

Revolutionizing Logistics:

Driving Risk Out of the Supply Chain

By ChainLink Research

After decades of market expansion, logistics executives know that their routes to market are laden with risks. Of all the enterprise processes that executives must monitor, remote operations and logistics management require far more visibility than ERP systems can provide. Fortunately, there are compelling new technology options that provide deeper insights into real-time operations and enable executives to write new rules for the road.

In this paper, we will discuss the challenges and risks faced today, especially by large multi-national organizations with complex, multi-modal logistics. And how, powered by revolutionary Internet of Things (IoT), sensors, networks, and analytics, real visibility and efficiencies can be achieved while reducing risk, creating new levels of business performance and the ability to revitalize today's dated, manual, and often inaccurate practices.

Finally, we will talk about the new user experience models, where business users can consume actionable information and intelligence rather than being burdened with clumsy outmoded approaches to technology procurement and implementation.

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Conquering Uncertainty: Visibility and Condition Monitoring

Globalization is a done deal. Corporations consider it commonplace to trade with suppliers and partners the world over. However, awareness is growing about the unintended and potentially severe consequences, and the associated risks and costs to their business activities. No industry is left untouched.¹ Estimates on theft, damaged or lost cargo worldwide total around \$50B per year.² Closer to home, supply chain disruptions may not make the headlines, but they still cost billions, with damage, loss, theft³ and delays. Incidents are not just about the damage to goods, but also the impact on the cost of goods sold, increases in operating expenses, lost sales, competitive displacement, disappointed customers, and damage to the brand. (See Figure 1.)

Day-to-day cost pressures and advances in technology are driving a complete rethinking of business processes. The increased costs to the business of logistics missteps have created an acute need for global visibility in order to improve efficiencies and performance, as well as reduce risk for in-transit goods—be they critical raw materials or finished goods for the end customer. Longer cycle times and more frequent supply chain delays are causing firms to rethink their inventory and transportation strategies. Benchmark statistics show on average 85% on-time deliveries, with even the best firms often missing their on-time statistics.⁴ Recent delays have driven many firms to increase warehouse space and seasonal inventory levels. Some shippers have turned to expensive air freight for high priority/time definite deliveries.

The *on-time challenge* is expected to get worse. In ports, changing business policies and labor issues are creating delays and backups in unloading cargo and getting it to market.⁵ On the ground, competition for rail capacity, shorter truck driver hours, stricter emissions laws that are taking older equipment off the highways, as well as increasing demand for last mile logistics, are all reducing capacity, which is driving up costs.⁶

In source markets (generally, developing economies), logistics are even more unpredictable. Layered on top of less-than-ideal transportation networks, changing weather, health crises, high levels of theft on dangerous routes, and/or political situations is the problem of aging transportation equipment, all of

¹ Metals, minerals, pharmaceuticals, food, lumber, and chemicals, for example.

² As cargo ships get larger, the value of the ship and the cargo they move rises. For example, the older largest container ships could carry 8,000 20-foot equivalent units; now there are Triple E-class ships, which carry 18,000 and 19,000 TEUs with potentially 24,000 TEUs in the near future. This raises the value from millions per ship to up to \$1 billion in cargo value. So though the number of incidents may not grow, the impact of each one surely will.

³ According to [Freight Watch](#) there were 946 truck theft incidents in 2013 with an average value of \$544K; the US thefts tend to be nonconfrontational vs. those in Mexico, which have a high percentage of armed, violent incidents. FreightWatch also stated that the EU has poorer statistics due to the under reporting on cargo theft. However 689 reported incidents in 2013 are part of a growing trend of crime, especially in eastern and 'southern' nations. Africa has the highest risk with many thefts associated with not just commercial theft but incidents associated with terrorism. Why should we care about international statistics? Many of the commodities and raw materials come from these nations, thus impacting the cost and reliability of global supply chains.

⁴ Or spending more cash to achieve them

⁵ Increased unplanned delays at border crossings due to unrest and sanctions in Europe

⁶ The [American Trucking Association](#) estimates that US/Canada will have a driver shortage of 260,000 in the next few years, while freight tonnage will grow by 24% in the next 5 years.

which prevent consistent and safe deliveries. Investments in infrastructure are not keeping up with the growth in many regions. Dependable results are hard to come by or costly to achieve.

