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COURSE 5: The Supply Chain Index

Supply chain management is a balancing act. Progress is made slowly through alignment and continuous improvement. The supply chain leader is charged with improving the potential of an organization at the intersection of operating margins, inventory turns, and case-fill rate. Sometimes the choices are made consciously, but others are unconscious and seem to just happen. Conscious choice in alignment with a business strategy is a strong factor in determining supply chain excellence.

While supply chain excellence is not the sole factor in a company's success, it is hard for a company to succeed without it. Ensuring success requires a nuanced approach that uses a portfolio of carefully selected metrics. In the journey toward excellence, we find that discrete industries are more focused on cycles, and process industries are more focused on the optimization of flows. However, all companies want a measuring stick of supply chain improvement.

It is difficult to determine whether a company is making progress. It is for this reason that we built the Supply Chain Index.

DEFINITION OF THE SUPPLY CHAIN INDEX

The Supply Chain Index of performance improvement is built on the framework of the Effective Frontier (shown in Figure 1). In this model, growth and profitability must be maximized, cycle time should be reduced, and complexity needs to be managed. It is a complex system. An overweighed focus on any one of the four categories can wreak havoc on a supply chain's operations; similarly, a focus on a single metric can throw the supply chain out of balance.

Using this model, the Supply Chain Index is designed to measure supply chain progress on a portfolio of metrics. To build the index, we chose the metrics of year-over-year growth, return on invested capital (ROIC), operating margin, and inventory turns.

The index assumes that its three components—balance, strength, and resiliency—should be valued equally. Balance tracks the rate of improvement in growth and in return on invested capital, while strength and resiliency factors are based upon progress in profitability and inventory turns. We believe that together these three factors provide an effective tool for measuring supply chain performance and improvement over a set time period.

Each industry has different potential, or ability to reach metrics targets. It is a mistake to include information from different companies in a single spreadsheet and evaluate them as a group without understanding their industry potential and market drivers. The maturity and potential of each industry within a value network is very different.

The Supply Chain Index is a measurement of supply chain improvement. In this analysis, the starting year and the duration of the analysis matter. Some industries, like chemical, that struggled significantly during the Great Recession have rebounded with greater gains in recent years. Similarly, the overall results for apparel and food and beverage companies improved in this period, while results for retail and consumer packaged goods stalled. (See Figure 2).

INDEX METHODOLOGY

There are three components of a Supply Chain Index score: Objective performance on *balance*, *strength*, and *resiliency*. Each contributes 30 percent of the final score. Maintaining *balance* in the supply chain is a constant struggle. Reduced inventory availability wreaks havoc on customer-service levels. Excess inventory leads to high carrying costs and obsolescence of product. Excessively long days of payables leads to weakened supplier health. The examples are endless, but one thing is clear: balance is critical.

The two metrics that determine the balance factor are revenue growth and return on invested capital. As a metric, return on invested capital is not as well known as return on assets (ROA). Return on assets has a narrower focus; our research indicates that, as the formula below suggests, ROIC has better correlation with stock market capitalization and provides a broad perspective on cash-flow generation and profitability, both of which drive shareholder equity.

$$\text{Return on invested capital} = \frac{\text{Operating income} + \text{Income tax total}}{\text{Total shareholder's equity}}$$

ROIC, then, is a measurement of a company's use of capital. The goal is to drive higher returns than the market rate of the cost of capital.

KPIs in Supply Chain – The Basics “Key Performance Indicators”

As in any business activity, supply chain operations need to focus doggedly on improvement to compete in the market place, but how do you know if your supply chain performance is satisfactory, or if it is getting better, or worse?

That's where KPIs come in.

What's a KPI, Anyway?

KPI stands for Key Performance Indicator, and can be defined as a practical and objective measurement of progress, either:

- Towards a predetermined goal, or
- Against a required standard of performance

It might help to think of a KPI as something like an instrument on a car dashboard—a speedometer, for example.

If you are driving your car and you wish to maintain a speed of 50 KPH, you will use your speedometer to maintain that velocity. You will drive a little faster if your speedometer needle drops below 50KPH or you will slow down if it climbs above the required speed.

You will use a KPI in the same way as your car's speedometer. The only difference is that in most cases, you wouldn't wish to lower performance when a business activity exceeds the required standard. As a

similar, and perhaps more accurate example, if your car has a fuel consumption gauge and you use this to try to drive economically, then you are making use of a bona fide KPI.

