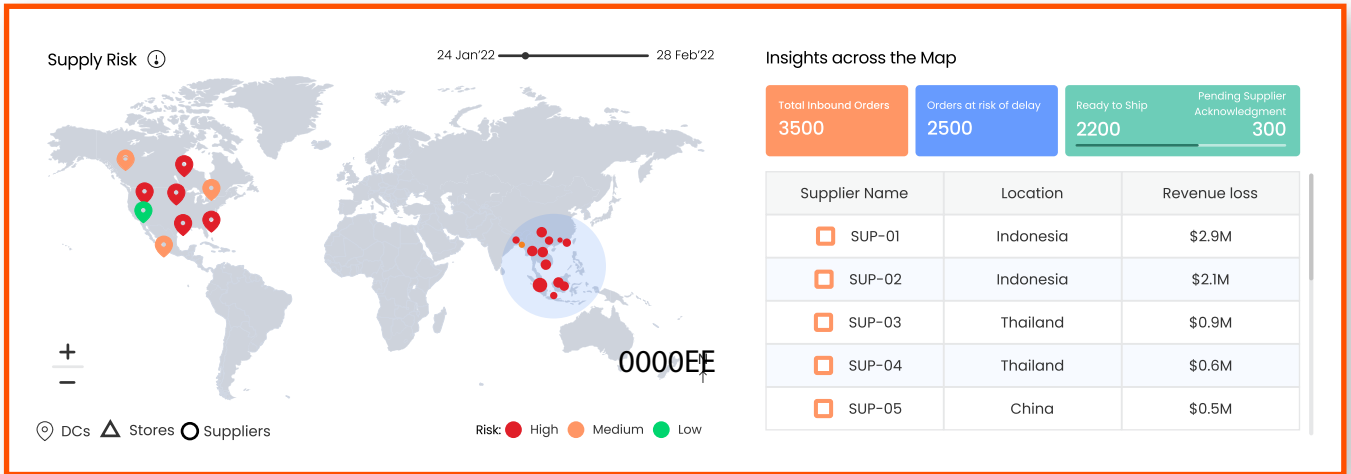
E.g., heavy storms in Southeast Asia could reduce the capacity of my primary supply base by 60% for three weeks resulting in an increase in out-of-stock by 2%

E.g., 60% risk to my inbounds supplies could lead to -

- Reduction in OTIF by 9% for certain key categories
- 4% increase in transportation capacity and a 6% increase in warehouse labor capacity
- Potential revenue loss of $7 million
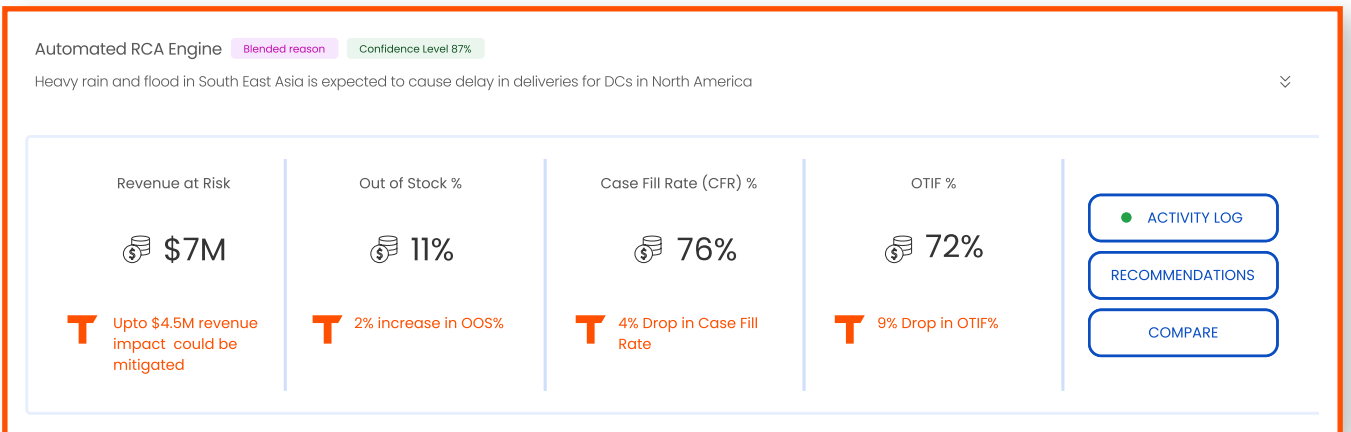
## 5. Prescriptive models and simulation layers to mitigate the supply chain risks

Tredence's predictive supply risk management solution has a powerful AI-driven recommendation engine along with powerful cross-functional scenario planning capabilities.

