

# Seven Principles of Supply Chain Management

Recent events have shown just how fragile many supply chains are. Here's how to apply seven principles of supply chain management to build in more resilience.

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# Introduction

The COVID-19 pandemic has thrust the supply chain into the spotlight. Its fragility and how to make it more resilient have been widely discussed. The phrase 'supply chain' has become a buzzword to explain a complex process with many moving parts. But what can be done practically to make it more robust? To answer this question, we need to better understand the principles of the supply chain.

But first, I would like to challenge conventional thinking of what a supply chain actually is. The term 'supply chain management' can be traced back to 1982 and has gained in popularity throughout the 1990s. Since then, many books and theories have been written about it, and many people have taken on the title 'Supply Chain Manager'.

Recently, images of panic buying and supermarket shelves emptied of toilet paper, rice and flour were seen in many countries. Suddenly, people who had never thought about the supply chain faced the prospect of shortages of staple products and panicked. This was partly caused by a failure to understand the supply chain, but it also highlighted how vulnerable and susceptible it is to outside influence.

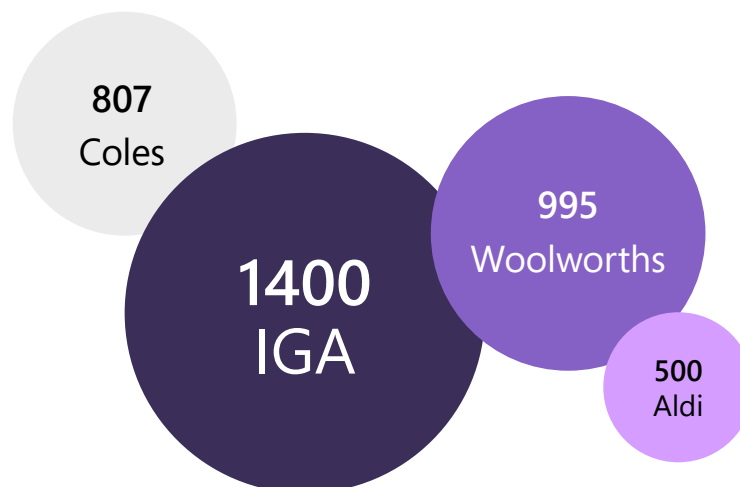
If you think about a chain, what do you think of? I have spent a lot of my life sailing ocean going boats. So when I think of a chain, I think of something that is incredibly strong and rigid, even unbreakable – something that, during storms, I have had to trust my life to. It's unthinkable that a chain would break, yet we use the word 'chain' to describe what can happen to a system that we visualise as extremely vulnerable to forces outside our control.

## Not a chain, a pipeline

I prefer to think of the supply chain as a 'supply pipeline'. While it doesn't roll so eloquently off the tongue, if you think about a pipeline, what comes to mind? A pipeline transports liquid, but it sometimes develops leaks or gets blocked. It can also run dry if supply doesn't match the pipeline 'flow' or demand. Does that sound more like what we recently experienced as a result of panic buying? For all sorts of reasons, people took to buying more of some products than usual.

This very short, intense spike in demand drained stock from the shelves and back rooms of stores and supermarkets. In Australia, four major supermarket chains account for more than 3,700 stores between them, and they all had their shelves stripped of some products at some point, if not simultaneously, during the first months of the COVID-19 pandemic.

Figure 1. Major supermarket chains and number of stores in Australia



Source: Corporate websites

Panic buying was so intense that March retail sales set a new record, rising a seasonally adjusted 8.5%, according to the Australian Bureau of Statistics (ABS). In particular, turnover doubled for toilet paper, rice, pasta and flour.

The reality is that the supermarket chains have tuned their replenishment algorithms so that they only replenish stock at each store's consumption rate. So when panic buying simultaneously depleted stocks at all stores, the distribution centres (warehouses) that receive, store and replenish from bulk suppliers were also emptied.

Remember our supply pipeline. Now, imagine a large pond filling a small pond. If you don't refill the large pond, both the large and the small pond will run dry, which metaphorically is what happened. Only a few manufacturers make each product, but they supply all the grocery chains. This magnified the effect of panic buying – which emptied the pipeline.

