END-TO-END SUPPLY CHAIN SYNCHRONIZATION
ORCHESTRATING A WINNING STRATEGY

BEST PRACTICES

A WHITE PAPER BY THE GLOBAL SUPPLY CHAIN INSTITUTE

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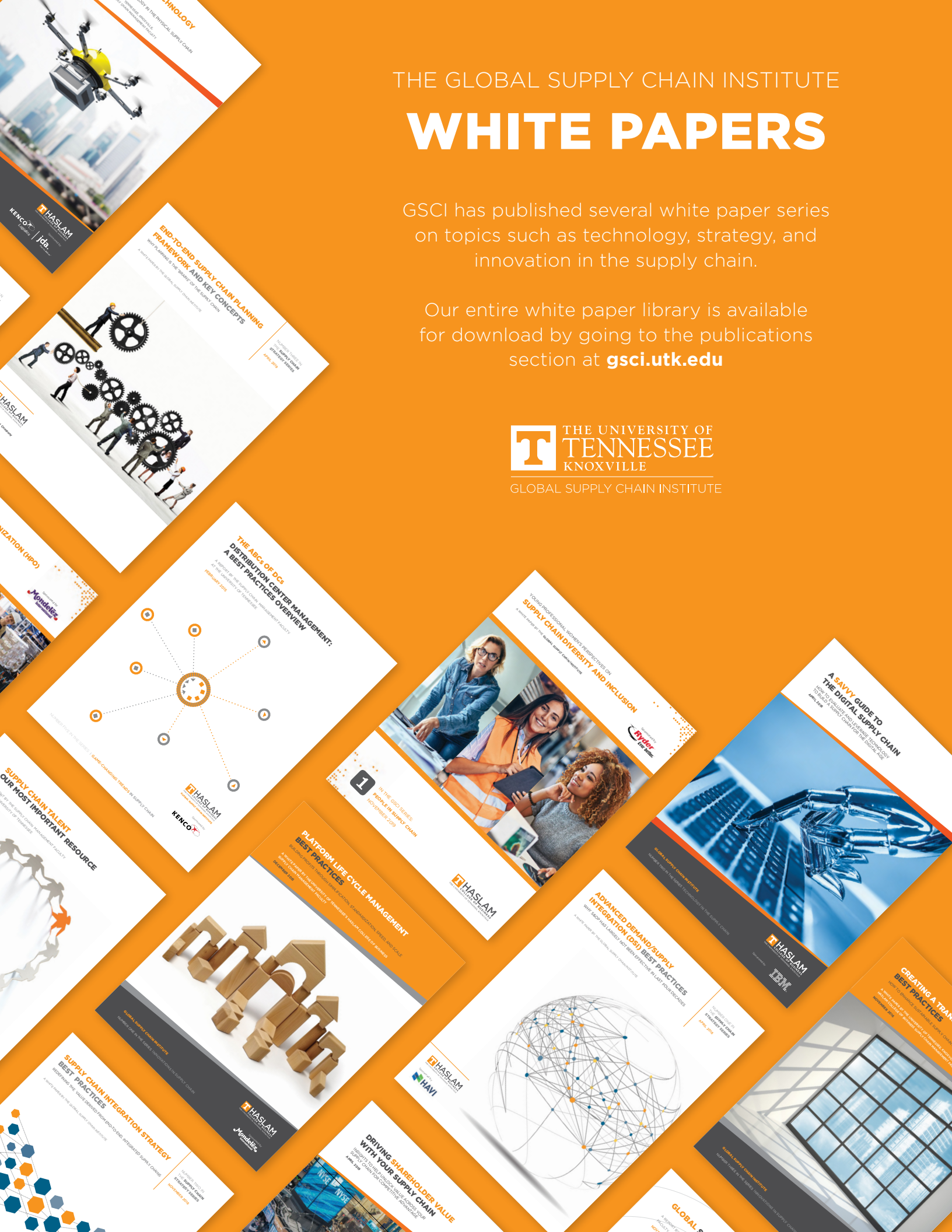
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Executive Summary

Since the creation of the University of Tennessee's Global Supply Chain Institute (GSCI) in 2012, we have networked with and benchmarked dozens of leading companies and become intimately familiar with their supply chains. These benchmark supply chains have implemented many impactful, end-to-end strategies over the past few decades, including such initiatives as Demand and Supply Integration (DSI); Vested Outsourcing, end-to-end supply chain integration and collaboration, lean for supply chain, supply chain information visibility and digitalization, and platform life cycle management, to name just a few. Over time, the experiences derived from implementing such initiatives have provided clarity on the strategies and tactics that best practice supply chains employ to achieve impressive performance improvements. As a result, the critical work processes, cultural improvements, and tools from these initiatives have become ingrained in their capabilities. The six most frequently implemented end-to-end supply chain strategies have been used to create the GSCI Supply Chain improvement model depicted in Figure 2 of the Introduction section.

Yet despite the progress made to integrate and improve performance within activities that comprise the end-to-end supply chains, many executives and supply chain leaders still acknowledge that their efforts are often out of sync with the goals and directions of the overall business. Such core business drivers play a fundamental role in generating (or driving) activity in an organization. They set the parameters for business decision-making and impact how resources are allocated and how rewards are distributed. To serve as a foundation for success and support an organization's ability to meet the requirements of its core business drivers, supply chain leaders must have a deep understanding of those drivers and continuously work to align resources, processes, and people to meeting their requirements.

In most organizations supply chain leaders are often relegated to supporting roles in devising strategies to support core business drivers and thus often sub-optimize performance in attempting to achieve over-arching business goals. A handful of leading organizations, however, are working to *synchronize* supply chain operations and their core business driver in order to unlock the full potential of the supply chain as a source of competitive advantage. This white paper reviews the definition, key concepts, best practices, and examples for arguably the most complex supply chain strategy: synchronization.

Supply chain synchronization

is the strategic work conducted to bridge the gap between supply chain operations, multifunctional business processes, and people systems (culture) with the core (total value) business driver.

Are You Ready To Synchronize?

An end-to-end supply chain synchronization strategy requires strong supply chain and business capabilities. Are you ready? Here are a few questions that you may ask to determine if you are ready for the synchronization journey:

- Are you a benchmark supply chain with advanced supply system capabilities?
- Have you been investing in supply chain collaboration and end-to-end integration?
- Have you developed visibility and data clarity through digital tools/systems?
- Does your multi-functional business team focus on end-to-end strategies that drive total value?

If your supply chain capabilities are not ready for this benchmark strategy you may still benefit from the findings presented in this white paper. There are many best practices, concepts, and examples in the research presented here that you can use to improve your system capabilities and the value you deliver to the business.

What Does Synchronization Mean?

One of the most interesting perspectives from our networking and benchmarking interviews is the high variation in supply chain leaders and professionals' understanding (definition, examples) of key supply chain terms. We discussed this phenomenon in our recent white papers on digitization, collaboration, and integration. Figure 1 is a wordle on some supply chain terms frequently misused by supply chain professionals.

Figure 1

Our research defines end-to-end supply chain synchronization based on applied strategic work conducted by the benchmark supply chains. Supply chain synchronization is the strategic work conducted to bridge the gap between supply chain operations, multi-functional business processes, and people systems (culture) with the core (total value) business driver. When the physical supply chain, business processes, and culture are fully integrated and synchronized with the core business driver, total value can be fully optimized. End-to-end supply chain synchronization is similar to a conductor leading an orchestra. The conductor creates a powerful story and the instruments play a perfectly synchronized symphony.

We interviewed 13 leading companies across seven industries to examine how benchmark companies use synchronization to their advantage. Our research provides insight into how leading firms are expanding their knowledge and capability by gaining clarity on core business drivers and then linking physical supply chains and the associated culture and processes to them. We found that when this strategy is executed with excellence, it can drive sustained competitive advantage. Interviews of top supply chain leaders also revealed eight best practices that increase total value across the supply chain. Two key examples of these best practices involve the importance of shifting from supply chain mapping to value stream mapping and the importance of supply chain visibility and data systems focused on optimization.

Additionally, GSCI studied multiple examples of successful end-to-end synchronization initiatives (success being defined as increasing value creation of the end-to-end supply chain). We also included a major case study that provides important insights on how synchronizing business processes to the core business driver is essential to this strategic work.

The top supply chain strategies

in 2020 require the supply chain officer and top leadership team to have effective "influencing and organizational boundary management" skills.

During our interviews, one of our supply chain leaders commented:

- The top supply chain strategies in 2020 require the supply chain officer and top leadership team to have effective "influencing and organizational boundary management" skills.
- An end-to-end synchronization strategy cannot be worked in isolation.
- Effective supply chain leaders are proactive, enterprise-wide leaders. The big ideas come from across the entire value chain.
- Supply chain leader's inherent role as both internal and external boundary spanners, are particularly well positioned to provide such insights.

This white paper provides external networking and benchmarking data regarding best practices for developing a supply chain synchronization strategy, examples of applying best practices, and insight on the supply chain leader's role in creating a culture that supports synchronization.

Introduction

Some things in business are just facts of life. For example, if you operate in the oil industry, the massive fixed investment needed to extract, refine, and transport oil is a fact of life that shapes decision making in all areas of the business. Alternatively, if you operate in the fashion industry, rapidly changing consumer tastes are a fact of life, which means your company's success or failure depends on its ability to bring new designs to market quickly.

We call these facts of life "core business driver." The core business driver can be internal to an organization – like a required rate of return on invested capital, or external – like changing customer preferences. They can arise out of supply side constraints or demand side opportunities. They can be brought on by competitive pressures, the macro-economy, or the regulatory environment. They can even change over the life of an organization or product. If you take a minute, you can probably identify two or three business drivers for your company.

Whatever their source, the core business driver determines what needs to happen and when, and therefore, they play a fundamental role in generating (or driving) activity in an organization. It sets the parameters for business decision-making. It impacts how resources are allocated and how rewards are distributed. It provides a structure for defining operational requirements and information flows. In short, the core business driver represents those fundamental aspects of business that determine your organization's success or failure.

Clearly, then, to serve as a foundation for success, the supply chain must support an organization's ability to meet the requirements of its core business driver. This means that supply chain leaders must have a deep understanding of the driver – and then continuously work to align resources, processes, and people to meeting its requirements.

