SGInnovate
Insights

In collaboration with
NEXST and Reefknot Investments

SUPPLY CHAIN DIGITAL TRANSFORMATION:

Enhancement of Supply Chain Visibility for the Post-COVID-19 World

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NEXST The Next Supply Chain

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About SGInnovate

At SGInnovate, we build and scale Deep Tech startups into high potential companies with global impact. We believe that hard global problems can be solved using Deep Tech, and Singapore, where we are based, is uniquely positioned to realise Deep Tech innovations that can tackle these challenges. Our Deep Tech Nexus Strategy is focused on adding tangible value to the Deep Tech startup ecosystem in two key areas — development of Human Capital and deployment of Investment Capital. With the support of our partners and co-investors, we back entrepreneurial scientists through equity-based investments, access to talent and business-building advice. Our efforts are prioritised around emerging technologies such as Artificial Intelligence, Autonomous Tech, MedTech and Quantum Tech, which represent impactful and scalable answers to global challenges.

About NEXST

The Next Supply Chain (NEXST) is a think-tank initiative aimed at driving new business models and transformational technology in the Supply Chain and Logistics industry. NEXST aims to positively create value and impact for the Supply Chain and Logistics industry, to partner with and support high growth technology businesses seeking to transform the Supply Chain and Logistics industry, and to become a global centre of gravity for all technology startups in the Supply Chain and Logistics industry.

About Reefknot Investments

Reefknot Investments is a global Joint-Venture Venture Capital Fund between Temasek and Kuehne + Nagel seeking to partner and actively support high growth technology businesses seeking to transform the Supply Chain and Logistics industry. Reefknot invests in founders and companies that solve meaningful problems and have the potential to make a transformational impact in the Supply Chain and Logistics sector. Additionally, Reefknot is focused on companies that develop and/or uniquely utilise Technology as a foundation or differentiating anchor for their respective business models. Their solution areas include but are not limited to Artificial Intelligence(AI)/Deep Tech, Digital Logistics and Trade Finance.

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1.

Introduction

Across the world the COVID-19 pandemic has exposed inequalities between the haves and have-nots. Nowhere is this clearer than in supply chain management.

Many companies with global footprints have been caught flat-footed, unable to adjust to the sudden factory closures and supply chain disruptions that began in China at the start of the year. Close to three-quarters of U.S. businesses have experienced supply chain disruption as a result of the outbreak, according to a survey by the Institute for Supply Management (ISM).

Their primary COVID-related supply chain challenges stem from: lack of flexibility of sourcing and supply chain networks; longer lead times; lack of production operating capacity flexibility for manufacturers and suppliers; lack of logistics cross-border capacity; delays in loading, moving, and receiving orders; inventory shortages; and uncertainties in future customer demand, and sequencing of demand, across a myriad of products.

By contrast, companies with comprehensive supply chain visibility have been able to proactively rework their supply chains. "In the first few weeks of January 2020," according to a commentary in the Harvard Business Review[1], "companies that had mapped their supply chain already knew which parts and raw materials were originating in the Wuhan and Hubei areas and, as a result, could bypass the frantic hunt for information and fast-track their responses."

A multi-year, supply chain digitisation process has well prepared a leading global F&B retailer for this pandemic, according to the firm's global supply chain operations director. "Supply Chain Visibility and transparency, up to our Tier-3 suppliers, have helped us weather this disruption."

Supply chain visibility has provided these firms with an early-warning capability, and to some extent, supported prescriptive decisions, for COVID-related disruptions.

But what exactly does supply chain visibility today entail? And how do companies go about improving it while contending with tightened budgets amid (likely) the worst economic downturn since the Great Depression?

[1] Harvard Business Review, "Coronavirus Is Proving We Need More Resilient Supply Chains", March 2020 [https://hbr.org/2020/03/coronavirus-is-proving-that-we-need-more-resilient-supply-chains]

2.

Supply Chain Visibility

According to Aberdeen Research, supply chain visibility (SCV) is the awareness of, and control over, specific information related to product orders and physical shipments, including transport and logistic activities, and the status of events and milestones that occur prior to and in-transit.

Figure 1 highlights the "Key Drivers" behind increased SCV; the current technological "Solutions" being deployed to achieve it; "Challenges" to adoption; and "Implications" of greater SCV.

Needless to say, the quality of visibility is a function of technology. Neat ledgers and sharp bookkeepers may have been the nineteenth century's SCV equivalent of today's blockchain and data scientists.