- AI-driven recommendation engine recommends best actions by analyzing various scenario options and maximizing the business objectives
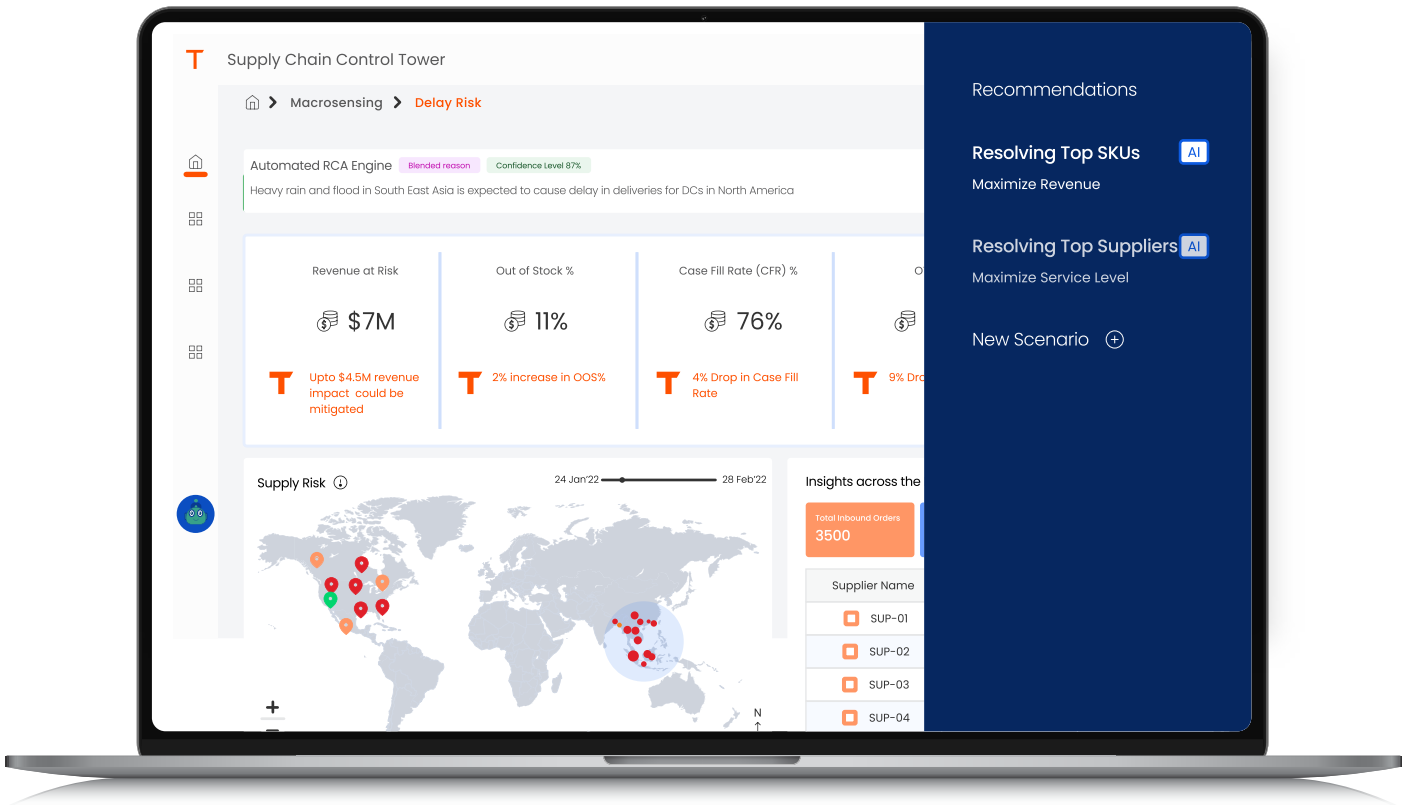
☛ "Cross-functional scenario planning" helps analyze multiple solution options and choose options with the best all-round performance across the value chain

E.g., The solution could aim for a target service level of 85% across 75% of SKUs by revenue, or aim for 90% OTIF across categories/items
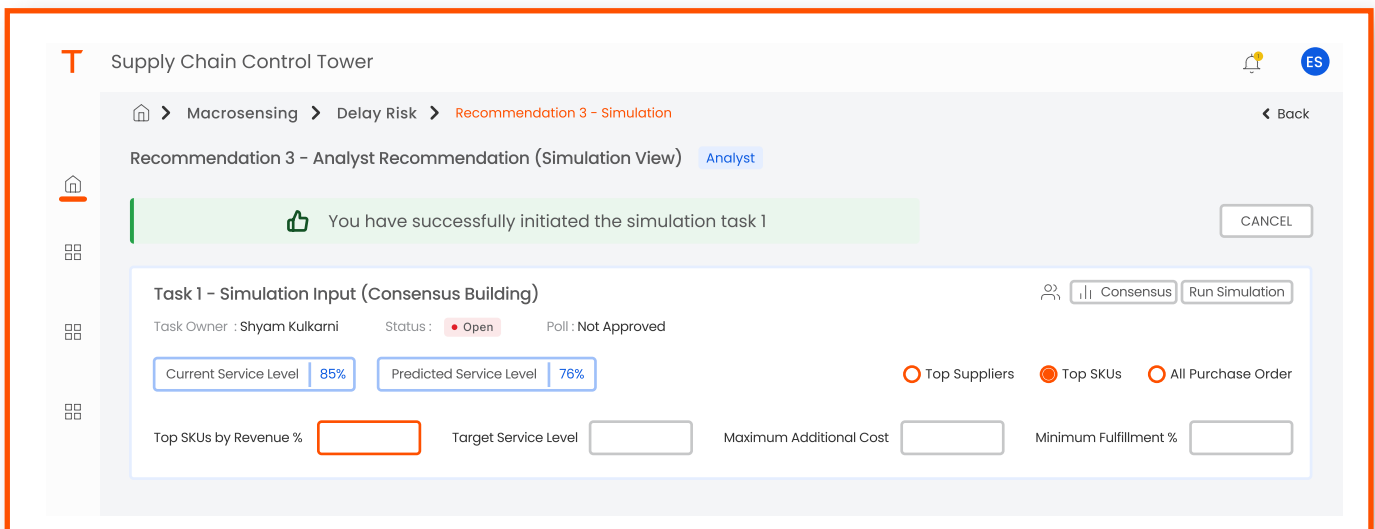
Supply Chain Control Tower

