

CHAPTER 1

SUPPLY CHAIN SYNCHRONIZATION

Since the Great Recession, the United States remains stuck in a jobless recovery. The same holds true for many other parts of the world. The U.S. economy is witnessing a profit recovery. Stocks have soared on Wall Street due to strong corporate profits, while unemployment in the United States has stayed stubbornly high above traditional norms. Although U.S. unemployment had dropped from its peak of 10% in October 2009, the Bureau of Labor Statistics still had the unemployment rate around 7% in late 2013. And it is not just the United States that is wrestling with joblessness. Unemployment remains high in other parts of the world as well. The 17-member Eurozone had unemployment rates above 12% in 2013.

This condition has been dubbed “the New Normal economy,” a term coined by William Gross, the founder of the global investment firm Pacific Investment Management (PIMCO), back in 2009. Gross used the term to describe a lackluster economy he predicted would occur for a decade, an economy that would witness high unemployment and a reduced standard of living for Americans as well as most other citizens around the globe.

One of the reasons behind the continued high employment rate, ignored by both economists and the media pundits, is the impact of supply chains on business efficiency that has resulted in strong corporate earnings. Companies have moved closer to achieving supply chain synchronization, although it should be noted they still have a long way to go before reaching perfection. But even a modest movement in that direction is having a strong economic effect. In theory, synchronization means that companies would make only the exact amount of goods necessary to meet actual consumer demand. Synchronization means that there is no excess inventory throughout a supply chain spanning continents. Synchronization of supply with demand leads to increased output without the need for additional labor.

Aligning production with consumption has been a business goal for decades. Manufacturers, wholesalers, and retailers have tried setting their inventory levels using forecasts based on historical data of past years' sales. But what has changed since the onslaught of the Great Recession is that business enterprises have worked very hard at making their supply chains more efficient in a drive to align inventory with consumer demand. As a result of that early, albeit modest success, there are fewer spikes in production.

Supply chain synchronization does not show up in macroeconomic discussions because it is a relatively new phenomenon. Swings in output are a normal part of the business cycle in classic economic theory. As consumption falls, manufacturers find themselves stuck with large quantities of unsold product. They then curb factory production, laying off workers. They mark down prices to goad consumers into buying products already made. After the excess stock gets depleted, manufacturers then resume production, hiring back workers, to meet customer demand.

That was what occurred in the twentieth century. But in the past few years, the world has changed, calling into question classic economic theory. In the last decade, many big companies have taken advantage of advances in supply chain management practices using special software to manage production and inventory. They have employed inventory optimization software to determine how much stock to keep on hand. They have employed multiechelon inventory software to determine where best to hold that inventory in the supply chain. They have employed network-modeling software to figure where to place the inventory to minimize the amount of buffer stock and still take care of the buyer. And most important of all, they have

started to calculate inventory holdings closer to actual demand rather than on the basis of historical forecasts.

As a result, companies have moved closer to matching manufacturing output to true demand, flattening the boom-and-bust cycle of production that took place throughout the twentieth century. With no spikes in manufacturing, a company does not have to hire a drove of workers for extra shifts to run more equipment.

This flattening of the business cycle reduces the need for workers at a time when more and more companies are already relying on software to manage their labor resources and to keep down the employee headcount. Companies use labor management software to measure individual worker activity against preset benchmarks. By boosting workplace productivity, they eliminate the need for additional hiring. Companies use workforce management software to schedule workers for factory, warehouse, and retail store jobs, ensuring that they have just the right amount of workers on hand for the tasks to be done that day.

Along with sophisticated software for improved labor management, businesses continue to pour investment into automation for factories, warehouses, and transportation services to reduce headcount. Increased automation plays a factor in the continuing high rate of joblessness. In fact, a study from the Oxford Martin School in October 2013 said that nearly half of U.S. jobs are in danger of being eradicated in the next two decades due to the computerization and automation. In particular, that study found that jobs in logistics, transportation, as well as in office and administrative support faced a high risk of elimination from automation. In the future, according to that study, the only jobs available to low-skilled workers will be those requiring social skills and creativity that are not susceptible to computerization.

In combination with automation, the improved synchronization of the supply chain will wipe out jobs in factories and warehouses. Synchronization is a trend that's here to stay as supply chain chiefs become more adept at supply and demand alignment. If companies can reduce the lag time in bringing a product from the factory to the market, that means that factories don't have to hire a large number of workers to produce stock that's simply a cushion for a spike in demand. Companies can be run as lean and mean enterprises.

