



AI Simulation for Supply Chain Decision Intelligence

COSMOTECH

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**Find Your Forward with
AI Simulation for reliable,
precise and explainable
decision making.**



IN THE KNOW

In an era of remarkable technological progress and increasing uncertainty, making optimal business decisions has become more crucial than ever. This ebook serves as a guide for addressing a vital question: how can we make optimal business decisions amidst pervasive uncertainty and unclear outcomes?

Uncertainty arises from limited knowledge about the future—and sometimes the past. We know wars, pandemics, inflation, and natural disasters are possible, even likely. However, assigning a single probability to these events is impossible. Often, we lack information about the mechanisms behind such events or sufficient historical data to predict them. Attempting to calculate their probabilities distracts from the real challenge: improving system resilience in the face of uncertainty. Decision-makers must accept uncertainty and proactively simulate all possible futures to cope with it effectively.

The best decisions consider this uncertainty, leading to positive outcomes even when the future differs from forecasts.

Supply chain management is advancing as the information revolution increases both data availability and analytical capacity. Despite this progress, decision-makers face the challenge of being data-rich but insight-poor.

Business leaders aiming to make optimal decisions for the future cannot rely solely on past events. They require simulated data, offering a view of the future, to make informed choices. This is why they turn to AI Simulation, anticipating a future that will differ from yesterday.

Hugues de Bantel

How Well Do Supply Chains Cope With Uncertainty?

Supply chains have endured numerous significant large-scale disruptions in recent years, including the devastating Covid-19 pandemic, a global semiconductor shortage, and rising inflation. Currently, they are navigating additional challenges stemming from significant shifts in the business environment: labor shortages, pressures to decarbonize and enhance sustainability, evolving customer expectations, and the advent of transformative technologies like artificial intelligence.

Reinventing supply chains for the new world order clearly requires making more complex trade-offs and decision making than most operations teams have ever encountered, between a larger and more complex set of priorities.

The right supply chain trade-offs will, of course, vary by business. But in our experience with companies around the world and across industries, the most successful companies implement an integrated, holistic and cross-functional decision making.



Navigate uncertainty with AI Simulation

Now, the question CEOs must answer is no longer "Should we transform our supply chain?" but rather, "How can we transform our supply chain to effectively navigate supply chain complexities? And how can we make sure we're making the right decisions during the process of reinventing our supply chain?".



Reconciling competing objectives and complex trade-offs

The traditional formula that governed supply chain decisions no longer suffices. Reducing costs, optimizing inventory, improving service and quality, and driving growth remain fundamental priorities. But now, supply chains must also become more resilient, sustainable, and highly responsive to changing customer expectations. Exceptional execution and continuous improvement is vital due to the complexity involved in today's supply chains. However, being able to make the right decision in a pool of thousands of possible options has become even more crucial.

Single scenario plans developed in silos is not enough. Planning processes, historically focused on a single scenario plan, must be redesigned to be future-fit and leverage technology as an enabler.

63%

Of CSCOs admit they struggle to cope with the impact of uncertainty.

A majority (63%) estimate that exposure to uncertainty will lead to revenue losses, and another 28% believe that they'll do no better than just maintaining current revenue levels. In all, less than 1 in 10 supply chain leaders (9%) believe that they will be able to benefit from the prolonged VUCA environment.*



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Critical Capabilities

Taking a holistic view to the whole system

Global enterprise organizations and their ecosystems are highly complex. Over the past twenty years, the number of connections—whether between people, machines, or both—has increased by a factor of 200,000. As variables multiply, trade-offs become more complex, leading to unpredictable downstream effects. Addressing one variable often creates new challenges in other areas of the supply chain.

Embracing uncertainty

Uncertainty is inherent in the business landscape. Global dynamics, technological advancements, and changing customer demands continually introduce uncertainties that shape operations. Embracing the unknown fosters agility, robust contingency plans, and resilience. Supply chain leaders who embrace uncertainty can navigate complexities and uncover new growth opportunities, staying ahead in a rapidly evolving marketplace.

More built-in flexibility and visibility

Increasing complexity and volatility necessitate a shift from fragmented and siloed visibility to end-to-end supply chain visibility and aligned decision-making. Enhanced situational awareness improves decision-making and risk management. It's about more than efficient execution—it's about responding to risks, adapting to customer needs, and making informed decisions on supply chain investments.

