Bolstering supply chain resilience by leveraging the power of Data

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Abstract:

For over two decades, Bosch has been a valued client of DSV. Together, we have developed a trusted partnership, built on a shared commitment to deliver innovative solutions that evolve with our customers' needs. This whitepaper began from a shared recognition that many customers are eager to integrate and benefit from AI and other digital tools, but often lack clear guidance on applications and deployment strategies. It brings together the combined insights of two partners, who understand these challenges. DSV and Bosch are both thrilled about these advancements and excited to explore new ways to implement digital tools, to empower our customers and set new industry standards.

This whitepaper is our attempt to cover the transformative potential of leveraging data to bolster supply chain resilience. We will begin by exploring the nature and impact of supply chain vulnerabilities, from natural disasters to geopolitical tensions and market fluctuations.

Our analysis will focus on the strategic use of data analytics to anticipate, respond to, and recover from disruptions. From topics like predictive analytics and real-time data monitoring to Supply chain and Digital twins – we will illustrate how these solutions/technologies can provide deep insights into supply chain operations and enable proactive decision-making.

Finally, we will provide a strategic framework that can help organizations effectively implement data-centric SC practices.

1. Defining Supply Chain Resiliency

Worldwide, supply chains were put to test during the pandemic -- some fared better than others. Though we've waded to the other side of the pandemic now, geopolitical tension and extreme weather events continue to affect job security for logistics professionals. "Welcome to the new normal, where the only constant is change."

That said, disruption is not new, nor is the quest for supply chain resilience. The first known global supply chain, the Silk Road, started around 2700 BCE. Merchants moved both silk and intellectual ideas between the Far East and Europe, navigating through wars, avalanches, and even pirates. Today's supply chains continue to power societal evolution, and technology has accelerated both efficiency and continuous improvement – we have more sophisticated techniques for detecting and avoiding pirates, freight can fly now, supply chain data lives in the palms of our hands, and we're figuring out how to harness the power of artificial intelligence.

At its core, supply chain resiliency is the ability to adapt to adversity quickly to protect critical upstream and downstream business requirements. It is not only about surviving but thriving and emerging stronger on the other side as well. Historically, companies that demonstrated resilience to disruption shared some key attributes.

Companies who fared well in turbulent times valued supply chain and logistic leadership, giving them access to the senior leadership suite. They established "crisis" teams comprising various organizational stakeholders like sales, manufacturing, distribution, and finance, who could quickly come together and make informed decisions, not wasting valuable days establishing command and control. These companies also aligned company policy around the risks posed by their value chain strategy, considering inventory and safety stock policy, mode selection and authorization parameters, and secondary sourcing options.

While these strategies have proven successful and should not be eliminated, they are just not enough in this "new normal." After decades of global expansion, the risk of an extended supply chain needs some serious rethinking. It is essential to develop a strategy and tool set capable of forging more resilient value chains. All companies must plan better and develop supply chain partners that can deliver or augment capabilities critical to success. And while no one strategy is perfect, doing nothing is fatal.

2. Technologies Enhancing Supply Chain Resilience (Control Towers)

As we delve deeper into building supply chain resilience, it's critical to understand the role of technology in the process. One of the most vital roles of technology is to help anticipate potential risks, reduce vulnerability, and enhance operational continuity. Technologies like IoT, AI/ML, blockchain, cloud computing, and generative AI contribute to these attributes, making supply chains more robust and less susceptible to disruptions.

A Supply Chain Control Tower is a data platform that provides end-to-end visibility across the entire supply chain network. A Supply chain control tower leverages diverse data sources (from suppliers, logistics partners, manufacturing systems, warehouses, customers, etc.) to generate real-time insights that aid faster decision-making, especially in the wake of unanticipated disruptions.