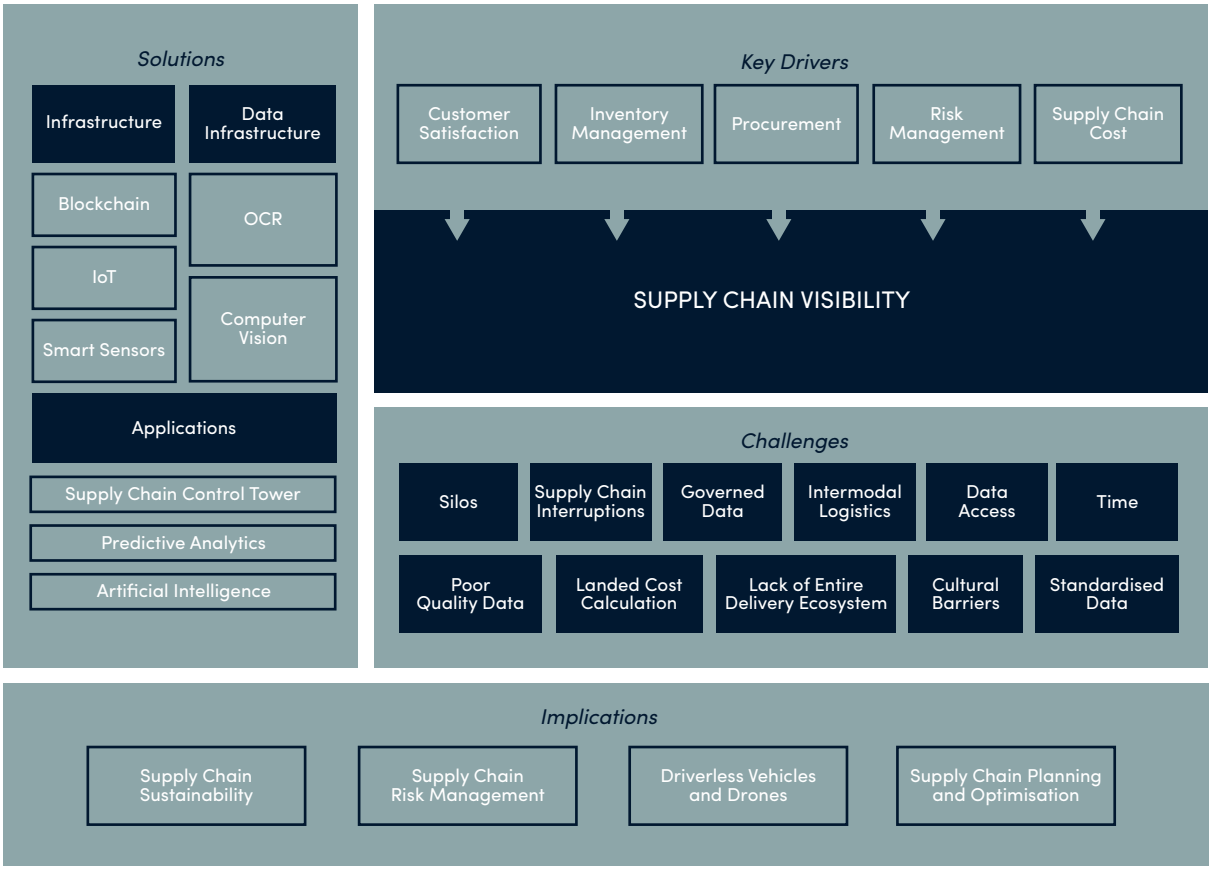


Figure 1: Supply Chain Visibility overview

Perhaps most importantly, today's communication infrastructure, cloud computing and the Internet of things (IoT) have together enabled the creation of a "digital twin": the mirroring of the physical world in the digital realm.

"This representation enables end-to-end visibility of assets, activities and capabilities which is the foundation of 21st century supply chain and logistics management," commented Wolfgang Lehmacher, supply chain and technology strategist. "It is the prerequisite of end-to-end visibility and transparency, demanded by many of today's consumers."

Implicit in this is the ability to selectively share data across the entire business ecosystem, which includes every stakeholder from government authorities and customs agents to insurance firms, freight forwarders and other public and private entities.

As such, with end-to-end SCV, the breadth of information churning through the ecosystem stretches from synthesised top-level key performance indicators (KPIs), which define the overall service level, to granular process data, such as the exact position of trucks (and the ambient conditions around each) in the network. This range of data feeds a comprehensive, consistent and cohesive informational storehouse that can be accessed by all levels of seniority and functions in the supply chain. In order to achieve that, the integration of data of suppliers, service providers and other parties is crucial in a fully integrated and dynamic supply chain eco-system. This helps to ensure that all stakeholder decision-making is based on the same data and facts.

Enhanced SCV is part of what some term Supply Chain 4.0, in which digitisation leads to supply chains that are, according to McKinsey, more flexible, granular, accurate, efficient and also faster.[2] "The future supply networks are truly dynamic with real-time optimisation of order-delivery flows, through embedded cognitive and artificial intelligence tools and capabilities," writes Lehmacher.

In such a world, customers might seamlessly change destination and delivery time, or even fine-tune the product itself. Links in the chain adapt and respond instantly, with new offers, sales, stops, releases and reroutes. The ecosystem begins to resemble a nimble and resilient organism.

How might such resilience have better prepared supply chain managers for the impact of COVID-19?