Clearly, without intervention, your process and performance statistics *can be one of the victims*. Considering the industry cases *ripped from the headlines*⁷ (Figure 1), it becomes obvious that bad things can happen to anyone.



Figure 1: Supply Chain Risks and Disruptions *Ripped from the Headlines*

Smart supply chain leaders have surely made many improvements, but there is more to do to achieve *required superior* performance. Supply chain professionals need to look at the total picture in order to gain that next level of improvement. Yet in the corporate world, supply chain execution and risk management personnel find themselves *a world away from the total picture* of processes in motion. A bolder and more informed approach is needed, and can be achieved.

⁷ Local law enforcement bureaus, as well as the FBI, have hundreds of cases that deal with interstate and international criminal issues.

Global Visibility?

When end users are asked about technology needs, they most often use terms like real-time visibility, intelligence, track and trace, and so on, to address these challenges. They need visibility since their processes are complex, spanning across multiple parties, hindering their ability to get timely information. In today's multi-party logistics world this becomes the largest challenge to achieving optimal results. They also rely on outmoded approaches: paper-based and poorly-integrated multiple systems.

They find themselves unable to utilize the massive amounts of data these systems throw at them, thus causing them to be blindsided in their processes, and limited in their ability to enhance performance. Yet thinking about investing in new systems seems daunting due to the cost, time and general challenges with successful technology implementation. However, the technology world has evolved, and herein lies the opportunity. We are more connected than ever before, with new sources of rich information along with the tools to analyze it, which helps managers *finally achieve the vision*, visibility and results they need to be effective.

In this paper we will create an understanding of what these new technologies are and then explore how they can be put to use to reduce risk and optimize supply chain performance.

What is Visibility?

To consistently have relevant, accurate, timely data —now—about what's actually happening in real time on the ground; to understand and then act intelligently.

Visibility encompasses:

- Environments
 - Routes
 - Things
 - People
 - Information
-

A Visibility System is:

A system that provides a current picture of events as they are occurring. The data is continuously refreshed so the user gets the most current picture. Further, the system should have methods to understand the cause of events and the ability to impact future outcomes.

Rethinking Technology: Moving Beyond the Buzz Words

The market is all abuzz with discussions about the Internet of Things, networks, clouds, sensors, location-based systems, analytics, and so on. These technologies and capabilities have the power and potential to reshape how businesses operate. But before delving into the *how*, let's level set on *what* they are, and what the key terms are.

Internet of Things (IoT): Sensor-rich networks that provide source data about the *things*—assets, cargo, the carriers, equipment (machines, vehicles, devices), and the people. IoT includes multiple layers of intelligence/software embedded in the devices, in local onsite processors, and up in the cloud.

Context Aware: Live geospatial data, including environmental data that provides *context*. Placing the *thing* in a geospatial and business process context creates *context awareness*.

Complex Event Processing (CEP): Built on top of this context aware source data, CEPs look for and identify patterns involving multiple events and streams of data. “Under this circumstance, this result occurs.” This allows a system to continually monitor the vast amounts of IoT and related data, which in their raw form will overwhelm any person. CEPs thus enable rapid awareness of problems needing action and decision making on what to do about them. Users can create rules that generate alerts and alter processes to achieve better outcomes.

On Demand: Often talked about but poorly defined, on-demand technology allows users to consume software, one app (or service) at a time.⁸ But now users can gain *on-demand information*—data feeds from multiple information sources—both public and private—thereby reducing upfront data creation and data entry, as well as cost and time to go live.

So far, so good. But these technologies are not generally provided in a way that is easy to digest for the typical business users—planners and expeditors. When combined in a unified solution, however, they can deliver more:

Purpose Built Application: There are a significant number of new IoT platforms—development tool sets, really—that are entering the market focused on the Internet of Things.⁹ But these rely on organizations to

What is the Internet of Things (IoT)?

The IoT is intelligent, connected objects and the capabilities and services they enable.

Intelligent means there is some sort of device integrated into or attached to the object, usually with some sort of sensor capabilities.

Connected means the object is connected directly or indirectly through a gateway or intermediate set of connections or networks. The Internet aspect denotes that the data about the thing is stored/accessible for other applications/subscribers.

Objects can include any thing—equipment, plants, animals, and people.

Capabilities are functionality, services, and applications.

What is On Demand?

Software on demand—allows users to acquire one app or one use case at a time through the chain.

Information on demand—allows users to consume Information, both public and proprietary.