Some of the key impacts delivered by a Supply chain control tower include:

1 Data-Driven Decision making

Control towers can provide a single glass-pane view of all your critical supply chain KPIs. For example, it can help monitor and manage your KPIs like supplier on-time delivery, supplier/delivery lead time, order fill rate, OTIF, perfect order rate, quality-related KPIs, order cycle time, return rate, or cost-related KPIs like shipment/freight costs, cost of returns, etc.
A better understanding of these KPIs helps in effective decision-making. Additionally, leveraging technologies like AI/ML on the data helps achieve higher autonomy in the decision-making process. Control towers can simulate different supply chain scenarios, such as supplier failure, allowing organizations to develop contingency plans and evaluate alternative courses of action. Data-driven decision-making shall also help efficiently allocate resources to optimize costs and reduce overstocking/stock-outs and waste.

2 Enhanced Supply chain visibility

Supply chain resilience hinges on supply chain visibility; control towers can help create transparency and reduce information asymmetry at each supply chain node throughout the entire cycle – Source -> Make -> Deliver -> Recycle/Reuse. Control towers integrate data from IoT devices, ERP systems, and 3PL/4PL logistics platforms and offer real-time dashboards that provide insights into inventory levels, transportation status, real-time condition monitoring in cold chains, production schedules, overall supplier performance, etc.

Real-time insights from data consolidation from diverse data sources can help users detect potential supply chain disruptions like delayed shipments, changes in demand patterns, equipment breakdowns, etc, earlier than usual. It therefore allows organizations to take concrete corrective actions promptly and enhance supply chain resilience.

3 Risk identification, mitigation, and response strategy creation

Control towers serve as a powerful tool to aid the supply chain risk identification and mitigation process. Continuous monitoring of supply chain activities and analysis of historical data help identify patterns and potential risks or vulnerabilities before they escalate. Control towers can help serve as a digital process twin for your supply chain and help build and run stress test scenarios for your supply chain.

Additionally, Control towers can integrate with external/3rd party risk management databases and leverage advanced algorithms to identify potential risk disruptions in their supply chain. Advanced AI/ML algorithms can help identify and streamline potential disruption scenarios for the supply chain risk management teams to develop mitigation strategies and business continuity plans.

4 Sustainability and compliance monitoring

Supply chain sustainability is one of the most critical aspects of building supply chain resilience. Control towers help companies monitor and effectively manage their sustainability efforts by tracking essential metrics related to carbon emissions, overall energy consumption, ethical sourcing, etc. Control towers help personnel track (and offset) emissions through fuel consumption (including tracking the use of low-carbon fuel), helping organizations reduce their Scope 3 emissions and achieve their carbon neutrality goals. Control towers can also help organizations in their supply chain circularity journey by helping track assets till their end of life (EoL) and suggest a more sustainable, actionable measure for the asset as it reaches its EoL. Combined with technologies like blockchain, control towers can help ensure ethical sourcing compliance with visibility into supplier practices and material provenance.