What Western nations in the world are witnessing is structural unemployment caused by a third industrial revolution that enables supply chain synchronization. It's a classic case of what economist

Joseph Schumpeter called “creative destruction.” A large group of workers lack the skills and knowledge to secure gainful employment; they’re stuck in low-paying jobs at fast-food restaurants and in retail stores. Although it’s tempting to take a bleak view of the future, with no jobs for the masses in a mechanized society, it should be noted that the United States and other industrial nations went through this kind of economic transformation more than a century ago. The current economic downturn resembles the Long Depression of the 1880s, when the U.S. economy switched from farming to manufacturing. Back then, farmhands who lost their jobs due to the mechanization of agriculture had trouble finding new work. Likewise, during this current transition period, many low-skilled workers will be hard-pressed to find jobs. As many educators realize, the third industrial revolution requires workers with advanced knowledge in the areas of computer science and engineering.

Surprisingly, few if any economists see the role of supply chain synchronization in the economic transformation taking place in front of their eyes. In my view, that’s probably attributable to the fact that they don’t look for it. But the evidence is out there. In fact, research on the U.S. economy sponsored by the Council of Supply Chain Management Professionals (CSCMP) provides some evidence that supply chains are becoming more ruthlessly efficient. CSCMP sponsors research that attempts to quantify the impact of logistics on the U.S. economy. The research was started back in the 1980s by the late Robert Delaney as a way to demonstrate the positive impact of transportation deregulation in lowering logistics costs in the United States. Today, economist Rosalyn Wilson continues Delaney’s research and updates the study each year.

The *2013 Annual State of Logistics Report* offered some data that shows that some supply chain chiefs are mastering supply chain synchronization. Despite a rise in business inventories in 2012 in the United States, the inventory-to-sales ratio stayed stable in the U.S. economy. That ratio is a measure of a company’s on-hand inventory relative to its net sales.

A look back at the inventory-to-sales ratio data shows that in the 1992, that proportion stood at 1.56. Over the course of the next decades, it fell drip by drip, nudging down a fraction of percentage until it reached 1.25 in 2006, just before the nation’s economic upheaval. During the nadir of the Great Recession, it shot back up, reaching 1.49 in 2009. Since then the ratio has fallen back, hovering between 1.25 and 1.29.

What that means is that American businesses have become more skillful at determining the right amount of inventory. In particular, retailers have become particularly astute about using inventory management to curtail stock levels, which frees up working capital or cash for the corporate balance sheet. The liberation of working capital boosts business profits. And stocks soar.

What's making this possible, as alluded to earlier, is the wider adoption of the discipline of supply chain management in combination with sophisticated software. The term "supply chain management" first surfaced in the 1980s. The person often credited with the first use of that term is Keith Oliver, who used the phrase in a 1982 article with the *Financial Times*. At that time, Oliver was a consultant with the firm Booz Allen Hamilton Inc. He believed that companies should manage inventory as a single chain of supply across all parts of the entire organization. A Booz Allen Hamilton white paper published in 2003 described supply chain management as "embedded, cross-functional capability designed to unify and rationalize otherwise incongruent parts of a dispersed organization."

Supply chain management was an idea with power. Companies carried too much inventory across all their departments, plants, and warehouses. To reduce inventory, they needed to take a broader view of operations to become more efficient with inventory in serving customers. The problem was that organizations were divided into silos on the basis of functions: procurement, manufacturing, distribution, marketing, and customer service. Silos hinder efficiency. Therefore silos between manufacturing, logistics and distribution had to be torn down so the company could manage the flow from sourcing through production through distribution.

Supply chain management when first proposed represented a new way of business thinking that forced companies to pay attention to the interconnectedness of their operations. It took awhile for chief executives and chief financial officers to understand even modest amounts of inventory create a drag on stock performance. Companies could influence stock prices simply by improving operational performance.

Well-run supply chains also keep their delivery commitments and provide high levels of service, and that drives up repeat customer business and revenue. Companies that embraced and applied supply chain management principles obtained a competitive advantage in the marketplace. Companies that got it got an edge. Still, in the decade following Oliver's first utterance of the term supply chain

management, most companies viewed supply chains as simply a cost of doing business. “It was pretty clear that even though [supply chain management] was having a big impact on an organization’s service, on its costs, and on the whole idea of response to the customer, it was viewed as a cost center,” said Ann Drake, chairman and chief executive officer of DSC Logistics in Des Plaines, Illinois, on the *Voices of the Pioneers* video series chronicling the history of the supply chain management discipline. “I think the evolution from cost center to comparative advantage probably started in the late ’80s, but it took well into the end of the ’90s before anyone really believed it. . . .”