Unfortunately, although most organizations have a strategy process that involves defining and refining their understanding of core business driver, strategy discussions usually make only a superficial impact on supply chain operations. Supply chain leaders, to the extent that they are involved, are often relegated to supporting roles. And what comes out of strategy discussions often lacks clear guidelines for how the supply chain needs to be managed. As a result, supply

chain managers fall back on implementing "popular" (in print, at conferences, etc.) supply chain strategies or "optimizing" supply chain processes without a deep understanding of the core business driver toward which the supply chain must ultimately be aligned.

However, there are exceptions. A handful of leading organizations are working to bridge the gap between supply chain operations and its core business driver. These companies understand that operations must be intimately linked to the core business driver in order to unlock the full potential of the supply chain as a source of competitive advantage. The work by these companies is leading edge and not fully realized. Different companies are making progress in different areas using different techniques. However, all of these organizations are convinced they are on track toward taking their supply chains to the next level of strategic impact.

Supply chain synchronization is the strategic work conducted to bridge the gap between supply chain operations, multi-functional business processes, and people systems (culture) with the core (total value) business driver. When the physical supply chain, business processes, and culture are fully integrated and synchronized with the core business driver, total value can be fully optimized.

Supply Chain Definitions

Supply chain professionals are often focused on making step-change improvements in the system. This process holds many challenges. One of the first and most basic challenges is terminology. What do collaboration, integration, and a long list of frequently used supply chain terms mean, and how do they differ from synchronization? How can they be operationalized to drive total value? Below are four of the key definitions (from previous GSCI white papers) that are critical to understanding synchronization.

Supply chain—the end-to-end system of processes and activities required to deliver product from the supplier's supplier to the consumer's shelf.

Supply chain organization—the holistic resources and teams required to deliver products and services to the consumer with excellence. This includes, but is not limited to, procurement, manufacturing, engineering, process control, quality, safety/environmental, innovation program management, logistics (warehousing, transportation, inventory management, order fulfillment), customer service, and planning (materials, production, inventory, and category/customer).

Supply chain collaboration[1]—the process of identifying and working issues/opportunities with specific business objectives between two or more parties in a way that increases overall supply chain value. Supply chain collaboration typically is created across the following organizational interfaces:
- Within the supply chain disciplines (i.e., between procurement, logistics, and manufacturing)
- Between the supply chain function and the other business functions (i.e., between supply chain and marketing)
- Between the enterprise's supply chain members and another enterprise in the end-to-end supply chain (i.e., between the supply chain and a 3PL)
- Between two different enterprises or supply chains to create scale advantages (i.e., sharing warehouse and transportation assets between two non-competing companies)

Supply chain integration[2]—the process of connecting decisions and actions across an end-to-end supply chain to drive total value for all stakeholders. Supply chain integration requires aligning strategies, effectively managing operations, and maintaining reciprocal flows of information among stakeholders to consistently enhance results for the entire supply chain. In the physical supply chain, nodes and transition must be analyzed at a strategic and activity level to confirm or improve integration.

GSCI Supply Chain Improvement Model

The University of Tennessee, Knoxville's, Global Supply Chain Institute (GSCI), in collaboration with industry leaders from across the supply chain management discipline, has produced a series of white papers that have covered topics from supply chain integration and collaboration with key supply chain partners to digitization and platform management. In all of these white papers we have provided professionals with practical "how to" guides and frameworks for managing critical aspects of the supply chain. But as management guru Peter Drucker argued in his classic HBR article, "Theory of the Business,"[3] there's a critical distinction between "how to do something" and "what you should be doing."

Previous GSCI white papers in this series have focused mainly on the "how to" – how to achieve end-to-end integration, how to manage digitalization, how to implement platform management. And the "how to" is absolutely important. No supply chain leader would argue that organizations should not eliminate waste or that integration is not important. Indeed, these represent foundational capabilities that any supply chain organization needs if it hopes to build toward greater strategic impact. Still there is a difference between understanding "how to optimize" supply chain processes and understanding "what the supply chain should be doing" to synchronize with a company's core business driver.

Supply chain synchronization requires maintaining a deep understanding of the core driver that determines an organization's success or failure, defining specific goals in relation to those drivers, and then creating a supply chain where material, information, and resource flows are intimately linked to those strategic imperatives.

End-to-end integration is important, but it is a tool for achieving a goal. The same is true for collaboration, platform management, and digitization. Synchronization is the next step; it is about taking the tools and capabilities of supply chain management and linking them to the core business driver to create a platform for long-term organizational success.

An end-to-end synchronization strategy starts with a focus on the purpose of supply chain improvement. The aspirational supply chain creates a competitive advantage for the business. When a firm's supply chain creates clear competitive advantage, it becomes a business multiplier delivering the highest level of total

value for the firm. Competitive advantage is the goal supply chain improvement should build toward. The six elements of the GSCI Supply Chain Improvement Model portrayed in Figure 2 represent key strategies that best in class supply chains utilize to drive such performance.

Figure 2
GSCI Supply Chain
Improvement model
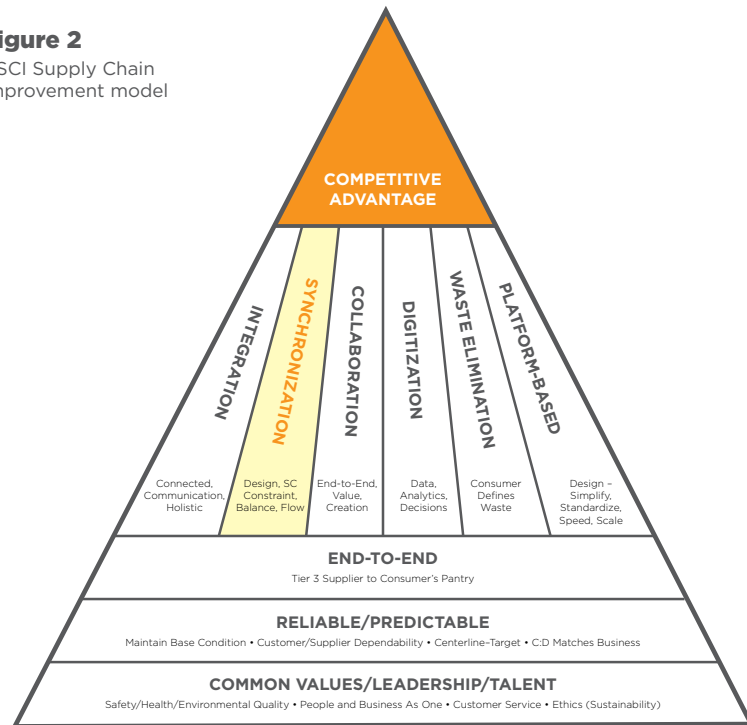
Supply chain competitive advantage is the creation of a capability (i.e. cost, quality, customer service, sustainability, flexibility) that is significantly better than all of your competitors. The enterprise can leverage this capability for increased shareholder value. Examples include:

- Significantly better quality, at the same supply chain cost, which enables the company to charge a premium price to consumers
- Significantly lower supply chain cost that enables a superior profit margin
- Sustainability capability that enables a unique product endorsement for which the consumer pays a premium price

The first step in creating a step-change improvement is building a solid supply chain foundation. Once the supply system is dependable, leadership can begin renewing the end-to-end supply chain strategy. The strategy renewal process is outlined in Supply Chain Transformation.[5] The renewal process includes assessments of the current supply chain capability, business strategy/goals, and competitor capability.

Implementing Supply Chain Synchronization

O ur research revealed a document-able process and steps involved in implementing supply chain synchronization. Each step will be covered below.

STEP 1: Identifying the Core Business Driver

A core business driver

is an item that, when it improves, the business experiences improved results

Step one in implementing a supply chain synchronization strategy is the determination of the core business driver. A core business driver is an item that, when it improves, the business experiences improved results (although the time frame may vary). When the same item degrades, the business experiences a decline in business results. The core business driver is different than the total list of important business measures. The core business driver typically impacts the demand and/or the demand variation. Once defined, an end-to-end supply chain rhythm can be established to synchronize supply components to the driver (creating the highest total value).

There can be multiple, potential core business drivers. The key activity is to determine the driver that impacts total value the most. After detailed analysis and alignment, the core business driver can be determined.

Global Fortune 500 companies with multiple business units/categories have multiple supply chains (a supply chain has common materials, material transformations, manufacturing technology, manufacturing transformations, operations strategies, demand patterns/variation, etc.). A large global company that has a snack food category and a furniture category will have at least two supply chains. Each supply chain will likely have a unique core business driver.

To clarify the concept of core business driver, in Figure 3, a list of examples is provided. Note that this chart is a generalization to illustrate the point. A thorough business assessment would need to be completed to align on the core business drivers for your supply chains.

Figure 3

EXAMPLE CORE BUSINESS DRIVER	
BUSINESS TYPE	**POTENTIAL CORE BUSINESS DRIVER**
Fashion/Beauty	Innovation
Pharmaceuticals	Regulatory compliance
Consumer goods	Consumption
Commodity	Commodity pricing
Retail	Channels and fulfillment
After-market	Technical data (maintenance/support)
High capital	Capacity

Different business types have a different core business driver

Therefore, a couple of examples of the different types of core business drivers follow:

1. **High capital –** Examples of high businesses include nuclear reactors, paper machines, and heavy equipment manufacturers. In these enterprises, the assets required for a global business can frequently cost billions of dollars. This investment can be the largest item on corporate profit/loss. If this is the case, the core business driver is 100 percent capacity utilization of the high-capital asset. The commercial community may be able to sell five percent more product, but this volume is not valuable to the business until it can warrant the investment of a (high capital) new system. The physical supply chain should be synchronized to running 100 percent (or as close as possible to 100 percent) capacity utilization. The business processes (and commercial organizations) should support optimizing shipments to match capacity.

2. **After-market –** Many high capital, automotive, and computer/information system businesses can have a large after-market category, driving significant profit and revenue from parts, maintenance, technical support, or software/hardware support. In the case of a heavy equipment company, the after-market revenue from parts and technical support is a critical financial building block. The company has a technical database supported by detailed historical usage and scientific assessments of climate/hours of operation, type of use, and product life. This is the core business driver, as the customer follows the vendor maintenance program. The physical supply chain should be synchronized to the internal maintenance demand, and the business and commercial processes should be synchronized to this demand. The people systems (culture) should drive superior and sustainable customer service to its clients.

