

END-TO-END SUPPLY CHAIN PLANNING FRAMEWORK AND KEY CONCEPTS

WHY PLANNING IS THE “BRAINS” OF THE SUPPLY CHAIN

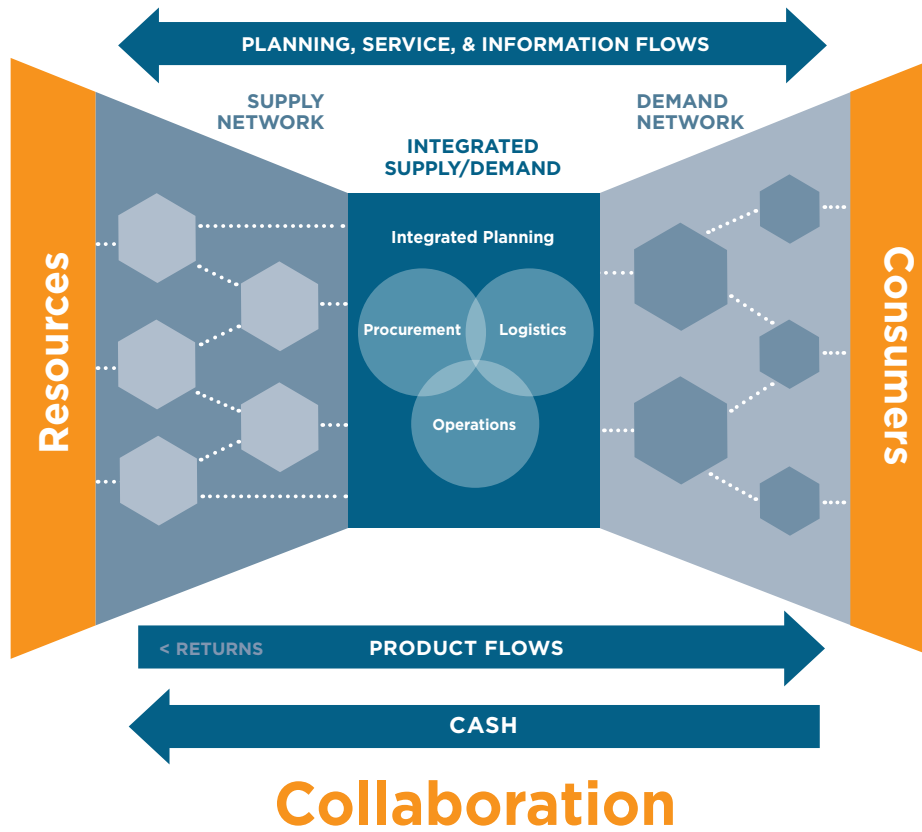
A WHITE PAPER BY THE GLOBAL SUPPLY CHAIN INSTITUTE

NUMBER THREE IN
THE **SUPPLY CHAIN**
STRATEGY SERIES

APRIL 2019



GSCI END-TO-END, INTEGRATED SUPPLY CHAIN



END-TO-END SUPPLY CHAIN PLANNING FRAMEWORK AND KEY CONCEPTS

TABLE OF CONTENTS

Introduction	3
The Rise of Planning	4
European Vacation Analogy	8
Supply Chain Planning Framework	10
Supply Chain Planning System Model	19
The Body Analogy	23
Top Ten Key Planning Concepts	24
Case Study: Rate-Based Planning Demand Trigger	33
Supply Chain Planning: Emerging Issues	36
Summary	37
Supply Chain Planning Maxims	38

END-TO-END SUPPLY CHAIN PLANNING FRAMEWORK AND KEY CONCEPTS

WHY PLANNING IS THE “BRAINS” OF THE SUPPLY CHAIN

NUMBER THREE IN THE **SUPPLY CHAIN STRATEGY SERIES**
OF UT'S GLOBAL SUPPLY CHAIN INSTITUTE WHITE PAPERS

APRIL 2019

AUTHORS:

MIKE BURNETTE
CHAD AUTRY, PhD

CONTRIBUTING EDITORS:

TED STANK, PhD
MARY HOLCOMB, PhD
SHAY SCOTT, PhD
MATT BURNETTE

RESEARCH ASSISTANT:

FALLON REEVES

THE GLOBAL SUPPLY CHAIN INSTITUTE

WHITE PAPERS

THE TECHNOLOGY IN THE SUPPLY CHAIN SERIES

New Supply Chain Technology Best Practices

A SAVVY Guide to the Digital Supply Chain

THE INNOVATIONS SERIES

Platform Lifecycle Best Practices

Selecting and Managing a Third Party Logistics Provider Best Practices

Creating a Transparent Supply Chain Best Practices

Transportation 2025 Megatrends and Current Best Practices

New Product Initiative Best Practices

End-to-End Supply Chain Collaboration Best Practices

THE GAME-CHANGERS SERIES

Game-Changing Trends in Supply Chain

Bending the Chain: The Surprising Challenges of Integrating
Purchasing and Logistics

Managing Risk in the Global Supply Chain

Global Supply Chains

The ABCs of DCs: Distribution Center Management

Supply Chain Talent: Our Most Important Resource

THE STRATEGY SERIES

Advanced Demand/Supply Integration (DSI) Best Practices

Supply Chain Integration Strategy Best Practices



GLOBAL SUPPLY CHAIN INSTITUTE

These white papers can be
downloaded by going to the
publications section at gsci.utk.edu.



Introduction

Business executives are increasingly recognizing the importance of supply chain planning, and are feeling an urgency to improve planning systems and processes. At the Global Supply Chain Institute (GSCI) at the University of Tennessee, we network with hundreds of supply chain professionals each year. Our interactions have revealed that, in many sectors, shortages of planning-focused talent and/or robust planning systems are creating substantial challenges. Historically in our GSCI white papers, we have conducted applied research from benchmark supply chains. In this planning paper we have used the insight from our network of business partners, and a more detailed set of input from heavy equipment, food, automotive, CPG, and electronic industry contacts. The GSCI has integrated this data with findings from our own University of Tennessee academic research in order to create two new supply chain planning models, define the key supply chain planning concepts and principles, and provide a detailed case study that illustrates how one best-practice company is addressing these challenges.

Business executives

are increasingly recognizing the importance of supply chain planning, and are feeling an urgency to improve planning systems and processes.





Over the last

several decades, the role of the supply chain planner and the discipline of supply chain planning have both dramatically increased in value within high-performance enterprises.

The Rise of Planning



Over the last several decades, the role of the supply chain planner and the discipline of supply chain planning have both dramatically increased in value within high-performance enterprises. The first reason for the rise of planning lies in the need to create total value across the end-to-end business. Both supply chain and business executives realize that planners hold one of the only roles in the organization that has a true end-to-end focus. Historically, manufacturing focuses on the plant, procurement focuses on suppliers/materials, engineers focus on equipment and logisticians focus on movement and storage. Planning is unique among the supply chain sub-disciplines in that planners must focus on all of the end-to-end activities required to achieve perfect customer service and drive total value creation. And so, executives view planners as one of the few enterprise resources that understand the end-to-end business. Commercial resources (e.g. marketing, sales) typically focus on the demand-side planning activities. Most technical/supply chain resources focus on the supply plan. Best-in-class planning units focus on the integration of supply and demand plans (at a strategic level, via DSI = Demand/Supply Integration, and closer to the ground, via S&OP = Sales and Operations Planning). Secondly, planning has grown in prominence, and accelerated as a key priority, due to three major shifts in the business landscape. These shifts are:

1. An exponential rise in **supply chain complexity**;¹
2. The creation of new **multi-functional business processes**;
3. A shift in **consumer and customer demands**.



Most supply chain

*complexity is viewed as
“non-valued added” by
consumers, who therefore are
not willing to pay for it.*

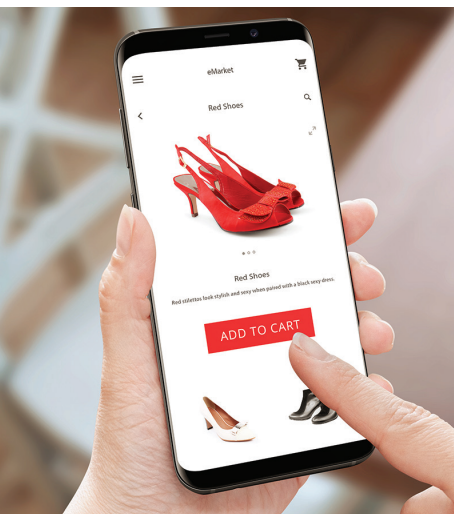
1. Supply Chain Complexity

Supply chain complexity has increased exponentially over the last four decades. Leaders have been forced to find new ways to create efficiency while increased complexity paralyzes their organizations' responsiveness. Supply chain complexity is unavoidable in the modern, global economy and is attributable to:

- Globalization and commensurate lengthening of supply chains, which creates increased time, distance, and cultural challenges;
- Acquisitions and mergers of companies, which creates redundant and unique IT systems, work processes, SKUs, and materials;
- Dramatic increases in governmental regulations in North America, Europe, Asia, and Latin America;
- Channel customer consolidation, which has shifted the supplier/customer balance of power;
- Increased product customization demanded from consumers;
- Emergence of new customer channels with new product requirements (i.e. omni-channel);
- A dramatic increase in SKU levels/product offerings.