# Amplifying the problem upstream

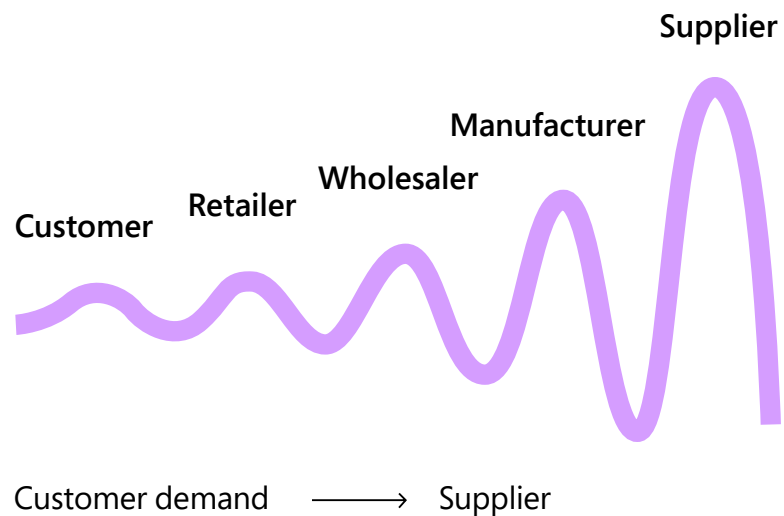
**Manufacturers make and supply goods using supermarkets' forecasts, which are based on the consumption rates in their stores.**

So the manufacturers only buy raw materials to supply this rate. This meant that when supermarkets asked the manufacturers to turn on the taps harder, they did not have the raw materials needed to meet the unexpected demand. For example, manufacturers of hand sanitiser experienced severe shortages of raw ingredients and packaging.

The shortages quickly moved upstream as manufacturers requested more raw materials. The raw material suppliers weren't expecting to produce more than the normal rate of supply and ran out. When you couple this with the distance the (mostly foreign) manufacturers are from the distribution centres, and how far they are from the stores, the problems multiplied again. The so-called supply chain was broken – or, as I prefer to think of it, the supply pipeline and all the reservoirs and pipes that fed it, were drained. Furthermore, the problem became more pronounced upstream. This effect was first documented by American computer engineer and systems scientist Jay Forrester in 1961 and called the Forrester effect or the Bullwhip effect. It is likened to cracking a whip. A small hand movement is increasingly amplified the further away you move from the hand.

In the same way, the effect of a small fluctuation in demand at a store increases the further it moves from the store to the manufacturer and beyond. Think of it like this: a store sells 300 ml drink cans that its distribution centre supplies in cases. But the distribution centre has to order the cans from the manufacturer in pallets, so the order multiplier effect causes a Bullwhip increase in demand the further it moves up the supply pipeline.

Figure 2. The Bullwhip effect



## Beware the 'bounce' effect

**If you think this is where the pipeline problem ends, think again. Take the shortages caused by the recent panic buying: how did we get products back on the shelves?**

Supermarkets needed to order complete refills of some merchandise, but they also had to refill their distribution centres. In turn, the manufacturers had to produce more, which required more raw materials. All these steps were way above normal consumption levels.

But the average person has not suddenly begun to consume more. The pipeline contents are simply stored in people's cupboards and garages, and they won't need to buy any of these items until they consume what they have. So supermarket stock stays on shelves, the distribution centres stay full and the manufacturers have to stop producing – the opposite of what happened previously. The pipeline is full and the taps are effectively shut, so the supermarkets cut back on orders, causing the supply pipeline to 'bounce'.



This effect was graphically illustrated in April when Australian retail sales plummeted 17.7% after the March spike, according to the ABS. So with all this in mind, how do we address this problem and ensure we are better able to handle an abnormal spike in demand? Bear in mind that in modern history, there has never been such an intense peak of demand. We have to look to World War I, World War II and the Spanish flu pandemic to find examples. The most obvious answer is to hold more stock, but that is not a solution. Holding more stock requires more space, consumes liquidity and often leads to waste through expiry of short life cycle products.