Why Are KPIs Important?

Using KPIs for performance measurement ensures that you are always evaluating your business activity against a static benchmark. That makes fluctuations immediately visible, and if performance moves in the wrong direction, you can quickly respond.

When a KPI shows that performance is consistently meeting or exceeding the required level, you can decide to raise the bar and set a higher standard to achieve. For this reason, KPIs are essential for any business improvement strategy.

Apart from an internal desire to improve and compete, KPIs play a part in attracting and retaining customers.

That's especially true in any business where customers tie into agreements or contracts. Service level agreements, in particular, will be monitored through KPIs agreed between an enterprise and its customer, with the probable application of penalties should performance fall below agreed levels.

In short, KPIs provide visibility of business performance and allow objective quantitative and qualitative evaluation. When you align them with business goals, they take away the guesswork and sharpen the focus on improvement.

Supply Chain KPIs



When measuring the effectiveness and cost of your supply chain, you will need to set up and monitor KPIs that give visibility of cross-functional activity as well as those applicable to individual supply chain components.

Later in this article, we'll look at some examples of functional and cross-functional KPIs. Broadly speaking though, the following areas are those where KPIs will be necessary:

1. Order capture
2. Inventory management
3. Purchasing and supplier management
4. Production/manufacturing
5. Warehousing
6. Transportation

Cross functional KPIs are likely to provide snapshots of the following end-to-end performance factors:

- Perfect order (the degree of accuracy to which customers' requirements are being met)
- Inventory levels
- Stock losses and/or damages

- Gross profit
- Cost of goods sold
- Total logistics cost

Try to construct cross-functional KPIs in a way that allows each function to see its contribution to overall supply chain performance.

Why Do Companies Have Too Many KPIs?

At the beginning of this article, I stressed the importance of not having too many KPIs. In the course of my consulting activity, I come across this issue repeatedly. The most common cause is a state of confusion about what constitutes a KPI.

Let me try to clarify. A KPI is a metric... but not just any metric. A KPI is a metric focused on a KEY element of business, departmental, or team performance.

There is nothing intrinsically wrong with capturing a large number of metrics, especially with today's sophisticated analytics software solutions to help. However, it is beyond realistic to expect anyone to scrutinize them all on a day-to-day or even week-to-week basis.

KPIs should comprise a handful of metrics that your teams CAN realistically monitor and react to continuously. They don't need to be exceptionally granular, but should instead track the most vital elements of supply chain performance.

How Many are Too Many?

Of course, the difference between KPIs and metrics will vary at different levels of your organisation, so while a metric recording "receiving accuracy" in a warehouse would undoubtedly be a KPI for a warehouse manager, it would be utterly extraneous as an executive-level KPI.

In determining your supply chain KPI suite then, the secret is to identify performance elements critical to those with the power to influence them, and develop appropriate KPIs for that audience.

At no level in a function, or cross-functionally though, should anyone need to monitor more than a few KPIs. Exactly how many is hard to say and will, in any case, vary from business to business, but frankly, if you are tempted to ask if you have too many KPIs, you probably do.

The Importance of Hierarchy



Another reason not to have too many KPIs is the need to apply various levels of detail to each one. Because of this particular necessity, the development of even half a dozen logistics KPIs will ultimately result in two to three times this number in total... at the very least.

Therefore, as you might imagine, an excess of KPIs will soon have your portfolio approaching the volume of the aforementioned telephone directory, making it hard to monitor and act on the mass of data generated.

Nevertheless, it is essential to have a hierarchy of KPIs, since, as already mentioned, a level of granularity suitable for one level of management will be either too general, or too detailed, for another. At the same time, it is not wise to have too many levels in your hierarchy.

The Two-Level Hierarchy

If you wish to keep things as simple as possible, you should find that two levels, or tiers, of logistics KPIs, are sufficient. You might call the highest level the “primary tier,” and the second level the “secondary tier.”