⁸ Traditional systems insist that users purchase big modules, often comprised of complex proprietary data models that have to be populated by users.

⁹ Our last count about 80, which shows a high level of interest by the market. But the fact is users care little for the technology jargon—they want results.

develop their own applications. Waiting for IT (like waiting for *Godot*) can be a very depressing experience, while your challenges continue to mount up. Business users need actionable applications, now, built with their *purpose* in mind.

Actionable Architecture: The term real-time is overused in the industry; most often, it means ‘fast,’ but is not truly real-time.¹⁰ However an architecture that is designed to be real-time—and actionable—leveraging the technologies mentioned above, delivers continuous monitoring and alerting in the short term and machine learning, over the longer term, to create insights into events and overall business processes. Typical tracing systems, on the other hand, are *record keepers* that use static or EDI data with no context or real-time intelligence. This is an incomplete, usually late, and nonactionable data source.

Adaptive Applications: Building on common use cases, adaptive applications allow users to use, modify or create apps based on their own experiences and accumulated knowledge. This adaptive ability delivers a vibrant application that lets users grow and manage a wider range of processes. This intelligence and ability to adapt contrast with rigid business applications like ERP systems that are ten-or-more years old software approaches where code is hard to change—and if changed, demand significant investments to create and maintain.

Dynamic Analytics: These allow users to identify current problems, respond in the *now* to mitigate risk, and optimize processes over time to enhance performance. Most systems that offer an optimization engine have a fixed use case, based on static data¹¹ that evaluates past events. But here we are talking about dynamic situations—and thus analytics that operate on current context awareness to predict and prevent negative outcomes and identify upside opportunities.

Now the question remains: What practical problems can these platforms solve today?

The Power of Now... and Understanding the Future!

In our current world, the big and little issues *happen now* and demand solutions *now*. Today’s new on-demand solutions allow users to go to work *now* on solving those problems, rather than purchasing technology and struggling to implement *later*. The following use cases in operation today demonstrate the *execution adeptness*—real-time actionable opportunities—that visibility on demand provides, giving businesses the ability to manage in the *now and improve the future*.

¹⁰ Typically, batch update

¹¹ Only a few in the market are providing an actual application that combines geospatial/IoT and provides practical use cases for clients rather than just tool sets for software developers.

Industry	Uses	Benefits
Pharmaceuticals, Food and Beverage	<p><i>Insight-based Chain of Custody and Condition Monitoring</i></p> <p>The Pharmaceutical industry has multiple and complex requirements and challenges such as traceability, serialization, anti-counterfeiting, and theft; as well as the more mundane operations—maintaining safety and efficacy through proper handling and on-time delivery.</p> <p>Unified purpose-built solutions in combination with tamper-evident seals, RFID, and authenticated location-stamped e-signatures can provide sensor-based condition monitoring to:</p> <ul style="list-style-type: none"> - Maintain a secure chain of custody. - Ensure that temperature- or humidity-sensitive drugs are not compromised. - Create awareness of thefts in progress using GPS, e-seals on truck doors, and real-time tracking alerts. <p>Once these measures are in place the real power and benefits can be achieved applying analytics that can discover systemic weaknesses and points of compromise. This may include problems with specific employees, equipment, locations, packaging, processes, or procedures.¹² As new regulations from the FDA and the EU are implemented, use cases will continue to increase in these industries, expanding the need for adaptive solutions.</p>	<ul style="list-style-type: none"> - Inventory accuracy - Logistics cycle time reductions - Freshness - Recall management - Brand protection - Anti-counterfeiting - Consumer safety (avoiding tragic and legal consequences of bad products)
Chemicals Fertilizers Oil and Gas	<p><i>Protecting Hazardous Shipments</i></p> <p>Chemicals and fuel shipping have critical processes and dangerous products to manage and protect. Not only is protecting the freight paramount, but also protecting the environment is critical—for example, protecting a vulnerable trade route and the communities that hazardous freight travels through. These are critical processes to monitor and control.</p> <p>Accidents have huge implications, from environmental disasters to loss of life and lawsuits. Many trucking and rail companies have increased their visibility and monitoring systems since accidents continue to occur.</p> <p>A unified platform combines asset management <i>in motion</i>. Monitoring includes tracking the condition of containers, tankers, and pipelines; as well as in motion monitoring of drivers, trucks, barges, and cargo ships.</p> <p>Data from monitoring is used to generate real-time alerts such as containers in need of maintenance, errors in track switching, or dangerous road conditions, <i>before</i> an accident happens. If a spill or collision occurs, containers equipped with self-identifying capabilities can alert first responders at a distance about the specific chemicals, risks, and recommended countermeasures. Internationally, tracking and monitoring container shipments is crucial to protect them from theft, damage and terrorist threats.</p>	<ul style="list-style-type: none"> - Reduction in costly incidents and high profile damage to brand - Environmental, Health, and Safety - Transship/ Intermodal or in-transit merge precision - On-time deliveries - Safer and more effective emergency response