Most supply chain complexity is viewed as “non-valued added” by consumers, who therefore are not willing to pay for it. Additionally, consumers are increasingly unwilling to wait for products/services (increased lead times can be an unfortunate consequence of increased complexity). Supply chain executives are often left with no choice but to manage increasingly challenging supply chains without increasing resources. The result is that too much time is spent managing daily business instead of creating new capabilities or products, or driving improvement/savings projects.

As a means of coping with complexity, business leaders and supply chain executives are prioritizing an increase in the number of supply chain planners on staff. Well-trained and educated planners offer firms the ability to improve the efficiency of their supply systems, offsetting the potential impacts of increased complexity.



***Demands placed
on the traditional supply
chain infrastructure—
originally built to service
brick and mortar shops —
is being simultaneously
stretched and constricted.***

2. Multi-functional Business Processes

As supply chains have become more complex, an increased number of multi-functional business processes have been developed and implemented to improve top-and bottom-line results of the enterprise. Multi-functional processes can be extremely complex, and often span across all functions within the business; frequently, this means that plans are devised by people having different rewards systems, cultures, data, and leadership. Some key business planning processes include: Demand and Supply Integration (DSI), Sales and Operations Planning (S&OP), New Product Introduction Planning (NPI), and Long-Range Business Planning (LRBP). These processes require significant planning skills and processes to access data, align functions, and deploy multi-functional resources against common action plans. Due to complexity and the levels of coordination and facilitation skills required, businesses have turned to leaders with highly-developed planning skills to manage and own these processes. These leaders primarily reside within the supply chain function.

Organizational efforts to implement and effectively manage such multi-functional processes, when executed successfully, have delivered significant value to businesses. The improvements stem from waste elimination in the “seams” of the organization where functions and processes connect, and from improved multi-functional integration, i.e. the development of common priorities, goals, processes, and business plans. Unfortunately, managers working within business functions all “see the world from their own unique perspective.” Facilitating best practices while drawing on resources across diverse functions is a skill that leading planners tend to possess, due to their history of driving alignment to the best plans. The planner’s exposure to top business leaders is increasingly seen as critical. Positive, multi-functional experiences build business-leader support for additional planning roles, as well as new and better tools to support the planners.

3. The Changing Customer/Consumer Landscape

The customer and consumer landscape has shifted dramatically in the last two decades. Heightened consumer expectations have increased demand for more customized products and services. In response, retailers seek to leverage these expectations to create a competitive advantage – often by increasing their number of SKUs or requesting highly customized SKUs, which means increasingly complex demand fulfillment.

Additionally, demands placed on the traditional supply chain infrastructure—originally built to service brick and mortar shops—is being simultaneously stretched and constricted. It constricts as traditional customer distribution channels, especially in the drug/pharmacy and office products industries, consolidate. But it expands as the expectation for omni-channel retail capacity grows. The prevalence of options has shifted power from the supplier to customer, increasing the propensity for unique customer requests, while also creating demand for secondary packaging to accommodate individual consumer Internet purchase shipments.



Furthermore, the quality and capability of private-label brands/supply systems have increased competition. High-value brands historically focus on demonstrating to consumers that their products offer the best value, driven by a combination of product quality and pricing. Private label brands (i.e. Sam's Choice, Dollar Shave Club) are creating pressure on the low-cost side of the market by supplying higher quality products at reduced prices. This dynamic is changing the customer landscape. Private brands add new channel requirements and, therefore, increased planning complexity.

The hiring and retention of an increased quantity and quality of supply chain planners is emerging as the best option for supply chain executives to minimize the impacts of shifting customer/consumer demands.

DEFINITIONS

Supply Chain Planning—The forward-looking process of coordinating assets, resources, and information in order to maximize customer and organizational value creation through supply chain flows and activities.

Supply Chain Planner—The organizational role (and people fulfilling it) that facilitates supply chain value creation. Supply chain planners coordinate supply chain activities and transitions with the primary purpose of delivering optimal levels of:

- Customer Service;
- Inventory;
- Cost.

Supply Chain Planning Discipline—The supply chain organizational discipline that prescribes methodologies for excellence in planning. This includes the development of standards for skills, training, qualifications, planning work processes, systems (including planning systems such as MRP, MPS, WMS, DRP), planning scorecards, and culture. In some benchmark supply chains, planning is group within a larger logistics discipline.

Supply Chain—The end-to-end, integrated system of processes and activities required to deliver product and services from the supplier's supplier to the consumer's shelf.

Supply Chain Organization—The holistic internal and external resources and teams required to deliver valued products and services to the end-customers and consumers with excellence. This includes (but is not limited to) procurement, manufacturing, engineering, process control, quality, safety/environmental, innovation program management, warehousing, transportation/distribution, and logistics (materials/production/category and customer planning).



European Vacation Analogy

Two friends, Jo and Mo, were planning a major two-week trip to Europe. Their “bucket list” trip was going to have a significant cost and exhaust the majority of both people’s savings. In order to make the most of the upcoming trip, each person agreed to develop a trip plan, meet for dinner, and align how the trip’s activities and budget should be managed.

Jo went to work immediately. Jo prioritized the European sites that could be visited within the two weeks, considering the top sites and the most efficient plan to experience the most sites. She researched the best airline pricing choices, efficient airport logistics, airport parking, and shuttle options upon landing. She then researched the highest-rated hotels with best pricing including options for free breakfast. Additionally, Jo researched the best restaurants by travel-site ratings, cost, and location and found several coupons for reduced pricing on tickets, tours, and bus and train fares. Finally, Jo typed a specific itinerary of what the two people would be doing

Supply chains have
stakeholders and shareholders
who have expectations for
cost, quality, and service that
must be met.

each hour of the trip with references to travel logistics, coupons, restaurant selections, and emergency numbers.

Mo spent the time really thinking hard about the trip. He wanted to have the best trip ever, and his best experiences had been when trips were kept very flexible. Find two or three cities to visit, travel to the first city, then see what the city has to offer by just walking around. Stay in that city as long as you enjoy it. Then, when the time seems right, make arrangements to travel on to the next city (and so on). After thinking about this approach further, Mo researched the hotels in the first city. He reserved only one night in the first city, enabling the pair to have the most travel flexibility afterwards. Since the only important item Mo had for the dinner meeting was a one-night hotel confirmation, in his mind, nothing else needed to be reserved or documented before the dinner.

You may have been faced with this type of situation in the past. Some people love a well-planned, efficient, and cost-effective travel plan to ensure that the most sites are efficiently visited. Some people prefer to enjoy the moment and live the travel experience. This is best achieved by not making plans prior to the moment. In life, there is nothing right or wrong with either Jo or Mo's way of planning – it simply depends on personal preferences.

But, in the supply chain world, Jo's approach is the only realistic way to take this trip. Jo's plan has prioritized the ways the allotted time will be spent, analyzed for best value, minimized cost, and optimized the efficiency of the trip. And unlike most vacations, supply chains have stakeholders and shareholders who have expectations for cost, quality, and service that must be met, and these are of the highest priority.



Supply Chain Planning Framework

Creating value in the supply chain starts with the construction of a strong supply chain strategy. This is no different in supply chain planning. Figure 1.0 diagrams the hierarchy of supply chain planning.

Over the last year, the Global Supply Chain Institute has developed an end-to-end supply chain planning framework (Figure 1.1). The purpose of the framework is to help students and business practitioners understand the types of supply planning required in today's complex global supply systems and to understand the planning horizons from daily tactical planning to longer-term strategic planning. In the following narrative, each step in the Supply Chain Planning Framework will be described.

Figure 1.0

SC PLANNING HIERARCHY



*Over the last year,
the Global Supply Chain
Institute has developed an
end-to-end supply chain
planning framework.*

Figure 1.1

SUPPLY CHAIN PLANNING FRAMEWORK					
	MATERIALS	MAKE	DELIVER	SELL	CONSUME
DESIGN PLANNING 12-60 months <i>(Top Leadership)</i>	Supply Chain Network Design Long Term Capacity Planning			Long Range Business Planning Acquisition Planning NPI Planning	
STRATEGIC PLANNING 6-36 months <i>(Top Leadership)</i>	Internal Sourcing			Segmentation Channels	
	External Sourcing Transactional-Relational-Investment				
BUSINESS PLANNING 3-18 months <i>(Mid/Top Leadership)</i>	Demand/Supply Integration (Integrated Business Planning)				Market Analysis Planning
OPERATIONS PLANNING 0-6 months <i>(Level 2)</i>	Category Planning				
	MRP	MPS	WMS/TMS/ DRP	Demand Planning Forecasting “Endcasting”	POS
EXECUTION PLANNING 0-1 month <i>(Level 1)</i>	PSI (Production, Shipment, Inventory)/Transactions				

The 12 to 60-month, (long-term) design planning processes focused on by top leadership are the most important for delivering long-term shareholder value.

Design Planning

The 12 to 60-month (long-term) design planning processes focused on by top leadership are the most important for delivering long-term shareholder value. When these processes are well-executed, the business and supply chain design is synchronized, enabling the enterprise to deliver on its business goals. The centerpiece of these planning processes is a Long Range Business Plan (LRBP). An LRBP details the product categories, sourcing of volume, and market share investments/plans for the next four to five years. Two other important commercial plans that supplement the LRBP include the acquisition plan (what do we plan to sell and what do we plan to buy, including volumes, categories, and supply requirements) and New Product Initiative plan (NPI covers the development and launch of new products/new categories as well as the rate/type of initiative churn).

