



Project on Supply Chain Network Optimization using stimulation

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Supply chain management has become a strategic issue for any company looking to meet targets in terms of economic competitiveness, time and quality of service especially in an economic environment characterized by the globalization of trade and the acceleration of industrial cycles. In the complex ecosystem of global trade, optimizing the supply chain network proves to be one of the most complex strategies for businesses in search of competitiveness and profitability. Needless to say, the journey from sourcing the materials to delivering the final product to consumers is fraught with opportunities for efficiency and cost-saving. The task aimed at improving the efficiency and effectiveness of a supply chain. It involves the strategic design and management of supply chain components to minimize costs, maximize service levels, and ensure robustness and flexibility in the face of uncertainties.

Objectives

Clearly defined objectives set the direction for the project and ensure alignment with the organization's strategic goals. Objectives should be Specific, Measurable, Achievable, Relevant, and Time-bound (SMART).

Cost Reduction: Effective network optimization fosters cost minimization through a multifaceted approach. Streamlining processes eliminates redundancies and inefficiencies. Inventory management becomes more precise, reducing the burden of excess stock and associated holding costs. Economies of scale are leveraged by optimizing production and transportation based on accurate demand forecasts.

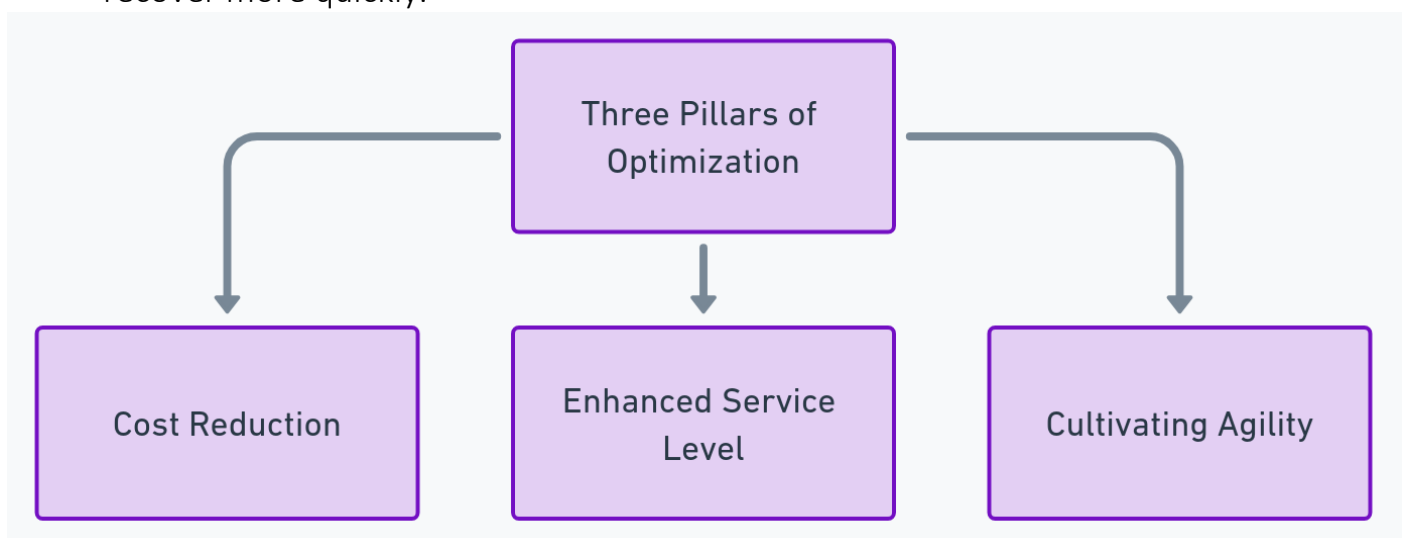
- **Service Level Improvement:** Enhance customer service levels by reducing lead times, increasing delivery reliability, and improving order fulfilment rates.
- **Inventory Optimization:** Reduce excess inventory and stockouts by optimizing inventory levels and locations.
- **Network Resilience:** Increase the supply chain's ability to withstand disruptions by diversifying suppliers, improving demand forecasting, and establishing contingency plans.
- **Sustainability:** Reduce the environmental impact of the supply chain through more efficient logistics, sustainable sourcing, and minimizing waste.
- **Scalability:** Ensure the supply chain network can support future growth and expansion plans.