Visibility of Tier-1 suppliers:

- Better understanding of their ability to meet supply requirements and mitigate potential risks by being aware of their ability to swiftly relocate production to where manufacturing is still possible.
- Greater appreciation of the supplier's allocation perspective and decision-making in the event of inventory and capacity shortages—as suppliers usually don't deal with only one customer.

Visibility beyond Tier-1 to the extended supply network:

- Visibility of key Tier-2 suppliers and beyond will enhance the company's understanding of its Tier-1 suppliers' order fulfilment performance. This maximises the time available to work with Tier-1 suppliers on alternative plans, and/or to proactively alter supply chain plans to keep plants running at maximum efficiency within the likely supply-side constraints.
- Enhanced understanding of holistic supply-side risk will promote agility within production and distribution networks, in turn enabling firms to quickly reconfigure and maintain supply to global demand.
- Helps address the domino effect of plant closures and supply shortages across the extended supply network, which can quickly lead to significant supply chain disruption.

[2] McKinsey & Company, "Supply Chain 4.0 – the next-generation digital supply chain", October 2016 [https://www.mckinsey.com/business-functions/operations/our-insights/supply-chain-40--the-next-generation-digital-supply-chain]

Visibility of inbound materials

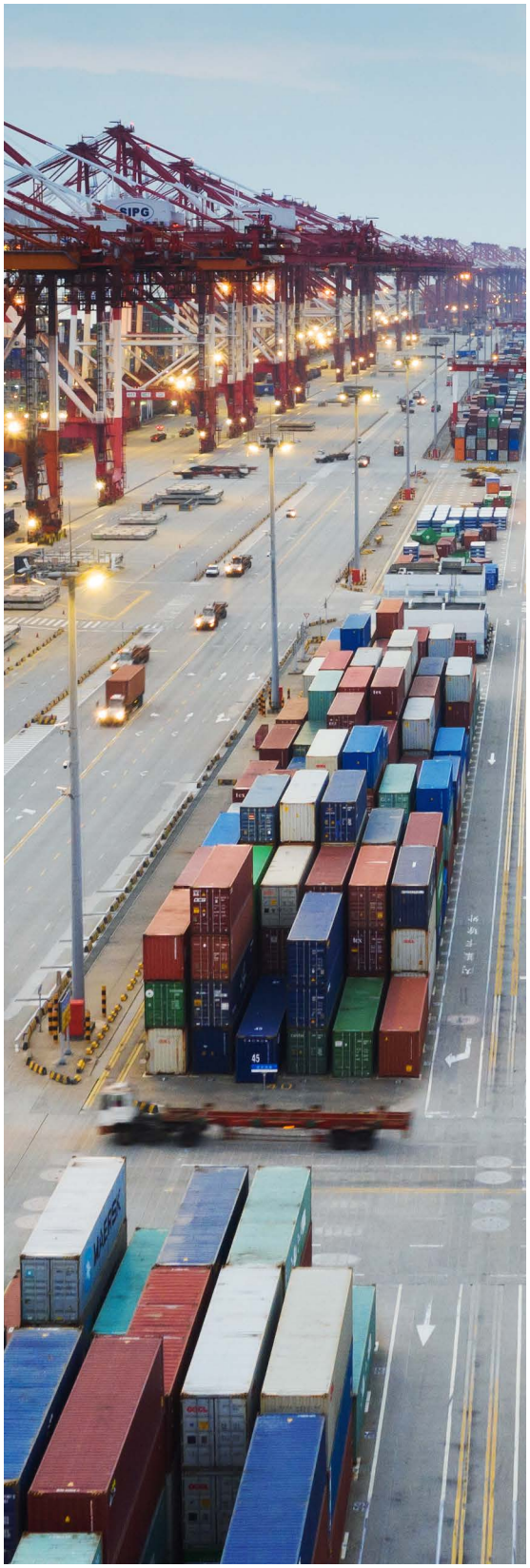
- Helps to estimate (the extent of) deterioration of on-time, in-full delivery performance from key suppliers.
- Allows for better prediction of potential supply disruptions, such as the length of delay, and helps proactively alleviate the impact.

Control Tower (End-to-end visibility)

- A Control Tower is a decision-making platform for a real-time, integrated and omniscient supply chain, providing end-to-end visibility and predictive/prescriptive analytics. It allows for increased efficiency without the need to implement widespread structural changes in the near term.
- Allows managers to pinpoint the exact source of disruption and assess how to react accordingly.
- Enables managers to assess options and engage in scenario-planning, which in turn fosters better forward planning.

Yet even if this tech-enabled logistics ecosystem seems like a realistic goal, getting there is another matter. With so many disparate actors in the ecosystem, exercising varied choices and sequencing of technology solutions, it can seem unclear how ecosystem-wide coordination will work.

Lehmacher reckons that in the logistics industry 80 percent of organisations know why they should digitally transform, 40 percent know what to do, 20 percent how to do it, and then, finally, a smaller proportion of organisations have already begun the journey—experimenting and gradually including advanced digital solutions into logistics assets and processes.