With the LRBP and supporting acquisition/NPI plans, the supply chain planning team can complete a supply chain network design (SCND) or identify modifications to the existing design required to achieve the LRBP objectives. The SCND is followed by an update of the Long Term Capacity Plan (LTCP). These plans determine the need for any capacity projects in the next five years such as: efficiency/rate increase programs, construction of new manufacturing plants/warehouses, development of new suppliers, creation of new logistics requirements, and elimination of non-value assets.

*The 6 to 36-month,
long-term strategic planning
processes can be completed
by top leadership when
design plans are clear.*



Strategic Planning

The 6 to 36-month, long-term strategic planning processes can be completed by top leadership when design plans are clear. The commercial team should complete a segmentation plan for consumers, customers, licensees, and distributors. This “ABC” prioritization process will engage the larger organization, where the deployment of the most advanced and resource-intensive processes will be utilized. In benchmark companies, the segmentation plan is followed by a channel plan, which will analyze and prioritize the customer channels the organization will focus on for the next year. In recent years, the importance of omnichannel distribution and sales has changed dramatically. An example of how the decision to prioritize omnichannel impacts the supply chain and R&D can illustrate the value of this work. For instance, direct-to-consumer channels can significantly change packaging (impacting hundreds of people in supply and R&D as well as capital/budgeting priorities). Omnichannel transactions require shipment in “eaches” and well as potential customization/personalization. These packaging requirements differ from shipping full truck loads (i.e. twenty-two pallets) of goods to a mass discount or club store channel.

NOTE: Supply chain planning plays an important role in these commercial (demand, marketing, sales) work processes. It is important for the long-term growth of the business to develop these strategic plans. Unfortunately, many businesses are better at developing strategies than following them. Organizational accountability and ownership for living the strategy becomes a critical role of the CEO/general manager. Due to the nature of supply chain planning roles in multi-functional processes, these leaders expect planners to proactively hold the organization accountable for aligned choices, processes, and making tough decisions in a profitable manner.

The key planning process in the 3 to 18-month timeframe is Demand and Supply Integration. Organizations with effective DSI planning deliver better business results.

For these reasons, supply chain planning is a key part of commercial planning. Leadership decisions should be about what work will be internally sourced, and what work will be externally sourced. If work is externally sourced, a key question is, how will the supplier be managed (level of teamwork/partnership)?²

Business Planning

While the commercial team is renewing market analysis planning, the majority of the multi-functional organization is managing the current fiscal year business. The key planning process in the 3 to 18-month timeframe is Demand and Supply Integration (DSI at the upper levels of the organization, and Sales & Operations Planning or Integrated Business Planning, S&OP and IBP, at middle and lower levels, respectively). Under the DSI planning umbrella, sales leadership owns the process of creating an unconstrained demand plan. Supply chain leadership owns the creation of an actionable (demonstrated) supply plan. The business general manager is responsible for making the important decisions to form an integrated demand/supply plan, adjusting either demand or supply to arrive at an achievable and profitable balance. Finally, the finance leadership owns the translation of this aligned plan into the enterprise financial plan. Organizations with effective DSI planning deliver better business results. DSI is a relatively simple planning process. Once the demand plan, supply plan, and issue sheets are created, the important leadership decisions necessary to drive total value can be aligned.

DSI ISSUE SHEET—A one page document, developed jointly by the system owners of demand, supply, and new initiatives (middle management) during the DSI process. These critical issue sheets (2 to 5/meeting) are presented to leadership in the Executive DSI meeting. The issue sheets contain: concise description of demand/supply issue, data (visual), recommended decision, and implications. The issue sheets enable the DSI executive leadership to focus DSI on its primary objective (decision making).

Unfortunately, DSI is very difficult to implement in many organizations due to cultural challenges, mostly stemming from conflicting reward and compensation systems and differing functional rituals. This topic is discussed in detail with best practices from benchmark companies in the GSCI white paper *Advanced Demand/Supply Integration Best Practice: Why S&OP Has Largely Not Been Effective in the Last Four Decades*.³

The impacts of the forecast (changes up and down) impact production schedules, loading schedules, warehouse capacity, truck capacity, and even personal vacation plans.

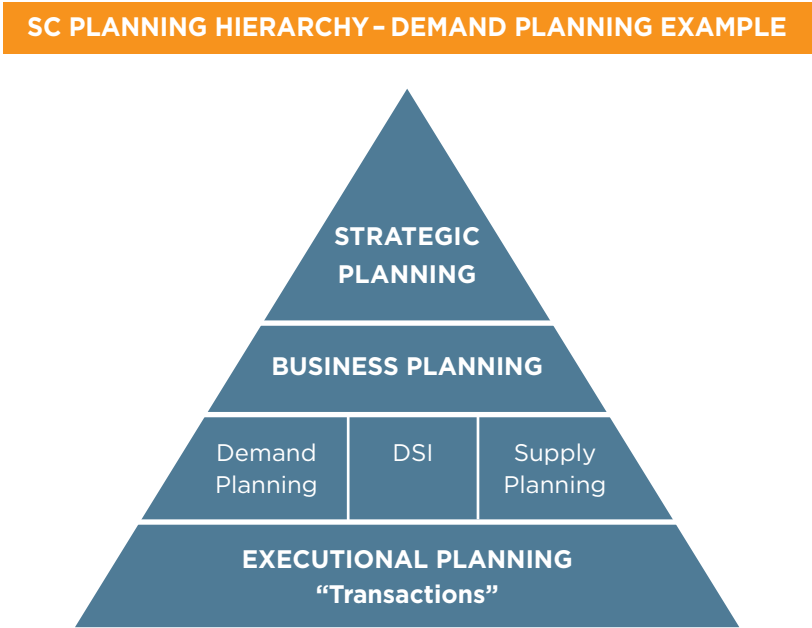
Operations Planning

Operations planning is the level of planning in which the majority of supply chain resources are involved on a day-to-day basis. Managers and technicians use MRP, MPS, WMS, TMS, and DRP (Materials Requirements Planning, Master Production Schedule, Warehouse Management Systems, Transportation Management Systems, Distribution Planning Systems) systems in their daily work. Additionally, although forecasting systems and methodology may not be understood broadly in the organization, the impacts of the forecast (changes up and down) impact production schedules, loading schedules, warehouse capacity, truck capacity, and even personal vacation plans.

Example: Key Elements of DSI

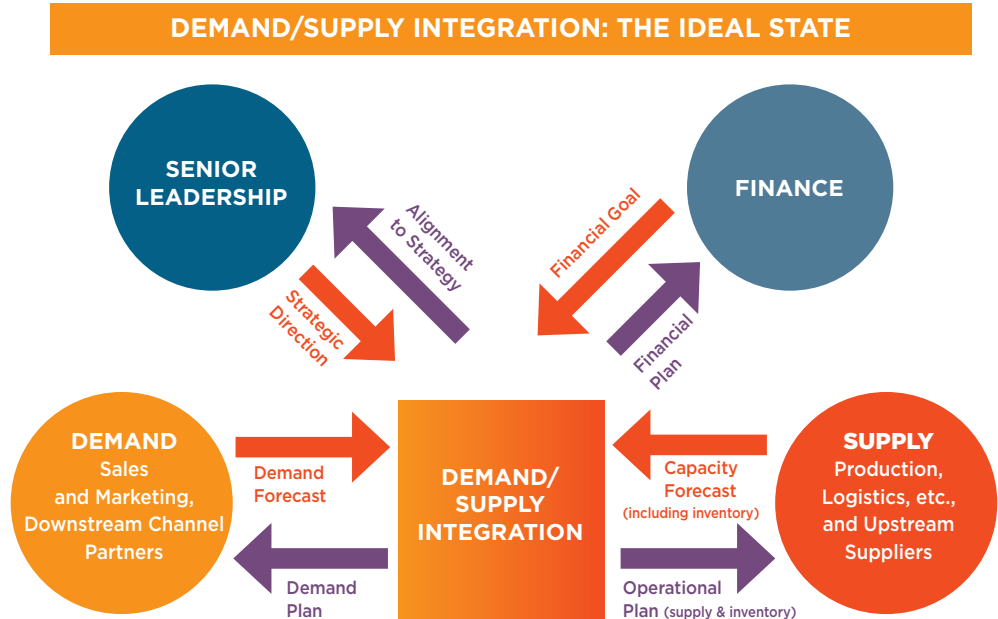
To understand the Supply Chain Planning Framework, key elements of demand planning will be used as an example to highlight the “business planning” level of the framework. The planning hierarchy for demand planning (from Figure 1) is shown in Figure 1.2.

Figure 1.2



Assuming that the Supply Chain Strategy and Design process has already been created to support the LRBP, the business planning process will then begin with the multi-functional DSI or S&OP process. Demand/supply integration is described in detail in the GSCI white paper: *Advanced Demand/Supply Integration Best Practices*³ and is portrayed in Figure 2.

Figure 2.0



As shown in Figure 2.0, the demand planning process provides one input to the DSI process. Demand planning has four elements:

- 1. Planning Demand (Forecasting)**—The process of determining the amount of product/service the business will provide. This forecasting plan is completed on a financial basis and a volume basis. The plan includes summaries at business levels (i.e. category, channel, regional) and at an SKU level. Forecasting for this “base” business typically utilizes historical data and is calculated using software with various analytical methods (time series, regression, etc.) to aid in the creation of the forecast. The result of forecasting is an unconstrained and unbiased estimate of demand.
- 2. Integrating Demand**—The process of utilizing DSI for the single-number demand plan and integrating this data into information systems such as SAP, Oracle, or another integrated system. Additional steps may be necessary to ensure this data is available for suppliers, customers, or other supply system partners.
- 3. Influencing Demand**—The process of modifying business programs or sales/marketing organizational behavior to increase or reduce demand to achieve the DSI plan. This can include adding/subtracting promotions, pricing (up/down, permanent/temporary), and NPI launch timing.

