

MASTERING SUPPLY CHAIN DATA

A How to Guide

Expeditors[®]

CONTENTS

03 Supply Chain Transformation

- 04 Aligning Your Supply Chain Data with Your Company's Corporate Objectives
- 06 Top Five Sources of Data in the Supply Chain
- 07 Visualizing Supply Chain Workflow and Data "Black Holes"
- 08 How to Document your Data Landscape

09 Data Spectrums

- 10 Spectrum One: Visibility
- 11 Spectrum Two: Performance Monitors - Activity Reports & Metrics
- 12 Spectrum Three: Strategic Planning

13 Bringing it All Together - Driving Improvements

- 14 Case Study: What Is Optimal?

15 About our Team

SUPPLY CHAIN TRANSFORMATION

Advocating for a Data First Strategy

It's a grim statistic if ever there was one: poor data quality costs the US economy USD3.1 trillion per year¹. We've seen it firsthand and you probably have too: inadequate supply chain data prohibiting companies from conducting analysis that could help them minimize costs or maximize sales. "Industry 4.0" is upon us, bringing with it an abundance of new data stores, new technologies and more complexity. Yet, the fundamental requirement of any supply chain analysis – complete and coherent supply chain data – continues to elude businesses both large and small.

Companies who struggle with managing their supply chain data will likely become less competitive over time and face challenges with implementing new technologies that rely on complex data sources and practices. Investing resources without the required fundamentals in place will only slow the development that is needed across people, process and technology. Like building a house, you can't expect to build the master suite upstairs without a solid foundation in place.

With this in mind, our aim is to provide a set of practical steps you can take to put your supply chain on a trajectory to achieving your company's goals and objectives through the use of data.

Companies who struggle with managing their supply chain data will likely become less competitive over time.

INDUSTRY 4.0 - AT A GLANCE

"Leading companies are now looking to disruptive technologies for their next horizon of performance improvement. Many are starting to experiment with technologies such as machine-to-machine digital connectivity (the Industrial Internet of Things, or IIoT), artificial intelligence (AI), machine learning, advanced automation, robotics, and additive manufacturing. The impact of this shift is expected to be so transformative that it is commonly referred to as the fourth industrial revolution, or Industry 4.0"

- McKinsey²

¹IBM https://www.ibmdatahub.com/sites/default/files/infographic_file/4Vs_Infographic_final.pdf

²<https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/the-next-horizon-for-industrial-manufacturing>



ALIGNING YOUR SUPPLY CHAIN DATA WITH YOUR COMPANY'S CORPORATE OBJECTIVES

“Data! Data! Data!” he cried impatiently. “I can’t make bricks without clay.”¹ So exclaimed Sherlock Holmes in “The Adventure of the Copper Beeches.”¹ Holmes’ declaration points to a tendency we have related to hurrying to solve problems without the means to do so – to make bricks without a foundational material: clay. Similarly, you can’t expect to drive substantive change and execute a large strategic objective without the necessary materials: usable data. In turn, we need to ensure our communicated supply chain (and data) strategy connects directly to our overarching corporate objectives. An appropriate place to start is ensuring that both the supply chain department and the executive team are aligned regarding your company’s business priorities and how they translate to your supply

chain’s design and operations. Your supply chain, and data, should be propelling the company closer to the corporate goals and objectives. Efforts put into capturing data, analyzing it and designing metrics that are not squarely focused on achieving these larger aims are likely a waste of time and resources. Figure 1 illustrates how strategic objectives should cascade to the various levels of your organization and impact the way you leverage supply chain data.