¹² For example, a specific site may habitually leave temperature-sensitive product on hot loading docks longer than allowed. Or a reefer truck may have an intermittently faulty refrigeration unit. Or a particular route at a particular time of day has the most theft associated with it. Criminal gangs may have methods and entry points from which to inject counterfeit drugs into the supply chain. These types of problems can be discovered and corrected by analyzing patterns in the chain-of-custody and condition monitoring data.

<p><i>High-value Freight</i></p> <p><i>Seasonal and time-sensitive products</i></p>	<p><i>Time-sensitive/High-consequence Logistics</i></p> <p>Examples of high-value perishable or time-sensitive assets are pharmaceutical biologics, emergency spare parts, or even human organs for transplant. More mundane but of economic significance is anything that can stop the production line or is extremely difficult to source elsewhere. The higher the value or impact, the more attention is required. Managing high-consequence shipments requires continual monitoring to ensure that the current conditions are positive, and routes are navigable, safe, and secure.</p> <p>Today, unified applications incorporate external data feeds such as traffic, weather, originating and destination conditions or major events en route, to ensure on-time delivery of these most critical perishable shipments.</p>	<ul style="list-style-type: none"> - On time delivery - Ability to provide visibility, current location/status, and more accurate ETA
<p><i>Construction</i></p> <p><i>Utilities</i></p> <p><i>Energy</i></p> <p><i>Manufacturing Execution</i></p>	<p><i>Insight-based Assets in Motion</i></p> <p>Industries such as construction, energy, utilities, and telecom have asset tracking requirements, from materials to mega-equipment used in projects, and repair maintenance.</p> <p>Revenue loss by the equipment owners, as well as project delays at mining or construction sites are caused by equipment that is lost, stolen, broken down, or delivered late. Contractor labor costs mount up when workers do not have the proper equipment.</p> <p>A unified multi-layered application for assets monitoring helps these organizations to achieve asset protection and keep work schedules on time. Equipment can be outfitted with locating technology in combination with cloud monitoring that track material assets on large sites. These measures go a long way in preventing theft or locating items when workers misplace tools.</p> <p>But beyond loss prevention, connecting inbound logistics to onsite coordination ensures on-time project management as well as effective use of the site (no idle resources, more effective cross docking).</p> <p>Lack of a specific piece of machinery or construction material can cause delays—or lack of any critical raw material, which for large projects could cost hundreds of thousands of dollars a day.¹³</p> <p>On the upside, there may be bonuses for completing the job ahead of schedule. There certainly are also reductions in all kinds of expenses associated with earlier completion of projects.</p> <p>In Manufacturing, a more optimized flow of inbound materials, equipment, and personnel can be choreographed so that no resource is idle and no shipment is half full.</p>	<ul style="list-style-type: none"> - Site planning/ optimization - Reduced overtime labor costs - On-time project management - Improved working capital - Reduction of theft - Better coordination of resources

¹³ There are some very large projects where delays cost [\\$2M per day or more](#).

Today's User Experience: Discover, Adapt and Predict

It's all well and good to tout these benefits. But no matter how exciting they may be, users face challenges during implementation. Opportunities and value cannot be realized without a practical 'on ramp.' For many users, confronting the idea of buying and utilizing new technologies is daunting. But on demand changes the game.

On demand adopts a new model for implementing: *Discover, Adapt, and Predict* (figure 2). This allows users to rapidly engage and use the solution. Rather than accepting the decades old systems project lifecycles, today's technology customers are seeking modern and agile approaches. Users *consume* and *adapt*, rather than design systems, leveraging on-demand information and libraries.