Digital Transformation

Digital transformation is essential for supply chain leaders, enabling data-driven insights over reliance on past experience or intuition. This shift may seem counterintuitive and require changing long-standing business practices. However, companies that master supply chain trade-offs will achieve strategic superiority and set new standards of operational excellence. They will capitalize on the opportunities presented by supply chain resets, investing in significant, bold initiatives and managing competing trade-offs throughout their transformation journey, ultimately achieving superior performance.

NAVIGATING UNCERTAINTY

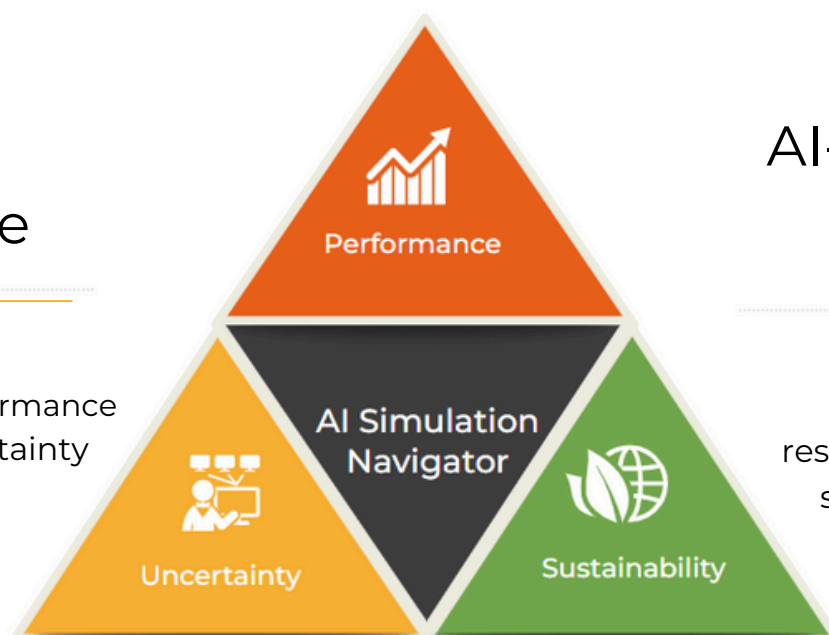
In the past, many business, environmental and socio-economic issues were largely treated independently from one another. Today, there is an increasing understanding that climate change interacts both with supply chain resilience, economic performance and a changing regulatory environment.

A new perspective with the Cosmo Tech Future-Readiness Triangle Framework

The Cosmo Tech Future-Ready Decision Triangle framework is taking a comprehensive approach to managing the full spectrum of environmental, social and economic impact on the entire value chain. This holistic model is designed to guide supply chain leaders through the complex interplay of these critical dimensions, ensuring that every decision contributes to a resilient, profitable and sustainable strategy.

Triple challenge

Sustainability
Economic performance
Risk and Uncertainty management



AI-Simulation Navigator

Every decision contributes to a resilient, profitable and sustainable strategy.

Cosmo Tech
Future Readiness Decision Triangle

NET ZERO EMISSIONS



SUSTAINABILITY

The Cosmo Tech Future-Readiness Decision Framework allows companies to move from focusing on a single issue to a more systemic, multi-dimensional approach. The integration of sustainability metrics within the decision process enables companies to make accurate, proactive and long-term decisions, ensuring that the business decisions made today don't compromise the resources of tomorrow.

PROFITABILITY



In an era where market volatility and competitive pressure constantly threaten efficiency and profitability, the Cosmo Tech AI-Simulation technology makes it possible to balance competing constraints and the impact of decisions on them. It can improve economic performance and resilience at an unprecedented level, while securing a net zero CO2 emissions trajectory.

ECONOMIC PERFORMANCE

RISK AND UNCERTAINTY MANAGEMENT



RESILIENCE

Carbon footprint as well as economic objectives are always associated with a certain level of uncertainty. What would be the impact on delivery, profit and CO2 emissions if this transport route is disrupted? How can I mitigate the risk? These are examples of questions and choices for which AI-Simulation technology helps users find the best answers.

IPCC 2000 states that expert judgment is often the only possibility for companies to deal with uncertainty, either by helping to identify and explain it, or as a source for the necessary yet missing data. The Cosmo Tech Future-Readiness Decision Triangle Framework provides decision makers with the best of both worlds, as the AI-Simulation technology answers are grounded on both industry expert knowledge and data generated from simulating the impact of decisions or disruptions on the company's metrics.