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Challenges

What are the concrete challenges on the route to SCV? Consider informational silos that exist both within organisations and outside, for instance in relation to third-party partners. These silos might impede data flows, especially with varying front-end technologies, such as Transportation Management Systems (TMS), and backend infrastructure, such as ERPs, in play. There are related issues around data access, poor quality data and the lack of standardised data.

Moreover, global data governance is still a work-in-progress. With countries and regions adopting tailored data frameworks, it remains to be seen exactly how cross-border logistics data flows might be optimised.

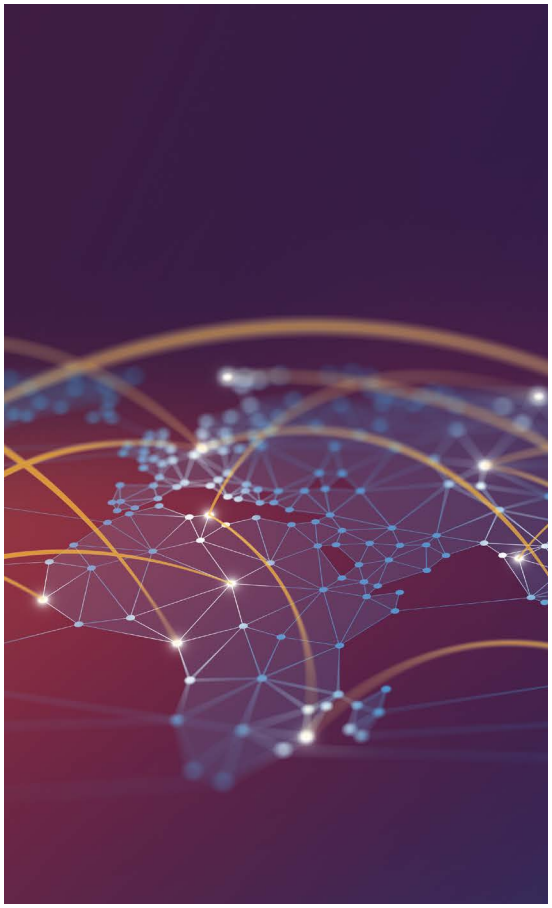
The characteristics of intermodal logistics—relying on a wide array of different freight methods such as trains, trucks, airplanes and boats—also increase complexity when it comes to SCV.

Meanwhile, itemised costing is a critical building block of SCV. Often cost components are not maintained across third-party partners, hence there exist difficulties in establishing visibility of landed cost.

The lack of a single technological solution that can cover the entire delivery ecosystem is also a hurdle, as is the sheer amount of time necessary for technological adoption, say transitioning ERP systems, or uploading data into the cloud.

Finally, IBM has found that there exist cultural barriers, such as issues of trust and fair reward, to achieving the level of interaction and visibility necessary for comprehensive SCV.[3]

Nevertheless, none of these hurdles are "show-stoppers", according to Marc Dragon, managing director of Reefknot Investments, a supply-chain focused VC. "There are many hurdles, but nothing stops companies from engaging with point solutions to fill specific pressing gaps, especially if there is a plan for these point solutions to roll up to a broader capability" he says. "In fact, some of those [challenges] might seemingly fall in the 'not critical for operations' category in the next 12-18 months, but instead will be critical for mid-long term organisational and operational capabilities."



[3] IBM, "The smarter supply chain of the future", October 2010 [http://www.ibm.com/downloads/cas/AN4AE4QB]

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The Bigger Picture

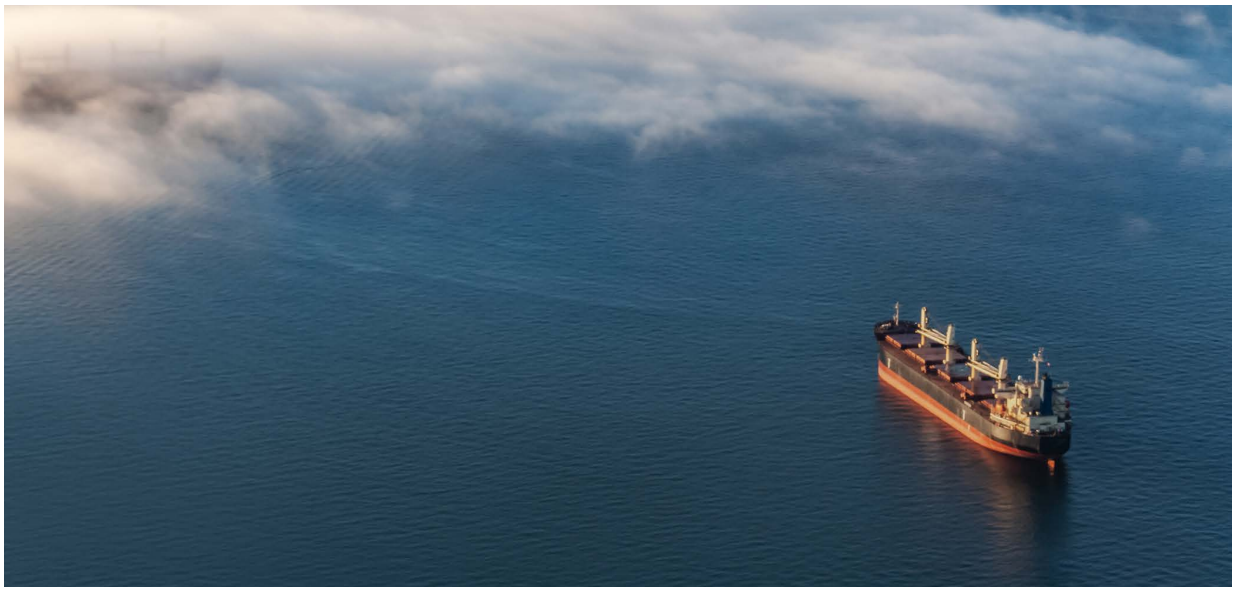
The COVID-19 pandemic has accelerated certain trends, such as: the regionalisation and localisation of supply chains that had been initiated prior as a result of other secular global forces, not least US-China trade tensions; and the growth in cross-border services, which according to Mckinsey is now rising 60% faster than the trade in goods.[4]