Supply chains can be broken into three main elements:

physical assets, business processes, and people systems.

STEP 2: Aligning the Three Ps (Physical, Process, People)

Supply chains can be broken into three main elements: **physical** assets, business **processes**, and **people** systems. We call these the three Ps of supply chain. In our research, we found examples of supply systems that drove capability improvements through greater collaboration or the implementation of platform management. These strategies produce incremental value improvement. However, two common gaps were observed:

1. The physical supply chain was often not well synchronized to the outputs of business processes (e.g. DSI, Long Range Business Plan, innovation strategy, budgets).

2. The supply chain culture (common values, talent, and leadership) was not in place to carry out the difficult relational work required for supply chain synchronization.

Synchronization needs to apply across each of the three Ps of supply chain. Supply chain synchronization occurs when the end-to-end supply chain operates as an integrated system that reliably and predictably meets the requirements of today's core business driver, while cultivating the supply chain culture needed for the organization to thrive in the future. When supply chain synchronization occurs, total value is maximized for all stakeholders.

This concept requires some unpacking because it relates to many of the previous topics covered in GSCI white paper series. In particular, synchronization incorporates the three foundations of GSCI's Supply Chain Improvement Model: that supply chain improvement must be end-to-end, must focus on building reliability and predictability, and must cultivate a supply chain culture (common values, talent, and leadership).

1. **End-to-end:** Synchronization requires a holistic, end-to-end approach aimed at building a truly integrated value creation system. To achieve synchronization, leaders need to fight their way past the word soup and platitudes dominating many supply chain discussions. This is where clear-eyed strategies of end-to-end supply chain collaboration and end-to-end supply chain integration come into play. We have detailed in previous white papers how leading companies have used these strategies to create actionable, value-added improvements. Synchronization relies on these end-to-end strategies for creating a supply chain that clearly aligns to the requirements of core business drivers.

2. **Building reliability and predictability:** Reliable and predictable supply chain operations are built on eliminating waste, critically evaluating redundancies, avoiding rework and returns, delivering innovation, and carefully managing variation. Here, too, there are proven strategies for success. As we have outlined in previous white papers, platform-based

management and digitalization create powerful opportunities to simplify, standardize, and speed supply chain operations. Organizations need to implement these strategies to create a synchronized supply chain that reliably and predictably meets the requirements of the core business driver.

3. **Cultivate a supply chain culture:** As Peter Drucker so aptly stated, culture eats strategy for breakfast. Every strategy we have ever outlined depends on supply chain leaders who develop their talent pool while fostering a deep sense of ownership within their team. Our white paper on high performance work systems details how supply chain leaders can create the kind of culture needed to carry out the hard work of synchronization. Moreover, our discussions of collaboration and integration delve deeply into the need to create common values within and across organizations in the supply chain as a foundation for aligning priorities and making trade-offs. Cultivating this type of supply chain culture is absolutely necessary for an organization to carry out the difficult relational work needed to achieve supply chain synchronization.

Table 1 provides guidance regarding how the Three Ps of Supply Chain relate to the foundations of the Supply Chain Improvement Model with regards to synchronization.

TABLE 1 - THE THREE PS OF SUPPLY CHAIN SYNCHRONIZATION			
Three Ps of Supply Chain	**End-to-end**	**Building reliability and predictability**	**Cultivate a supply chain culture**
Physical Supply Chain	Are we making the right physical investments to meet the requirements of the core business driver? When do physical investments need to be made? Are upstream and downstream partners making the right physical investments? Are there physical investments already in the supply chain that can be better utilized?	How flexible are physical assets? Can they support multiple business/customer requirements? Are physical investments being maximally utilized? What is our gross profit margin? ROA on fixed assets? EVA? Are there ways to reduce the physical footprint through digitization? Outsourcing?	Are we building technical mastery and strengths into the team, while also building new skills and an appreciation of technological change? Are we ensuring that all employees have visibility into current and future challenges and giving them a chance to grow new hard and soft skills that are key to remaining competitive in a dynamic work environment?
Business Processes	What is the appropriate timing for the output of business processes? Are we taking an end-to-end approach in our management of key business processes, including customer relationship management, sales forecasting and demand management, production and operations management, purchasing and supply management, order fulfillment, resource management, new product development, end of product life and commercialization, reverse supply chain management, and data management? Do supply chain stakeholders adopt a process perspective that focuses on optimizing the overall flow of supply chain activities, rather than simply executing activities at the stakeholder's individual node? Do stakeholders work to resolve conflicts in decision making to ensure that the sequencing and timing of activities are matched with maximum efficiency?	How flexible are our business processes? Can they adapt to meet changing business/customer requirements? **Are business processes maximally efficient and effective? What is our NOPAT (Net Operating Profit)?** EVA? Cash-to-Cash? Are there ways to reduce business process complexity? Are there ways to reduce working capital requirements? Are there ways to digitize and/or automate business processes? Outsourcing? Are we eliminating waste, critically evaluating redundancies, avoiding rework and returns, delivering innovation, and carefully managing variation in our business processes?	Are we investing in cultivating the adaptability, emotional intelligence (EQ), and political skills needed by successful end-to-end business processes? Are we emphasizing change management as a critical element of overall supply chain skill set? Are we providing the time and experiential learning needed to build a deep reservoir of talent in our supply chain leaders?
People Systems	When will key positions come open? What is our development plan for incoming supply chain talent? What is our supply chain succession plan? Do we know the supply chain talent gaps of our key partners?	How do we manage replacement for retirements versus new additions for tomorrow's jobs? How do we manage employee flex time? How many resources are we devoting to hiring, training, and developing supply chain talent? Can those resources be better utilized?	How are we building norms and values that support a holistic, end-to-end systems approach to supply chain management?

The next sections illustrate how the three Ps link with the end-to-end supply synchronization strategy and provide examples to clarify how this work could fit within your strategic work.
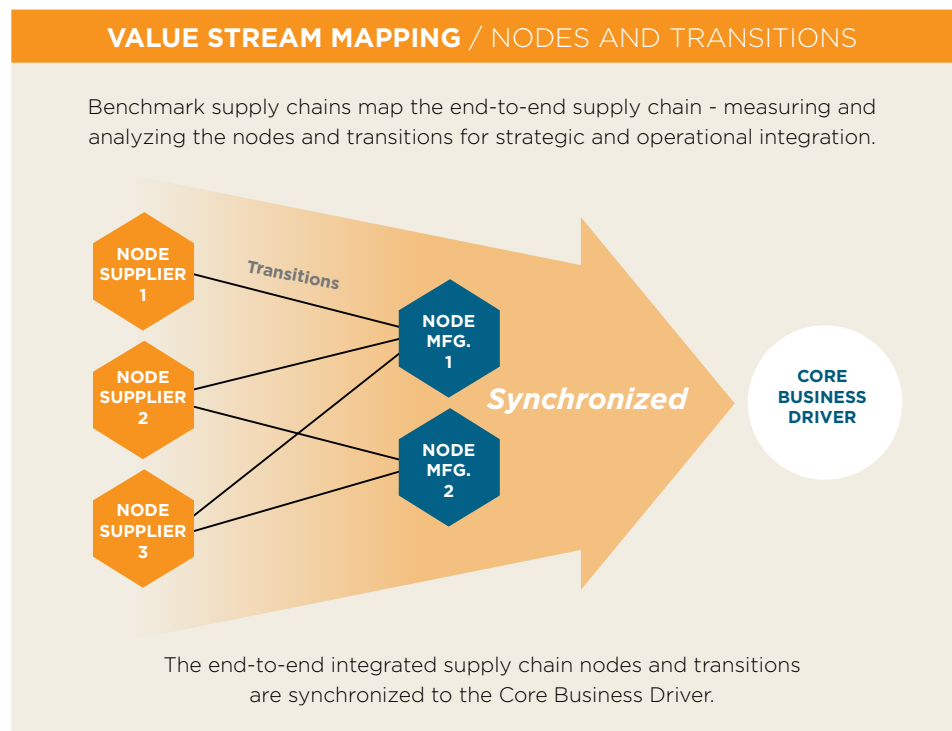
STEP 3: Synchronizing the Physical Supply Chain

To synchronize the end-to-end supply chain, organizations must first understand their value steam. Step one in the process is to map the value stream. (Note: the "Best Practices" section below will discuss why benchmark supply chains call this value stream mapping). Value stream includes the supply chain and other non-supply processes (e.g. product development) required to deliver the product to the consumer.

Figure 4 displays a visual of how the mapping could be documented. Complex global supply chains can have hundreds of suppliers. As these suppliers may source multiple materials to multiple manufacturing sites, it is easy to understand that the mapping effort is significant and complex.

Figure 4

VALUE STREAM MAPPING / NODES AND TRANSITIONS

Benchmark supply chains map the end-to-end supply chain - measuring and analyzing the nodes and transitions for strategic and operational integration.

NODE SUPPLIER 1

Transitions

NODE MFG. 1

Synchronized

CORE BUSINESS DRIVER

NODE SUPPLIER 2

NODE MFG. 2

NODE SUPPLIER 3

The end-to-end integrated supply chain nodes and transitions are synchronized to the Core Business Driver.

TABLE 2 - VALUE STREAM MAPPING – STEPS AND OBJECTIVES		
	Value Stream	**Objectives**
1	Map the supply chain end-to-end. Ideally, this includes every node and transition, although realistically this may be initially narrowed to encompass only the key flows. Select what node/transition measures will be dimensioned in the supply maps. Note: most enterprises have multiple supply chains	To understand all the supply chain transformations. To increase understanding of supply chain capabilities (including basis for results)
2	Simplify, streamline, and standardize (three Ss) the supply chain nodes/transitions	To (through three Ss) reduce supply chain time, increase responsiveness, produce immediate value creation, and enable less effort for the remaining mapping/project work
3	Integrate nodes/transitions at a strategic level (detailed in GSCI Integration[2] white paper)	To integrate the physical supply chain at a strategic level
4	Integrate nodes/transitions at an activity level (detailed in GSCI Integration[2] white paper)	To integrate the physical supply chain at an activity level
5	Synchronize nodes/transition to the core business driver (Note: steps 3, 4, and 5 may be completed simultaneously)	To synchronize the physical supply to the core business driver
6	Develop, prioritize, and execute the projects to integrate and synchronize the physical supply chain	To drive total value creation (reason for value stream terminology)

In a synchronized supply chain the "bull whip" effect is eliminated.