An overhead photograph of four business professionals in a meeting. They are seated around a wooden table, looking at various documents and charts. One person is pointing at a pie chart, another at a bar chart, and another at a line graph. A laptop is open on the table. The scene is brightly lit, suggesting a modern office environment.

***"Strategic
decision making
and risk
planning in top
CSCO priorities."***

In 2023, 47% of industrial supply chains saw cost reduction as their top priority. While a focus on operational efficiency will be maintained in the next three years, industrials will shift their long-term attention to strategic decision making (46%) and risk planning (49%).*

ACTIONABLE DECISION INTELLIGENCE

EMPOWERING SUPPLY CHAIN LEADERS TO DELIVER ON MISSION-CRITICAL PRIORITIES WITH AI SIMULATION

AI-Simulation technology emerges as a beacon of supply chain resilience and confident decision making. It provides reliable and accurate predictions, even in unprecedented situations and for strategies that have not yet been tested.

Decision impact visibility and generating all possible future scenarios is now an imperative for critical decision making. We strongly believe that having easy access to AI-simulated data that provides reliable visibility into the future will increasingly play a central role in navigating risks, accelerating decisions, and optimizing choices at each stage of supply chain transformation.

What is AI Simulation?

AI Simulation is the convergence of several types of AI, including complex system simulation, machine learning, Gen AI and optimization. It provides powerful techniques that can be used, alone or combined, in order to address decision making problems in an increasingly complex and uncertain world.

At its core is complex system simulation, which is the process of using computer models to imitate the operation of a real (or hypothetical) system or process. This digital replica is called a Simulation Twin and replicates the dynamic functioning of an organization's complete operational system.

How AI Simulation helps Supply Chain Managers?

For supply chain managers, the Simulation Twins offer the unique ability to replicate all activity and interactions throughout the production chain, regardless of the number and location of assets, manufacturing sites, suppliers, contractors and subcontractors involved.

Confidently navigate uncertainty and complexity

Using AI-Simulation technology, supply chain managers can create unlimited predictive "what-if" simulations that demonstrate the impact of different

decisions on operational efficiency and KPIs. Supply chain managers can evaluate the strength of their action plans, testing their robustness in the face of unexpected events and gaining valuable insights into how to implement their plans across the entire value chain.

Discover the best possible path out of thousands of possible scenarios

Advanced Simulation Twins further provide prescriptive “how-to” optimizations that help supply chain managers discover the course of action that best meets their needs. Users can choose among a range of KPIs (e.g. efficiency, cost, environmental needs), then use the simulation twin to discover the optimal action plan and implementation strategy for their business.

A technology that supports the complexity of an organization

Decision makers find in AI Simulation a technology that supports the complexity of their organizations and addresses greater uncertainty: every impact and cascading effect of a disruption or a decision can be simulated, including impacts that have not been experienced before.

It has the capability to generate unlimited scenarios of an organization’s possible behaviors in response to decisions or events. Guided by AI algorithms, thousands of simulations are automatically generated and optimized until the best course of action is determined in response to given KPIs.

Beyond illusions: pioneering trustworthy AI

AI technologies such as Large Language Models (LLM), are powerful tools that have demonstrated impressive capabilities. However, they are not entirely immune to generating inaccurate or misleading outputs. These “hallucinations” occur when the AI models generate content that appears plausible but may lack accuracy or fail to consider contextual factors.

Simulation, in contrast, is a model-centric AI and avoids the hallucination issue due to its inherent design and methodology based on human knowledge expertise and a controlled environment where different scenarios can be tested rigorously against real-world observations to ensure their accuracy. These results are provided by a simulation; they are auditable, can be understood and traced back to the business rules within the simulation. This is unlike most other AI tools which lack transparency.

The Trust Factor.

Did you know that there is a significant difference between data-driven AI and knowledge-driven AI such as simulation? While AI learns from past data to create new data, simulation, in contrast, is model-centric.

To acquire higher accuracy, there is a complementarity between knowledge-based AI and data-based AI. The ideal solution combines both approaches.

Unlike traditional approaches that treat AI and Simulation as separate disciplines, Cosmo Tech combines both AI and simulation on a single platform. This allows us to leverage the power of simulation and human knowledge expertise with AI algorithms, enabling more sophisticated analyses and providing more accurate results to enhance decision making. By harnessing the strengths of both data-based AI and knowledge-based AI, Cosmo Tech offers a range of unique capabilities that differentiate us from other solutions on the market.