Enhanced Service Levels: The hallmark of a well-optimized network is its ability to elevate service levels. On-time delivery becomes the norm, not the exception, fostering customer trust and loyalty. Lead times are minimized, ensuring products reach customers swiftly. Order fulfilment accuracy improves due to optimized warehouse layouts and inventory control mechanisms.

- ❑ **Impact on Customer Satisfaction:** Discuss how improved service levels can lead to higher customer satisfaction and loyalty.
- ❑ **Competitive Advantage:** Highlight how superior service levels can differentiate a company from its competitors.
- ❑ **Order Fulfillment Rate:** Define and explain the importance of the percentage of orders completed on time and in full.
- ❑ **Lead Time:** Discuss the time taken from order placement to delivery and its impact on service levels.
- ❑ **Stock Availability:** Explain the significance of having the right products available at the right time.
- ❑ **Delivery Accuracy:** Describe the accuracy of deliveries in terms of the correct items and quantities being delivered to the right locations.

Cultivating Agility: The dynamic nature of today's markets demands a supply chain network that is both responsive and adaptable. Optimization empowers businesses to react swiftly to unforeseen circumstances. Market fluctuations and evolving customer preferences can be addressed with agility through data-driven insights. The network becomes adept at handling disruptions, such as supplier shortages, by having the flexibility to source materials from alternative vendors.

- ❑ **Benefits of Agility:** Discuss the advantages of having an agile supply chain, including quicker response times, better adaptability to changes, and improved customer satisfaction.
- ❑ **Flexibility:** Explain the importance of flexible processes and systems that can quickly adapt to changes.
- ❑ **Visibility:** Highlight the need for real-time data and transparency across the supply chain to make informed decisions.
- ❑ **Speed:** Discuss the role of swift decision-making and fast execution in maintaining agility.
- ❑ **Resilience:** Describe how an agile supply chain can better withstand disruptions and recover more quickly.



Optimizing the Essentials:

To achieve these goals, meticulous attention must be paid to several crucial components of the supply chain:

- **Inventory Management:** Optimization dictates the optimal allocation of inventory across the network, minimizing stockouts while avoiding excessive holding costs.
- **Transportation Logistics:** Route planning and carrier selection are meticulously evaluated to ensure efficient and cost-effective product movement.
- **Facility Location Planning:** Strategic placement of production facilities, warehouses, and distribution centers minimizes transportation costs and optimizes product delivery times.
- **Demand Forecasting:** Accurate forecasting methodologies are employed to anticipate customer needs and ensure adequate inventory levels to meet fluctuating demand.

Key Objectives and Goals

Supply chain network optimization targets several key areas to enhance efficiency and meet specific company needs:

1. **Inventory Optimization:** Striking a balance between too much and too little inventory is crucial. Techniques like safety stock modelling and demand forecasting help maintain optimal inventory levels, reducing holding costs and preventing stockouts.
2. **Transportation Efficiency:** Optimization involves not just fast delivery but also cost-effective and reliable transport. This includes streamlining routes, selecting suitable transport modes, and evaluating carriers to minimize costs and ensure timely deliveries.
3. **Facility Rationalization:** Assessing and optimizing the number, location, and size of facilities can reduce operational costs and improve delivery times. Consolidating warehouses or strategically placing distribution centers closer to customers are common strategies.
4. **Supplier Collaboration:** Building strong relationships with suppliers enhances visibility and coordination. Real-time data sharing and joint innovation efforts can reduce disruptions and streamline processes.
5. **Demand Forecasting Accuracy:** Leveraging historical data, market trends, and advanced analytics improves the accuracy of demand forecasts. This ensures better alignment between production and inventory levels, meeting customer demand effectively.

Strategies for Supply Chain Network Optimization

Let us discuss various strategies that can be employed by businesses to optimally improve their supply chain networks.