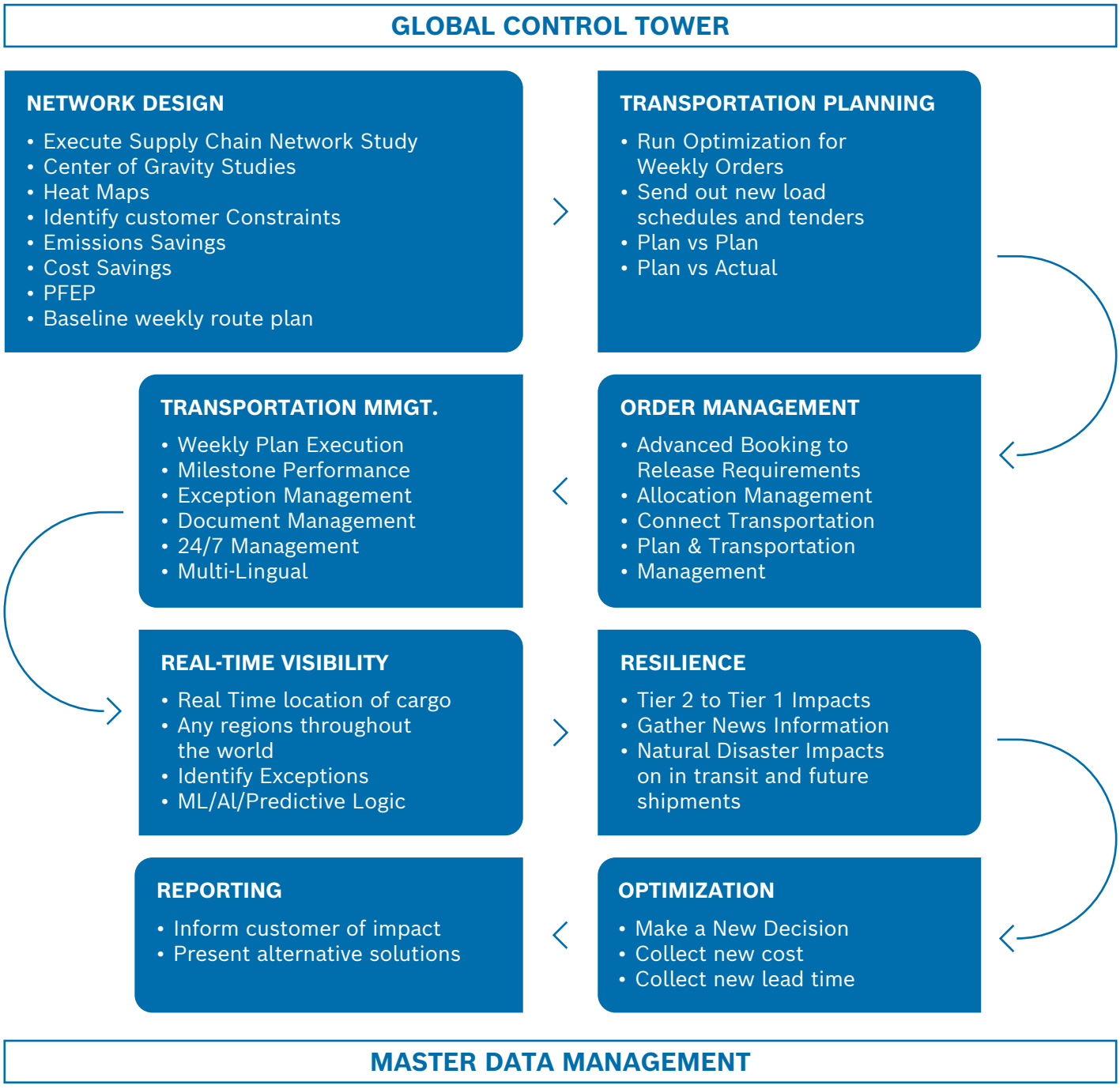
Through enhanced visibility and risk management, supply chain control towers can empower supply chain leaders to create a more flexible, responsive, and sustainable supply chain. They can also leverage the power of descriptive analytics with advanced AI/ML to drive predictive, prescriptive, and diagnostic analytics. This is why they're a critical technology tool for creating resilience in our modern, complex supply chains.

Organizations should operate with the assumption that disruptions in the supply chain are inevitable; the only way to protect oneself is by investing in the right technology that helps build long-term resilience and maintain a competitive edge.