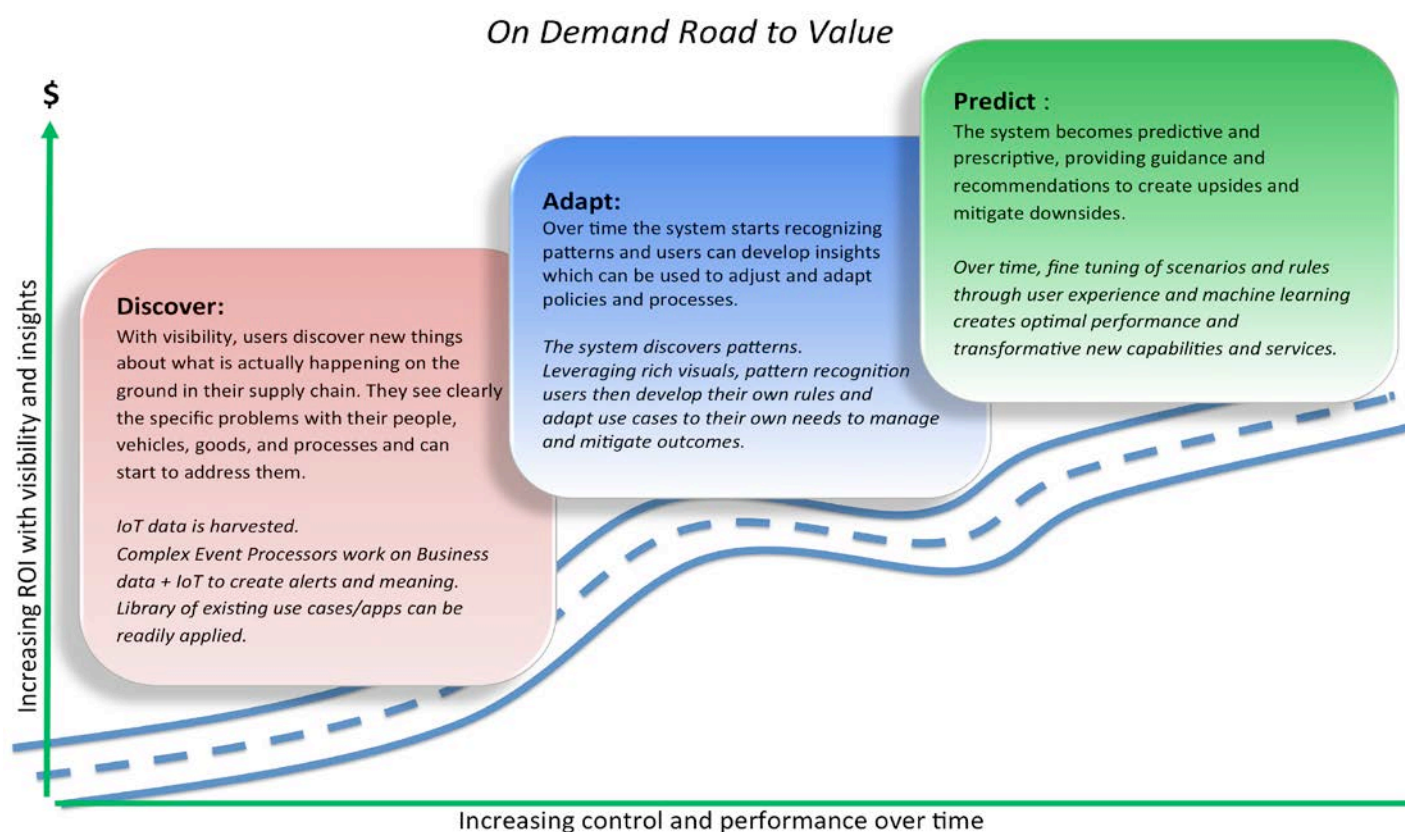


Figure 2: On-Demand Technology Adoption Model

First, rather than purchasing, installing, populating and cleaning data as a precursor to even getting an opportunity to engage and use technology, the Internet of Things technology allows users to gain the sensor data directly from the asset in context. The information stream is 'turned on,' allowing users to begin monitoring their situation in the *now*.

Then users can 'discover' by deploying on-demand libraries of use case applications. For example, a single use case or single asset type can be easily deployed to detect and address issues immediately. *Over time*, leveraging rich visuals, users can adapt existing scenarios or develop new ones as they gain more mastery and depth. They move from being reactive to predictive, thus increasing value and transforming the business.