1. Inventory Management: Proper inventory management is essential in reducing holding costs and maintaining product availability. Such techniques as just-in-time (JIT), vendor-

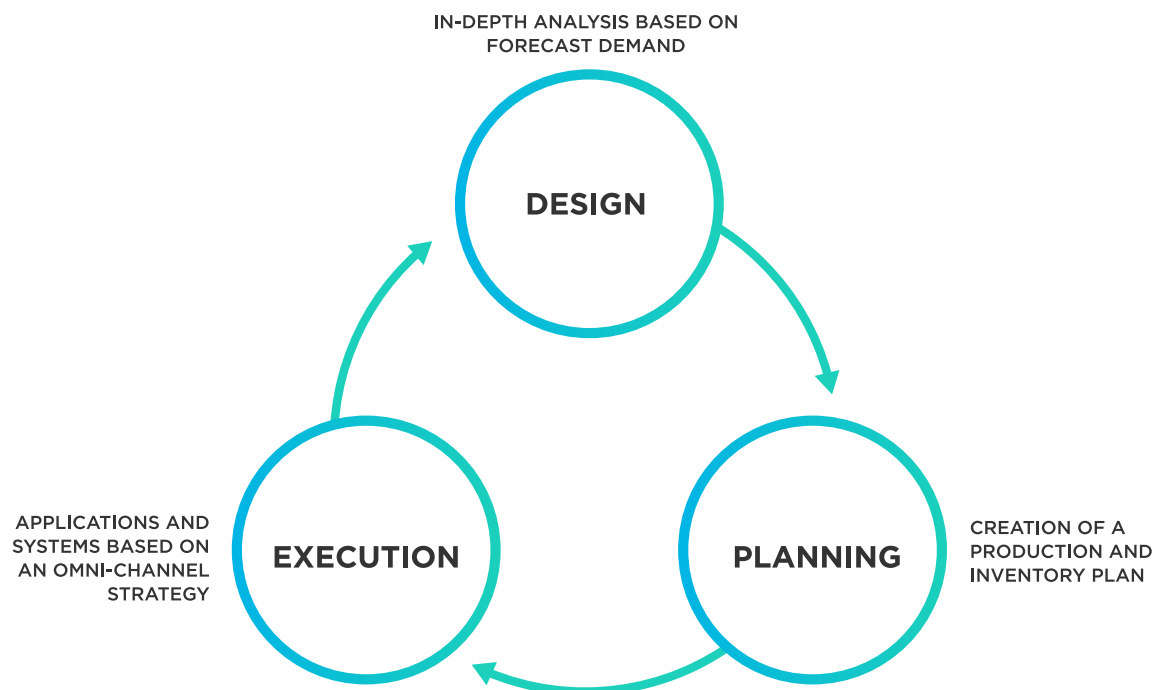
managed inventory (VMI), and ABC analysis methods are instrumental in optimizing the levels of stock, thereby reducing carrying costs.

2. Transportation Logistics: Optimizing transportation logistics means choosing the most cost-effective ways of transporting goods, designing routes, and selecting carriers with an eye on factors like transit times, freight costs, and service reliability. Transportation management systems (TMS) and route optimization software can help streamline operations and enhance efficiency.

3. Facility Location Planning: Strategic facility location also contributes significantly to overall supply chain optimization efforts. Factors such as proximity to suppliers and customers, transport infrastructure, and labour availability, among others, must be considered when determining where warehouses, distribution centers, or production facilities should be located.

4. Technology Adoption: Encompassing progressive technologies like AI, IoT, and data analytics is going to bring a revolution to supply chain optimization. These technologies play the role of the real-time data capturer, analyser, and decision-maker which enables businesses to be proactive, in solving various problems, foreseeing disruptions, and optimizing various processes.

These strategies, if designed in a complete and integrated approach can lead businesses to find new levels of efficiency, swiftness, and competency in their supply chain network.



Tools and Technologies in Optimization

It is quite apparent that the implementation of software and sophisticated technologies is integral in the process of supply chain network optimization. Enterprises now have a wide array of tools that range from elaborate planning and simulation to cloud-based platforms and demand analysis solutions that can be used to optimize their processes.

1. Supply Chain Planning and Optimization Software: Effective supply chain planning and optimization software solutions involve powerful capabilities for the calculation, analysis, and optimization of complicated supply chain structures. This set of tools allows companies to design simulation scenarios, spot bottlenecks, maximize critical parameters like inventory levels, transportation routes, and production methods, and, by so doing, realize business success.

2. Transportation Management Systems (TMS): TMS software simplifies supply chain management and allows companies to get the best out of their transportation processes by making optimal route planning, selecting several carriers, consolidating loads, and managing freight rates. Through system automation and optimized transportation processes, TMS systems can help decrease costs, improve efficiency, and boost visibility over the entire supply chain network.