Other mid-to-long-term consequences of the pandemic, suggests Lehmacher, are: larger companies will benefit while SMEs struggle; Asia will recover first and hence possibly exploit supply chain gaps; digitisation and automation of the economy will accelerate; and virtual workforces will become more ubiquitous across all stakeholders, from government to NGOs.

"This crisis not only will drive deeper thinking and transformation to a more regionalised and localised ecosystem, but also expose smaller, non-differentiated supplier dependencies," says Dragon. "As a result, the future state ecosystem design will likely be more distributed yet digitally and financially integrated."

The upshot of all this, according to Dragon, is that firms with strong financial management will be able to invest more in digitisation to come out of this crisis stronger. He believes there will be greater focus on data and process integration across enterprises, SCV, technologies that streamline operational process integration across enterprises, and AI technologies that enhance demand predictions and planning across the ecosystem. By contrast, he sees much less emphasis on models and technologies that struggle to define large enough specific and quantifiable value for the industry.

There are a multitude of logistics startups assisting firms on their SCV journeys. Some are focussed on addressing highly specific challenges in particular industries, like DiMuto (Case Study 1), which helps agrifood players digitalise their supply chain. Others, like Roambee (Case Study 2), have asset-light and industry-agnostic business models, which rely on a combination of AI, cloud computing and IoT to enhance SCV for just about any firm. Still others, such as Prowler (Case Study 3), have an arsenal of light, elegant algorithms that can be deployed to improve decision-making at any level.



[4] McKinsey Global Institute, "Globalization in transition: The future of trade and value chains", January 2019 [https://www.mckinsey.com/featured-insights/innovation-and-growth/globalization-in-transition-the-future-of-trade-and-value-chains]

Case Study 1:

DiMuto

Californian oranges, lemons and grapefruits are finding eager new buyers across Asia and the world, all thanks to supply chain visibility technology from DiMuto, a Singapore-based startup that helps agrifood players digitalise their supply chain.

At Fancher Creek Packing, a family-run outfit in the fertile San Joaquin Valley, DiMuto's DACky (Digital Asset Creation) device, hovering above the production line, seamlessly snaps image of fruits in cartons as they roll through. DACky, an IoT device, works in concert here with DiMuto's artificial intelligence (AI) engine, which is overlaid to provide a scoring on each carton to ensure that it meets the requirements set by the buyer. Within seconds every fruit and every carton has a unique QR code and "digital identity", which can then be associated with traditional trade information such as purchase orders and shipping documents on DiMuto's blockchain-powered platform.

Wholesale buyers and traders in Asia can thus track any item through its entire supply chain journey, with clear oversight on food safety, security and provenance. Fresh produce trade disputes—for instance a buyer not receiving the specified product—can typically lead to losses of 5-10% of every order.

"The custody of truth and the burden of proof had become a problem [in the produce trade]," says Gary Loh, DiMuto's founder and CEO. "The custody of truth is now on the blockchain, and so the burden of proof is now not on one [party] or the other."

Yet DiMuto can solve more than just fresh produce disputes. This accountability and traceability for each fruit—from farms, packing facilities, cold chain to distribution channels and end consumers—can potentially deliver far greater benefits to the global agrifood industry.

Improving traceability of each fruit with the DiMuto technology

The UN Food and Agriculture Organization (FAO) reckons that one-third of the food produced annually for humans is lost or wasted. DiMuto's end-to-end, 24/7 visibility system could mitigate this by enabling agrifood traders to penetrate new markets, and also helping them redirect supply to demand effortlessly and dynamically—market rewiring that is all the more pressing, as we've seen, during a pandemic.