Macrosensing > Delay Risk > Recommendation 3 - Simulation   ‹ Back

Recommendation 3 - Analyst Recommendation (Simulation View)   Analyst

Task 2 - Simulation Report Output   (36% of PO resolved)   Consensus   Approve

Task Owner : Shyam Kulkarni   Status : ● Open   Poll : Not Approved

Resolution Type	No. of POs	$ impact recovered
Create stock transfers	10	$ 81K
Create expedite orders	08	$ 55K
Create new PO at alternate vendor	05	$ 31K

Total PO Resolved	23	Total Impact Saved	$ 160K	Expected Service Level	80%	Additional Cost	$ 36K

➤ Trade of analysis engine will help choose the best option by considering the business objective and cost involved

Supply Chain Control Tower

Immediate Problem > Delay Risk > Recommendation Comparison

North America ⌄

PO prioritization engine has identified 100 POs which can be expedited to reduce the revenue impact of $ 362K

Recommendations	Additional Cost	% of Risk mitigated	Revenue Recovered	Service level offered	Recommended By
Maximize Revenue	$ 51K	77.20%	54.20%	75%	Elon
Maximize Service Level	$ 90K	85.20%	38.90%	81%	Elon

SIMULATE NEW SCENARIO   COMPARE

Impact and Outcomes

$90 million
in revenue loss was identified due
to stock-out risks

50%
reduction in supply chain disruptions

80%
accuracy in lead time

Improved
prediction

Increased
precision

Why Databricks?

A risk management solution should have
a platform capable of:

On-demand access to data and information for analysis

A powerful solution would need the capability to fetch a couple of billion news, articles, tweets, and other updates to keep the risk monitoring live every second. This would require hitting more than 4 to 5 million sources in different languages, including news channels, govt reports, and social media platforms. Making these live connections requires the capability to fetch information from these sources quickly with zero latency.

High computational power and processing efficiency for data processing and analyzing

Data gathered from millions of sources must be processed for relevant information extraction through text mining, classification into useful versus non-useful information, extraction of outcomes like the date of event or sentiment from the news feeds, and more. This requires high computational power to convert the immense volume of unstructured data into a structured format so that it can be fed to machine learning models to gather insights from it.

High computation power is also required to generate the best possible scenarios and evaluate user-created scenarios in minimum time to enable the customer to react faster and mitigate or manage the risk.

Streamlined deployment of ML models to calculate risk with high accuracy

To compute any emerging risk to the business, a combination of traditional and new-age machine learning models is required to find patterns from various inputs, such as weather, news, and social media. These models running 24x7 on the various data feeds can provide risk scores with high accuracy, keeping a watch on false alerts.

Databricks is the go-to platform for deploying and scaling a robust risk management solution

As businesses face an ever-changing landscape of compliance regulations and customer expectations, there is a dire need to accelerate machine learning and analytics initiatives. Databrick's platform complements us in this initiative and provides a stringent platform for building and deploying a risk management solution to succeed in today's customer-first businesses.

Tredence's risk management solution built on Databricks' platform can help businesses meet the supply chain risk challenges by providing a scalable, cloud-based solution that can be tailored to the specific needs of each organization. The platform's flexibility and scalability will allow businesses to keep pace with changing regulations and customer demands, while our comprehensive suite of tools will help them identify and mitigate risks across the enterprise.

With Databricks and Tredence, businesses can build a risk management solution that is fit for the future.

About Tredence

Tredence is a data science and AI engineering company focused on solving the last mile problem in analytics. The 'last mile' is defined as the gap between insight creation and value realization. Tredence is more than 1,600 employees strong, with offices in Palo Alto, Chicago, Toronto and Bangalore, with the largest companies in CPG, retail, hi-tech, telecom, travel and industrials as clients.

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