3. Warehouse Management Systems (WMS): WMS programs allow businesses to optimize warehouse processes by managing inventory, orders, and workflows efficiently. It is equipped with supply chain functionalities like item tracking, pick and pack, and workforce management that lead to higher productivity, accuracy, and delivery speed.

4. Demand Forecasting and Analytics Tools: Through the use of advanced AI, machine learning, and predictive modelling technologies, demand forecasting and analytics tools can continually improve forecast accuracy and reliability. Through scrutinizing historical data, market trends, and the company's surroundings, these tools assist businesses to not simply anticipate fluctuation in demand but also improve together, inventory levels, production schedules, and distribution strategies.

5. Real-time Visibility and Collaboration Platforms: Sharing information using a cloud platform for supply chain visibility and collaboration makes it possible for everyone to be on the same page about the inventory, shipment statuses, and order fulfilment processes being done in the supply chain network. Through facilitating cohesion and dialogue among stakeholders, these platforms offer increased visibility, coordination, and response, thereby allowing companies to be proactive, on time, and to identify and address any possible problems that come up.

Challenges in Supply Chain Optimization

Even though supply chain network optimization leads to numerous advantages, it goes hand in hand with multiple barriers. Such factors as organizational silos, legacy systems, and low-

quality data as well as supply chain disruptions can create barriers to optimization and slow down progress.

1. Complexity and Interconnectedness: Contemporary product chains are the most complex and interconnected, involving all the stakeholders having processes and technologies. The intricacy of managing complex multinational corporations with wide product portfolios and global operations can be a challenge.

2. Data Quality and Integration: The truth about supply chain optimization is that data from different sources like suppliers, manufacturers, distributors, and customers, should be accurate and punctual. Meanwhile, the problems of data quality which include errors, inaccuracies, and incomplete datasets, will interfere with the optimization. Bringing together different data sources, and guaranteeing data accuracy must be prioritized by organizations that plan to run data-driven optimization.

3. Organizational Alignment and Collaboration: Ensuring unity and collaboration between functions and departments in the organization will be key to successful supply chain optimization. Despite the fact silos may know how to overcome compatibility issues, cooperation may be hampered by conflicting goals and change resistance. To overcome these barriers, we need strong leadership, precise communication, and a culture of universal improvement.

4. Supply Chain Disruptions and Risks: The effects on the operation of companies arising from the disruptions in the supply chain can be destructive. These range from the occurrence of bad weather to the market changes brought by political events and unpredictable fluctuations in the market. It is a constant task for companies to manage risks and build resilience, which necessitates risk assessment, contingency planning, and quick response strategies.

Although entrepreneurs may be facing some challenges, they can cope with them and discover all facets of supply chain network optimization by expanding their frameworks and handling the situation comprehensively. The organizational, technological, and operational challenges are the barriers to success and the competitive advantage, and there is a way to overcome them in a dynamic market that is now.

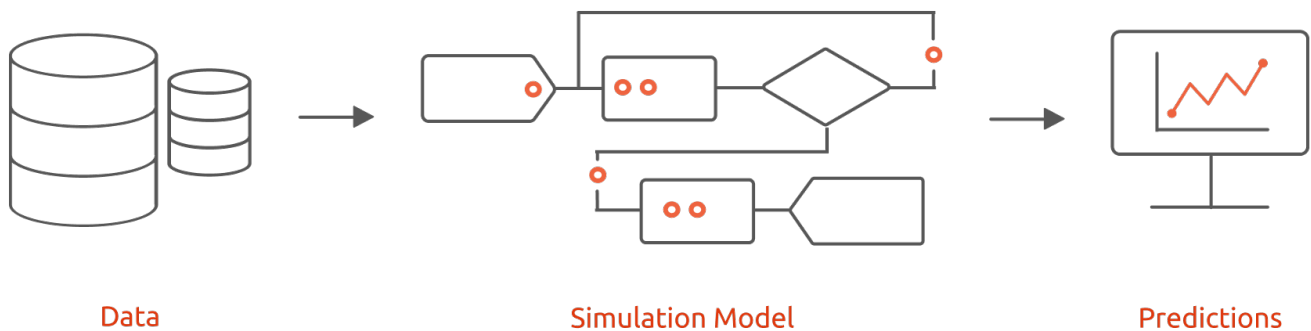
SUPPLY CHAIN SIMULATION

A supply chain simulation shows the behaviour of a logistics network over time. The logical rules of a supply chain are represented in a simulation model and then executed over time, making the simulation dynamic. For example, production is started when orders deplete inventory below a threshold. Such rules can be combined, and their relationships investigated as well as tested against disruptive events, like strikes and natural disasters.