DiMuto has to date identified, classified, tagged and tracked over 30m fruits (worth over US$100m). Its global network stretches from Asia to Latin America. Its future plans include leveraging its supply chain data to pivot into financial services and trade financing—it has already helped finance the sale of over US$2m worth of durians from Thailand to China.

Durian consumers may be a rare breed, but DiMuto might help find every last one.

Case Study 2:

Roambee

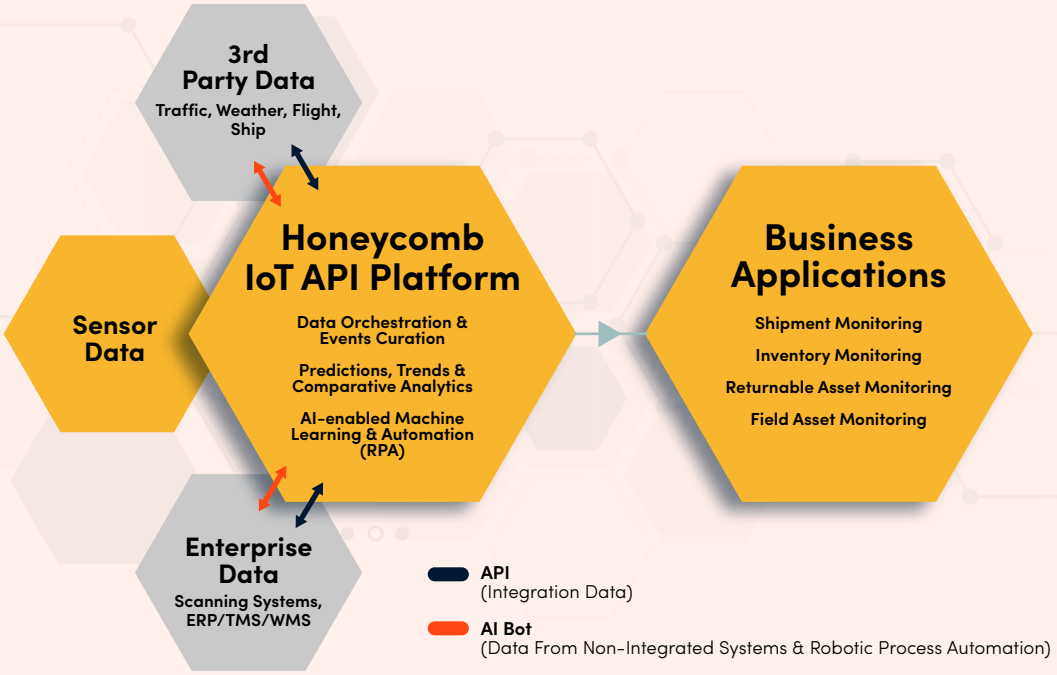
Illegal prescription drugs, sometimes made by adulterating original product, have caused terrible suffering across the world, most notably with the opioid crisis in the US. So when GlaxoSmithKline (GSK), the largest pharmaceutical firm by volume in India, sought help from Roambee, a supply chain visibility firm, to reduce theft in its supply chain, its motivation was more than just reputation or costs—GSK wanted to save lives.

California-based Roambee's real-time, multi-sensor, visibility solution not only eliminated theft altogether, it also ultimately led to overall end-to-end optimisation of GSK's supply chain, including better ETA predictability and reduced buffer inventory.

To explain, GSK uses 11 transport vendors (third-party logistics, or 3PLs) to move over 10,000 shipments between 30 locations in India, including long stretches of country road. Before its Roambee engagement, theft was a constant problem on some routes, particularly between 11pm and 5am, when drivers would stop to sleep. The firm could not seal containers as they needed to be accessible for customs inspections. GSK tried to track shipments using GPS and also attempted to enforce service-level agreements with its 3PLs. Both to no avail.

Enter Roambee. Its "Bees" are tiny low power wide area network (LPWAN) modules that can be affixed to any box. Sensor data is uploaded to the cloud via a "Bee Beacon" in each truck every 15 minutes. GSK first deployed these to track 50 of its most critical and risk-prone monthly routes, enabling it to flag route deviation, unscheduled stops or night driving (when safety risk is highest).

GSK then scaled it up to over 400 routes per month. To handle the higher workload, Roambee also set up a 24x7 manned incident and crisis response center—BeeCentral—that worked exclusively for GSK. BeeCentral is a seemingly whimsical name for what is actually a cutting-edge version of Supply Chain Control Towers.



If one considers First Generation towers that used lists, spreadsheets and phone calls to coordinate a logistics network, then the Fourth Generation, represented by BeeCentral, offers end-to-end supply chain control, scope for automation and better analytics. It does this through better contextual data visibility (through integration with external feeds); improved, durable data capture devices; automated exception flagging and handling; and prescriptive and predictive analytics.

BeeCentral allowed GSK to tie visibility directly into analytics, from which it could derive useful foresights. At that point, GSK realised that comprehensive supply chain visibility could not just solve its security pain point; but enhance optimisation of its entire supply chain.