This is truly a game changer for business, *turning the world of technology procurement and implementation on its head. Users become consumers* vs. having the burden of purchasing technology and dealing with long and risky implementations. They consume technology from growing libraries of apps, information streams that they can select and leverage as well as the rules and analytics they create for themselves.

Even a few years ago this opportunity did not exist. So naturally, systems were not developed around these concepts. Those older architected solutions are probably the systems your company is using and they do have their purposes. But, today, even in consumer markets, newer apps and access to real-time data is being used on demand to identify patterns of behavior, locate inventory, and influence decisions and behaviors of consumers. In the business world users can not only leverage app libraries, but can gain more value over time as they adapt apps to their specific needs, and the technology gets smarter via machine learning capabilities.

At the pinnacle of the adoption model (Figure 2) is this concept of prediction. Most systems today just don't tackle this problem. Their systems amass data but do not have the analytic tools to interpret that data. Organizations have amassed thousands of spreadsheets which are not accessible, scalable or usable across the enterprise. In addition, the wider world presents 'big data' from many web sources that are merely referential, since the systems don't have the means to leverage or analyze them.

Now powerful analytic software can process this data and present it in rich yet simple visuals that users can make sense of—in real-time. This potential is enormous. Rather than just fixing or recovering from issues, users can understand the impacts of events, and build resilient processes to reduce or recover from risks. But more importantly, they have the means to prevent problems before they occur. As we mentioned before, this is not part of traditional solutions.

On-demand solutions, provided by third parties such as freight forwarders, third-party logistics services or security and inspection firms, are also an option. Several worldwide organizations provide 'one asset' or one cargo journey trace and monitoring, so small shippers can get all the benefits without huge capital investments. This approach is being more widely adopted as service providers grow their business models and provide managed services to their customers.

Discover

Instant visibility of in-motion processes

- Detect delays, damage, diversions, theft
- Avoid losses, fix vulnerabilities
- Protect people and assets

Metrics:

- On-time delivery
- Improve safety record
- Asset protection/Product quality
- Reduced theft/Shrinkage

Adapt

Operational Excellence is achieved by applying acquired knowledge to optimize processes

- Optimized routes save time and money
- Higher on-time delivery performance
- Reduced cost, increased profits
- Awareness/improvement programs with employees
- Demonstrate process integrity—reduce insurance premiums, fines, and fees

Metrics:

- Working capital
- Capacity utilization
- Driver/operator safety
- Cargo damage

Predict

Realization of upside potential. New capabilities and services. Enhanced, smarter business processes

- Develop new agreements and sources of revenue with customers
- Anticipate and avoid risks
- Anticipate and capture opportunities before competitors do
- Provide insights to customers

Metrics:

- Operational excellence
- Increased revenue
- Higher-margin services

New Era of Visibility: Conclusion

We have entered a new decade—we are mobile, social and more analytic in our approach to managing processes. At the same time, we have become more security conscious and compliance aware. We are more worldly wise, and need to have greater visibility into current events as well as the consequences of future events.

Since unintended consequences and unplanned events increase the cost of doing business, users need to explore and find new approaches to mitigate risk and improve performance—particularly when goods are in transit, where organizations have the least amount of control over them. Across industries, global supply chain organizations are increasingly anxious about multi-tiered and far-flung activities that they can't see or control. Shifting their suppliers, partners and carriers is a constant activity. They are always seeking partners who seem to manage 'better.' But outsourcing often introduces risk. Without inter-enterprise technology, visibility still escapes them.

Users should demand more. That is, they should seek and *adopt applications* that embody the use cases they need now, so that they can start *today*, gaining insights which will also help on the journey *tomorrow*.

Abraham Lincoln said, "You cannot escape the responsibility of tomorrow by evading it today." This is true of all aspects in life. In business, the customer, employee and environmental safety, asset value, improving performance, and brand reputation are all at stake.

References and Further Reading:

[Tanzania Adopts SGS RFID Cargo Tracking](#)—RFID Journal

[Preventing a Vanishing Act, Laura Billingsley](#)—PDF from Connected World Magazine

Examples of solutions:

Savi [Insight](#)

[SGS OMNIS](#)



About ChainLink Research

ChainLink Research, Inc. is a Supply Chain research organization dedicated to helping executives improve business performance and competitiveness through an understanding of real-world implications, obstacles and results for supply-chain policies, practices, processes, and technologies. The ChainLink 3Pe Model is the basis for our research: a unique, multidimensional framework for managing and improving the links between supply chain partners.

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