Simulation can be used to:

- Determine safety stock values in multi-echelon supply chains

- ❑ Evaluate inventory policies
- ❑ Identify bottlenecks
- ❑ Cost service levels
- ❑ Test the robustness of your supply chain
- ❑ Ask what-if questions regarding, for example, new manufacturing facilities, or transport policies



Together, analytical optimization and dynamic simulation are a powerful combination of methods. They complement each other perfectly when addressing supply chain problems and provide a basis for advanced supply chain development.

Key Features of Simulation Software

1. Scenario Analysis

- ❑ Allows users to test different network configurations, transportation routes, and inventory policies.
- ❑ Evaluates the impact of changes in demand, supply disruptions, and other variables.

2. Visualization

- ❑ Provides graphical representation of the supply chain network, including facilities, routes, and material flows.
- ❑ Helps in identifying bottlenecks and inefficiencies visually.

3. Data Integration

- ❑ Integrates with existing data sources, such as ERP and WMS systems, to use real-time data for simulation.
- ❑ Ensures the accuracy and relevance of the simulation results.

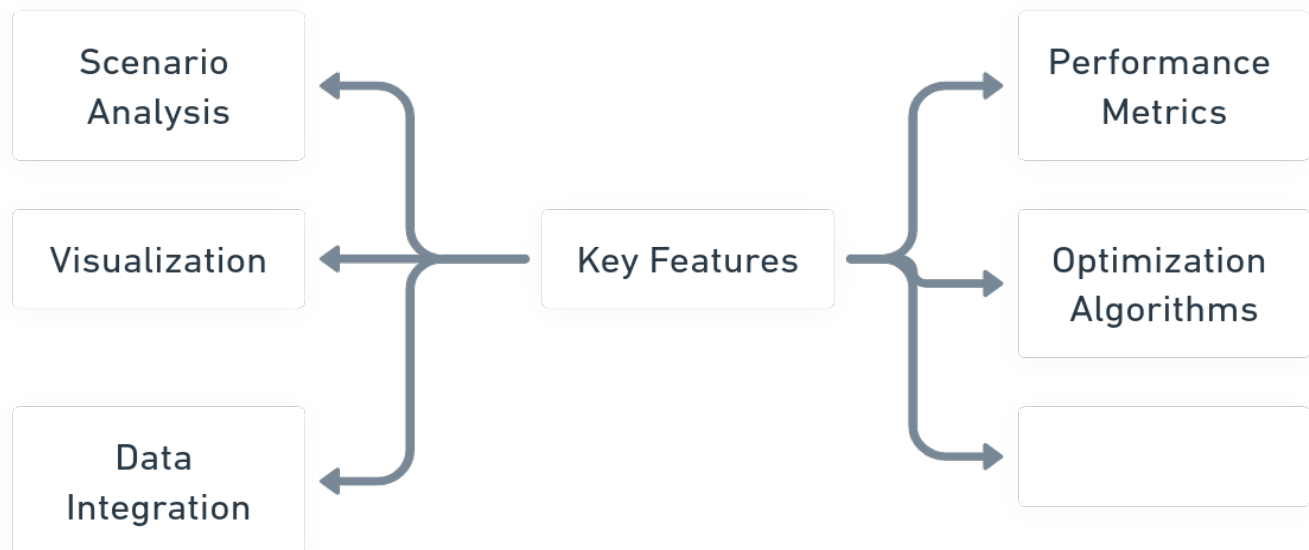
4. Performance Metrics

- ❑ Measures key performance indicators (KPIs) like lead times, service levels, transportation costs, and inventory levels.
- ❑ Provides insights into how different scenarios affect these metrics.

5. Optimization Algorithms

- ❑ Uses advanced optimization algorithms to find the best solutions for network design and operation.

- Can handle complex constraints and multiple objectives.