This is just one of many Roambee use cases. Roambee's clients today include 3M, Diageo, Del Monte, Lenovo, Nippon Paint, Tata, VW, and Unilever. Among other things they like Roambee's subscription model—"Pay as you go, scale as you go"—which involves no sensor purchase or Capex.

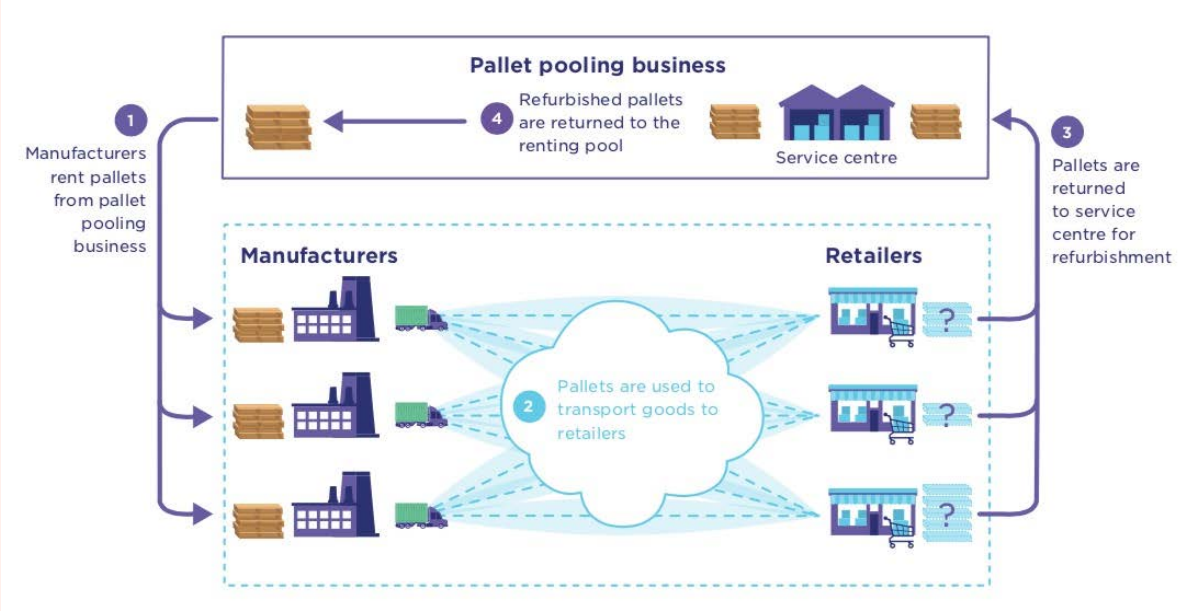
"Customers begin by using our service as an early warning system to eliminate disruptions and reduce risks in their supply chain," says Sanjay Sharma, CEO of Roambee.[5] "We then extend our value proposition by providing insights and foresights to streamline and optimise their operations."

Case Study 3:
PROWLER.io

Artificial intelligence (AI) is widely known for leveraging big data and deep learning to aid in perception, for instance helping an autonomous vehicle identify a dog on the road. That approach—a system educating itself with vast quantities of data—also enabled Google's AlphaGo to beat a human at the board-game Go in 2016.

In reality, AI encompasses a broad array of machine learning techniques, including some adept at working with less data. This is the premise behind PROWLER.io, a UK-based firm whose AI Decision Engine employs a unique combination of sophisticated probabilistic modelling and decision-making libraries that empower businesses to use readily available data to make better decisions.

Consider the Decision Engine's impact in the logistics sector. PROWLER.io recently worked with a leading pooled pallet company that every day has to decide how many trucks to send to each retail customer for pallet collection.



The life cycle of pooled pallets

[5] Roambee, "Roambee Raises $15.2M to Help Shippers Monitor and Automate their Supply Chain", January 2020 [https://www.prnewswire.com/news-releases/roambee-raises-15-2m-to-help-shippers-monitor-and-automate-their-supply-chain-300993924.html]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Send too many trucks, and transportation costs rise with too few pallets available for pickup. Send too few, and pallets sit idle, wasted assets that could have been used elsewhere in the supply chain. A default big data "solution" to this challenge would be to physically tag and track every single pallet and allocate resources based on analysis of the millions of data points—a cost prohibitive investment for an asset of this nature.

Fortunately, the PROWLER.io Decision Engine offered a cost-effective, data-efficient solution to improve pallet collection accuracy. The historical data set available included the status of previous collection attempts, marked either as "failure" or "success". A failed collection means fewer pallets were available than expected, and a successful collection means at least as many pallets were. With this available data PROWLER.io was able to simulate a range of scenarios from which the decision maker could choose, based on their domain expertise. Using this approach, PROWLER.io identified an opportunity for the customer to reduce failed collections by 33%, resulting in the potential to significantly improve pallet utilisation and reduce transportation costs.