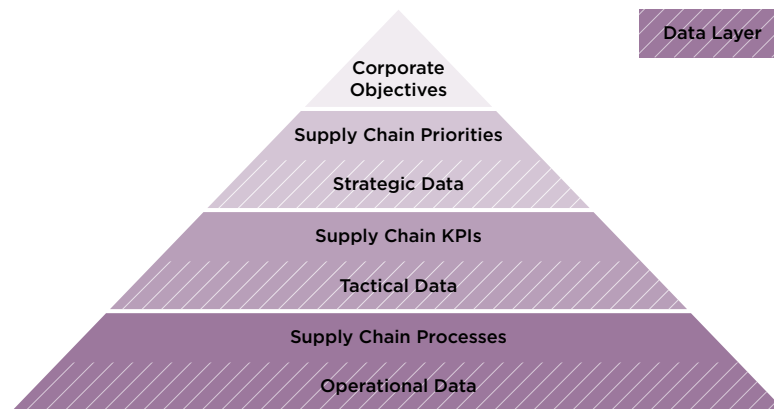


Figure 1 - Supply Chain Data Hierarchy

Your supply chain, and data, should be propelling the company closer to these goals and objectives.

So, where do you begin on this journey? First, you will need to turn your strategic objectives into the questions the supply chain needs to answer and/ or the metrics it needs to achieve.

Then, you can identify the critical data elements required to measure your current performance. The performance measured might be by function, region or individual business unit. Going through this process will assist in the alignment between the strategic objectives and the people in your business working on this supply chain project. You want to ensure the people and the business are pulling in the same direction towards a common aim. Let’s look at an example in Table 1 on the next page:

¹ Doyle, A. (1892). Adventure 12: “The Adventure of the Copper Beeches”. The Adventures of Sherlock Holmes

| GOAL TYPE | GOAL DETAIL |
|--|--|
| CORPORATE OBJECTIVE | Improve working capital position to allow for new investments. |
| SUPPLY CHAIN PRIORITY | Develop improved supply flow with contract manufacturers that is more consistent and reliable to reduce buffer stock and in-transit inventory. |
| SUPPLY CHAIN METRIC 1 | Ensure 96% supplier on-time performance (Based on PO complete date) with a standard deviation of <1. |
| Responsible Supply Chain Team | Contract Manufacturer Relationship Management Team |
| Key Data Elements | Notations |
| Supplier | <i>Captures manufacturing field from "PO supplier" table</i> |
| Planner | <i>Identify Buyer code</i> |
| Product Family | |
| PO number | |
| PO submitted date | |
| PO Received Date | <i>PO received data is based on INCOTERM location. Mostly FOB.</i> |
| Expected PO Completion date | |
| Actual PO Completion date | |
| PO change date (if applicable) | |
| SUPPLY CHAIN METRIC 2 | Ensure Logistics Service Providers uphold 98% gross on-time performance. |
| Responsible Supply Chain Team | Logistics Service Provider Relationship Management Team |
| Data Elements | Notations |
| Supplier | |
| Logistics Service Provider | |
| PO number | |
| BOL Number | |
| PO completion date | |
| LSP pickup date | <i>Actual pickup date based on LSP</i> |
| LSP delivery date | |
| Mode | |
| Service Level | <i>Air: STD, EXP. Ocean: LCL/FCL</i> |
| Delay Flag Reason Code (If Applicable) | |

Table 1 – Translating Strategic Objectives Example.

TOP FIVE SOURCES OF DATA IN THE SUPPLY CHAIN

So, what supply chain data do you require? In Table 2 below, we summarized five common data sources and their corresponding data elements. This list is not exhaustive, however, in our experience, these elements are the most critical. While it may not look extensive, there is enough here to evaluate many dimensions of your supply chain and keep you very busy! [Click here](#) for a detailed explanation of each data source.