3. Building Supply Chain Control Tower

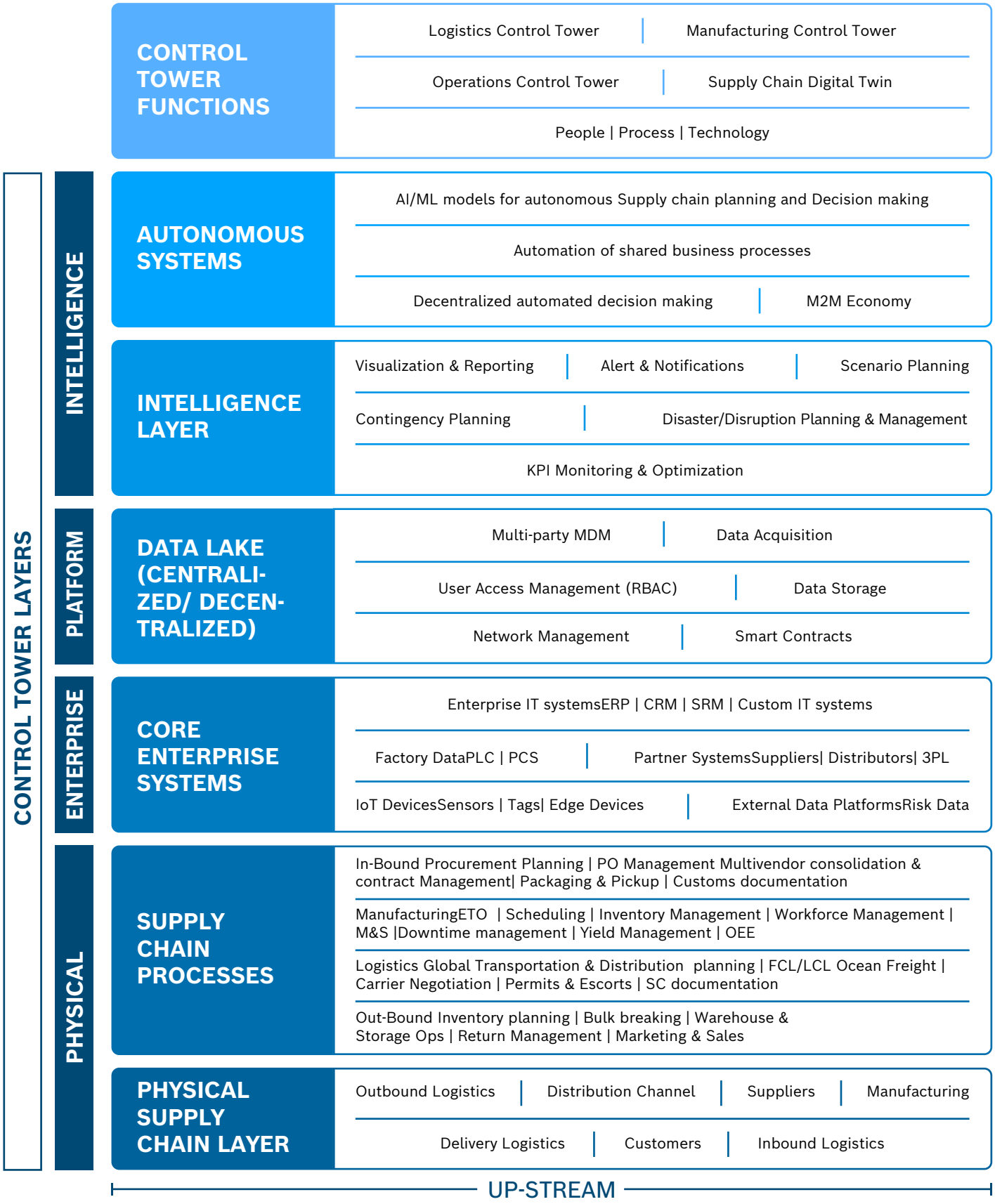
As a preliminary step to developing a control tower, it is critical to define its scope and what one would expect the control tower to achieve. It is imperative that building the control tower is approached comprehensively, keeping all three – people, process, and technology in mind.

The diagram below showcases a proposed approach for building a supply chain control tower:



The model begins by creating a network design- that aims at a detailed study of the existing supply chain to identify gaps. The gaps would serve as an input to look at critical supply chain functions like- Transportation Planning, Order Management, building supply chain visibility, optimization resilience etc.

The diagram below explains the key technology layers to consider in the process of designing a Control Tower: -



Let us look at each of these layers in some detail: -

1. The physical Layer represents the actual physical supply chain (Source ->Make->Deliver). As a first step, it is critical to document the processes involved at each stage (i.e. listing and documenting In-Bound, Manufacturing, Logistics and Out-Bound processes). Please note, that this can be considered an iterative process, it is important to begin with a few critical processes and keep adding more and more processes to increase the coverage of the control tower.

