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### Three Practical Tips For Designing a More Resilient Supply Chain

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In the aftermath of COVID-19, supply chain disruptions have emerged as one of the most significant challenges for organizations worldwide. The call for a resilient supply chain has become paramount, yet resilience often comes with a substantial price tag. Costs can include additional safety stock, relocation of manufacturing bases, and building in redundancies, all of which can erode margins. In addition to focusing on resilience, cost efficiency remains a non-negotiable for supply chain executives.

Many companies utilize AI tools such as machine learning and heuristics to help manage their operations and make data-driven plans, predictions, and decisions. However, the problem is that many of these tools depend on historical data, and given the unprecedented nature of today's economic challenges, past performance is not a reliable indicator of future business outcomes.

To deal with today's disruptions and chart a course to profitability amid such immense uncertainty, companies must have AI tools that consider their current business situations, challenges, and constraints—and mathematical optimization is one such technology.

### TIP 1: DON'T JUST OPTIMIZE FOR ONE THING

Designing a resilient supply chain is more than just safeguarding against disruptions. It is also about balancing cost, profit, resilience, and sustainability.

Simple optimization for one objective could undermine the others, leading to a poorly performing supply chain in the long term. Rather than focusing exclusively on cutting costs, it is important to consider the regions, labor, and skills your business depends on. As the world's current supply chain issues show, many companies have not had this foresight.

Fortunately, businesses today have an array of AI technologies – like mathematical optimization – at their disposal, which can help them combat and overcome these challenges. A mathematical optimization model is like a digital twin of your real-world business situation; it mirrors your actual business landscape and encapsulates your unique business processes and problems in a software environment.

Defining your business problem as a mathematical optimization model can help you better understand your business conditions and challenges. But how can that model actually be used to help you deal with disruption? To do this, you need to feed your model up-to-date data and integrate it with a mathematical optimization solver that:

- Automatically processes the data and reads the model.
- Combs through and considers an astronomical number of possible solutions to your business problems.
- Finds the optimal solutions to use as the basis to make your business decisions.

Supply chain optimization software, such as Gurobi, can assist in this balancing act using *multi-objective optimization*. This technique enables supply chain managers to assign relative weights for each sub-objective, creating a more balanced and resilient supply chain design. For example, in a commodities supply chain with a projected global surplus, one could assign 50% weight to cost, 30% to sustainability, and 20% to resiliency.

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However, a challenge arises when comparing sub-objectives. When combining the three into one mathematical optimization equation, it is crucial to measure each sub-objective on a common scale. A typical approach is to quantify all factors in monetary terms. For instance, potential lost revenue from unfilled demand could quantify resilience, while carbon emissions could be valued by implementing a carbon pricing mechanism.

#### TIP 2: STRESS TEST YOUR SUPPLY CHAIN, VIRTUALLY

The recent past has taught us that even the most unlikely disruptions can occur. Questions such as "What if lead times triple?" or "What if demand decreases by 50%?" are no longer theoretical but real-world phenomena for some companies. Although predicting the next disruption is impossible, running your supply chain through a battery of stress tests can identify and mitigate vulnerabilities. Optimization techniques and analytical tools such as sensitivity analysis, scenario analysis, and discrete event simulation can provide insights into the resilience of your supply chain under a variety of conditions.

With mathematical optimization's robust scenario analysis capabilities, you can:

- Explore supply, demand, inventory, capacity, macroeconomic, geopolitical, and other what-if scenarios and evaluate their potential effect on your business.
- Uncover hidden risks and gauge your risk exposure and time to recover in a disruption, such as a natural disaster or a production or transportation breakdown.
- Unlock opportunities to mitigate risk and drive improved supply chain resilience by reallocating your resources or reconfiguring your supply chain.

By exploiting mathematical optimization's robust scenario analysis functionality, you can insulate your supply chain against the impact of future disruptions by making proactive and strategic decisions in several areas, including capital investments, supplier selection, capacity and inventory planning, and production and warehouse facility location. By virtually stress-testing your supply chain, you can prepare for the unpredictable and strengthen your supply chain's resilience.

#### **TIP 3: IDENTIFY AND MITIGATE KEY RISKS**

An important part of handling supply chain disruption is assessing risk and proactively planning and preparing for the future – and mathematical optimization empowers your planners and key stakeholders to do this quickly and easily.

Despite the best efforts to design a resilient supply chain, eliminating all risks is impossible. However, identifying the key risks and taking action is within your grasp. For instance, consider a crucial component supplier threatened by increasing flood events. If relocating the supplier is infeasible due to high costs or a lack of alternatives, engineering solutions such as flood barriers or uninterrupted power supply systems may be needed.

Quantifying these key supply chain risks is critical. Using potential revenue impact and mitigation cost as metrics allows you to prioritize the key risks.

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The unprecedented economic disruption triggered by Covid-19 has created a seismic shift in our business dynamics and data. Companies must continue to leverage AI tools to enable data-driven decision-making. However, they cannot rely solely on tools like machine learning that use data from the past to make future predictions.

The most valuable AI tools for companies today run on up-to-date data, encompass the present-day reality, and empower decision-makers to respond to a disruption in the most efficient and effective manner possible.

While the mathematical optimization field is over 70 years old, many organizations are still learning to make the most of its capabilities. That is why Gurobi established the **Value Accelerator Program**.

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Issues of CSCMP Hot Topics may include early results from ongoing research being conducted for CSCMP or other organizations; new supply chain practices, thought-provoking ideas, or emerging trends; discussions of changes in the broader business and regulatory environment that may impact the supply chain and logistics field. With Gurobi Optimization technology, you can make optimal business decisions in seconds. From workforce scheduling, portfolio management, marketing optimization, supply chain design, and everything in between, Gurobi identifies the optimal solution out of trillions of possibilities.

Districon Solutions specializes in fast, agile, custom supply chain solutions. It brings Gurobi Optimizer to life, creating logistics and supply chain solutions that address strategic and operational challenges.

Together, they enable enterprises to integrate prescriptive analytics applications into their day-to-day operations and optimize their real-time decision-making and execution.

We want you to be successful with optimization. So **start with 12 free hours of guidance** with Districon at no cost. The engagement will kick off with a two-hour workshop, where Districon's team of optimization experts will learn about your unique business challenges and work with you to identify which ones can benefit most from decision intelligence technology. Next, they will work with you to develop a proof-of-concept solution that demonstrates the value of optimization—putting you on the fast track to success. And if you decide to move forward with a full optimization implementation, they can guide your teams through every step.

You can transform your decision-making with Gurobi's 2,500+ global customers across 40+ sectors, including more than half of the Fortune 10 and 70% of top global tech companies, and Districon's 45 years of supply chain experience and modeling expertise.

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