| Data Source | Purchase Order | Sales Order | Logistics | Warehouse & Distribution | Trade Compliance |
|-------------|---------------------------------|--------------------|--------------------------------|----------------------------|--------------------------|
| Data Points | PO number | SO number | Shipment identification number | Warehouse locations | HS codes |
| | Manufacturer / supplier details | Sold to party name | Transport mode | Services & rate sheets | Tariff concession Orders |
| | Product/SKu | SO create date | Cargo weight & dimensions | Warehouse activity reports | Free trade agreements |
| | Product family | Price | Asset type | Warehouse storage reports | Customs entry data |
| | Price | Originating DC | Carrier name | | |
| | PO create date | Customer name | Cargo information | | |
| | Buyer's name | Customer location | Origin data | | |
| | Destination | Required date | Logistics event data | | |
| | PO create date | Incoterm | Logistics costs | | |
| | Required date | | | | |
| | PO completion date | | | | |
| | Incoterm | | | | |

Table 2 - The "Top 5" Data Sources

VISUALIZING SUPPLY CHAIN WORKFLOW AND DATA “BLACK HOLES”

Although we’ve just identified the typical sources for data, it’s not always obvious where your data is stored or how it ties to your network of vendors, service providers and customers. This problem can paralyze a supply chain project before it begins. Figure 2 is an example of a supply chain network diagram that could help form a structured and thorough approach to locating your supply chain data across your network. It builds off concepts from the supply chain operations reference (SCOR¹) model of Plan, Source, Make, Deliver, Return and Enable. A detailed explanation of how to create the supply chain workflow can be found by clicking [here](#).

In building out your visual supply chain workflow and matching it to existing data you have, you can identify where you have “black holes,” i.e., areas where no data (or very poor data) exists. This is denoted in Figure 2 with question mark icons. You’ll need to identify where these are so you can work to close them out. We find that using a network diagram to visualize the supply chain helps communicate this message to a wide range of audiences, across multiple functional areas. It is useful to communicate and align stakeholders regarding activities and flows (physical, data or process) occurring in your supply chain in a visual manner because most humans are visual learners. It allows everyone to be able to “see” connections and activities in the same way and, consequently, is helpful in communicating inefficiencies and discussing improvements.

Armed with a supply chain workflow, you can begin to focus on documenting where your supply chain data is stored so you can build off it.