So to understand what we can do to adapt the supply pipeline to these intense peaks in demand, we need to consider a number of principles of supply and demand. They haven't changed in more than 250 years and likely never will; however, when looking for silver bullets – instantaneous mystical solutions to problems – we often overlook the obvious.



**At Breville we focus on a concept around Agility. We build our information systems so that our executives have accurate data on what's happening up and down our supply chain. That gives us the ability to pivot the business depending on what's happening at the consumer or manufacturer end."**

Nathan O'Donnell  
Dynamics 365 Global Program Leader  
Breville

# Supply chain principles and actions

The solutions lie in the seven principles of effective and efficient supply chain management.





Principle 1:

# Improve inventory visibility

**The first and most important consideration is having visibility of inventory. As futurist and author John Naisbitt said, “The most reliable way to forecast the future is to try to understand the present.”**

If we don't have integrated, real-time visibility of inventory throughout the supply chain, we risk losing control. Yet between procurement and sale, too many organisations have 'blind spots', where they have leaks and delays in gaining visibility of stock, creating real challenges.

Take the case of a high fashion retailer I worked with. It had great systems for new product development and sales, but tracked its supply chain on spreadsheets. In some cases, it had a 12-week lead time from order to delivery of items that were highly fashionable, making it vulnerable to volatility in demand. Additionally, no one had any idea of what was available where or when. This meant it couldn't commit to fulfilling customer orders and so, in the fast moving world of high fashion, it couldn't compete. As a result, sales and market share slipped. In industry terms, it fell behind the fashion curve, which led to its demise and acquisition by another brand.

By contrast, Perth-based Marubeni-Itochu Tubulars Oceania has shifted its finance and operations system to the cloud to gain end-to-end transparency of its oil and gas tubing supplies. Employees now have access to real-time inventory movements and balances, enabling them to provide a much-improved experience for customers.



## Action

Make sure systems are in place that enable real-time visibility of inventory across your distribution network – from supplier to customer – and that all staff know how to transfer information across corporate borders, with visibility and velocity. Also ensure your staff understand the importance of having an accurate inventory. It must be updated as a priority for each transaction, and losses or gains accounted for and processed immediately.



**For us, the consumer is at the centre of everything we do. We look at resiliency and agility in terms of an outcome – we want our customers to be able to buy our products when and where they want to.”**

**Nathan O’Donnell**

Dynamics 365 Global Program Leader

Breville



Principle 2:

## Manage supply and demand as a flow

**Supply cannot just switch on and off – and the more volatile the demand, the less we are able to source supply. So we need to manage the product flow throughout the supply pipeline.**

This means that in an ideal state, there is a balanced movement of product from supplier through to customer. The store holds the amount of product being consumed. It matches the amount in the pipelines from the distribution centre to the store, and from the supplier to the distributor and so on back through to raw materials. This theory is perfectly illustrated by Dr Eli Goldratt, the business management guru in his best-selling novel The Goal, where he shows that it is vital to balance flow, not capacity.

Auckland-based homewares retailer Citta, for example, is using business intelligence to perfect its flow of products from its supply chain, ensuring it has enough to satisfy demand, but not so much that it's left with unsold stock at the end of a season.



## Action

Aim for more frequent, smaller deliveries when trying to manage the way products are procured and delivered. This is better than infrequent, large bulk deliveries, and balances the flow of movement through the entire supply chain. We need to rethink the concepts of minimum order quantities to remove lumpy irregular supply. This will mean the need to have a new conversation with suppliers and, potentially, logistics providers. Because of the cost of freight, retailers often increase quantities to reduce the freight cost per unit, but for products with volatile demand (see Principle 4), this increases supply issues if demand changes.





**Using Power Apps, we were able to deliver a standardised workflow and approval process to create efficiencies in our supply chain.”**

John Khoury  
Chief Information Officer  
Allied Pinnacle



Principle 3:

## Adopt a fast, flexible pipeline planning system

The supply chain reaction time spans the period from manufacturing to when a customer purchases a product. It is almost self-evident that the longer it takes for the supply signal (abnormal sales volume) to reach participants in the supply pipeline, the greater the risk of the pipeline being emptied before it produces a 'refill signal'.