The first-tier KPIs would be the ones monitored at an executive level in your company, and would perhaps include metrics like:

- Logistics costs as a percentage of sales
- Inventory turns
- Total inventory days
- Source-to-deliver cycle time (the time from sourcing raw materials to delivery of finished goods)
- DIFOT

At the secondary level, you would have KPIs that provide more granularity and highlight the causes of fluctuations in tier 1 metrics. Examples of these secondary KPIs could include:

- Warehouse costs as % of sales
- Transportation costs as % of sales
- Finished goods inventory turns
- Raw materials inventory turns
- Inventory obsolescence
- Work in progress days
- Finished goods days
- Raw material days
- Inbound delivery in full
- Inbound delivery on time
- Outbound delivery in full
- Outbound delivery on time
- Manufacturing cycle time

The Three-Level Hierarchy

A three-tier KPI solution is a little more involved, with the top two tiers comprising end-to-end supply chain metrics with Tier 2 being more granular than Tier 1. Meanwhile, the third tier can include KPIs that show performance at a functional level, and highlight how each function’s primary activities are contributing to end-to-end performance.

Whether you choose a two or three-tier system will depend on the specifics of your company’s business, the company’s size, and other similar factors.

Of course, it’s also possible to add further tiers for even more granularity, but again, the more levels you have, the more complex your KPI solution.

Now let's get a little more granular in this study of supply chain KPIs, and look at some of the specifics involved in tracking cross-functional and functional performance.

Cross-Functional and Functional KPIs: How to Apply the Right Ones

Functional KPIs offer value, of course, but when you combine and integrate them to offer an end-to-end view of performance trends, you can magnify that value considerably. It can be helpful, therefore, to identify the processes involved in your supply chain before deciding upon the functional-specific measures that collectively, will show how these processes are performing.

You can identify and categorize your company's processes in any way that suits you. Still, it's worth briefly discussing, as an example, one of the process cycles commonly used when monitoring supply chain performance. That cycle typically goes under the heading of order-to-cash.

Order to Cash

Order to Cash (OTC) is the end-to-end process involved in capturing and fulfilling a customer's order, and can be measured using a carefully coordinated range of functional KPIs. The OTC cycle loosely comprises the following sub-processes:

- Customer-order capture
- Order picking and packing
- Dispatching, shipping, and delivering the order
- Billing the customer
- Receiving and recording the customer's payment

OTC is a process that illustrates clearly, how the supply chain comprises a broader range of business functions than you might have thought.

For example, the sales function is not typically seen as part of the supply chain, but if your sales team captures orders from your customers, the first step in the supply chain is very much sales-related.

Similarly, it's easy to forget that a supply chain comprises the flow of information and money, as well as goods. That necessarily implies a need for financial functions to be measured if you want a full picture of end-to-end supply chain performance.

Who's Involved in Order to Cash Measurement?

When you measure the order-to-cash cycle, you will need to set appropriate KPIs for your sales department, warehousing and transportation functions, and for some areas of finance, such as accounts receivable. To illustrate how much this matters, consider the possible consequences of any failure or delay in recording a customer's payment.

Let's assume a system or process issue that results in the delayed posting of the customer's payment. If the customer makes frequent purchases, receipt of payment for the previous delivery might not be recorded before the customer places a fresh order.

Because there is no record of payment, the customer's account might be put on hold in your ERP system, and the whole process of supplying that customer stops until somebody spots the problem and resolves it. That's a supply chain performance issue, just as much as if your warehouse team fails to pick the order.

Functional KPIs in OTC

If you're beginning to think that order-to-cash cycle measurement sounds incredibly complicated, you can relax a little, because it need not be that hard. For one thing, a made-to-measure(?) KPI exists that's relevant to pretty much any type of supply chain operation. It's a composite KPI called *perfect order*, and it incorporates functional measurements for all stages of the OTC process.

You can use the perfect order KPI to track OTC performance, by breaking it into its components and applying the metrics as relevant to the different functions in your supply chain. The breakdown should look something like this:

- **Sales function:** Percentage of orders captured accurately (reliant on customer feedback)
- **Warehouse function:** Percentage of orders picked in full
- **Transport function:** Percentage of orders delivered in full; Percentage of on-time deliveries
- **Finance function:** Percentage of orders billed correctly
- **All functions:** Percentage of orders with correct and accurate documentation

The functional KPIs mentioned above are the highest level of metrics that you will use. They will likely need breaking down further to maximize identification of performance issues and aid in solution planning—always remembering to keep things simple by only holding people responsible for the KPIs they can directly affect.

For instance, in the warehouse, the percentage of orders picked in full might be broken down into...