4. Allocating Demand—The process of selecting which customers receive product/services when the amount of available product is less than demand (frequently called allocation process).

Benchmark companies are actively working on demand planning. Three key items impacting how the demand plans are built include:

- 1. Elimination of Forecasting**—While businesses may not be able to fully eliminate forecasting, the extent that forecasting is utilized in the supply chain can be significantly reduced through the concept of demand triggers (this will be discussed later in the key planning concepts).
- 2. Auto Select**—The process of using high-powered computing capacity to create SKU-level forecast by multiple regression analysis of historical data. The auto-select system tracks the forecast accuracy results versus multiple regression estimates and then selects the most accurate method for that SKU.⁴
- 3. Endcasting**—The process of using consumer social networks to predict demand trends. The forecasts are based on analysis of historical trends. In dynamic and innovative markets, historical data is not sufficient for identifying future shifts in demand.

Similarly, the supply plan provides another input to the DSI process. The supply plan represents the best guess about what future supply capability will be, and if there is uncertainty around any estimate of supply capability. Raw material or component parts availability, labor availability, machine efficiency, and other supply chain variables introduce uncertainty into estimates of future capacity levels.

Normally when these two forecasts are created, demand and supply are not in balance. DSI processes are designed to answer what organizations should do when they are not in balance. Proper action depends on the costs of each alternative and on the strategic desirability of each alternative. Because each situation will be unique, with different possible alternatives that carry with them different cost and strategic profiles, it is necessary to put these available alternatives in front of knowledgeable decision-makers who can determine which is the best course of action.

Figure 2.0 also contains arrows that designate outputs from the DSI process. These outputs should be seen as business plans: demand plans, operational plans, and financial plans. Demand plans represent the decisions that emerge from the DSI process that will affect demand generation functions—usually, sales

While the planning math is simple,

the challenge comes from the number of transactions that occur each day.

and marketing. Operational plans represent the decisions from the DSI process that will affect the supply chain. Examples of these operational plans are productions schedules, inventory planning guidelines, signals to procurement that drive orders for raw materials and component parts, signals to transportation planning that drive orders for both inbound and outbound logistics requirements, and the dozens and dozens of other tactical and strategic activities that need to be executed in order to deliver goods and services to customers. Financial plans represent signals back into the financial planning processes of the organization based on the anticipated revenue and cost figures agreed upon during the DSI process.

Execution Planning

Finally, the most basic, tactical level of supply chain planning is execution planning. This is at the first level of the organization and deals with the daily transactions that execute the higher levels of planning. It is important to note that, while the planning math is simple (see Figures 2.1 and 2.2), the challenge comes from the number of transactions that occur each day. An average-size regional company can have thousands of these transactions daily.

Figure 2.1

THREE EXAMPLES OF PSI (PRODUCTION, SHIPMENT, INVENTORY)			
	MATERIALS	PRODUCTION	WAREHOUSE
STARTING INVENTORY	Starting Inventory	Starting Inventory	Starting Inventory
+P	Receipts	Production	InBound Inventory
-S	Production	Shipments	OutBound Inventory
=I (Ending Inventory)	Inventory (End)	Inventory (End)	Inventory (End)

All Planning is Basic Addition and Subtraction

Figure 2.1 shows the basic planning math for materials, production, and warehouse. The method is called PSI (where P=initial production, S=amount of product shipped, and I=ending inventory). All supply activities (across materials, make, ship, etc.), and planning levels (tactical/strategic) across the Supply Chain Planning Framework use PSI methodology as their basic analysis. Figure 2.2 shows the three time periods for the PSI analysis. Historical, current, and future data is assessed in planning.

Figure 2.2

PSI (PRODUCTION, SHIPMENT, INVENTORY)						
	ACTUAL		CURRENT	FORECAST		
	Month-2	Month-1		Month+1	Month+2	Month+3
STARTING INVENTORY						
+P						
-S						
=I (Ending Inventory)						

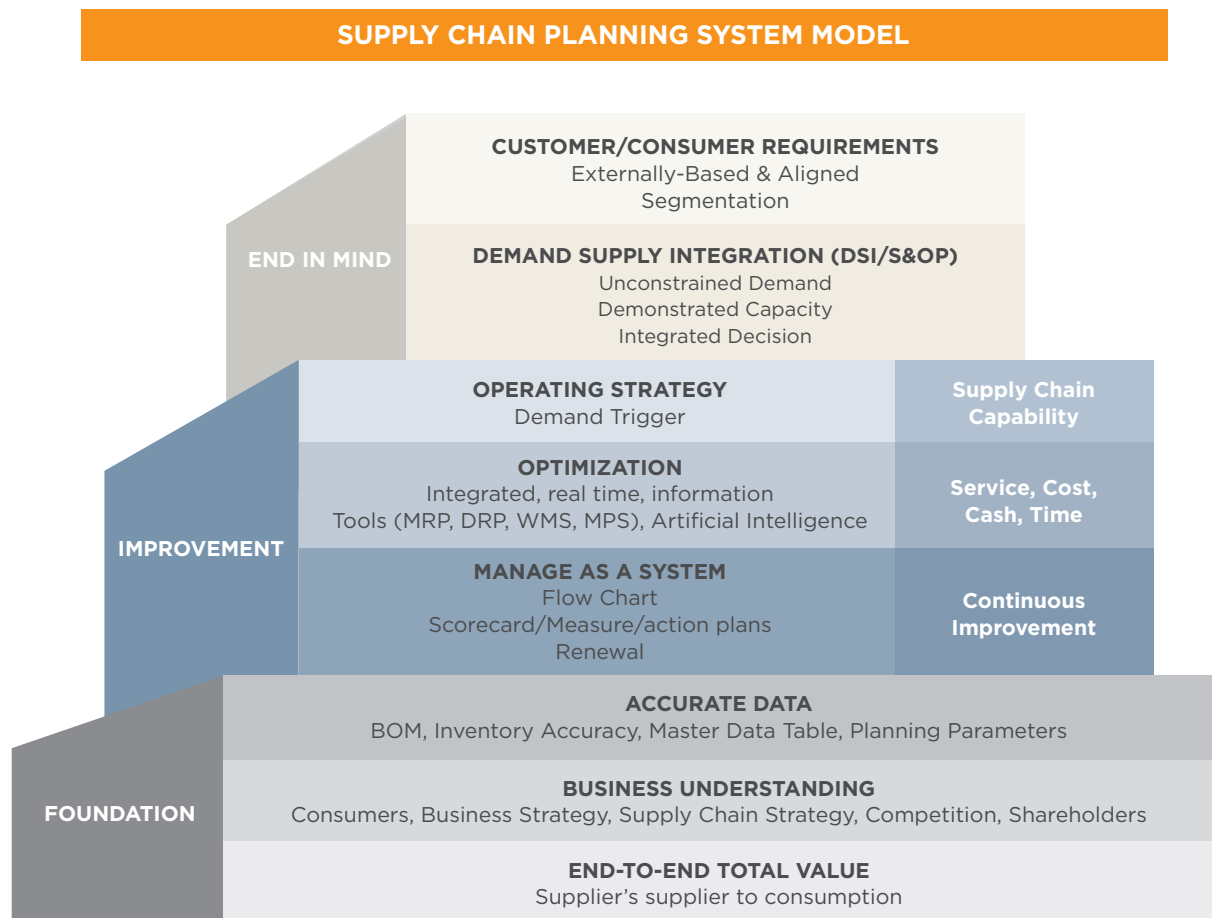
Ending Inventory = Starting Inventory for Next Month



Supply Chain Planning System Model

The majority of supply chain planning work happens in the eighteen-month-or-less timeframe at the execution, operations, and business planning levels (see Figure 1.1 – Supply Chain Planning Framework). Through its networking efforts, the Global Supply Chain Institute (GSCI) has collected data on the critical planning systems that successful businesses are using to drive end-to-end supply chain total value. Figure 3 is the GSCI Planning System Model.

Figure 3



Planning processes

are intended to optimize total value by meeting or exceeding consumer and customer requirements.



Keep the End in Mind

Planning processes are intended to optimize total value by meeting or exceeding consumer and customer requirements. Successful planning systems “keep the end in mind.” These requirements are best determined external to the organization “through the eyes of the consumer/customer.” Having the consumer and the customer at the top of the planning process model reminds us that, no matter how efficient the planning process is, it is only effective if it delivers on business needs.

The second element at the top of the planning system is Demand/Supply Integration (DSI). DSI ensures that the entire multi-functional organization is working aligned with the same plan. Total value creation is optimized when everyone in the organization is working towards a common goal and plan. Planning is instrumental to DSI. DSI is a planning process that has the demand and supply plans as its “heart.”