At a large textile company, for example, their systems would only allow a full regenerative plan over the weekend, such was the compute time needed – and then it would need another two to three days of analysis. As a result, a major shift in demand could take up to 10 days before upstream changes came into effect.



### Action

Ensure the supply chain planning system can run at any time. Legacy systems create delays in signal processing. This is often due to planning processes running overnight or only at weekends because of the length of time they take, and the impact on the system due to downtime. Having a system that can run in minutes and at any time eliminates delays and maximises the ability to identify supply chain issues and quickly resolve them.



## Principle 4:

# Use real-time analytics to measure volatility of demand

Not all products are consumed at the same rate or time; some are consumed at a flat rate. Take the flour example again. The average person's rate of consumption hasn't changed during the pandemic.

At various times in their life, a person may use consume more, but consumption is largely predictable. Compare this with fashion clothing, which is highly volatile. It's based on trends, styles, influencers and celebrities, and demand can fluctuate wildly from store to store, region to region and culture to culture.



## Action

Install real-time analytics across the entire supply pipeline. This is a fundamental requirement to manage demand and supply. Identify and group products by their volatility, and use high-visibility analytics to monitor and provide real-time alerts to tightly manage volatile stock levels. For products with highly volatile demand, tie demand very tightly to supply signals, and automate alerts for when these move outside tolerance. For non-volatile products, take a more relaxed approach with set minimums and maximums, and reordering points for restocking.



**The challenge of COVID-19 broke down the localised site based silos for two reasons. We had to move outside of traditional site based production lines and the use of our S&Op systems planning and BI Reporting together are now embedded to ensure effective business enablement through technology and systems."**

John Khoury  
Chief Information Officer  
Allied Pinnacle



## Principle 5:

# Improve forecasting models

**A lot of people are scratching their heads about why their forecasts (or other people's forecasts) let them down during COVID-19. The truth is that we have not had this level of demand fluctuation during the career of anyone working in a supply role in 2020.**

To find this, we have to go back to 1914–18 (World War I), 1939–45 (World War II) or 1918 (the Spanish Flu). However, most retail and distribution organisations across the globe today use forecast models that only look at two to three years of historical data.

So, regardless of the level of data science applied to those models, they could not have forecast the effect of COVID-19. Customers stripped supermarket shelves for one of two reasons: fear that stores would close and people would not be able to buy essentials; or greed, which led some people to bulk buy to resell at much higher prices for a profit.

Queensland-based snack foods company Majans, for example, has digitised its supply chain to dramatically reduce the time of every process. It's also using Internet of Things technology to help identify trends early. This enables line, plant and executive management to make more informed decisions, optimise operations and rein in costs and risk.

When developing these systems, businesses also need to cross corporate boundaries to share forecasts with suppliers and collaborate in real time. Having a single shared model, where all participants cooperate to identify peaks and valleys, and determine whether they are one-off or sustained events, would assist with developing remediation strategies.

Toyota has been doing this for years, not just with forecasts, but also with visual Kanban views of its supply chains. Its systems are tightly integrated with its suppliers – so much so that if a Toyota production line stops, the relevant suppliers' production lines are stopped as well.



## Action

Increase the amount of available data so that we can accurately forecast extraordinary events, such as what happened with the pandemic. Do this by looking at current forecast models and how they connect with your planning systems, and develop signals to identify un-forecasted demand in real time. We also need to create procurement methods that have very short-term reaction times.



## Principle 6: Diversify suppliers

**One of the factors that has exacerbated the shortages during COVID-19 is that for certain products we have very few suppliers, and they supply many distributors and retailers. This means that when the volume required to resupply entire supermarket chains and distribution centres, it has a massive impact on manufacturers.**

The suppliers simply couldn't catch up with demand in a short space of time, bearing in mind that they had to restock entire stores and keep up with normal consumption.