An end-to-end synchronization strategy requires detailed analysis of the value chain. Since the supply chains that benefit most from the integration strategy are complex, the effort and resources to complete this analysis can be significant. Value stream mapping of parts or all of some of an enterprise's supply chains is a tool that can be applied to all supply systems (including those systems that are not prepared to attempt a full end-to-end synchronization strategy).

Value stream mapping is one of the benchmark best practices. Additional information on how the best supply chains complete this work is included below. In a synchronized supply chain the "bull whip" effect is eliminated. The value stream is designed to efficiently and effectively deliver the core business driver. All elements of the value stream work are synchronized to eliminate variation through reduction of time and improved responsiveness.

End-to-end supply chain strategies

like integration, waste elimination, and synchronization illuminate the importance of an agile and responsive system.

Time Measures

A key part of mapping the supply chain is documenting (or in some cases determining) the performance (efficiency and effectiveness) at each node and transition. This enables the organization to increase understanding of the supply chain capability, problem solve customer service gaps, and analyze waste/losses in the system. Most supply chains start by measuring cost, quality, and service at each point.

Some benchmark supply chains evolve to measuring time, waste, and cash at each point. End-to-end supply chain strategies like integration, waste elimination, and synchronization illuminate the importance of an agile and responsive system (Note: this is one of the benchmark best practices below). Agility and responsiveness are enabled through reduction in time (average time and time range).

Some common examples of time metrics utilized in value stream mapping include:

Total supply change time – The time required to source/mine/grow the materials (through manufacturing and distribution) to consumption

Charged supply chain time – The time for the supply chain to respond to an unforecasted order (demand signal to shipment)

Lead time – The time from a demand signal to completion of a node/transition (i.e., supplier lead time).

Cycle time – The time necessary to complete a transformation until the next time the same transformation is completed (i.e., the time between producing SKU A until SKU A can be produced again – including requirements of all other SKUs)

Takt time – The rate at which you need to complete a product in order to meet customer demand. Takt time is the sell rate and can be categorized as the "heartbeat" of your work process

In the next section of this paper, synchronizing business processes is reviewed. Time can be critical to business process and non-physical supply chain work. An example of this is for businesses where the core business driver is the innovation process. Fashion, beauty, and electronic businesses may drive more value from the launch of new items than from the ongoing business.

Examples of time used as metrics in flow charting innovation/NPI (new product initiative) processes include:

Qualification time – The time to qualify and prove the launch financials for the product and commercialization plan

Manufacturing verification time – The time to prove that the new product can be produced reliably at design rate

Build period – The time from start of production to initial shipments for pipeline and consumption

Innovation launch - Idea to launch – The time between the creation of the idea (normally aligned with leadership by an initial charter to develop a creative idea) to launch (first large-scale shipments to a customer or consumer)

Global launch - First to last region launch – The time between the first global region to launch and the last global region launch (globalization of an idea)

STEP 4: Synchronizing Business Processes

The synchronization strategy cannot be isolated to the physical supply chain. By definition, this strategy links the capability of the supply system to the core business driver. Therefore, the business processes must effectively translate the current needs consistent with what creates the largest total value (core business driver). Figure 5 shows examples of key business processes.

Figure 5

EXAMPLE BUSINESS PROCESSES					
	MATERIALS	**MAKE**	**DELIVER**	**SELL**	**CONSUME**
DESIGN PLANNING 12-60 months *(Top Leadership)*	Supply Chain Network Design, Long Term Capacity Planning			Long Range Business Planning, Acquisition Planning, NPI Planning	
STRATEGIC PLANNING 6-36 months *(Top Leadership)*	External Sourcing Transactional-Relational-Investment			Segmentation Channels	
BUSINESS PLANNING 3-18 months *(Mid/Top Leadership)*	Demand/Supply Integration (Integrated Business Planning Stop)				Market Analysis Planning
FINANCIAL PLANNING 3-18 months *(All Employees)*	Budgets, Operational, Expense, Capital and Cash			Budgets, Terms, R&D Marketing	

The translation of business needs seems to be simple and logical. Unfortunately, this is a major challenge with the effective implementation of the synchronization strategy. Outputs from the business strategy impact all the functions. Examples include:

- Budgets provide the financial resources for each function (determines staffing level).

- Demand/Supply Integration (DSI – frequently called S&OP) determines how much volume (by SKU) that Supply must produce and that Sales has to ship. By its nature, DSI is the process that synchronizes supply with demand.[4]

- Innovation processes determine what/how many new products will be developed (R&D budget, marketing budget). The new products will determine the capital expenses, new equipment, and start-up resource requirements.

- Long-Range Business Planning (LRBP) determines the timing of capacity investments.

Because of the significant impact of the business processes, many functions are hesitant to make changes.

After determining the core business driver, flow charting the key business processes is the first step in this work. Flow charting enables the broad organization to understand the process. This seems simple, but confusion on objectives, key steps, inputs, and outputs of a process is common. Once the process is clear, it can be renewed to ensure that the process outputs are consistent with the core business driver. In other words, the business process(s) is synchronized.

The second step is to ensure the process flow chart and system summary (written summary of objectives, procedures, measures, etc.) are documented as well as a system owner is defined.

The following DSI case study shows the importance of the three Ps aspect of the synchronization strategy. The total value of the strategy work is unlikely to be achieved without a holistic focus.
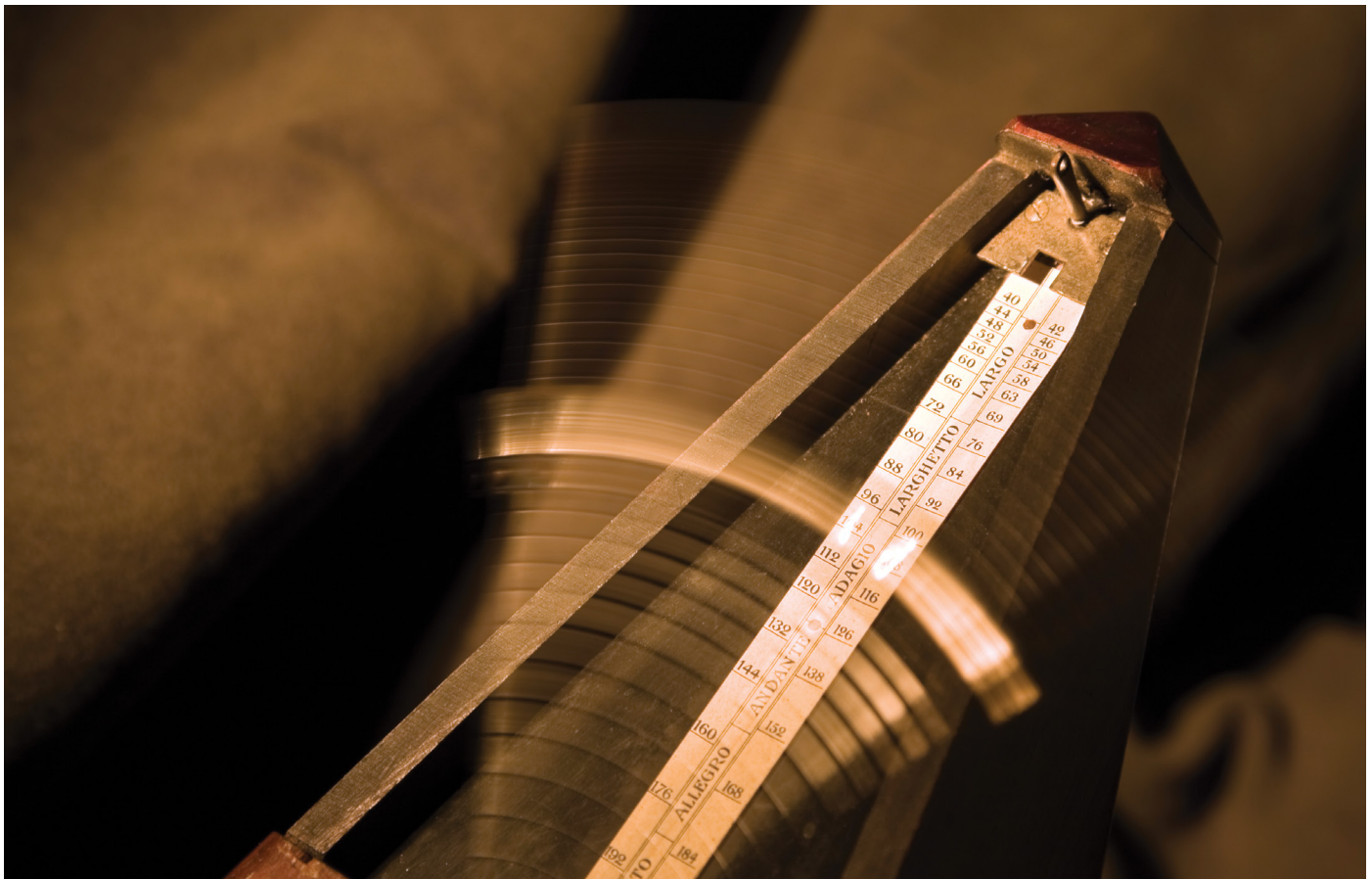
DSI Case Study

A global Fortune 500 consumer goods company (CPG) has multiple business categories. The company (strongly influenced by the supply chain) is implementing an end-to-end supply chain synchronization strategy. After working lean, 6 sigma, TPM, and end-to-end supply chain integration over the last several decades, the supply chain has the foundation and capability to move to an end-to-end synchronization strategy. As a CPG with multiple businesses, most of the category assessments (except non-high capital and high fashion/beauty segments) determined that consumption was the core business driver.