Improvement

The three aspects of strong planning systems in the middle of the GSCI Supply Planning System Model ensure the long-term health of the supply system. Current supply chains are extremely complex. The days of managing the supply chain on an Excel worksheet are over. Planning utilizes powerful information systems to manage complex activities. Planners must manage supply plans as a system, leveraging the planning tools/processes (e.g., MRP, WMS) to optimize results. Finally, planners need to make wise choices on supply chain operating strategies to deliver competitive cost and service, and effectively use cash. The following are key elements of best-in-class supply chain planning systems:

- 1. Manage as a System**—Best-in-class supply chains manage planning as a system. The system owner(s) is identified and documents the system. This should include flow-charting the process, development of a scorecard (in process and output measures), management of action plans, regular leadership reviews, and continuous renewal. This systemic approach is the proven way to manage complex systems and deliver long-term continuous improvement.
- 2. Optimization**—The current key planning tools are complex information systems. To productively compete, these information systems need to be real-time and cover the end-to-end supply chain. These systems include tools such as: MRP, MPS, TMS, and DRP. These tools include a level of optimization within the software that should be utilized. In today’s digital supply chain, supplemental planning tools such as artificial intelligence (AI) can document historical decisions/impacts and make recommendations for current issues. This ensures that the planning team is learning from the past

Having the consumer

and the customer at the top of the planning process model reminds us that, no matter how efficient the planning process is, it is only effective if it delivers on business needs.

and using the best data to optimize the supply chain. Additionally, “big data” can allow the information planning system to run thousands of calculations to optimize results (i.e. auto select in demand planning discussed above). Planning optimization provides the organization with the capability to deliver its customer service, cost, cash, and time goals.

3. Operations Strategies—Understanding current supply chain capability is critical to successful planning. Maximum outputs are generated when the supply chain is operated at its peak. Supply plans should reflect:

- a. Instantaneous Capacity** – Instantaneous capacity can significantly reduce inventory levels, deliver superior supply chain responsiveness (customer service), and reduce/eliminate the reliance on a forecast;
- b. Daily Planning Windows** – The shorter the planning window (locked zone), the more responsive the supply chain. Again, this reduces inventory and improves customer service;
- c. Lead Times** – The shorter the materials, production, and transportation lead times, the more responsive the supply chain;
- d. Demand Triggers** – The use of demand triggers (see key concepts below) can better match supply capability with demand;
- e. Drumbeat** – When possible, keeping the supply chain on a rhythmic drumbeat reduces variation. Reducing supply chain variation eliminates waste (improves cost), reduces inventory, and improves customer service.

Planners are the owners and leaders of these strategies. The supply chain should be planned consistently with the operations strategy. Traditionally, planners built a wall around the operational units in an attempt to lower cost and improve internal efficiency. Operational requirements with long lead times, long planning windows, long fixed zones, and large minimum order quantities (MOQ) were the norm. Modern supply chains eliminate these walls and build supply chain capability to match the business requirements. This shift has created a focus on time. Fixed zones, planning windows, and lead times are reduced to the absolute minimum. MOQs have either been eliminated or significantly reduced. These time-based changes create more responsive supply chains.

Leading the interaction between the actual operation and its strategies make planners ideal for being actively involved in creating appropriate future operational strategies. This includes the identification of new supply chain capabilities that are required to deliver the three- to five-year business goals in an environment of rapid change.

The overall planning process for the fashion or heavy equipment industries, for example may be based on principles that are common with CPG, but the principles must be applied to the distinct setting and assessment of customer values.

Foundation

The foundation of successful planning systems is the most important part of any system. Without a strong foundation, all remaining elements of the system must perform with an unstable base. The planning system is no different. It requires a strong foundation. The foundation has three important parts:

- 1. End-to-End (E2E) Total Value** – The GSCI planning system is based on a supply chain that encompasses the supplier's supplier to consumption (end-to-end). This ensures that the system optimizes customer service, inventory, and cost for the entire value chain. Narrowly-defined planning systems can optimize results for a specific department while adding inventory/cost in other elements of supply or increasing customer service risk. A foundation focused on total value across the end-to-end supply chain forces every supply activity to holistically manage their planning and focus on end-to-end measures;
- 2. Business Understanding** – Excellent planners have a deep understanding of the business, business strategy, competitive strengths/weaknesses, shareholder needs, and the E2E supply chain strategy. This deep business understanding enables them to utilize planning systems and every planning process to deliver short- and long-term business needs. The overall planning process for the fashion or heavy equipment industries, for example may be based on principles that are common with CPG, but the principles must be applied to the distinct setting and assessment of customer values;
- 3. Accurate Data** – Data accuracy is the foundation of many supply chain systems and is vital to planning. Supply plans are only as accurate as the data used to develop the plans. The critical databases in end-to-end supply plan include: bill of material, ERP parameters (i.e. planning parameters inputted into SAP to build the supply plans such as lead times, planning windows, and operating efficiencies), inventory accuracy, and customer master data tables.

The Body Analogy

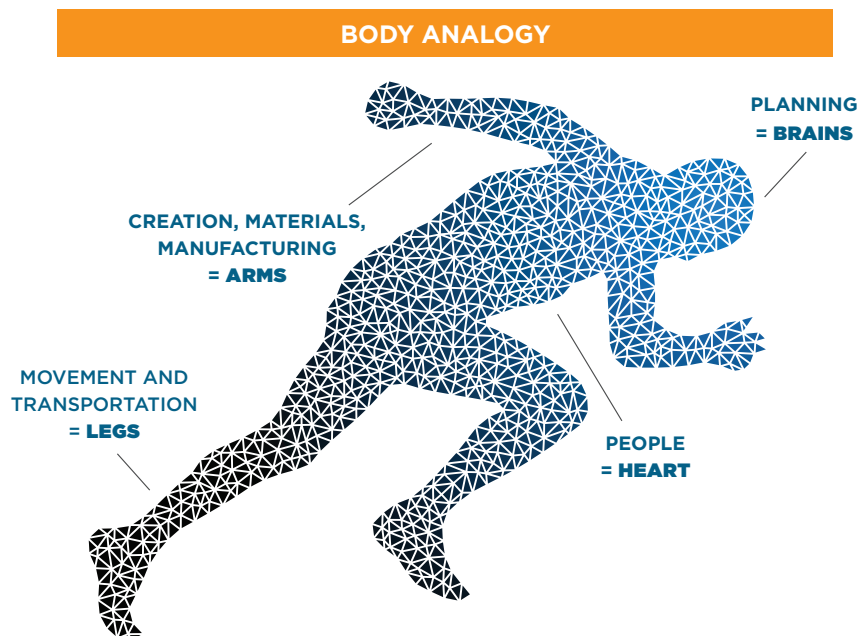
At the Global Supply Chain Institute, we interface with hundreds of companies every year. A common supply chain planning analogy discussed with executives is the body analogy. This analogy provides common sense insight into the important role that the planning discipline plays.

A human is a marvelous creature. It is one of the few creatures that can think through complex problems and learn from experiences. Most supply chains experience similar challenges. Supply chains must create and supply products. Supply chains must think through very complex geopolitical, regulatory, operational, engineering, human, and logistics problems. They must learn from these problems and execute with optimal efficiency.

The legs of the body represent the movement of products within the supply system (transportation, shuttles, fork trucks, etc.). The arms of the body represent operations that create materials, products, and services. The heart of the body represents the supply chain people. It is our most important asset/resource and the part of the body that is the center of our work.

Finally, the brain of the body is planning. Planning facilitates and orchestrates our supply chain. Planning must gather data on what the future requires of the supply system. It must organize the body to deliver a plan that meets our customer/consumer needs. Finally, planning must learn from experiences and incorporate this knowledge into future plans.

Figure 4





Top-Ten Supply Planning Concepts

TOP-TEN SUPPLY PLANNING CONCEPTS
1. Having dedicated, capable supply chain planners is based on risk and reward.
2. Planning complexity is driven by supply chain complexity.
3. Planning is based on the business.
4. Planning mirrors strategy.
5. The critical supply planning output measure is customer service.
6. Accurate data is the key foundation of the planning system.
7. Segmentation enables the organization to efficiently work on what is most important.
8. Eliminate non-valued added supply chain time.
9. Demand trigger should match supply chain strategy.
10. Influence the right NPI (New Product Initiative) launch plan.

1. Having Dedicated, Capable Supply Chain Planners is Predicated on Risk/Reward Tradeoffs

Supply chain activities represent both a risk to the business and the opportunity to create total value that can result in significant reward for the organization. Supply chain risk includes customer service, cost/waste, inventory, and proprietary assets. If a significant risk for a supply chain activity exists in one or more of these four areas, it is wise to staff (the number and talent level) capable supply chain planner(s) to orchestrate this section of the supply chain. The total value opportunity of the supply chain can be the second rationale for staffing the supply chain planning function. This includes opportunity to save cost/cash, improve customer service, increase revenue, reduce assets, manage the supply constraint, or significantly improve the activity's effectiveness/efficiency. Figure 5.0 shows a list of supply chain activities that could be assessed for dedicated supply chain planners.

Figure 5.0

EXAMPLES OF SUPPLY CHAIN ACTIVITIES (DEDICATED PLANNER?)				
MATERIALS	MAKE	DELIVER	SELL	E2E
Tier 3 Materials	Production	Warehouse Receipt	Customer Logistics	Category
Tier 2 Materials	External Manufacturing	Warehouse Storage	Retail Logistics	Global
Tier 1 Materials	Postponement	Shipping/ Loading	Demand Planning	Supply Plan (DSI)
Inbound Transportation	Product Manipulation/Displays	Transportation – Air, Ocean, Truck	Reverse Logistics	SCND
Material receipt/storage/ship	Services	Drop Lot and Cross Dock	Maintenance	LTCP
Sub assemblies		Import/Export	Service Contracts	
New Product Launch				

2. Planning Complexity is Driven by Supply Chain Complexity

Planning is middle school algebra. PSI is the basic planning calculation (Beginning inventory plus production minus shipments equals ending inventory). The planning complexity in the supply chain comes from the number of transaction (parts, SKUs, pieces of equipment, locations, etc.) in the system. Figure 5.1 shows the number of activities that an average-size, global supply chain creates.