Popular Simulation Software for Network Optimization

1. AnyLogic

- Combines discrete event simulation, system dynamics, and agent-based modeling.
- Supports supply chain and logistics optimization with customizable models.
- Offers a graphical interface for easy model building and scenario analysis.

2. Arena

- Focuses on discrete event simulation.
- Widely used for modeling manufacturing processes, supply chains, and logistics.
- Provides extensive data analysis and visualization tools.

3. FlexSim

- Provides 3D simulation capabilities.
- Used for supply chain modeling, logistics, and warehouse optimization.
- Allows for detailed process analysis and resource optimization.

4. Simul8

- User-friendly simulation software for supply chain and logistics optimization.
- Supports rapid model development and scenario testing.
- Includes various optimization and reporting tools.

Network built:

When we build our logistics network, we have to determine how many facilities do need, such as warehouses, terminals and so on. And where to locate them, that is a very important decision. And how to pick the right locations is really an art form, because we don't know what our needs are going to be in the future. Nevertheless, good planning pays off, so when we look at our logistics network, we have to make the decision.

When we have fewer warehouses, the advantages are that we locate our inventory in fewer locations, we pool our risk, and therefore are able to hold less inventory. When we have many facilities, we will carry more inventory, but

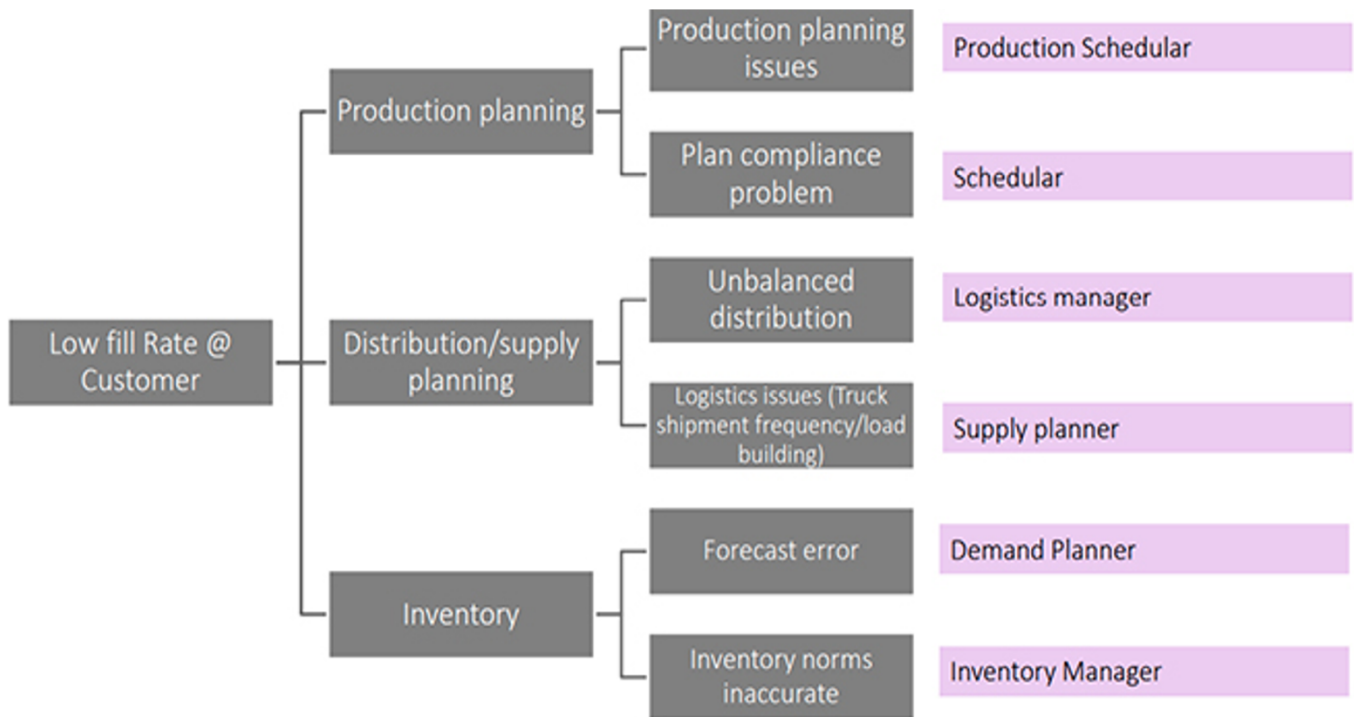
our access to our customer is going to be much quicker, so the decision is a trade-off. Do we want to save money building facilities and holding inventory, or do we want quicker access to our customers? The thing about inventory is that if it is in fewer locations, we need less of it, and that has to do with a safety stock. Because we can spread our safety stock over a larger area. The risk of stocking out is less with fewer locations. If we have more locations, each location needs their own safety stock, thus we have more safety stock overall in the system. After we determine how many warehouses to build, we have to determine where to locate them. And we typically follow a center of gravity approach that puts us as close to the customer as possible. But we also have to consider that we do not stock every item in every warehouse, because some items may be needed in certain locales. Such as, in the north we need more winter coats than we do in the desert. Another interesting way to think about it is that we can use transportation network as a storage device. For example, carmakers sometimes put several weeks' worth of inventory into trains and rail yards before they get to the dealers. That gives them a storage option even though it is transportation.