As more companies understood the value of supply chain management, they began creating new executive positions to focus on supply chain synchronicity. The positions usually had supply chain in the title. On the organizational ladder supply chain chiefs stood a rung above executives in manufacturing, procurement, and logistics. By 2005, the practice of supply chain management had become so mainstream that the professional organization Council of Logistics Management Professionals (CLM) (founded originally as the National Council of Physical Distribution Management) changed its name to reflect the recognition of the concept in business circles. CLM became the CSCMP.

When supply chain management was first proposed, its focus was on streamlining the internal flow within an organization. But in a global economy, supply chains are really extended enterprises. They involve multiple partners working together to bring a product from start to finish to market. The scope of supply chain management expanded to encompass a group of companies.

As academicians began publishing studies on the critical role of supply chains in creating business efficiency and business management consultants developed proven methods to implement strategies, evidence started to appear that showed synchronization of supply chains could improve shareholder value. Well-run supply chains save costs and boost revenues. Improvements to the bottom line and the growth on the topline maximize business profits. A 1995 study of 225 companies done by the consulting firm PRTM in Weston, Massachusetts, found that manufacturers with best-in-class supply chains had cost reductions of up to 7% of revenue in comparison to the average operation. (PRTM has since been acquired by PwC.)

Even though chief executives and boardrooms began embracing the idea of supply chain management in the 1990s, it took a decade

or more to completely turn that concept into full-fledged action. Because corporations are generally large enterprises with thousands of employees, it takes considerable time to change organizational behavior. It takes time to introduce a new tactic or strategy and get it to work the right way. By the time the U.S. economy turned down in 2007, a number of companies in manufacturing, retailing, and wholesale distribution had reached a high degree of supply chain execution. In fact, as the world economy teetered on collapse, corporate executives did everything they could to apply supply chain management practices and techniques to extract money from operations and stay afloat.

Managing global supply chains is a complex undertaking that would not be possible to do effectively without computers and software. And it took awhile for the software to come into existence to support supply chain management strategies and practices. Although mainframe applications for business management existed prior to the personal computer revolution, including a few for supply chain activities, it was really during the mid to late 1980s that a group of niche software vendors took advantage of the increased computing power of desktop computers to write applications specifically for various aspects and areas of the supply chain. Vendors making software offerings explicitly for the supply chain were dubbed best-of-breed. That label distinguished that class of software makers from the enterprise vendors who offered a broad suite of business applications. Best-of-breed software companies developed applications for supply chain planning, procurement spending, transportation management, warehousing oversight, global trade, and inventory control. Without these kinds of software tools, it would be nearly impossible for any company to implement any sophisticated supply chain strategy. There are simply too many parts and products for a human mind to keep track of.

By the start of the Great Recession, the software tools were there.

It should be noted that companies didn't rush in and buy all these tools at once. Back then, before the advent of cloud computing, companies had to buy a license for the software and install the application on their corporate servers. Plus, the initial supply chain software packages were not cheap, either. The price on each package ran into the thousands of dollars. Deployments of software were also enormous undertakings. A software implementation project could take months as the application often had to be integrated with existing software that the company already had. The integration was

necessary for the exchange of information as often supply chain software took data out from other systems. So, on top of the cost for the software license, a company generally had to pay thousands of more dollars on systems integration, hiring experts to set up the software. Once the application was installed, employees had to be trained on how to use it. Installing supply chain software was often a big decision for a company because of the resources involved, such that projects were done selectively over time.

Because so many companies since 2000 have deployed software to implement supply chain management techniques and practices, it's having an impact in creating the "New Normal" economy. In particular, the use of robust software for demand planning and for inventory management plays a huge role in boosting company profits. In large part due to the development of sophisticated algorithms, those two types of software create the tools to better connect supply with customer takeaway. The mathematics behind these types software is extremely effective.

The software can use actual information on customer purchases to make inventory adjustments. In fact, the latest applications in demand planning software now use point-of-sale (POS) data to drive both replenishment and production. Every time a cashier scans a bar code on a product at the checkout counter in the store, there's a data notation of the purchase transaction. That means the retailer knows what's sold and where at each store in its chain.

Retailers today can use POS data as the way to determine which products to ship from their warehouses to replace items that are actually being bought. They can adopt a replenishment approach of replacing a product only after it's bought. It's a practice called "buy one, ship one." That's in stark contrast to the way it was done even a decade ago when store replenishment was based on a forecast that was really an assumption as to what consumers were expected to be buying. The assumptions were seldom correct. They were really just guesses.