Figure 5.1

SUPPLY CHAIN COMPLEXITY DRIVES PLANNING	
EXAMPLE: SMALL GLOBAL COMPANY DO THE MATH: How many combinations? What is required for 100% perfect SC orders?	Materials
	Suppliers
	Plants
	Warehouse/DCs
	Customers/Doors
	Consumers
	1000's
	100's
	10's
	100's
	1000's
	1000000's

The planning complexity

in the supply chain comes from the number of transaction (parts, SKUs, pieces of equipment, locations, etc.) in the system.



*The first step
in planning is a deep
understanding of the business.*

3. Planning is Based on the Business

The first step in planning is to learn the business. A frequent mistake by new SCM graduates who show up for work as a planner is to begin the process by only studying how the person who preceded them created supply plans. Fundamentally this is a defect in the planning training system.

The first step in planning is a deep understanding of the business. While supply chain planning concepts slice across industries, the application of the concept is business-based. You may have heard a teacher quote the rabbit in Alice in Wonderland: “If you do not know where you are going, any direction is equally good.” Obviously, efficient supply chains need to understand that the work is headed in the best direction.

Benchmark companies start new planners (and most employees) by immersing them in the business. This includes physically visiting the marketplace, understanding consumers needs, understanding customer needs, and reviewing competitor strengths/weaknesses. Beyond learning the marketplace, learning the business, supply chain, and operational strategies will enable planners to develop supply chain plans targeted for success.

4. Planning Mirrors Strategy

Successful planners learn the business, business strategy, and supply chain strategy. This level of strategic understanding is required but not sufficient. Each type of supply chain planner requires further strategy understanding. As Figure 5.2 illustrates, each of the six planning roles has a critical strategy that drives the work.

Figure 5.2

PLANNING ALWAYS STARTS WITH UNDERSTANDING THE STRATEGY

TYPE PLANNING	STRATEGY	EXAMPLE ELEMENTS
Demand	Business	Profit, priorities, consumers, customers, competitors
Material	Material Sourcing and Segmentation	Commodity, strategic, spend
Production	Operations	Schedule, staffing, dedicate/flexible
Category	Supply Chain	Supply network, capacity, make/buy
New Products	Innovation	Lead/follow, launch, Platforms
Customer Logistics	Customer Channel	Direct shipments, role of promotion, POG, channels

The key objective of supply chain planning is to optimize total value for the end-to-end supply chain.

5. The Critical Supply Planning Output Measure is Customer Service

The key objective of supply chain planning is to optimize total value for the end-to-end supply chain. The critical output measure is customer service. Most senior supply chain executives agree that delivering customer service performance, which is externally-defined and creates competitive advantage, is the defining measure of most supply chains' capability and therefore the key measure of supply chain planning.

Beyond customer service, cost and inventory are critical output supply chain planning measures. The highest level "in process" measurement for planning is time. In the long term, the elimination of supply chain time is the metric that has the biggest impact on supply chain capability and total value creation.

Figure 5.3 shows a sample supply chain planning scorecard.

Figure 5.3

EXAMPLE SUPPLY PLANNING MEASURES			
AREA	EXAMPLE OUTPUT MEASURE	EXAMPLE IN PROCESS MEASURES	
Customer Service	Perfect Orders	Transportation delivery on time	
	% On time	Inventory accuracy	
	% Complete	Master production schedule%	
	% Accurate (Billing)	BOM accuracy	
	Customer service as viewed by customer	On time delivery of customer highest profit items	
Inventory	Total \$ or Average \$	Items above buffer limit	
	Days on Hand (DOH) or average DOH	Obsolete/at risk inventory In process inventory	
Cost	Total Delivered Cost	Operational efficiency	
	Logistics Cost	Premium/expedited cost	
		Time	• SC Time (SCT) • Total E2E SCT • Charged SCT

Data accuracy

is vital to planning. For supply chain plans to be accurate, the data in the information system must be accurate.



6. Accurate Data is the Key Foundation of the Planning System

Data accuracy is vital to planning. For supply chain plans to be accurate, the data in the information system must be accurate. The critical databases in end-to-end supply chain planning include: the bill of material, ERP parameters (i.e. planning parameters inputted into SAP to build supply chain plans such as lead times, planning windows, and operating efficiencies), inventory accuracy, and customer master data tables. Benchmark supply chains have detailed, robust daily management systems to verify data accuracy to ensure that supply chain planners are making decisions based on the most correct data available. Inaccurate data generally leads to suboptimal plans; it truly is “garbage in and garbage out.”

7. Segmentation Enables the Organization to Efficiently Work on What is Most Important

As stated earlier, overall supply chain complexity has significantly increased over the past four decades. This complexity has been driven by an increased pace of acquisitions, new products, in-store promotions, channel/supplier complexity, and by leadership’s (finance, general management, supply chain, sales) inability to make tough rationalization decisions. Ideally, organizations would have systems to offset increased complexity by rationalizing materials, suppliers, SKUs, customers, and channels. Since these decisions may not be possible for many organizations, segmentation strategies are critical to delivering total value. The most frequent approach is an “ABC” method where “A” represents the few most profitable variables (customers, products, suppliers, etc.), “C” represents the many non-value added, and “B” represents everything in the middle. The important parts of segmentation are:

- Segment to ensure you are focusing on the most important (value added) work—do not treat every item the same;
- Create standard processes for each segment and rigorously follow the standard;
- Create automated systems for discontinuation;
 - Involve leadership heavily upfront in the process, setting parameters for non-value-added complexity (SKUs, materials, suppliers, and customers);
 - Avoid leadership involvement late in the process where their value is limited, avoiding decisions driven by functional reward systems.

Experienced planners

understand that wasted supply chain time is a “golden nugget” for a defect-free culture.

8. Eliminate Non-Value-Added Supply Chain Time

Benchmark supply chains understand the importance of time. The supply chain's basic purpose is to produce products and service that hold value on the market. Once the material, product, or service is created, any remaining time normally creates waste. This waste manifests itself in non-value inventory, product movements, premium cost, storage, etc. Beyond waste, time in the supply chain creates a buffer between the producer and the consumer. This buffer (normally lead time or inventory) makes the supply chain less responsive to changing consumer needs.

Effective planners focus on creating a defect-free culture. This focus enables planners to have a very high personal impact on the total value created in the supply chain. Experienced planners understand that wasted supply chain time is a “golden nugget” for a defect-free culture. Reduction in time typically creates new supply chain capability and delivers a “trifecta” of value in cost, inventory, and customer service.

9. The Demand Trigger Should Match the SC Strategy

In the PSI Figure 2.2 above, a forecast is used as the demand trigger. A demand trigger is the data in a supply chain or planning system that creates the requirement for previous supply chain activity.

One of the biggest mistakes a supply chain professional makes is to assume that a forecast is the only possible demand trigger. A major challenge with thinking about requirements (the “S” in PSI) is that a demand trigger must equate to supply chain capability. This concept can be understood with a few examples of demand triggers (and the operations strategy that pairs with the trigger):

A. Forecast (Produce to Forecast) – A forecast that is developed for the business and fully deployed “down” in the organization by an ERP system is the traditional way to provide requirements for supply chain activities. Unfortunately, there are many issues with this approach. First, all forecasts are incorrect. In every transaction, waste is created by use of a forecast. This waste is either the creation of non-value added inventory if the forecast is too high or customer service risk if the forecast is too low. Secondly, forecasts are tied to a reward system developed by leadership. This cultural decision creates an environment that makes accurate forecasting almost impossible. Finally, a third issue is the business forecast which is typically created in monetized terms at the top levels of the organization with multiple iterations. The translation of this “dollar”

forecast into SKU level and by material forecasts is extremely difficult. This challenge is multiplied by the multiple layers of edits to the forecast. Forecasting is required (even in benchmark companies) for longer-range business requirements (DSI/S&OP, LRBP, LTCP, and SCND), but the best supply chain organizations seek other demand triggers to use for the SKU and material forecasts in the system;

B. Historical Volume (Produce to Buffers/Kanban/Rate-Based Planning)—

A popular demand trigger in operations is the use of buffer management. The concept of buffer management is that supply activities that have relatively low demand variation and high volume productivity can be managed without a forecast. The activity's requirement is calculated using a frequency chart to cover over ninety-nine percent of the historical requirements. A lower buffer limit, upper buffer limit, and a target order point are created. A supply chain drumbeat is created (to limit variation) to operate between these limits. Examples:

- i. Production** – The production activity operates to fill a buffer (this could be a bin or shelf). When the buffer is low the activity produces. When the buffer is at the top, the production activity stops;
- ii. Warehouse/Distribution** – The warehouse creates slot locations for every SKU. The warehouse only creates a replenishment request to manufacturing if the SKU slot has dropped to the re-order point or less;
- iii. Supplier** – In vendor managed inventory environments, the supplier only brings materials to the manufacturer when the material specification slot is at or below its re-order point.