Factors Influencing Logistics Networks

When we build our logistics network, we trade-off two important factors. The one is cost, the other one is service. If we want better service to our customers, we probably have to spend more money. But logistics networks are already expensive, so most companies try to reduce those costs as much as possible while still maintaining a high-level of service. The cheapest logistics network looks different from the most expensive one. Nevertheless, the concept of cost versus service always applies and we can have a logistics network with only one warehouse and overnight transportation, which will give us great service, but it will be very expensive. Or we can be like Amazon and have top customer service, two-hour deliveries in some cases, but we need over 100 warehouses for that. Nevertheless, we have to pick the network that minimizes cost and gives us the best service possible.

The way the impact logistics network is as follows:

- When interest rates are high, the cost of holding inventory goes up, because most of the money spent holding inventory is cash tied up that we could use otherwise.
- When fuel costs are going up, remember, fuel costs are the single largest expense of most transportation, the overall cost of transportation goes up. So, when transportation is expensive, we want to have less of it. Therefore, we need more warehouses



SUPPLY CHAIN MASTER PLANNING SOFTWARE

anyLogistix (ALX) can help optimize your supply chain network. When used with data from a supply chain, it enables the analysis, forecasting, and testing needed for master planning. It is a digital twin of your supply chain that helps coordinate production, transport, and storage policies.

Supply chain master planning with ALX combines powerful optimization with simulation modeling to inform and deliver tactical and operational objectives.

Supply chain master planning with anyLogistix enables:

- Coordinated production, storage, and transport to meet demand at minimum cost
- Efficient supply chain resource utilization, accounting for all constraints
- Production, storage, transportation, and purchasing plans for each product
- Overview of all material flows
- Target demand fulfilment

□ Challenges in Supply Chain Optimization

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Overcoming Barriers to Effective Optimization

The most efficient way to break down the obstacles to supply chain optimization is to develop a standardized business process.

Key strategies include:

1. Executive Leadership: High management support leads to a culture of developing quality and assures that the targets are similar.

2. Cross-functional Collaboration: Building cooperative bridges across the departments nurtures corporate target setting and collaboration. Reading comprehension is the ability to understand and process written text to gain meaning and insight from the text. It is a critical skill for students in any academic discipline, as it allows them to navigate all types of written material, ranging from novels and poems to research articles and textbooks. The importance of this skill cannot be overstated,

3. Investment in Technology: Contrary to conventional methods that take a long time to check all the components, modern technologies such as AI and IoT introduce visibility and responsiveness levels.

4. Data Management: Data management and governance provide consistent quality and data informativeness for uniform decision-making.

5. Continuous Improvement: It is worth mentioning that tracking progress via KPIs and periodic evaluations are constant stimulators of improvement.

These strategies are important in achieving results so that decision-makers can generate maximum value as well as gain leverage in today's dynamic marketplace.

Case Studies: Real-World Supply Chain Optimization

To demonstrate the pragmatic benefits of supply chain network optimization, let's explore the actual phenomenon of certain companies improving their operational efficiency, cost-effectiveness, and customer satisfaction by utilizing supply chain network optimization programs.