- Percentage of orders picked with errors – incorrect quantity
- Percentage of orders picked with errors – incorrect product
- Percentage of order lines picked with errors – incorrect quantity
- Percentage of order lines picked with errors – incorrect product

At this level of granularity, the picking-performance measurement will allow you to see trends and patterns in picking accuracy. You might notice, for example, that a significant number of orders are picked with minor errors, or that a small number of orders contains many errors.

Furthermore, by applying codes to highlight the exact nature of each error, you will gain an even higher level of visibility. You might notice, for instance, that a particular product is affected more than others by picking errors, and then determine if the problem lies with that product’s markings, labels, storage location, or proximity to a similar product in the slotting plan.

What Makes an Effective KPI Suite?

Earlier, I mentioned that the SMART acronym might be a little too simple to use as a standard for developing KPIs. As a more practical guide, you might wish to apply the following list of golden rules when building up a suite of logistics KPIs for your company:

- 1) Make sure you align all KPIs with the overall business objectives of your company.
- 2) Ensure that each KPI has an “owner”, whether that is an individual or a group of people.
- 3) Design each KPI as a leading metric, able to assist with the prediction of performance issues.
- 4) KPIs should be actionable, providing timely, accurate data that owners can interpret and utilise.
- 5) Each KPI should be easy for its owners to understand.
- 6) Each KPI should reinforce and/or balance others.
- 7) No KPI should contradict or undermine the others.
- 8) Each KPI should have a target or threshold indicating a minimum-acceptable level of performance.
- 9) As each KPI is proved stable and effective, it should be reinforced by incentives or compensation.
- 10) Each KPI should be update-able, as they will lose relevance over time.

The one caveat I would add here, concerning golden rule #9, is that it’s essential to incentivise only behaviours that do not jeopardise health and safety or regulatory compliance, or otherwise put the reputation of your business at risk.

To Sum Up

There are four crucial KPIs that can be assessed to check the health of a supply chain.

1: Storage Space Utilization

Storage space utilization refers to the average amount of warehouse, or storage, capacity used over a specific amount of time.

$$\textit{Total storage space in use (ft}^3 \textit{ or m}^3\textit{) / Total storage space available (ft}^3 \textit{ or m}^3\textit{)}$$

Storage space utilization can help managers assess whether they should change the layout and size of the storage area and identify obsolete products that should be removed. This formula can also be used to determine if material flow should increase or decrease. However, it is important to recognize that warehouses are not necessarily optimized if at maximum capacity. Some studies suggest that a warehouse capacity of 80-85 percent is optimal because that allows warehouse managers to respond to shifts in demand in a more feasible manner.

2: Order Fill Rate

Order fill rate is defined as the percentage of orders that can be filled based on the inventory at hand.

$$\textit{Orders filled complete on the first shipment / Total Orders Shipped}$$

Evaluating the order fill rate percentage helps to determine how balanced an inventory is and helping to forecast the amount of sales that can be met. Generally, a higher fill rate signifies a better ability to meet sales requests, keeping customer satisfaction high.

3: On time delivery/shipments:

Depending on a company's specific business, either on time delivery or on time shipments may be more important than the other. But the rationale for measuring them is the same.

An on time shipment is classified as a shipment that is off the dock and in transit on schedule. An on time delivery is one that reaches the recipient on schedule.

$$\textit{Number of orders shipped or delivered on time / total number of orders shipped}$$

The need for this KPI is perhaps the most obvious: customers expect on time deliveries and shipments. For this reason, it is in everyone's best interest to ensure that on time delivery is as high as possible so that the supply chain runs smoothly and satisfaction remains high.

In the B2B world, a late delivery can have a huge effect on the business waiting for the finalized product. For B2C, the impact on delayed orders is more fragmented. Some customers will return late orders; others give bad reviews. Some want refunds, influencing cash flow. One thing is for sure, it will increase activity in customer service. This could be disastrous for companies that use external suppliers to handle stock and shipping without integration of relevant data. It creates a black hole for the customer until the product is delivered. Only then can they tell you there's been a problem, eliminating the ability to be proactive on delays. This makes it impossible to build a trusted brand.

4: Perfect order metric

The perfect order metric, key to this list, is a higher level performance measure that is formed by a combination of performance markers. It is a dynamic KPI that makes it possible to determine if various factors have successfully worked together, including if a shipment has been delivered to the right place, at the right time, in the right condition, to the right customer and with the correct invoice.