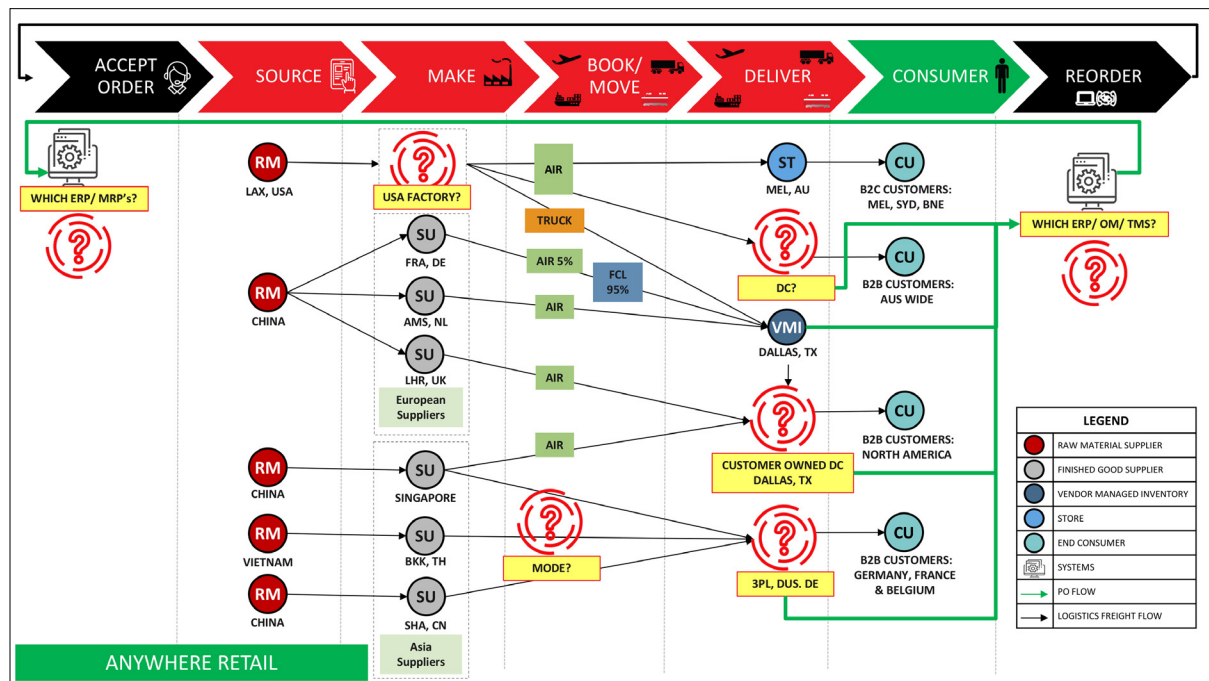


Figure 2 - Supply Chain Workflow denoting data “black holes”

¹ <http://www.apics.org/apics-for-business/frameworks/scor>

HOW TO DOCUMENT YOUR DATA LANDSCAPE

As you go through this process, recording your findings will greatly assist your efforts. This is because it is easy for it to get out of control. Data can exist in the strangest of places and can sometimes be duplicated or triplicated, causing even more confusion. The worksheet in Table 3 below is an example of how to record the status, location and quality of your supply chain data in an ordered fashion to keep your processes clean and clear. It can also be used as a catalyst to engage the data owners and discuss options for how they record your data today and how that can evolve in the future to meet new objectives. If, over time, issues arise with the data, you can refer back to your worksheet to address the data source and root cause with clarity. A blank template to record this data for your own supply chain data is available [here](#).

Data can exist in the strangest of places and can sometimes be duplicated or triplicated, causing even more confusion.


| Company | |  | | | |
|----------------|---|--|--------------------------|------------------------------|-----------------------------|
| Project Leader | Tim | | | | |
| Date | 31/7/2020 | | | | |
| Business Unit | Jewelry | | | | |
| Region | North America | | | | |
| Port Pair | NA | | | | |
| | DATA TYPE | DATA NOT GENERATED | GENERATED BUT NOT STORED | DATA STORED WHERE? | COMPLETENESS OF STORED DATA |
| PLAN | Bill of materials | | | Office server – Word and PDF | Complete |
| | Demand Planning | | | Excel spread sheet | Complete |
| | Product & Process Compliance | | | Office server – Word and PDF | Complete |
| SOURCE | Supplier location/s | | | Excel spread sheet | Incomplete |
| | Supply planning | | ✓ | | |
| | Contracts and Incoterms | | | Legal Team | Incomplete |
| MAKE | PO fulfilment | | | Accounting software & email | Only current year |
| | Raw material | ✓ | | | |
| | Lead time performance | ✓ | | | |
| | Packaging data | ✓ | | | |
| | Process: build to order or build to stock | ✓ | | | |
| DELIVER | Logistics | | | Freight forwarder | Incomplete |
| | Commercial Documents | | | Freight forwarder | Incomplete |
| | Customs Compliance | | | Customs broker | Incomplete |
| | Warehouse/ DC/ Inventory | | | 3PL | Complete |
| | Customer location/s | | | 3PL | Complete |
| RETURN | Customer returns | | ✓ | | |
| | Reverse logistics | | | 3PL | Complete |

Table 3: An example of a filled out data worksheet to record the status, location and possible quality of your supply chain data

The work sheet has several fields including “business unit” and “region.” These fields are included because it may be easier to break down the global supply chain into sub-level supply chains. Also, certain business units and/or regions can sometimes have better data capture and storage than others. A region or business unit that is performing well at capturing supply chain data can be used as a benchmark for the rest of the business.