Explainability and reliability

AI Simulation is effective for decision making because it is reliable and explainable. It surpasses typical machine learning techniques by starting with an expert understanding of cause and effect and producing reliable results. Simulation also allows for model testing and adjustment, improving prediction accuracy and understanding. If business needs or decision parameters change, the model can be quickly adjusted to reflect this.

Demystifying complexity

Modern businesses are highly interconnected, and ignoring this complexity often leads to suboptimal outcomes or outright failures. The Cosmo Tech technology uniquely models the entire ecosystem, incorporating heterogeneous elements across the system. It enables the modeling of dynamics and behaviors of each sub-system, their interactions, and the cascading effects over time, avoiding unexpected consequences from actions in different areas of the organization.

The certainty in uncertainty

In a real system, unexpected events may occur due to the high complexity and uncertainty of the real-world. Simulation allows the analysis of a system under abnormal conditions, a rare event or a completely new design which is impossible with the data-modeling approach.

An eye on future possibilities

Simulation is not based on past data only but on the dynamics of the underlying systems of the organization, providing a comprehensive view of all possible and probable futures, including the inherent uncertainties linked to today's complex environments. Knowing these features helps organizations navigate through the complexity and uncertainty.

Scalability and reusability

A Cosmo Tech Simulation twin evolves and scales over time in order to remain responsive to customer needs and to new business issues. Our customers can start small, to meet a first business challenge, and over time, easily adapt, or quickly expand the scope of their simulation digital twin, once adoption is secured by every stakeholder.

Optimal decision making

In addition to answering what-if questions with simulation, Supply chain executives need to know how best to get to a desired goal. AI Simulation goes beyond data insights by providing prescribed actions to optimize target performance indicators in areas such as supply chain efficiency, profit, production capacity or CO2 emissions. It is a powerful approach to understand the causes behind a business problem, predict future outcomes and recommend optimum decisions.

From insight to impact. ■

The AI-Simulation technology has broad market potential and adoption across various industries and sectors. The adoption of such technology is not limited to a specific size of organization either. It is equally relevant to a small part of a supply chain or the entire supply chain for example.

Cosmo Tech collaborates with major players and manufacturers from various sectors such as the energy, automobile, consumer goods or technology sectors.

All these complex organizations are complex systems that make it now impossible for the human brain to know the outcomes of decisions or disruptions on the overall performance.

The AI-Simulation technology provides a major benefit for the critical decisions they have to make: it brings better explainability of results and better reliability with reduced hallucinations compared to machine learning techniques



A photograph of a cardboard box on a conveyor belt in a warehouse. The box is in the center, moving along a track. The background is filled with industrial equipment and lights, creating a blurred effect. The overall scene is brightly lit with a warm, yellowish glow.

AI Simulation for Optimal Supply and Demand Management

Problem

Supply Chain leaders face a trade-off between inventory and service levels. On one hand, inventory incurs costs in terms of working capital, labor, and real estate while depreciating rapidly. On the other hand, the goal is to deliver the right products at the right time, maintaining an optimal balance between cost, quality and customer service.

Solution

Supply Chain managers use AI-Simulation technology to simulate unlimited scenarios that optimize inventory levels, considering factors such as demand variability and cost constraints. AI Simulation can then be used to assess the impact of different inventory strategies on service levels and analyze risks associated with inventory and service levels. By striking the right balance, supply chain managers can enhance service levels, reduce costs, minimize stock outs and maintain a competitive edge on the market.



Optimizing Logistics and Operations with AI Simulation

Problem

Supply chain managers face several challenges when it comes to optimizing logistics and operations. Some of the key problems they encounter include: supply chain complexity, determining the most efficient and cost-effective transportation routes, efficiently managing warehouse operations, aligning purchasing and logistics goals or optimizing production capacity.

Solution

The AI-Simulation technology has the capability to model and simulate complex supply chain networks, enabling managers to pinpoint bottlenecks and enhance efficiency. For example, it can help supply chain managers analyze transportation alternatives, leading to the identification of cost-effective routes and carriers. In warehouse operations, it can optimize network design and storage strategies in order to decrease travel time and enhance fulfillment.