"We are approaching decision-making in a practical and novel way that empowers people in businesses to make better decisions with data available in the moment," says Vishal Chatrath, co-founder and CEO of PROWLER.io. "Unlike traditional approaches to AI which rely on vast static data sets, we have developed a decision-making engine which can train on readily available data, adapt to uncertainty and act in real-time."

PROWLER.io technology is sector agnostic and it is currently diversifying from supply chain and finance to other sectors.

The company is creating a new paradigm for decision-making in business. As a result, AI is now no longer just for huge conglomerates with massive data sets and hefty computing horsepower tackling a narrow set of problems. Instead, through solutions like the PROWLER.io Decision Engine, AI is also accessible to businesses with limited, sparse or incomplete data sets, even if they lack the time or expertise to prepare them. This enables decision-makers to draw upon new tools and techniques to address a far greater range of real-world challenges.

3.

Conclusion

Even before COVID-19 the world's leading supply chain executives had, at the very least, started to familiarise themselves with the cutting-edge technology options that could propel their firms towards Supply Chain 4.0.

Yet today it is no longer a matter of building competitive advantage—but one of ensuring survival.

"This is an opportunity for any organisation that thinks supply chain is a cost centre to reinvent its mindset," says the global supply chain operations director at a leading global F&B retailer. "It is a global problem, unless business leaders reimagine and accelerate the digitisation of their supply chain, businesses will surely be hit by another crisis."

What should companies do now?

Familiarise yourself with the key drivers of Supply Chain Visibility and the associated technology solutions and data integration imperatives

- Understand the functions and value of technology capabilities such as blockchain, the Internet of Things (IoT), Smart Sensors, OCR, Computer Vision, Supply Chain Control Towers, Predictive Analytics and Artificial Intelligence, and how these technologies enable specific aspects of Supply Chain Visibility.

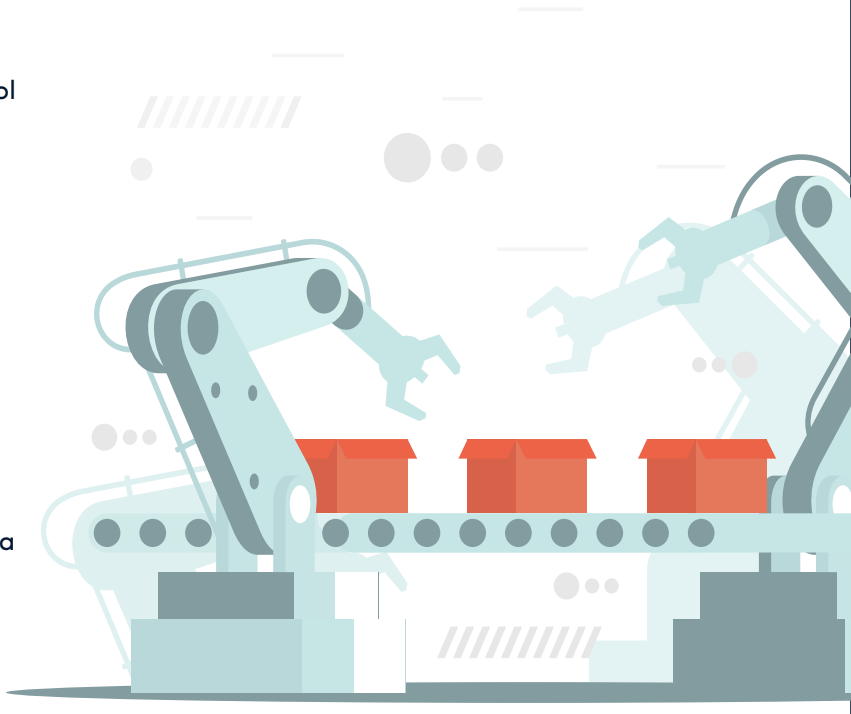
Develop an understanding of your data universe

- Data integration can seem a daunting process, especially with numerous legacy systems in play. It is important to quickly develop a revised holistic understanding of your supply chain's informational requirements, given learnings from the impact of Covid-19, and the associated data strategy and integration imperatives. This includes the need to break down data silos across your supply chain ecosystem, and technologies that support this new data strategy and integration requirements.

Identify short- and medium-term Supply Chain Visibility issues that you can address

- While there are many relevant technologies associated to Supply Chain Visibility, it is important to continue to prioritise based on a combination of immediate operational ROI, as well as continue to invest in technologies that add to strategic advantage for the firm. As such, while immediately implementing technologies such as Data Integration, IoT or robotic process automation (RPA), will return immediate Supply Chain Visibility benefits, further investments into Demand Predictions, Dynamic Planning and associated AI technologies will enable exponential strategic value in the long term.

- "For the short term, companies will be squarely focused on immediate quantifiable ROI and results," says Dragon. "However, those stronger and/or more strategic in nature will continue to invest in broader and longer term initiatives, including those 'ecosystem dependent' capabilities, and these investments will ultimately strengthen these firms' industry position over the long term".

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