DATA SPECTRUMS

Now that we have clarified the key data points and their location to enable our strategy, we can put the data to work across strategic, tactical and operational processes. This is illustrated in Figure 3. While the underlying data across these time horizons may very well be the same, the data's aim, the tools that are used and the questions they support will all be different. As you bring the data in and start to see it, you should expect it to be unclean and containing many variations of naming conventions to denote the same meaning. Data shaping work will likely be needed and you can find some best practices in a related document [here](#) to help set you on an effective path. But, let's take a look at the different spectrums for how we can use our data.

While the underlying data across these time horizons may very well be the same, the data's aim, the tools that are used and the questions they support will all be different.



Figure 3: Data Spectrums describe how data is used across time to the benefit of the business.

SPECTRUM ONE

VISIBILITY

If at a moment's notice you had to take inventory of all products in your supply chain, could you? This question prompts us to the operational layer of supply chain data. This spectrum of data is our "eyes" on our supply chain, providing inputs for decision making. Like driving a car, we have to be able to see and sense our environment in order to make adjustments to navigate hazards. The more data, the more we can optimize our decisions.

Supply chain visibility should be as close to real-time as possible; ideally, across all nodes of our chain from the sourcing of raw materials to the final delivery to your end customer. Capturing this information can support, at minimum, the following four objectives:

1. Understand the progress of each individual shipment/order
2. Provide information to improve customer service
3. Improve planning and sourcing decisions based on the movement (or lack thereof) of materials across the supply chain
4. Match the processes your people follow and the positive or negative impacts they have on the supply chain

Like driving a car, we have to be able to see and sense our environment in order to make adjustments to navigate hazards. The more data, the more we can optimize our decisions.

Once you start consuming the data, you can then build tools, reports and calculations to improve supply chain processes and decisions. This is a significant area of opportunity for supply chains today that involves incredible technologies and algorithms. But, first things, first: get your foundations in place.



SPECTRUM TWO

PERFORMANCE MONITORS – ACTIVITY REPORTS & METRICS

The next, more aggregated view into the supply chain should be through the use of performance monitors and dashboards. Typically, these monitors are a consolidated view of both the activity occurring across the different segments of your supply chain and the drivers or exceptions against your designed plan. The metrics developed for these monitors will be wide ranging depending on the portion of the supply chain under evaluation and our goals. They can focus on logistics costs vs. budget, supplier on-time performance, order fulfillment accuracy, customer service complaints and many, many more. Yet, the important point is the dashboard should simply encapsulate the performance against a few important metrics that you defined as critical to executing your supply chain strategy. Remember our exercise at the beginning of the paper (in Table 1) where we defined the key supply chain objectives and metrics in support of our overarching strategy? These can carry forward and be a key part of our performance monitors. One look at the monitor should tell you:

1. Where you are performing according to your metrics
2. Where you are failing against your goals and objectives (both departmental and corporate)
3. Where you are at risk of failing

Ultimately, these metrics are your finger on the pulse that informs you of both positive and negative trends emerging. By identifying these trends you should be able to then either adjust the execution of the plan or redesign the plan to account for new, unexpected dynamics. But keep in mind, these metrics and dashboards will only diagnose the problem and clue you into potential symptoms; they won't tell you how to fix the problem. This is where more strategic and detailed analysis is needed.

Ultimately, these metrics are your finger on the pulse that informs you of both positive and negative trends emerging.



SPECTRUM THREE

STRATEGIC PLANNING

This is the final spectrum, as it relies on the first two being completed. Your data can now be used to perform a strategic assessment of your supply chain. These assessments support your understanding of whether your supply chain is optimally designed to support both current and future business strategies (e.g., spanning cost, working capital, lead-time, agility and risk tolerances).

Your data can now be used to perform a strategic assessment of your supply chain.

Often times, the patterns and opportunities that emerge from your performance dashboards will act as a trigger for potential network reconfigurations. For example, you may notice that you are seeing a significant increase in new customers in a certain geography. Based on those new sales and planned growth projections you may look to stand-up a new regional DC to reduce expedited transport costs and improve lead times to those customers.