2. As we define the process, the immediate next step is to identify the core enterprise IT systems that help manifest the physical processes in the digital world. These solutions include your ERP, CRM, SRM systems, your PLC/PLS systems, your partner systems or the IoT devices/systems that are used in your supply chains. At this point, you may also look at integrating with some external data sources to run advanced algorithms in future an example for this could be -integrating with external risk management data, weather data etc.

3. Considering that supply chain control towers almost always rely on data sources coming from a myriad of external and internal systems, we believe building a data lake is the next logical step in the process. The data lake serves as a single source of truth on top of which the entire supply chain intelligence would be built.

4. Further north of the model is building visualizations, alerts scenario planning etc. The autonomous layer uses a combination of your supply chain intelligence to make an action, usually, it involves a play of multiple technologies like RPA, IoT etc. along with Data and AI to reach the “True-North” state of supply chain autonomy.

We also advise breaking the entire Control tower into bite-sized smaller implementations based on functions. For example, you may begin with a Logistics control tower, manufacturing control tower and so on.

Finally, building a supply chain control tower is a transformative step towards a more resilient, efficient and sustainable supply chain. As you embark on the journey, remember that successful control towers are built on clear goals, seamless data integration and continuous improvement.

4. Implementing Data-Driven Strategies

Unfortunately, a lack of internal organizational buy-in is an all-too-common entry barrier for those wishing to implement software solutions to enhance data-driven supply chain strategies. Many are wary of proposals for new software, hesitant to upset the existing delicate ecosystem of software already in use, and/or in disbelief about the actual cost, lead time, and complexity of such an implementation. Additionally, corporate needs such as research and development for product development or capital expenditures for expanding manufacturing capacity or improving efficiency tend to be more visible, understood, and prioritized over preventing supply chain disruption events that have not occurred yet and may not conclusively materialize. This leaves supply chain professionals competing for budgetary table scraps amidst pent-up skepticism from organizations gravely affected by those rocky software implementations.

However, the potential for supply chain disruption is growing as supply chain complexity increases, and the historical costs of disruptive events are staggering. Downtime is more expensive than ever, and the cost of a day's manufacturing line stoppage likely exceeds the cost of software. Though many have tried, accurate predictions of future events cannot be guaranteed. For some, the potential penalty that has not been incurred may not be enough to overcome the fears of a messy and drawn-out integration.

In addition to calculating an opportunity cost for business case justification, we encourage those who desire a smooth implementation to spend time clarifying their actual objectives upfront. What is the actual problem that needs to be solved? Gaining absolute clarity about what is in scope and, just as importantly, being clear about what is not. Once this has been defined, the selection of a tool that is appropriate for meeting the needs is much easier, decreasing the chances of finding out too late into integration that the chosen software package will leave unexpected performance compromises and disappointments.

Classically, this is the correct point to try to project a return on investment (ROI). However, looking through the traditional lens of ROI when attempting to prevent disruption that will undoubtedly occur but

may not be meaningfully compared to the Value of the investment. Nevertheless, there is an actual cost to disruption even if it cannot be forecast; for example, S&P Global Mobility2 estimates that in 2021, more than 9.5 million units of global light-vehicle production was lost as a direct result of a lack of necessary semiconductors... another 3 million units were impacted in 2022.

Many of these vehicles, built as unsaleable units, aged as they waited for the arrival of missing chips. It was a massive capital outlay without the possibility of revenue – can events like this be prevented or minimized in the future? Yes, and perhaps the better metric for improving supply chain resilience to avoid or reduce such kinds of events is Return on Value (RoV) rather than ROI.

While scoping the desired outcome for the project, it is also worth taking the time to define what success will look like. In the example of vehicle assembly and disruption preventing a critical component from arriving when needed, is it a digital dashboard showing potential risks so that decisions can be proactively taken to allocate components to the most profitable vehicles, the manufacturing facilities with the most expensive downtime, or at least knowing farther in advance when the risk of supply chain mishaps has exceeded a pre-determined tolerance level or has the potential to cause financial impact which surpasses a specified threshold?