Buffer management as a demand trigger is widely used in manufacturing operations today. The primary opportunity is to expand its use with suppliers, warehouses/DCs (both internal and customer), and customer stock;

C. Consumption (Produce-to-Demand Utilizing Supply Chain Capability) –

The optimal demand trigger is to base requirements on consumption. This is typically called a PtD (Produce to Demand) strategy. The requirements are based one-hundred-percent on consumption. Minimum safety inventories (based on frequency chart analysis) are placed at decoupling (or transition) points in the supply chain. When a product or service is consumed (purchased by consumer), the supply produces a replacement for it. Point of Sale (POS) systems and data is required for these systems. When POS is not available (or too expensive to obtain), customer shipments of finished goods (FG) inventory buffers can be used to represent this consumption.

*Consumption based
demand triggers require
high-level supply chain capability.*

Consumption based demand triggers require high-level supply chain capability. In these systems, lead times, fixed zones, MOQ, and planning windows are obsolete. A careful financial analysis is required to assess the total value created versus the investment in building these systems. The segmentation key concept above shows that PtD strategies may choose to apply this to only the most important/profitable segments of the business (i.e. “A” SKUs). To create competitive advantage for the organization, a consumption-based trigger is a viable option. Produce-to-demand is difficult to build and maintain. Creating true competitive advantage is never easy and requires highly-skilled supply chain leadership.

10. Influence the Right NPI Launch Plan

The above nine key planning concepts apply to all elements of supply chain planning, but are insufficient when it relates to new product initiatives. NP launches have been grouped into four categories and accompanied by the key supply chain planning concepts for each.

TYPES OF NPI

A. “New-to-World” Products

- “New-to-the-world” products by their nature are high risk, high reward. Companies are built around successful new-to-the-world products. Unfortunately the “hit rate (percentage of launches that meet financial expectations)” are very low. Therefore, a key supply chain planning concept is to help leadership build a set of market testing steps with success criteria (achievement of criteria moves NPI to next step). Launch gates typically include: consumer research, social media buzz analysis, small market test, large market test, by regional waves of launch, and by country/global waves of launch.
- Supply chain planning would include building supply capability to deliver each test market without building anticipation inventory.
- Supply chain planning should break the NPI requirements between pipeline product (product to fill new slots in warehouses/stores) and consumption. The pipeline requirements should be known, enabling planning to create the optimal supply plan. Consumption is a more difficult process as the shipments may be delayed from the launch timing (consumers must consume product prior to re-purchase). Planning for the consumption element of shipments is best performed by supply capability, and if not cost-justified, then a future-based forecast is typically the best method.



B. Continuous Improvement Products (New SKU)

- Continuous improvement product launches are changes to existing products with features that consumers have requested or would view as increased value. Unfortunately, if the changes are significant (e.g., impact price, master data table, or shelf plan-o-gram) a new SKU is required. This is referred to as a “hard conversion.” Supply planning would need to follow the consumption and pipeline concepts above.
- Frequently the decision to utilize a new SKU is a “grey” area. Supply chain planners should actively provide business leadership with all the cost data for a hard conversion (pipeline inventory, customer service risk, etc.). Since NPI launch hit rates for continuous improvement average less than ten percent, the highest total value may be created with a soft conversion (no SKU change).

C. Continuous Improvement Products (Same SKU)

- Continuous improvement product launches with the same SKU should be managed with “no-to-limited” additional inventory. There can be an argument to add a layer of stock for variation caused by the customer (an improvement that the customer wants to advertise). Since the consumer awareness of a launch with no SKU change is very small, adding this layer of inventory rarely is justified.
- The key supply planning work for these launches is to ensure the material and SKU substitution processes in MRP are working properly as well as the management of the sales order pad communications.

D. Promotions/In-Store Display

- Promotions and in-store displays are major sources of value deterioration for “non-impulse” product businesses today. Marketing may drive in-store promotion/display as a tactical action for short-term volume goals. These promotions are sold under the justification of increased consumer awareness. Therefore, the most important data to track for in-store promotion/display is long-term market share gain from promotions (not customer service percentage).
- Normally, the best supply chain planning approach for these launches is allocation. Create a number that the multi-functional team is sure will ship and reach the consumer’s pantry. Allocation covers the highest business risk in this type of launch (downside profit risk).
- Unfortunately, another major issue with these promotions is the ownership and disposal of excess inventory. Benchmark companies show all promotion cost in the sales budget as well as holding sales responsible for disposal and cash management.



Case Study:

Rate-Based Planning (Demand Trigger)

A North American (NA) Food manufacturer has begun utilizing rate-based planning (a form of Kanban/buffer planning) to drive increased total value in its supply chain and business. The team has created improvements in customer service, inventory, and cost utilizing the rate-based system and is looking to expand the concept across the end-to-end supply chain.

RATE-BASED PLANNING DEFINITION—The operational planning process that utilizes actual shipment data to determine the demand triggers for all supply chain activities in the end-to-end supply chain. The process focuses on delivering the highest customer service, lowest inventory, lowest total cost, and highest total value through utilization of actual data versus forecast data to reduce non-value added activity/variation.

KEY CONCEPTS IN RATE-BASED PLANNING:

- Actual shipment data is collected and analyzed using a frequency diagram to determine the appropriate rate for planning.
- Rate-based planning has proven to be successful in supply chain applications with “low demand variation and relatively high volume.” It can be utilized across all materials, production, warehouse shipments, customer shipments, etc. or the lower variation forms of this supply (i.e. “A” SKUs, “A” materials, dedicated SKUs such as single “club store” products).
- Rate-based planning eliminates the use of a forecast in the short term (zero to six months). The forecast is replaced with the targeted rate (from actual historical shipment data).
- In businesses with low demand variation that suffer from inaccurate forecasts, high operational cost, and/or over control of inventory, rate-based planning can create increased value.

A visual representation of the types of businesses (Figure 6.0) and SKU profile (Figure 6.1) that best fit rate-based planning processes is shown in the charts below. It is important to note that in Figure 6 (Industry Types), a generalization of volume/demand variation is made for the “typical” supply chain in these industries. Specific supply chain characteristic can and will vary within these business types.

Figure 6.0

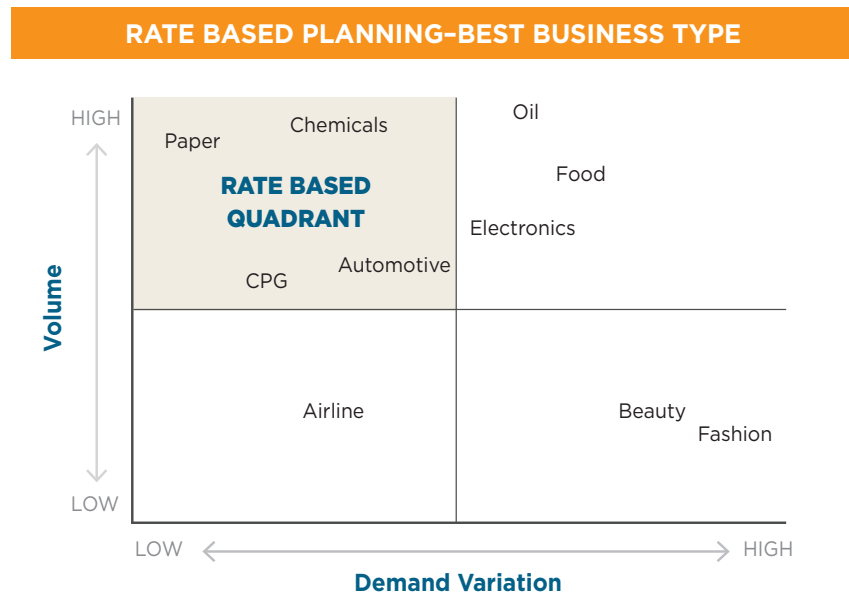
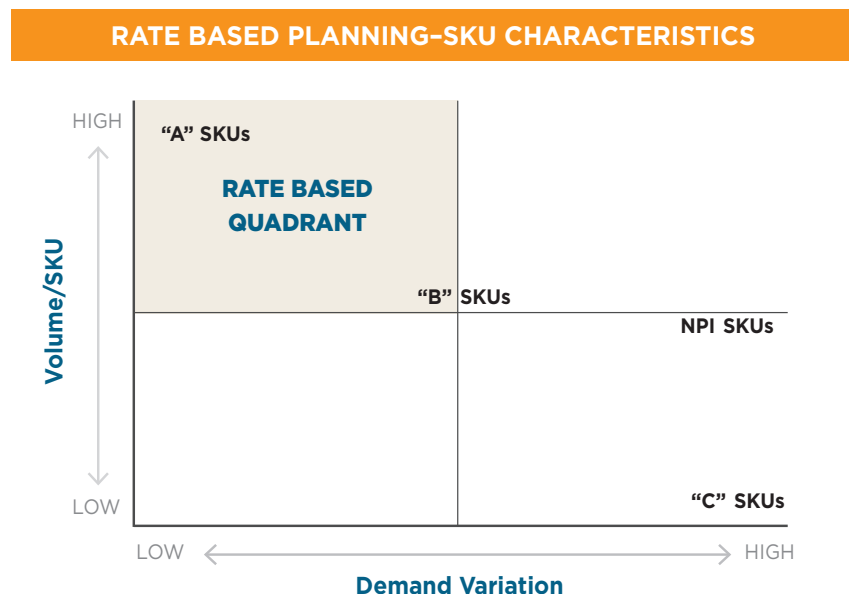


Figure 6.1



The North American food manufacturer has relatively low variation (consumption, customer shipments) and high volume/SKU on its “A” finished product SKUs. The supply system has converted its common “SKU family level” materials, “A” SKU-specific materials, “A” SKU products, and select single-channel SKUs to rate-based planning. The planners shifted their MRP/ERP system to use historical average data versus forecast data to become the planning demand trigger. These changes have already driven improved results in customer service, cost, and inventory. The team’s next steps include:

- Expanding the rate-based concepts to the end-to-end supply chain. Rate-based planning in supplier operations, the warehouse, and customer logistics activities are the next areas to drive end-to-end total value. Note: Transportation planning (largely managed as a commodity today) has been intentionally queued to the end of the rate-based action plan.
- Utilization of a standard process for analysis of actual shipment data (frequent charts).
- Utilizing rate-based planning pilots to add additional “B” SKUs/materials that would qualify for rate-based planning (if the shipment variation analysis validates this expansion).