The supply chain busily worked to update value steam maps, work remaining gaps in integration and determine if each node/transition of the physical supply chain were synchronized to consumption. The supply chain leadership, with support from HR, renewed the people and cultural systems to ensure that 100 percent of the organization was focused on the consumer, total value, and zero losses. Excellent work by the supply chain and its partners produced good results, but not the level of total value creation that was possible.

The team doing the business and commercial process work reported that their task was complete with few changes.

Frustrated with less than expected return on this effort, finance leadership asked the organization to re-think the work: specifically, a request to renew the DSI process.

A basic Demand/Supply Integration (DSI) best practice involves:

- Supply plan based on demonstrated capacity
- Demand plan based on unconstrained consumption (in the new synchronization world)

The demand plan and DSI system had not been converted to using consumption as the basis for the demand plan. Historical retail shipments remained the basis of the forecast. The demand pattern of consumption versus retail shipments was very different. In this category, the consumption chart was basically flat with little variation or seasonality. The shipment plan was highly variable and driven by internal (company and major customers) action.

The physical supply chain and the people systems (culture) of the supply chain were renewed based on synchronization. Without the business/commercial process and cultural renewal, synchronization could not be achieved.

Leadership faced a tough choice. If the enterprise wanted to fully benefit from the synchronization strategy's total value creation, major commercial changes were required. In fact, the terminology was "commercial revolution is required."

The leadership decided to make the difficult choices and synchronize to the core business driver (consumption). The early efforts have demonstrated improvements, but more work is required.

This case study clearly shows how the three Ps are essential to an end-to-end synchronized supply chain.

An organization's culture is influenced by the norms of behavior and attitudes that are present in a company.

STEP 5: Synchronizing People Systems

Easily the most difficult—and certainly an important—way to achieve full synchronization is through influencing the people systems[4] (organizational culture).

An organization's culture is influenced by the norms of behavior and attitudes that are present in a company. How people think, how they interact with others, what they find important, how hard they work, how they dress—all of these factors and countless others define an organization's culture.[4]

These norms and behaviors are largely created by the people systems. Rewards, rituals, promotions, compensation, communication, problem solving, celebration, and role modeling are a few of the key systems/activities that strongly influence norms and behavior.

Some organizational cultures support synchronization and some resist it. Resistant cultures are characterized by each functional group having its own unique culture, with people being distrustful, or even disdainful, of other functional groups' cultures. Cultures that promote synchronization encourage the pursuit of total value through the core business driver, regardless of the functional area in which personnel work.

Most benchmark companies creating supply chain synchronization capability establish the core business driver and then ensure all of the business functions and corporate systems support full collaboration to achieve the business goals.

Characteristics of the benchmark cultures include:

- Core business driver focused
- Learning culture
- Rewarding attention to detail and a deep understanding of the core business driver
- Understanding and leading the organizational shift of a "push" versus "demand driven" strategy much closer to consumption
- Utilizing digital tools and capability to enable demand driven strategies
- Eliminating time and variation driven waste
- Continuous improvement of cultural systems to drive total value
- Overlapping functional rewards systems (including executive leadership compensation systems)
- Celebrating total value improvement (versus functional goals)
- Cross discipline and functional collaboration

Next, we review the best practices that were revealed by our interviews with top supply chain performers. These best practices shed light on how industry leaders approach the complex but rewarding task of synchronization.

Best Practices

I n developing this summary of end-to-end supply chain synchronization strategy best practices, we conducted field interviews with 13 benchmark companies. These companies spanned food, equipment, furniture, chemical, packaging, health care, and CPG companies.

Most examples focused on how companies were driving synchronization best practices in North America, but many companies also shared best practices developed from their global operations. Because of the breadth of the topic, the industries sampled, and the different stages of maturity, benchmark company focuses were also broad. Over 100 best practices were discussed. We have chosen the top eight of these to present and share in greater detail. Not only did these eight represent the most advanced best practices, but also they often were cited as areas of continued opportunity by many of the benchmark companies.

Best Practices

- Multi-functional strategy leadership/ownership

- Aligned core business driver

- Solid supply chain foundation (end-to-end, dependable)

- Skills and capabilities to enable synchronization

- Value stream mapping and flow charting

- Segmentation to create focus

- Supply chain agility enables synchronization

- End-to-end supply chain visibility and optimization (digital)

1. Multifuncional Strategy Leadership/Ownership

The synchronization best practice mentioned most frequently by benchmark supply chains is the importance of full multi-functional support, ownership, and role modeling of the strategy by top leadership across every aspect of the business. This best practice is not unique to synchronization. This same practice is mentioned in every GSCI white paper on the top six current benchmark end-to-end strategies (GSCI Supply Chain Improvement Model – Figure 2). Enterprises and supply chains are experiencing exponential complexity growth (reviewed in multiple GSCI papers). The largest total value creation opportunities rest at the seams and edges of these complex value chains.

Top supply chain executives

must have excellent boundary management, influencing, commercial/financial, and leadership skills

Top supply chain executives must have excellent boundary management, influencing, commercial/financial, and leadership skills to succeed in this environment. The days of only having the capability to run efficient supply chains are over in benchmark environments.

Beyond influencing all business functions, outstanding capabilities in jointly developing an effective technical community (R&D, Supply Chain Management, Finance) was cited as critical to this strategy.

Benchmark systems develop aggressive total value commitments to the business upon successful completion of an end-to-end synchronization strategy. Elements of this total value commitment include customer service, cost savings, cash savings (inventory, capital, account terms), product quality/freshness, and speed/pace of innovation. These commitments must ultimately be translated into revenue, profit, and cash flow business objectives.

The technical community (supply chain, research/development) comes to the full business leadership with a compelling business benefit from choosing a synchronization strategy. It is then critical that the agreed upon synchronization projects/initiatives are incorporated into the company business processes.

EXAMPLES

A. A Fortune 500 company executed an internal supply chain synchronization strategy with partial improvement. The work had to be re-chartered with the full multi-functional community/leadership to start achieving the vision of total value goals.

B. A global Fortune 500 food company was frustrated with its lack of progress in synchronization. The Supply Chain EVP decided to prioritize leadership's role in understanding external capabilities. The leadership visited companies with benchmark synchronization capabilities. The information gathered was sobering. The food company supply chain's goals were too low. The business value of synchronization was well above what leaders thought possible. Business and supply chain leaders created new paradigms on what value creation was possible.

C. A global Fortune 500 CPG company found a huge opportunity. A full review of the functional KPIs was necessary to align on business-wide support. The KPIs for inventory were grossly different across the plant, logistics, sales, and finance. This exercise highlighted the lack of consistency in business direction, explaining the limited corporate cash improvement over the last decade and the cause of significant, unproductive internal debates. The goals and approach to inventory had to be synchronized.

D. A global Fortune 500 chemical company had reported high levels of waste driven by the commercial (Marketing, Finance, Sales, Design) and technical communities' lack of balance and alignment. The business decided to work together to eliminate this waste. A single business operating model was developed to synchronize the overall flow of supply and demand.

E. A global Fortune 500 CPG company CEO chartered the synchronization strategy. A corporate executive was staffed (with strong commercial experience) to build synchronization between the technical and commercial communities. The first important step was education. The commercial community thought the supply chain had unlimited capacity. The technical community thought marketing was trained to demand "unreal" programs. The initial training proved effective, but this must be an ongoing effort. Second, the two communities now have been able to define their current agility and how this agility can be utilized as a competitive advantage (see Best Practice 8 for more on agility).

F. A global chemical company dramatically changed its DSI process in a European specialty chemical business. The company had spent years creating an inaccurate shipment forecast (despite annual goals to increase forecast accuracy). An effort to determine its core business driver created clarity that the "number of building permits approved each month" was the core business driver and provided a more accurate demand plan.

2. Alignment with the Core Business Driver

As discussed previously in this paper, the core business driver is what makes the synchronization strategy unique. Historically, most enterprises are programmed to track and continuously improve on operational output from internal systems without regard to the impact on downstream elements of the supply chain. Most of our benchmark supply chains have experienced significant waste in environments focused on driving the business through such a narrowly focused lens. Much of operational variation can be internally driven (i.e., promotions, temporary pricing) and drive downstream echelons of the supply chain to hold inventory. The recent GSCI white paper *Advanced DSI Best Practices*[4] reviews this waste and how some supply chains have reduced waste in this area.

Benchmark learnings from core business driver analysis include:

- Finance is a critical leader in the core business driver analysis
- All functions should actively participate and provide data, experience, and knowledge to this process. Supply chain is vital to this process (e.g., COGS, customer service knowledge, understanding of waste generated by business processes)
- Large businesses have multiple category and multiple supply chains
- A core business driver is required for every supply chain
- The business may have multiple potential core business drivers. Typically, businesses determine that the biggest driver is the centerpiece (core business driver) of the synchronization strategy

All functions should actively participate and provide data, experience, and knowledge to this process.

EXAMPLES

A. A global cosmetics company historically utilized retail shipments (forecast accuracy was poor and variation was high) as a tool to communicate business demand. The supply chain role was to supply the forecast and cover any variation in forecast miss. The outcome of this business process was:

  a. Supply produced to a demand = "the forecast plus worst-case shipment variation"

  b. Inventory goals were rarely achieved

  c. Supply chain agility was lost as capability was utilized for high-side forecast variation

  d. Customer service goals were rarely met due to forecast mix issues

The supply chain was not ready for an end-to-end synchronization strategy, but leadership decided to complete an assessment of the core business driver. The first learning was that cosmetics had multiple supply chains. Lipstick was a wax modeling operation with high complexity (very low volume/SKU). Face powder was a pressing operation, with higher capital and higher volume/SKU than most cosmetics segments. Without further detail, one can see that different supply chains may be required for the other cosmetics categories such as fragrance (high-end package, alcohol), nail polish (hazardous materials), pencils (lip/eye), and mascara (tar, brushes). A different core business driver was determined by supply chain (i.e., mascara and powders were typically used daily and many lipstick and nail polish shades were only used in holiday periods).