Now if the retailers share that actual selling information with manufacturers—and some pioneers are doing just that—then the product makers can adjust their factory production to make items—not according to a forecast—but to what's actually being bought in the store. A business model of make-one, sell-one would result in perfect supply chain synchronization.

There is some evidence that does show that synchronization is starting to happen. One piece of evidence comes from a study

conducted by Terra Technology, which makes demand-sensing software. Its 2011 study found that nine leading consumer packaged goods (CPG) companies in the United States reduced their amount of forecast errors through the use of a sophisticated demand-sensing approach. Taking part in the study were such well-known companies as Campbell Soup, ConAgra Foods, General Mills, Kimberly-Clark, Kraft Foods, Procter & Gamble, SC Johnson, J.M. Smuckers, and Unilever. The study covered virtually all items in the North American warehouses of these nine multinational companies. By the way, those nine companies together account for more than one-third of the North American market for consumer package goods, excluding alcoholic beverages.

During the combined calendar years of 2009 and 2010, those nine leading U.S. consumer product goods manufacturers reduced their weekly forecast error by an average of 40%. Some of those companies even saw their error rate drop by 49%.

Now on one hand, these companies have a ways to go to reach a perfect unity between supply and demand; on the other hand, they have made remarkable and dramatic strides. They have managed to reduce forecast error, and that means they have come closer to aligning production and inventory with sales. By reducing forecast error on what to make and ship to the store, they have become smarter about what to produce. It is a step change, but a positive one with tremendous ramifications for the economy. After all, a forecast error means that the right product is not on the shelf when the consumer comes into the shop, and the company loses a sale. Or the forecast error results in unsold inventory that ties up capital and eventually results in discounted sale at a lower profit.

There are other data out there as well to support the argument that companies are managing to keep their inventories leaner. A Morgan Stanley & Co. survey of 500 U.S. and Canadian shippers—conducted in the first quarter of 2013—found that almost half of respondents—46%—planned to maintain current inventory levels and not add extra stock. In an article titled “The End of Inventory” in the April 2013 issue of *DC Velocity* magazine, William Greene, an analyst with Morgan Stanley, was quoted as saying about that survey: “Shippers continue to manage inventories very tightly, with no evidence of any big restocking in the future.”

As companies began seeing the financial impacts that result from maintaining lean inventories, a new mindset has taken hold in the boardroom. It’s a mindset that’s grown out of the economic

downturn of the Great Recession, and it's a mindset that's here to stay. Corporate executives have come to believe in the importance and value to their shareholders of supply chain management. They religiously believe that they can control costs and raise profits through improved supply chain management. With that mindset, business leaders will continue to look for ways to adjust their supply chain operations to balance inventory with demand.

As companies look to achieve a perfect fit for alignment between supply and demand, they will create what I call "protean" supply chains. Protean is a reference to Proteus, a sea god in Greek mythology who could change his shape at will. Proteus had mutability. The word protean means the ability to take on different forms and shapes.

Since the 1990s, supply chain gurus have described the need for supply chains to have flexibility, agility, and resilience in written articles, in presentations at conferences, and, of late, on blogs posted on the Internet. Although a protean supply chain has all those attributes of flexibility, agility, and resilience, its most important characteristic is mutability. It can respond and adapt to changes in business conditions and marketplace demands. It can alter its supply chain capabilities—people, resources, and technology—in rapid fashion to connect supply to demand. In short, a protean supply chain represents the next stage of evolution in the field of supply chain management.

Why will this evolution occur? Companies will strive to create protean supply chains as way to stay atop a fast-paced global economy roiled by online commerce and electronic trade. Companies will take great pains to develop mutability. They will strive for protean supply chains whose shape can alter quickly in response to fluctuating world events, market conditions, economic upheavals, and disruptions occurring in international trade. In some cases, the transformations in shape will require companies to change the number and locations of their factories and distribution centers. But in many cases, no physical action will be required. The changes will be "virtual" in that software will allow companies to make modifications to their supply chain operations and practices to have a different capability to respond to shifts in demand.

Protean supply chains are influenced by 10 major dynamics taking place today: demand signal realization, nearshoring, network design, segmentation, omnichannel commerce, control towers, personalized manufacturing, shared supply chains, software analytics, and the environmental movement of sustainability. How those trends support,

influence, and necessitate the development of protean supply chains is what this book is about.

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