1. Essentra: Revolutionizing Supply Chain Management with GoComet

Essentra, a leading global manufacturer and distributor, faced significant logistical challenges, including manual shipment tracking, inefficiencies in freight selection, and communication gaps. Seeking to enhance operational efficiency and financial reporting, Essentra partnered with GoComet. By integrating GoComet's advanced modules like GoTrack, GoInvoice, GoShipment, and GoProcure, Essentra transformed its supply chain management.

With GoInvoice, Essentra automated invoice management, reducing processing time and preventing overpayments. GoProcure streamlined procurement processes, attracting increased vendor participation and enabling better deals. GoTrack and GoShipment provided automated shipment tracking and consolidated supply chain visibility, empowering Essentra to make data-driven decisions and reduce turnaround times.

The results were remarkable. Essentra experienced enhanced efficiency, centralized invoice tracking, increased savings, improved vendor participation, and better data-driven decision-making. This partnership exemplifies the power of technology, with GoComet playing a pivotal role in revolutionizing Essentra's logistics operations and ensuring continued growth and success in the competitive landscape.

Future Trends in Supply Chain Network Optimization

As businesses continue to adapt to evolving market dynamics and technological advancements, several emerging trends are shaping the future of supply chain network optimization:

1. Advanced Analytics and Predictive Modeling: The dissemination of these in assessing, planning, and optimizing demand, inventory, transportation, and production management. Through the use of up-to-date analytics tools that can only be used with a large amount of data, companies can extract more elaborate information with which they can detect potential causes for problems in the supply chain as well as difficulties dominating the market.

2. Blockchain Technology for Supply Chain Transparency: Blockchain technology channels the capability of redesigning supply chain management processes better by bringing greater transparency, effectiveness, and integrity to the supply networks. Blockchain technology levels up visibility, integrity, and accountability, as it stores every transaction and piece of information in a reliable and impervious timeline, inhibiting several possible risks (errors, fraud, etc.).

3. Internet of Things (IoT) and Sensor Technology: The infiltration of an array of smart devices and GPS technology into the supply chain has now enabled the real-time monitoring and tracking of all assets, inventory, and equipment. By collecting and examining data from devices that can be connected, enterprises will increase supply operating more effectively and maximizing the exploitation of assets.

4. Robotic Process Automation (RPA) and Autonomous Systems: The use of RPA and autonomous systems will make sure that the supply chain management process becomes less admin-intensive. These automate order processing and control inventory; robots for autonomous cars and drones in transportation and warehousing are what make the supply networks very efficient, accurate, and scalable.

5. Sustainable and Resilient Supply Chains: Sustainability, along with resource scarcity and social responsibility, is one of the major issues in today's business world, driving companies to establish a resilient and sustainable supply chain network. Through introducing environmental, social, and governance (ESG) criteria in the process of decision-making on the supply chain, companies can decrease carbon emissions, reduce waste, and increase engagement at the community level as well, while at the same time building up the capacity of supply chain management in response to the uncertain environments (climate change, disasters, and political instability) which are beyond the control of the individual company.

Thereby there is a difference in how the flow of supply network resources is designed based on these trends this can lead to the exposure of companies and the freshness of opportunity to improve efficiency and sustainability thus competition. Through a supportive innovative culture,

collaboration, and a process for continuous improvement, organizations have the means to remain competitive and realize the productiveness and stability of their supply networks.

Conclusion: The Continuous Journey of Optimization

The configuration of the supply chain network optimization will remain as a tactical process that requires far-sightedness and readiness to change. Through the utilization of a holistic and customer-oriented mode of operation, businesses can stand to gain immensely in production efficiency, as well as reduction of expenditure and also customer satisfaction. This in turn leads to successful ventures in the current high-level international trade economics. Inventory management, logistics, partnership networking, and technology integration are the approaches that can be made to achieve advancement in the manufacturing supply chain. Utilization of big data, ingenious technology, and sophisticated planning methods is a necessary measure for companies to stay nimble and upbeat in the changing economic game field.

The key to success is to accept change as a fact, establish collaboration, and stay sensitive to market movements. By continuing to work on improvements and completing new designs, companies will be able to overcome many challenges that are relevant to fast-paced marketplaces. Lastly, this may be achieved by always maintaining focus on the aspects of ongoing improvement, innovation, and collaboration which in turn would transform the supply chain of the company into engines of value creation, yielding growth, resilience, and ultimately profitability in the global business environment becoming more integrated.

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