### Action

Diversify supply. This means spreading the risk across multiple suppliers, both local and overseas. We have all heard a lot about how manufacturing has all moved offshore, based on price. Unfortunately, the downside is that in many cases we have come to rely on overseas supply, often resulting in long lead times and increased risk. However, to balance the flow, it is essential to have suppliers with short and long lead times, and even different cost models.



Principle 7:

## Create new distribution networks & channels

**In modern society, we take as a given many things that can be changed. We may have been used to the idea of a supermarket being the most convenient way to buy groceries and other convenience items, but technology and logistics have made it possible to use other channels.**

The COVID-19 crisis has forced many people who may not have considered purchasing online to do so. In fact, during the pandemic, online shopping proved very popular and at a stage, grocery retailers were forced to pause due to lack of supply. For example, Uber and Uber Eats have changed our way of thinking about personal transport options and consuming restaurant food. We can imagine a new future, not only for grocery and convenience shopping, but also for many other everyday items.



## Action



### Transport and logistics

We could use an Uber-style service to deliver click-and-collect orders. Such a service would broaden the availability of local delivery networks, particularly for the frail, the elderly and the vulnerable. This service could apply to any products that are easy to transport, such as groceries and perishables, where timeliness is critical to the product's quality and lifecycle.



### Social shopping

The old concept of the Tupperware party could be used for products that fall outside the groceries and convenience items category. For those who haven't been around long enough, party selling was a big trend in the 1970s and 1980s. The only way to achieve scale in selling was to mass sell – in people's homes.

Tupperware was an 'in' product that was sold in homes. A host would invite their friends to a social occasion that happened to centre around someone selling a highly desirable product. Now, in the context of social media, imagine using a Teams meeting to invite your friends to a call where a product seller could demonstrate, discuss, answer questions, enable promotional pricing and even take orders, which could be delivered to your home. This could suit sectors such as cosmetics, fashion and technical products where product knowledge is an important factor in the buying decision.



### Drive-through collection

Imagine being able to order online, drive to a store or a warehouse and have your order loaded into your boot, without you even getting out. We have drive-through fast food outlets and bottle stores, and a small number of home and office goods retailers offer a drive-through service, so why not expand the concept to cover groceries, fresh food or other items?

# Using technology to make the supply chain more resilient

**Just as a chain is important for keeping a boat safe in a storm, following the principles of a resilient supply chain is essential for managing the highly complex processes that ensure continuous supply.**

While the COVID-19 crisis has shone a spotlight on the supply chain, when we break it down into the principles, and follow them, it helps us to focus on how to make it more resilient.

Ensuring resilience doesn't necessarily mean throwing out all our systems and starting anew. It can mean re-evaluating existing systems to ensure they are optimised for resilience. It can also mean adding new or additional workloads to existing systems and infrastructure, and capability, or expanding the footprint of business applications.

The ability to deploy modern business applications as individual workloads, or as a whole, brings a different model of agility that enables rapid prototyping and constant innovation.

Integration is one of the big challenges with modern systems. This is where enterprise resource planning (ERP) systems assist businesses. They were developed to provide fully integrated transactions across organisations, not just in the supply chain, creating the right level of data visibility for different stakeholders.

This visibility and agility can often make up for a lack of features. For example, knowing how much of a product is available at any location in real time far outweighs not having fields to describe detailed product commentary.

Furthermore, the arrival of cloud-based ERP systems brings a level of agility and scalability never seen before. They also offer a new, more affordable way of adopting advanced technologies, such as analytics and artificial intelligence (AI).

If the current crisis has taught us anything, it's that business systems must offer the visibility and agility to enable organisations to become more resilient and adaptable to sudden change. But they also need to support good business fundamentals – such as the supply chain principles.

### **Microsoft Dynamics 365**

Microsoft Dynamics 365 supports these principles with an integrated Supply Chain Management suite. Through the Microsoft Power Platform, Dynamics 365 offers the ability to rapidly innovate, using 'last mile of delivery' low code, automation and AI technologies. Dynamics 365 also comes with prebuilt business accelerators for automotive, health and other industries. Further, these technologies are all delivered securely and with scalability on the Azure cloud platform.

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## **Microsoft Dynamics 365**

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