With this vision in mind, Key Performance Indicators (KPIs) can be established so that degrees of success can be measured. How many potential disruptive events were detected and avoided? How will their severity be ranked and then correlated to the operational cash flow unaffected in preventing disruption? It is with these KPIs that we can establish a Return on Value.

https://www.spglobal.com/mobility/en/research-analysis/the-semiconductor-shortage-is-mostly-over-for-the-auto-industry.html

5. Navigating the tightrope of Supply Chain Transformation

It is no news that the global supply chains are going through a seismic shift, accelerated by the convergence of break-neck technology evolution, changing customer expectations, and disruptions from events like the COVID-19 pandemic and quickly escalating geopolitical tensions. The proverbial bus has already left the station; organizations must run fast (faster than ever before) to form a digital growth strategy- and those who fail to do so would be at risk of being left behind.

However, it's important to note that the path to this transformation is not without challenges – it's a tightrope walk and requires a delicate balance between urgency and caution. While the need for transformation is pressing, it is equally important to approach this transformation methodically. No matter how enamored with and inspired by new technologies like AI, it is critical to define the pain points/challenges to avoid expensive missteps. Tools, no matter how great, can never create art by themselves.

The first step in defining the transformation roadmap is creating a business case- it starts with a thorough assessment of your supply chain processes – identifying the bottlenecks, potential breakpoints, failure modes, etc. Also, it's critical to develop business cases comprehensively — financial returns, a fundamental metric, should be viewed in conjunction with strategic/ long-term benefits — sustainability, customer satisfaction, increased agility, future readiness, resilience, etc. A well-defined, comprehensive business case serves as a roadmap to guide organizations through the complexities of the transformation onto the growth path.

It is also essential for organizations to break the entire journey into small parts (transformation legs)- Transformation is a marathon, not a sprint. "Transformation Legs" allow the whole transformation program to be managed effectively (and objectively) in terms of risk. They also allow us to pivot (if required) to maximize the overall impact of the transformation and to ensure scalability as this Industry 4.0 matures. As the saying goes- a big success is a summation of many small achievements; pilot projects and small-scale PoCs allow organizations to fail fast or learn fast and help create bite-sized successes- thereby helping achieve the larger goal.

Another critical ingredient of a successful transformation (and often an underrated aspect) is the focus on continuous learning of employees, empowering employees to learn new technologies, and enabling them to be better informed and accepting of the change. Organizations should earmark a good portion of the transformation budget for employee training and upskilling while creating an environment that fosters innovation and continuous improvement.

In conclusion, supply chain transformation is no longer an option but a necessity for organizations to thrive in the modern business environment. While the urgency is accurate, it is essential to have a thoughtful and deliberate approach. By focusing on the correct problems, defining a solid business case, and taking incremental steps while focusing on employee upskilling, organizations can confidently navigate the tightrope walk of transformation.

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Established in 1886, the Bosch Group is a leading global partner for technology and services. Bosch Software and Digital Solutions (Bosch SDS) is a global digitalization provider of consulting, engineering, and IT services. We help enterprises Switch to Smarter Digital, a forward-looking approach to digitalization that is centered on the user. From creating new digital business models, enabling resilient future-proof enterprises and accelerating sustainability goals, Bosch is a trusted partner for a multitude of industries across the world. As a global technology partner, Bosch SDS operates in North America, Europe, the UK, the Middle East, and Asia Pacific markets through a network of on-shore, near-shore and off-shore delivery centers.

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At DSV, we keep supply chains flowing in a world of change. We provide and manage supply chain solutions for thousands of companies every day – from the small family-run business to the large global corporation. Our reach is global, yet our presence is local and close to our customers. Approximately 75,000 employees in over 80 countries work passionately to deliver great customer experiences and high-quality services. We aspire to lead the way towards a more sustainable future for our industry and are committed to trading on nature's terms.

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