Alternatively, a pivot in business strategy might call for investing in your ecommerce business. Consequently expanded warehouse operation would be required, putting your current facility over capacity. This acts as the trigger for exploring what options are available to expand distribution capacity. But there are several options:

- Expand the existing facility
- Redesign the existing facility to allow more efficient use of the space
- Lease a larger facility
- Contract a third-party warehouse company and retain the existing facility
- Combinations of the above

Each of these options has different cost and service impacts that will require comprehensive analysis to objectively compare the pros and cons of each alternative so you can make the best decision. The effort put into ensuring you have a means to both capture and then store data across the various segments of your supply can now be used to perform a strategic [Network Design](#) assessment, enabling you to perform network simulations across a variety of different fulfillment design configurations, product assortment strategies and distribution models.



BRINGING IT ALL TOGETHER

Driving Improvements

The aim of this paper was to provide a focused view on the foundational elements of supply chain data. These fundamentals require first translating your company's strategic objectives into a set of key questions that can then be applied against your supply chain either in the form of key metrics or more strategic "what if" questions. To do this, you need to first define the data points needed and then ensure you have access to this data. Where there are gaps, they need to be prioritized and addressed until you have a comprehensive, end-to-end view of your supply chain activities.

As you begin to capture an end-to-end view of the supply chain – and start to see the interplay of different decisions and trade-offs – more questions, interesting patterns and fruitful opportunities will emerge. Delving wider and deeper will likely require more comprehensive and granular data to fold into your areas of focus. This is a good sign and should serve as a beacon of your team's progress towards real, holistic performance improvement across your supply chain.

As you begin to capture an end-to-end view of the supply chain – and start to see the interplay of different decisions and trade-offs – more questions, interesting patterns and fruitful opportunities will emerge.

To help bring it all together visually, what follows is a case study to emphasize and illustrate how important high quality, comprehensive data is when looking to identify and then deliver improvement. While everyone is looking to "optimize" their supply chain, as we will see, the perspective of "optimal" may be skewed based on the narrow lens through which you are peering.



CASE STUDY: WHAT IS OPTIMAL?