B. A regional food business is not ready to implement an end-to-end synchronization strategy, but the concept of the core business driver is active among the multi-functional leadership team discussions/planning. The core business driver is likely consumption. Most of this company's products are staples with relatively constant consumption/demand. The challenge in the business is that its customers create a significant amount of shipment variation through in-store promotions and shelf pricing adjustments (these programs shift volume and rarely increase market share or consumption). Therefore, the company decided to concentrate on improvements that could be accomplished until the customers could be influenced. These short-term total value creation plans include:

  a. The commercial team is focusing on programs to drive increased market share and consumption (avoid internal, short-term shipment variation).

  b. The supply chain is aggressively driving time (see "Time Measures" in the "Synchronize Physical Supply Chain" section) out of the system to improve agility/responsiveness. This enables the supply chain to react to shipment variation with the least waste.

C. A global CPG identified a competitive gap in consumer convenience expectations (next day shipments, warehouse picking in eaches). The company decided to focus on significant improvements in Takt time. This organizational focus has driven a step change improvement in supply chain responsiveness eliminating the competitive gap.

3. Solid Supply Chain Foundation (End-To-End, Dependable)

An end-to-end
supply chain
synchronization
strategy

must be built on a supply
system with a solid
foundation.

An end-to-end supply chain synchronization strategy must be built on a supply system with a solid foundation. Maintaining a solid foundation requires ongoing work, but leadership should not progress beyond the foundation if major issues are present. There are three primary areas in the foundation:

1. Common values—Supply chain leaders need to create a culture with common values. Common values prevent significant conflict and rework in the organization. They allow the organization to focus on supply products/ services as opposed to non-value-added issues. This focus is vital in the supply chain, which typically employs the largest number of the people in the organization.

   Effective supply chain leaders utilize organizational communication, rewards, recognition, pay/benefits, promotions, discipline, and assignment planning systems to reinforce—and change if needed—the values of the organization. Such supply chain leaders strive to have 100 percent of their organization thinking about safety, quality, customer service, ethical behavior, integrity, and the environment in the same way. Values should not be treated like priorities. Priorities can and should change regularly based on business needs. Values do not change. For example: we have as a value preventing all personal injuries. This does not change with business priorities.

   During the synchronization work, the culture will be further renewed to ensure all the systems are supportive of the strategy. A 2019 GSCI white paper on high performance organization best practices[6] is an excellent resource to help cultural renewal.

2. Reliable/predictable/zero waste—A typical supply chain has thousands of activities and transformations. The system is only as reliable and predictable as its weakest link. Because of the number of activities and transformations, even a high level of reliability may not produce a predictable supply.

   If a system had 100 dependent steps and each step delivered its product on time 98 percent of the time, the total system would deliver its product on time less than 20 percent of the time. Having a reliable and predictable supply chain enables leadership to work on more strategic capabilities. Conversely, non-reliable/predictable systems prevent development of more strategic capabilities.

   A zero-waste mindset directly follows the work to create predictability. The highest levels of waste are typically observed at the ends of the supply chain, including poor product design, lack of integration, information, and synchronization with suppliers and customers.

3. End-to-end—The supply chain cannot drive total value improvement against the core business driver unless the end-to-end supply chain activities that must be integrated are fully understood and utilized in assessment/analysis/decision making. Leadership must shift from a departmental focus to end-to-end value chain creation. Benchmark supply chains organize around a single end-to-end supply chain executive to support this foundation principle.

This foundational work should create a dependable supply chain. Firefighting should not be the norm. The organization should be able to focus on the work to drive out the waste at the seams of the entire value chain.

EXAMPLES

A. A regional food manufacturer had issues with a significant amount of firefighting consuming key resources' time. The organization could not proceed to higher level supply chain strategies like integration and synchronization because the foundation was not stable. The company had experienced exponential complexity increases over the last three years. The new product initiative (NPI) pace had multiplied by seven and several complex acquisitions had been integrated. Supply chain leaders decided that a simplification program was needed as the first step to recapture their stable supply chain. This change proved very successful as customer service levels returned to previous levels. Workloads were reduced and time became available for additional strategic work.

B. A global paper company determined that its operational excellence was not sustainable (it required significant daily oversight). The Supply chain leaders decided to focus on driving time out of the systems. A step change improvement in Takt time was aligned. Value stream mapping was completed with clear responsibilities for nodes and transitions. Each team focused on driving time/waste out of their nodes and transitions with an overall objective of 100 percent dependability. This work drove end-to-end dependability. Additionally, this strengthened the supply chain's basic capability to support more complex strategic work.

4. Skills and Capabilities to Enable Synchronization

End-to-end synchronization capabilities require supply chain personnel to develop new and improved skills/capabilities. In our networking and benchmark interviews, we have gathered a short list of some important skills in the synchronization world. They include:

- Influencing and boundary management
- Business analytics (digital tools)
- Value stream mapping
- Leading agility and dependable operations
- Demand driven operating strategies
- High performance organization (HPO) leadership skills (cultural renewal)
- End-to-end supply chain skills and experiences
- Multi-functional business process skills and experiences

Best practices, role modeling, training/development systems, and assignment planning should actively support development of these skills/capability in enterprises developing synchronization capability.

End-to-end synchronization capabilities

require supply chain personnel to develop new and improved skills/capabilities.

EXAMPLES

A. A global CPG company developed a global community of practice (CoP) approach to document synchronization best practices. The best work processes were developed, standardized, and validated. These processes were captured in the CoP for training and reapplication. The organization is focused on keeping the CoP alive and current to address the challenges of efficiently managing complex global operations.

B. Another global company developed a synchronization road map. The purpose of the road map is to provide every business unit an aligned process to drive synchronization work processes and the expected total value creation. The road map includes standard measures to help leadership with managing milestones along the strategic journey.

5. Value Stream Mapping and Charting

Mapping the value stream with details on the supply chain elements is discussed above in "Synchronize the Physical Supply Chain." This section reviews the basics of mapping, nodes/transitions, and synchronizing the system to the core business driver. Benchmark companies expand these basic concepts to mapping value creation.

In general, benchmark companies call this undertaking value stream mapping. There are three major points in this distinction:

1. The value stream includes everything required for an enterprise to deliver value creation. This includes design, source, make, deliver, sell, and service.

2. The purpose of the value stream is to deliver the end business objective. Benchmark companies use the term value stream to focus the organization on the purpose of the system. As discussed in the recent GSCI HPO[6] white paper, the idea is to enable 100 percent of the organization to be fully involved in managing and improving the value stream.

3. Value stream mapping is detailed work. In a large, global multiple-category business, the total effort is significant. Frequently, teams can lose sight of the objective and get caught up in the grind of mapping the system. Labeling the work as value stream mapping reinforces the critical point that the purpose is to increase total value.

To deliver incremental total value quickly, benchmark companies simplify first, standardize, and then integrate/synchronize. The mapping exercise will generate hundreds of questions (e.g., Do we need 12 suppliers for material X?). Supply chains tend to focus on the current work and sometimes neglect finishing the last task. In the example above, rarely would a supply chain professional agree that the system needs 12 material suppliers. Investigation may reveal that 80 percent of these suppliers were not a part of the sourcing strategy, but were added for new initiatives, supplier issues, etc., and were not "cleaned up." Simplifying first will reduce value stream mapping greatly.

Benchmark companies use standard node and transition measures (and flow chart steps). Frequently used mapping measures also include time (see commonly used measures and definitions in "Time Measures" in the "Synchronize Physical Supply Chain" section) and dependability.

> **Dependability -** The percent of time in value stream mapping that the node or transition delivers 100 percent of the next customer's requirements

The purpose of the value stream

is to deliver the end business objective

Dependability measures have replaced efficiency measures as the critical capability to create agility and responsiveness. This allows organizations to be 100 percent certain that the previous step in the supply chain is performed each time. Historical efficiency measures provide information only on "how" a unit operation, on average, performs over time.

Under every pile of inventory rests a supply chain defect.

Finally, benchmark supply chains will overlay the levels of inventory on the value stream map. Under every pile of inventory rests a supply chain defect. Inventory piles indicate lack of synchronization (low level of agility/responsiveness). The inventory overlay provides a second set of data to highlight lack of synchronization (and thus reveal potential total value projects).

EXAMPLES

A. In one of our global benchmark companies, the general manager hosted a quarterly meeting at each regional manufacturing facility. Finance, marketing, and R&D executives were required to attend a review with the GM and supply chain. A table was prepared displaying all of the products (including promotional packs) that the plant produced the past quarter. A second table was prepared displaying all of the products the plant/warehouse is holding in inventory that were not produced in the last quarter.

The initial reviews proved to be both educational and embarrassing.

The supply chain was shown to be producing hundreds of SKUs that were not profitable, and it was holding inventory for hundreds more that were not selling. The quarterly meeting brought the multi-functional community closer together in listing non-productive SKUs and developing more robust new product proposals. Additionally, the business began to identify processes and rewards that caused business decision that did not drive total value (how can these processes or rewards be eliminated or changed).

B. A large global CPG company had a program to reduce fragrance complexity in one of its products. Hundreds of fragrance codes created virtually no scale for procurement. Supply chain leadership established a task force with a goal of 10 percent fragrance cost reduction and 50 percent fragrance specification reduction. One change streamlined 16 different lavender fragrances to three (one for each product form: aerosol, mist, and liquid formats). After the early work, the team now expects to deliver 15 percent cost savings and a 67 percent specification reduction. The success of this project motivated the technical leadership to adopt standard material specification lists.

C. A global beauty company mapped a value chain for one of its color product categories. The core business driver was hypothesized as the innovation process. Eighty percent of its SKUs had a life cycle of less than three years. The decision was made to value stream map the color product supply and flow chart the NPI (new product initiative) process. The team working on the value stream map included supply chain, marketing, R&D, and sales. The outcomes included:

- **Multiple false assumptions of the consumer, supply chain and NPI were shown –** The multi-functional team members (and business executives) learned how the actual value stream operated and the NPI process worked (many understood only parts of the systems). The team felt this outcome alone would have justified the task. The new initiative teams and value stream members made significant changes to how supply and demand issues were problem solved and how new products were launched.

- **Simplification projects were identified –** A significant list of simplification projects with unnecessary inventory, parts, equipment, and testing were found. These proved to be wins (total value creators) for the team.

- **DSI was not clear –** The outputs of the DSI meeting were largely unused by the value stream. Demand was provided in total dollars at a category level. Internal value stream resources created internal demand plans, which, in effect, eliminated business leaders from the DSI process.