Risk and Uncertainty Management with AI Simulation

Problem

A supply chain is a highly interconnected system that needs to be managed in ways that reduce costs, increase profits, and minimize risks. For each operation, there is a lot of uncertainty that can lead to a series of unknown problems farther down the line: stock outs, shutdowns, increased costs and more. Supply Chain leaders must be prepared for a range of eventualities, with managers needing ready answers to numerous “what- if” scenarios.

Solution

Impact-based decisions are the future of Supply Chain planning and AI-Simulation technology is used to understand where the supply chain is weak, where it might break, how much it will cost, and how to mitigate the risk. It helps business leaders manage risks and uncertainties by identifying the top vulnerabilities in the supply chain, automating thousands of simulations to anticipate future uncertainties, and formulating action plans for risk mitigation and resilience. This technology allows leaders to make informed decisions, minimize revenue loss, and ensure business continuity.

AI SIMULATION IN ACTION

SUSTAINABILITY

OPTIMAL INVENTORY MANAGEMENT AND REPLENISHMENT PROCESS

Our customer is a global leader in the electronics industry recognized for its supply chain excellence. They are doing this through process automation and a data-driven decision making process that takes into account disruptions, is in sync with the real world and brings visibility into the future.

Challenges

The challenges faced by the customer in managing its operations were due to uncertain demand and unforeseen events. While they preferred ship transportation due to its cost effectiveness and lower environmental impact, last-minute order and delays forced them to use more expensive and higher polluting air transport. To find a balance, the customer needed to simulate various scenarios and uncertainties to estimate the total fulfillment costs and decide the best replenishment policy. This would help them reduce the need for air transport, maximize profits, and exercise better control over their P&L statement.

- High demand variability and uncertainty
- High level of constrained inventory (limited storage capacity)
- Multimodal transport shipments
- Balancing inventory costs while maintaining acceptable service levels.

Our approach

For their first use case deployed, the customer selected Cosmo Tech to optimize the transport and storage costs within a finished goods assembly area. They used the simulation digital twin representing the “Build-To-Stock Supply Chain policy from the Original Design Manufacturer (ODM) to the Hub” digital replica to run various simulation scenarios of the different transport modes and stock policies.

- Simulation of different transport modes and stock policies
- Scenario comparison of the “Build-to-stock” simulation results with the Build-to-Order baseline scenario
- Inventory management optimization
- Simulation of the next level of air express transport based on the current stock policy and high demand variability
- Optimal replenishment strategy.

Benefits

The simulation of the competing transport dynamic allows the customer to predict the next level of air express transport (based on the current stock policy and high demand variability) and determine the optimal replenishment policy.

Results

- 17%

Air costs

\$3M

Yearly cost savings opportunity

\$10M

Annual savings

The Future of Decision Making

The ability to not only overcome crises but also to benefit from them in order to improve and strengthen oneself is known as "antifragility".

This concept surpasses the idea of resistance and solidity. Something that is resistant can withstand shocks and remain the same, whereas something that is antifragile actually improves when exposed to disturbances and even welcomes chance to some extent. It represents a positive determination to adapt in an increasingly complex, ambiguous, and uncertain world.

It's not just about resisting crises, but about asking oneself: "How can I overcome the next crisis and learn from these moments that, ultimately, serve as opportunities for reinvention for all companies?"



“

Can you do antifragility with existing technology? Probably not. Most existing supply chain technology is still fragility based. I've lost count of the number of providers that are going to improve the accuracy of the forecast using only AI/ML, or are going to improve responsiveness through visibility, control towers or command centers.”

**- Tim Payne, Gartner Analyst,
Thriving under uncertainty**

ABOUT COSMO TECH

Cosmo Tech provides an AI-Simulation platform to navigate complexity and uncertainty in enterprise decision making, anticipating what is coming and confidently optimizing day-to-day operations and strategic planning for better performance.

Combining advanced simulation with other AI techniques, Cosmo Tech AI-Simulation Copilot and Simulation-Twin software delivers new predictive and prescriptive capabilities with the reliability demanded for critical decision making in large complex organizations. It enables companies to continuously improve performance and resilience at an unprecedented level while ensuring a net-zero emissions trajectory.

PARTNER ECOSYSTEM

All of our partners have recognized expertise in their respective industries and are able to help our customers to more easily solve the challenges that are specific to their business, but also to improve their performance and profitability thanks to the Cosmo TechAI-Simulation platform.

CLOUD INFRASTRUCTURE



SYSTEM INTEGRATORS



BUSINESS APPLICATION ISV





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