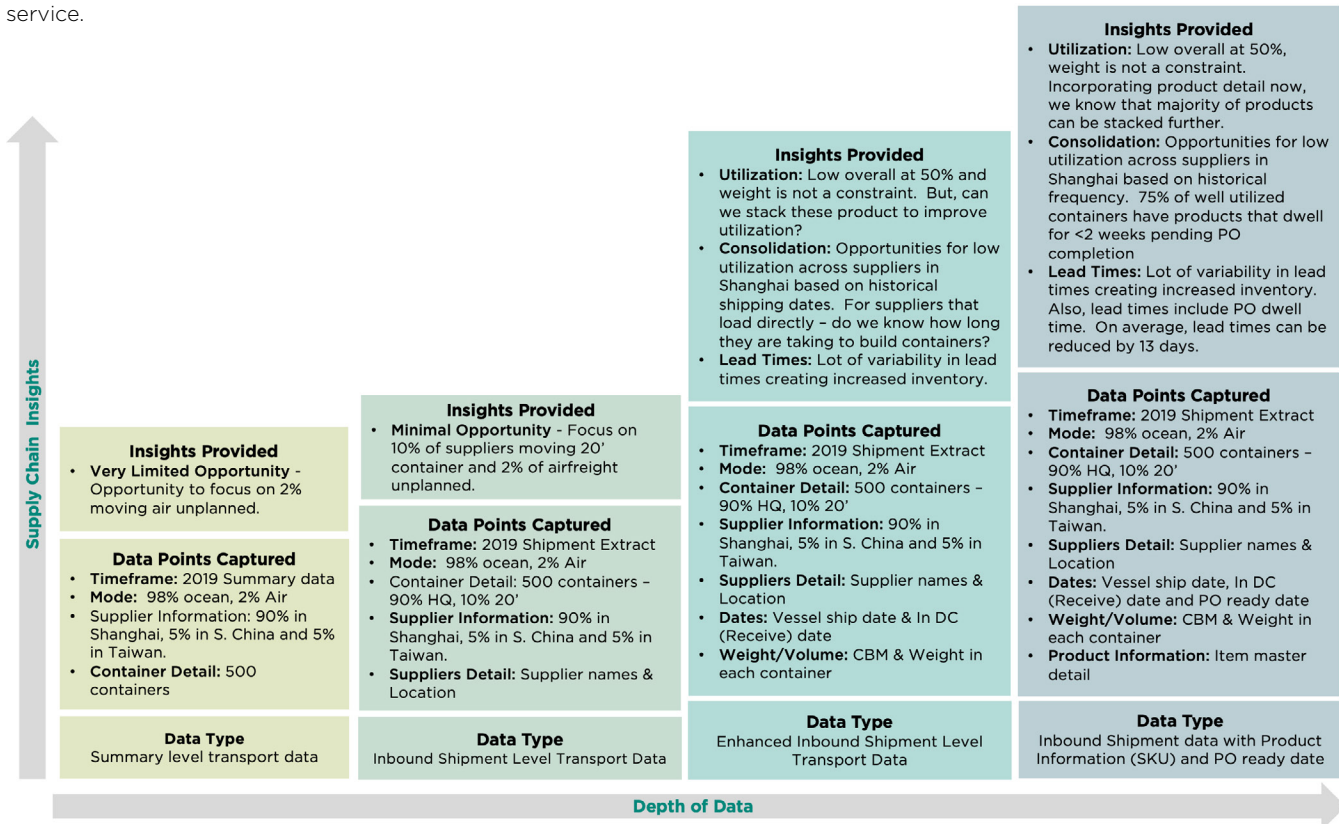
Identifying what is optimal for your supply chain involves finding the most appropriate balance of competing trade-offs for your particular company. However, the perspective of “optimal” will depend on both the granularity and accuracy of the data, as well as its ability to connect to other aspects of the supply chain. The more we can connect our data to adjacent areas, the more well-rounded and accurate our prescriptions can become. Below is an example of how our lens of “optimal” will sharpen as we get more granular with the data and can connect it to other related business elements.

Scenario

A logistics director needed to trim 10% from her inbound logistics costs to achieve budget. Previous benchmarking has shown logistics rates were near bottom and the current provider is competitive - no more low hanging fruit. The logistics director turns to her logistics data to evaluate other opportunities for efficiencies to meet budget and maintain service.

The Problem

The logistics director made a change to a new logistics service provider for her inbound flows last year and has not been capturing detailed transactional data for her movements; only high-level aggregate and spend data is readily available. If she had developed a more comprehensive data strategy and had richer and more comprehensive data, how would her insights and path forward change?



Summary

Following the “Data Type” box from left to right, you will notice that the more comprehensive and detailed the data, the higher the quality and accuracy of the insights can be provided. As this compare and contrast shows, the more comprehensive and granular the lens through which you can evaluate your supply chain, the clearer the analysis, opportunity and path forward.



ABOUT OUR TEAM

The Supply Chain Solutions team is comprised of experts in all aspects of supply chain management, data analysis, and modeling, committed to helping customers extract higher levels of performance from their supply chains through a broad range of projects. Our customers trust us to help them make data-based decisions with thoroughly considered risks and sensitivities that move them towards a best-in-class supply chain capable of meeting the complex challenges of today's global marketplace.



Shane helps lead our practice in the Americas region and is based in Denver, Co



Justin leads our practice in South Asia and is based in Sydney, Australia

We wish you great success in your own performance improvement journey and hope that this paper has provided you with a practical pathway to build out your own supply chain data fundamentals.

Please reach out to us if you have questions or are interested in learning more about how we may be able to help you and your company.