- **NPI process was creating excess launch inventory –** The NPI process created redundant product demand for the launch period. The team implemented new processes to involve key customers in pipeline inventory calculations and involve product researchers more overtly in consumption forecast (the consumption ramp-up data was much slower than marketing predicted).

A supply chain synchronization study

is ideally suited for complex global supply chains with a solid foundation and strong capabilities.

6. Segmentation to Create Focus

A supply chain synchronization study is ideally suited for complex global supply chains with a solid foundation and strong capabilities. The organization has leveraged these capabilities to drive significant cost savings over time. The current largest total value creation rests in the seams of the organization. The synchronization strategy work requires significant effort from across the organization. As a result, choices must be made. Benchmark supply chains embrace these choices. How can the organization generate the most value the fastest? In Best Practice 4, simplification and standardization are suggested strongly as the starting to point to create early wins. Segmentation is the second big implementation idea.

While the supply chain is only as strong (and responsive) as its weakest link (i.e., unsynchronized parts), not every element of the supply chain is equal in value creation. Benchmark supply chains make the strategy implementation choices through extensive segmentation. Materials, suppliers, platforms, operating units, supply chains, customers, shipping lanes, and transportation modes (to name a few elements) should be segmented (A, B, C). The priority (A) elements should be worked first.

EXAMPLES

A. A global food manufacturer segmented its brand portfolio by shipment velocity. As a part of their platform management strategy, all of the platforms were assessed to determine if the capabilities matched these velocities and variations. This analysis enabled the organization to fund a new, continuous process (with faster changeover times) to replace outdated batch making. This increased the dependability on the highest velocity brands.

B. A global CPG company has hundreds of SKUs in some categories. All of the SKUs are segmented (A, B, C). The strategic work starts with the "A SKU" supply chains. If unique supply chains exist for "C SKUs," the focus is on elimination of these SKUs and unique supply chains (as not worth the effort).

C. A global chemical company segments its chemicals by the core business driver (commodities, strategic, etc.). Since the corporate profit is determined by the commodity pricing, the supply system is synchronized to create a push system when pricing is most favorable.

The
synchronization
strategy

closely links the supply chain
to the core business driver.

7. Supply Chain Agility Enables Synchronization

The synchronization strategy closely links the supply chain to the core business driver. The business benefits (less cost, better service, fresher product) from elimination of the waste (i.e., Inventory) between these areas. The supply chain challenge with this improvement is the opportunity to replace the waste with capability. For most core business drivers, the capability involves improving supply chain responsiveness and agility. Benchmark supply chains focus on creating agility/responsiveness. Frequently value stream mapping uses time (see "Time Measures" in the "Synchronize Physical Supply Chain" section) as a key metric for the mapping work. These maps provide the basis for the synchronization projects, estimated value of the strategic work, and insight into the changes required to bring the full capability of the supply chain to deliver the core business driver.

Agility work will include the following types of efforts:

- Supply chain time reduction (charged and total)
- Flexible, agility-based partnerships (suppliers, 3PL, carriers, etc.)
- Rapid changeover
- Rationalized supply chains (fit the right supply chain to the priority and business driver, internal/external supply)
- Instantaneous, data-based decision making
- Instantaneous capacity improvement
- Supply chain network design (SCND, re-platforming)

Benchmark supply chains

focus on creating agility/responsiveness.

EXAMPLES

A. A global paper manufacturer has reevaluated its manufacturing operating strategies. For this industry, very high capital cost with capacity is the core business driver for some categories, and consumption is the core business driver in other categories. Historically, high capital, paper-based production units have been designed to optimize throughput (limited changeover capability). Digitization, equipment technology, and agility-based strategies have enabled this historical practice to be challenged in categories driving the business from the consumer point of view. New, flexible equipment, changeover time reduction, and other agility-focused work is a priority in this paper business.

B. A global heavy equipment business has built "late differentiation" (agility) capability into its equipment process centers. The change involves equipping these centers with the capability to make a significant number of product differentiations regionally. The global operations can make the base model and then use the regional centers to deliver exactly what the consumer/customers requires. This agility is a source of advantage in the heavy equipment industry because of its high cost and the investment by consumers in the equipment and the diversity of the equipment's geological requirements.

C. A global CPG company experienced significant waste in promotional product. Some categories were synchronizing to shipments. Promotional volumes were forecast based on historical performance, but internal pressures to meet monthly shipment goals often impacted the forecast. Because of the complexity of promotion designs, the supply chain has historically produced the volumes to forecast. This process created huge waste. Unsold promotions had to be discarded or reworked, and inventory spiked during promotions, which increased cash and operational expenses, and base business shipments were impacted by in-store inventory loading. As a part of the synchronization strategy, supply was changed to PtD (produce to demand). This capability synchronized supply directly to shipments. A 3PL customization house was developed to support a reliable and efficient promotion supply.

Digitalization largely has enabled

end-to-end, integrated, platform-based, and synchronized supply chains since the turn of the century.

8. End-To-End Supply Chain Visibility and Optimization (Digital)

Supply chain leaders have discussed the advantages of more complex supply chain strategies for decades. Digitalization largely has enabled end-to-end, integrated, platform-based, and synchronized supply chains since the turn of the century. Supply chains are now capable of analyzing traditional variable (cost, quality, shipment) and end-to-end/agility-based elements of the system (i.e., time, cash, service, responsiveness). To illustrate this point, digitalization is broken into two parts.

- The physical digital tools – Cost effective robots, servo motors (drives, tools), programmable controllers (with highly flexible software), advanced optical tools, and drones are a few examples of tools that have enabled instantaneous changeovers, instantaneous decision making, quality verification, wider ranges of material specifications, and the ability for operating units to handle a significant increase in product characteristics. This agility is essential to supporting complex end-to-end supply chain work.

- The information/analytical technology – The ability to access massive amounts of data, real-time data analysis (traditional and cognitive), global information platforms (to communicate/learn internally and externally), and machine learning (to avoid re-programming) are a few examples of information capabilities that have disrupted how supply chains use information. Examples of critical supply chain capabilities from this digital capability include:

  - Supply chain visibility – It is now feasible to view the end-to-end supply chain. Materials and products can be tracked from the Tier 2 supplier to consumer delivery. This visibility enables the organization to confirm that customer/consumer expectations are exceeded as well as anticipate issues and bottlenecks.

  - Data-based decisions – Complex supply chains can now make real time, data-based decisions. With the addition of AI, the information system will not only provide historical data, calculations, and real-time information, but also suggest decisions and solutions based on statistical probabilities or assessment of history similar problems, decisions, and results.

  - Optimization – The information and analytical tools enable supply chains to analyze significant levels of data, model the supply chain, simulate solutions, and continuously improve systems to deliver optimized total value (service, time, cost, revenue, quality, cash, etc.). This capability has become the basis for improved end-to-end planning and replenishment systems using internal and external (supplier, customer) data to improve how supply chains manage supply.

Two recent GSCI white papers have focused on both the physical and digital aspects of digitalization.[7, 8]

EXAMPLES

A. A global CPG company has used digital capabilities to enhance end-to-end planning capability. The idea goes well beyond the historical ERP system capability. The system provides a single view of data on every node between procurement and delivery. This enables a single planner to orchestrate (synchronize) multiple nodes and transitions to ensure that a single strategy and planning process drives total value.

B. A heavy equipment manufacturer has implemented digital information systems to view the entire global inventory system. This includes inventory in manufacturing warehouses, transit, replenishment centers, and franchises. This capability (high accuracy) has enabled the company to enact inventory sharing processes to increase service while reducing cash.

C. A global CPG company is implementing Control Tower 4.0, which goes well beyond the ability to see the finished product inventory in warehouses or in transit. The new control towers provide not only the visibility for product deployment, but also the ability to collaborate with partners and competitors. It also offers AI capability to help planners make real-time data decisions with statistical probabilities and historical examples.

D. A global information company is using cognitive capability to help complex regions like Asia make product shipping decisions. Its information system will analyze the possible supply system's reliability, inventory, and other capabilities. If supply disruption (or possible disruption) occurs the system will:

   a. Provide real-time data (i.e., inventory, lead times, capacity)

   b. Analyze option and provide a summary of choices

   c. Provides assessment of possible solutions (statistics, cost/time implications)

   d. Review of history similar issues, choices made, and outcomes

   e. Implement the information changes in the total system to support decisions

Case Studies
Business Need Versus Core Business Driver

One of the frequently asked questions by supply chain executives working on an end-to-end supply chain synchronization strategy is, "what is the difference between an important business need and the core business driver?".

Recall our discussion of the core business driver in Step 1 (above):

A core business driver is an item that, when it improves, the business experiences improved results (although the time frame may vary). When the same item degrades, the business experiences a decline in business results. The core business driver is different than the total list of important business measures. The core business driver impacts the demand and/or the demand variation. Once defined, an end-to-end supply chain rhythm can be established to synchronize supply components to the driver (creating the highest total value).

The examples in table 3 (see page 45) provide real-world examples of the business needs and core business driver. Maine Pointe, a member of the SGS Group, is a global supply chain and operations consulting firm (and sponsor of this paper), focuses on defining the important business needs as the first step in the process to improve the end-to-end supply chain. This is a vital step to ensuring the supply system is designed to deliver the business needs. Maine Pointe worked with their CEOs, senior management teams and down to the shop floor to help these organizations drive measurable and sustainable value through their unique Total Value Optimization™ (TVO) approach. The goal being to create a business-based supply chain and to synchronize their supply chains to their core business drivers to truly unlock the strategic potential of their supply chain management capabilities.