Overall, this rate-based planning strategy is ideal for this food manufacturer. It has started to deliver improved value and the team has a solid plan for continuous improvement.





*GSCI interfaces
with hundreds of
supply chain organizations
each year.*

Supply Chain Planning: Emerging Issues

As mentioned in the introduction, the GSCI interfaces with hundreds of supply chain organizations each year. Several emerging supply chain planning issues have been captured from these network discussions. Some of the most important to consider now and in the near future are:

- 1. Utilization of advanced supply chain digital capability to drive total value** – The two most promising tools are:
 - a. Big data** – Use of large computing capability to manage the complex supply chain transactions and access multiple alternative decisions to optimize results;
 - b. Artificial intelligence** – Use of an AI system to efficiently collect data on like problems, access results and recommend the best solutions.
- 2. Web-based ERP systems** – The speed of information systems and digital development requires cost-effective platforms to adopt new technology quickly and with minimum investment.
- 3. Supply chain planning processes at the speed of business** – The days of having a month to complete the four major steps of an S&OP or DSI business process are coming to an end. The days of extended planning windows and lead times are over. Can quality demand and supply plans be created, issue sheets developed, and single number/aligned plans be decided in ten percent of this time? Can the supply capability for planning windows, lead times, and fixed zones requiring ten percent of the current time be developed?
- 4. Externally-based customer service measures** – Current supply chain and business customer service measures are based largely on internal information system capability and are standardized corporately. The end of most supply chain systems is dramatically changing with new (omni-channel) customer consolidations and consumer demand for personalized products. These market forces create the need for externally-based customer service measures.
- 5. International/Tariff/Political** – The trend towards both globalization and regionalization (regional demand and supply pods) creates the need for tacit knowledge about how to operate in this increasingly complicated global/regional/local environment. Most firms are generally not adept at making decisions that optimize the interactions between the many complex drivers that are in play that ultimately impact both the demand and supply side of the planning equation. Adding to this complexity is the fact that the international scenario is highly dynamic, with continuous change in trade and tariff regimes and political influences, even in industrial nations long considered “stable.”



Supply chain planners

are truly the “brains of the organizational body”.

Summary

As the dynamism of the business environment grows due to changing consumer, competitive and environmental conditions, supply chains become more complex, and the importance of supply chain planning and supply chain planners intensifies. Yet supply chain executives and business leaders accurately despair about the insufficient pool of planning talent and ineffective business processes. Benchmark supply chains are fast at work solving this issue through improvements in information systems, recruiting/development of supply chain planners, and building robust planning systems and processes.

Business complexity not only impacts the pace of change but also the scope of activities that must be managed. Broadening and speeding up supply chains serves to exponentially expand networks and increases the number of supply chain activities (nodes and transitions). Thousands of activities, executed even at ninety-nine percent dependability, creates hundreds of defects such as waste/cost, customer service defects, and non-value added inventory. In addition, increased customer demands for high levels and more personalized service have forced organizations to re-organize finished products logistics systems including the importance of the last one hundred yards. Supply chain executives are turning towards adding more dedicated supply chain planners or higher qualified planners to eliminate this waste.

Business leaders are prioritizing improvement in multi-functional business processes (or creation of such processes if absent) such as DSI/S&OP, NPI, and LRBP as important building blocks to deliver corporate goals. Unfortunately, personnel with the appropriate skills and mindsets to succeed in a multi-functional world are scarce and have to be deliberately cultivated. As a result, these business leaders are turning to professionals with supply chain planning skill sets to lead and manage these processes.

The GSCI Supply Planning Framework, GSCI Supply Planning Process Model, and the Top-Ten Key Planning Concepts will help supply chain professionals on the journey to improving the orchestration of supply chains to deliver on the promise of optimizing value provided to end-customers while also optimizing the economic profit to the supply chain. Supply chain planners are truly the “brains of the organizational body.”



Supply Chain Planning Maxims

- 1. Supply plans based on end-to-end, integration supply chain**
 - Focus on creating total value
- 2. Let the system do the work**
 - Supply chains are too complex for Excel spreadsheets
 - Daily planning work focuses on exception and error reports
- 3. Data accuracy is job one**
- 4. Variation creates waste**
 - Eliminate all internally-driven variation
 - Reduce waste from external driven, customer/consumer variation by simplifying, leveling, and creating operational drumbeats
- 5. Competitive advantage is built from superior supply chain capability (not inventory)**
- 6. Under every pile of inventory is a supply chain defect**
 - Remove the inventory pile for everyone to see the defect
 - Eliminate the defect
- 7. Segment and prioritize all transactions, at all levels of the planning framework, to drive effectiveness and efficiency**
- 8. Time matters – eliminate non-value added supply chain time**

End Notes

- ¹ Mike Burnette, “Platform Life Cycle Management Best Practices” (white paper, University of Tennessee’s Haslam College of Business, 2015).
- ² 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).
- ³ Mark Moon, Mike Policastro, and Mike Burnette, “Advanced Demand/Supply Integration Best Practices” (white paper, University of Tennessee’s Haslam College of Business, 2018).
- ⁴ Gerald Feigin, *Supply Chain Planning and Analytics* (New York, NY: Business Expert Press, LLC, 2012): 28-30.

Acknowledgement

We would like to acknowledge our Global Supply Chain Institute sponsors, more than sixty corporations representing over \$1.7 trillion in annual revenue, and our advisory board, forty senior executive supply chain officers, for their proactive support, including networking, benchmarking, coaching, financial, and project partnerships. These leading companies are dedicated to delivering world-class supply chain innovation.

Global Supply Chain Institute

The Global Supply Chain Institute provides relevant research and practical educational services to enable highly effective supply chains. These include:

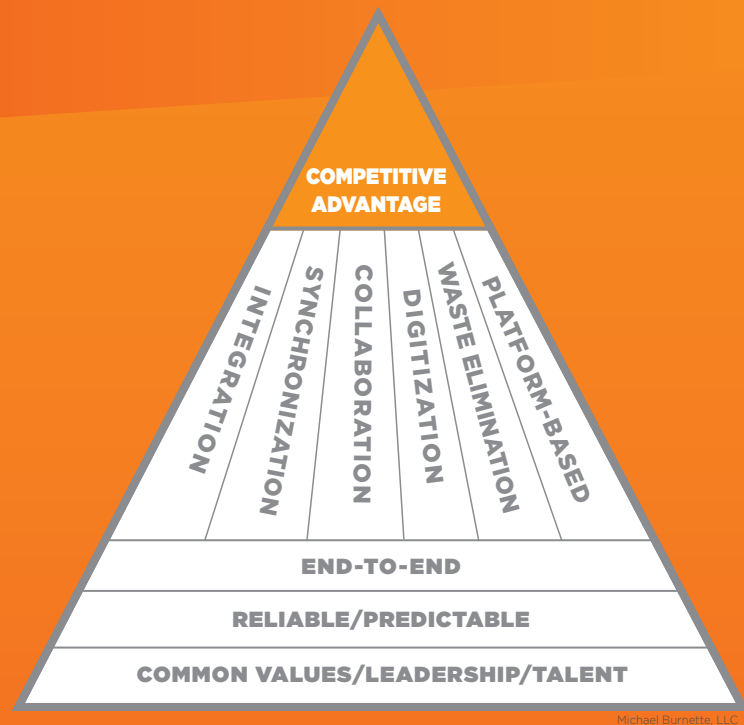
WHITE PAPERS: applied research and benchmarking papers on current, impactful topics

SUPPLY CHAIN AUDITS: coaching for supply chains working to improve based on an extensive collection of current supply chain best practices

EXECUTIVE MBA AND EDUCATIONAL COURSES: programs to create a continuous, long term learning process for supply chain leaders

SUPPLY CHAIN FORUM: the nation's largest academic forum for supply chain leaders, focused on networking, benchmarking, and leadership

SUPPLY CHAIN STRATEGY



A FINAL NOTE

We hope you have found the material in this white paper helpful and useful. We at the University of Tennessee's Haslam College of Business are committed to translating our top-ranked position in academic research into information useful for practitioners. We believe the real world of industry is our laboratory. It's why we have the largest Supply Chain Forum in the academic world, with over sixty sponsoring companies. We are always looking for industry partners to assist us in this journey. Let us know if you are interested in being one of our valued partners.

Shay Scott, PhD
Executive Director, The Global Supply Chain Institute
The University of Tennessee's Haslam College of Business
sdscott@utk.edu

gsci.utk.edu



GLOBAL SUPPLY CHAIN INSTITUTE

310 STOKELY MANAGEMENT CENTER
KNOXVILLE, TN 37996
865.974.9413

GLOBALSUPPLYCHAININSTITUTE.UTK.EDU