TABLE 3 - MAINE POINTE CLIENT TVO EXAMPLES				
Industry sector	**Omnichannel retailer**	**Alternative energy provider**	**High-tech provider of systems and solutions to diverse markets**	**Food producer**
Business Needs	Shrinking market due to changing consumer behavior

Threat of disruptive business models | Dynamic shift in the market seriously impacting the business

Needed to remain relevant in highly competitive market

At risk from rising costs as a result of US-China tariffs | High cost of manufacturing in the US

Needed to accelerate revenue recognition

Needed for integration following growth through acquisitions | Long-established business needed to adapt to changing customer demand

Threat from disruptive business models and more agile competitors

Shift from traditional to innovative, market-driven organization |
| **Core Business Driver** | Internet consumer orders (Lower average demand with higher variation) | Market Dynamics (impact on demand variation) | Acquisition Demand profile | Embrace new customer demand and variation. (Demand driven system) |
| **Cultivate a Supply Chain Culture** | Implemented market-leading data analytics to enhance visibility, improve control and optimize inventory levels

Transformed procurement from tactical to strategic

Streamlined organization and resolved cost-control issues | Optimized distribution networks and management of logistics

Optimized cost structure and drove value through strategic procurement strategies

Redesigned and re-engineer products

Negotiated with strategic suppliers to optimize P&L impact and mitigate operational risk

Sought suppliers in low-cost regions not impacted by tariffs | Established a centralized global procurement strategy

Aligned procurement with ORCI to ensure right people in right role to drive transformation

Accelerated the movement of manufacturing to lower-cost global sourcing | Cost, Cash, Growth, Risk

Reshaped purpose, values, vision

Removed functional silos to create cross-functional teams working together to resolve complexities

Improved working capital position, releasing cash to reinvest in new product development |
| **Benefits** | Decreased working capital by 25%

Reduced logistics spend by 7-12%

Saved tens of millions of dollars in procurement costs

Achieved a 5:1 ROI | Improved EBITDA by 13.5%

Reduced inventory level

Improved warehouse efficiency and cycle time to deliver higher customer satisfaction | Reduced global spend by 10.5% across 17 major product categories

Category savings up to 50% in some areas

70% increase in revenue in 80 days | Drove 20% EBITDA improvement

Achieved 18% reduction in addressable spend

Improved working capital position while maintaining quality |

Benchmark supply chains drive value by

verifying that all supply chain activities, processes, and transitions are synchronized to the core business driver.

Summary

Synchronization extends the notion of end-to-end supply chain integration, going well beyond a catch phrase implying just balance or collaboration within the internal and external supply chain. Benchmark supply chains drive value by verifying that all supply chain activities, processes, and transitions are synchronized to the core business driver. The organization focuses on elimination of the 'bull-whip" effect by driving time and variation out of the system. The supply chain culture must be renewed to embrace synchronization and accelerate it.

Is an end-to-end supply chain synchronization strategy right for your business? If you have complex global supply chains, have multiple acquisitions, have significant customer service issues, or have a small pipeline of large cost-saving projects, your supply chain is a prime candidate for this strategy.

Synchronization is not easy. Successful implementation requires:

- 100 percent commitment (alignment, resources, tough decisions) from business leadership

- A supply chain with a solid foundation (culture, talent, dependability, responsiveness)

- A supply chain that has built capability over time using proven concepts and tools from lean, six sigma, TPM, end-to-end, collaboration, and integration

- Detailed supply chain work and analysis

- Detailed business process work and analysis

- Cultural renewal

- 100 percent employee involvement

If your supply chain is not ready for a full end-to-end supply chain synchronization strategy, you still can benefit from these concepts and best practices. Elements such as alignment to the core business driver, value stream mapping, business process flow charting, time elimination, agility creation, and cultural renewal can be implemented independently to create total value.

Leaders conduct the orchestra. Supply chain leaders must influence all functions to partner in this strategic work. Leaders must implement these best practices and role model behavior in an integrated, synchronized, end-to-end supply chain. This approach will drive top and bottom line improvement while enabling the team to create competitive advantage.

End Notes

[1] Mike Burnette and J. Paul Dittmann, *End-To-End Supply Chain Collaboration Best Practices* (white paper, University of Tennessee's Haslam College of Business, 2017).

[2] Dan Pellathy, Mike Burnette and Scott Meline, *Supply Chain Integration Best Practices* (white paper, University of Tennessee's Haslam College of Business, 2018).

[3] Peter F. Drucker, "Theory of the Business," *Harvard Business Review*, September 01, 1994.

[4] Mark Moon, Mike Policastro, and Mike Burnette, *Advance Demand/Supply Integration Best Practices* (white paper, University of Tennessee's Haslam College of Business, 2018).

[5] J. Paul Dittmann, Supply Chain Transformation (New York, NY: McGraw Hill, 2013).

[6] Mike Burnette, Mike Policastro, Tim Munyon, *High Performance Organization (HPO) Best Practices* (white paper, University of Tennessee's Haslam College of Business, 2019).

[7] J. Paul Dittmann, *New Supply Chain Technology Best Practices,* (white paper, University of Tennessee's Haslam College of Business, 2017).

[8] Shay Scott, Ted Stank, Ben Hazen, *A SAVVY Guide to the Digital Supply Chain* (white paper, University of Tennessee's Haslam College of Business, 2018).

Appendix
Synchronization Tool Kit

How to Start

Initiating an effective end-to-end supply chain strategy is important, consuming leadership work. The 2025 benchmark strategies may not be as transparent as those used in the last three decades, and significant financial and resource investment is required to enable an end-to-end strategy. However, the benefit of a strong end-to-end supply chain strategy is vital to creating competitive advantage and driving value and is, therefore, worthwhile.

This synchronization tool kit is intended to help supply chains create a roadmap of the early work to initiate the synchronization strategy. The first requirement on this journey is to develop an end-to-end strategy for your business. Developing an end-to-end supply chain strategy is complex, and it requires significant time and resource commitment. For those just beginning this journey, the nine-step process outlined in the book, *Supply Chain Transformation*, by Paul Dittmann[5] offers a useful framework.

Once you have determined that an end-to-end supply chain synchronization strategy is the right path, the following eight critical actions can help supply chain leadership focus their efforts. The toolkit is intended to be concise and focused. Clarification of terms and examples of implementation are included above in this white paper (many helpful examples are also included in the other five GSCI strategy series white papers).

1. **Ensure that the foundational items from GSCI supply chain improvement model are in place:**

    a. Leadership, talent, and common values

    b. Reliable/predictable processes

    c. End-to-end supply chain perspective

2. **Determine the core business driver**

    Partner with finance and commercial leaders to determine what the core business driver is for the business. Each unique supply chain should have a core business driver. The core business driver typically drives demand or demand variation enabling the supply chain to efficiently and effectively synchronize itself to the driver.

3. Create multi-functional ownership for synchronization strategy

Supply chain leaders must be passionate about the work and be crystal clear on the value to the business. This includes selling business leaders, commercial leaders, supply chain leaders, all supply chain employees, suppliers, customers, and external partners. Commitment to make changes, allocate resources, and role model the strategy from both the business and commercial leaders is vital.

4. Simplify, streamline, and standardize first

The first step is to simplify, streamline, and standardize the three Ps (physical supply chain, business processes, and people [cultural] systems). This will significantly reduce the resources required to build this strategic capability and will generate the fastest return on investment.

5. Value stream map the physical supply chain

This requires a significant amount of effort, but it is necessary to enable the value improvement from synchronization. If resources are limited, start mapping the priority areas of the supply chain (revenue, profit, waste, time, defects, volume). This prioritization can be helpful to start the work but realize that it can be counter to a synchronization strategy because the weakest link in the supply chain can limit value creation. The physical supply chain needs to be integrated (strategy and activity level) and synchronized with the core business driver. Make a list of the business projects from the value stream mapping and complete the projects in order of priority. The "bull whip effect" should be eliminated. Most of the projects should focus on reducing time and improving cycle time, dependability, agility, and responsiveness.

6. Flow chart key business processes

Flow chart the critical business processes (i.e., DSI, budget, innovation, LRBP). Verify that the process is based on delivering the core business driver.

7. Renew cultural systems

Charter a team to renew all key cultural systems. The systems should be consistent with the core business driver and support synchronization. Capabilities in agility, waste elimination, responsiveness, and dependability will accelerate the synchronization journey.

8. Publicly celebrate and fix the synchronization defects

Reward people for finding and fixing the synchronization defects. Leadership behavior that motivates employees to hide the defects is not productive. Publicly talk about defects and how they have been resolved to motivate 100 percent total employee involvement.

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The University of Tennessee's Global Supply Chain Institute (GSCI) shapes and influences the practice of supply chain management (SCM) by serving as the preeminent global hub for leading practitioners, academics, and students to learn, network, and connect.

It was in this spirit of engagement and impact that the Department of Supply Chain Management and the Graduate & Executive Education programs in the Haslam College of Business at the University of Tennessee created the Global Supply Chain Institute to serve as their vehicle to extend relationships to industry and to drive an impact on the profession.

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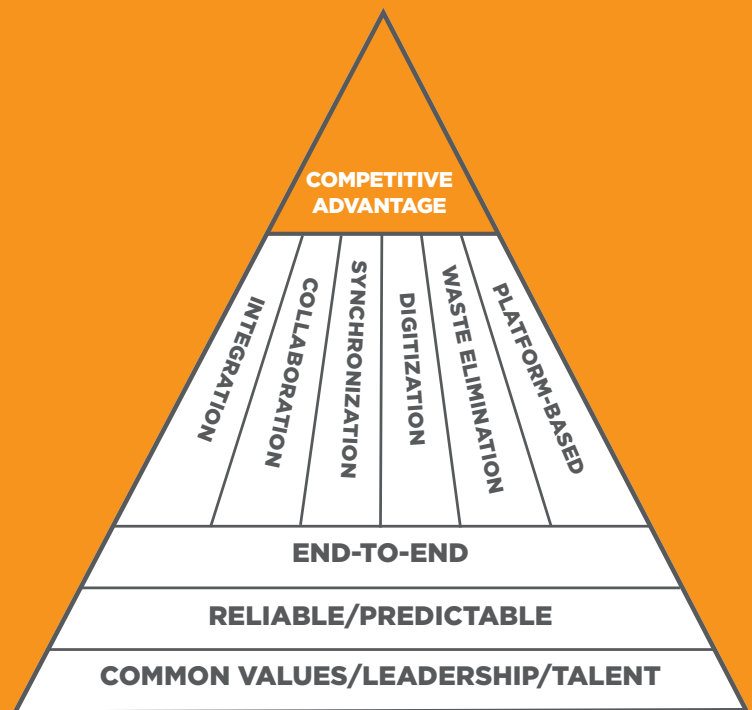
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