WHITEPAPER

Fasten your seatbelt!

Managing upcoming volatilities in the Automotive Supply Chain

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About this paper

In this paper, we share our vision of how organizations in the complex automotive supply chain can deal with the current crisis. In section 1, we argue that a different approach is needed to face this crisis. In section 2, we discuss the demand and supply shocks in the automotive supply chain. In the third and fourth sections, we predict that there are multiple crises ahead and recommend how to deal with them. In section 5 we explain modelling, forecasting and volatility management. Section 6 is about how to organize a Bullwhip Response Team.

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1 Different times call for a different approach

Automotive has been hit hard

Life has changed dramatically since the detection of the COVID-19 virus in Wuhan in December 2019, and the pandemic is now ravaging societies across the globe. Worldwide lockdowns, hunts for medical supplies, pressure on health systems and the search for a vaccine have everyone's full attention.

The economic consequences are also huge; the worldwide system of demand and supply has collapsed and we are seeing sizable shocks in consumption and production. In some businesses – such as retail of food, medical and hygiene products – consumption has gone up, while in others – such as leisure and fashion retail – demand has plummeted.

This crisis is different from the credit crisis of 2008. There is more uncertainty on both the demand and the supply side. This crisis has a global impact, but there are differences per geographical region and per industry. Moreover, this crisis will probably have an economic, political and societal impact for many years to come.

Automotive supply chains are particularly suffering. These complex supply chains are long and international, affected by lockdowns both upstream and downstream and by customers who – influenced by all the uncertainty – are postponing discretionary purchases like a new car. A different approach is needed to face this crisis; the classic risk management approach is not enough.

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Demand & supply shocks in automotive supply chains

The automotive supply chain has been hit especially hard and faces huge challenges to recover from the coronavirus crisis. What is so special about automotive supply chains that makes it so difficult to get business back on track? In general, the vulnerability comes from the complexity of the whole chain. To make things worse, the end-customer demand has dropped off rapidly in this specific crisis.

Physical and technical complexity

Automotive supply chains are very diverse. It takes thousands of parts to assemble a car. Production of those parts requires a broad range of technologies and is therefore spread over many different suppliers. The suppliers are often located close to the assembly plant to minimize transportation costs in the case of large volumes and to facilitate short delivery times, but some suppliers are also based much further afield. Driven by the high degree of specialization and economies of scale, some parts are produced in only a handful of plants for almost all the world's car manufacturers. And the simple truth is that not a single car can be assembled if a crucial part is unavailable – even if it is something as seemingly insignificant as a bolt. If assembly then grinds to a halt, all the suppliers in the chain are faced with business disruption.

Some automotive supply chains are very deep and multi-tiered. Many parts and components that are needed to assemble a car are produced in multiple stages. For example, to produce a wing mirror in the right colour, the mirror supplier (tier 1) buys paint from a coating company (tier 2). To produce the paint, that company sources resin from a chemical company (tier 3), and the chemical company will probably get its raw materials from a petrochemical company (tier 4). Counting the assembly plant, there are five links in the chain – and this is just an example for one part out of the thousands that are needed.

Long supply chains amplify volume fluctuations. Besides the physical complexity, the way the automotive business is structured makes it difficult for the individual players to gauge the level of demand. One important mechanism is the de-stocking and re-stocking that takes place at the individual links throughout the supply chain. In some automotive supply chains, there may be an overall inventory for up to 12 months. For a certain supplier upstream in the chain, a 25% fall in customer demand means that the existing four weeks' worth of inventory in the pipeline is suddenly enough to cover five weeks. The supplier will adjust its own inventory by one week, so the supplier's supplier will see a drop in demand of 25% plus one week.

Although the major car manufacturers are the dominant players in the supply chain, they have no direct influence further upstream in the chain. Car manufacturers have forced the main importers and dealer organizations to generate a more or less levelled demand. In order to do this, the dealers typically build up inventory at certain periods of the year to level their orders. In some regions 50% of orders placed with the car manufacturers are destined for this inventory; the other 50% are specific end-customer orders.

End-demand uncertainty

On top of the complexity of the supply chain and the way the business is structured, consumer demand is uncertain during this specific COVID-19 crisis. Because of the higher contamination risk, commuters and other travelers might avoid public transport and use their cars more. On the other hand, many more people are working from home and may continue to do so even after the coronavirus crisis is behind us. The mileage per year has a direct impact on the vehicle lifetime and the need for replacement parts. Meanwhile, as also seen in the 2008 financial crisis, reduced consumer confidence affects buying behaviour as consumers postpone discretionary high-value acquisitions such as a new car. Governments may create incentive schemes in an attempt to stimulate sales, but these merely blur the view of the structural demand by bringing it forward and lead to lower demand later on, as happened in the 2008 crisis.

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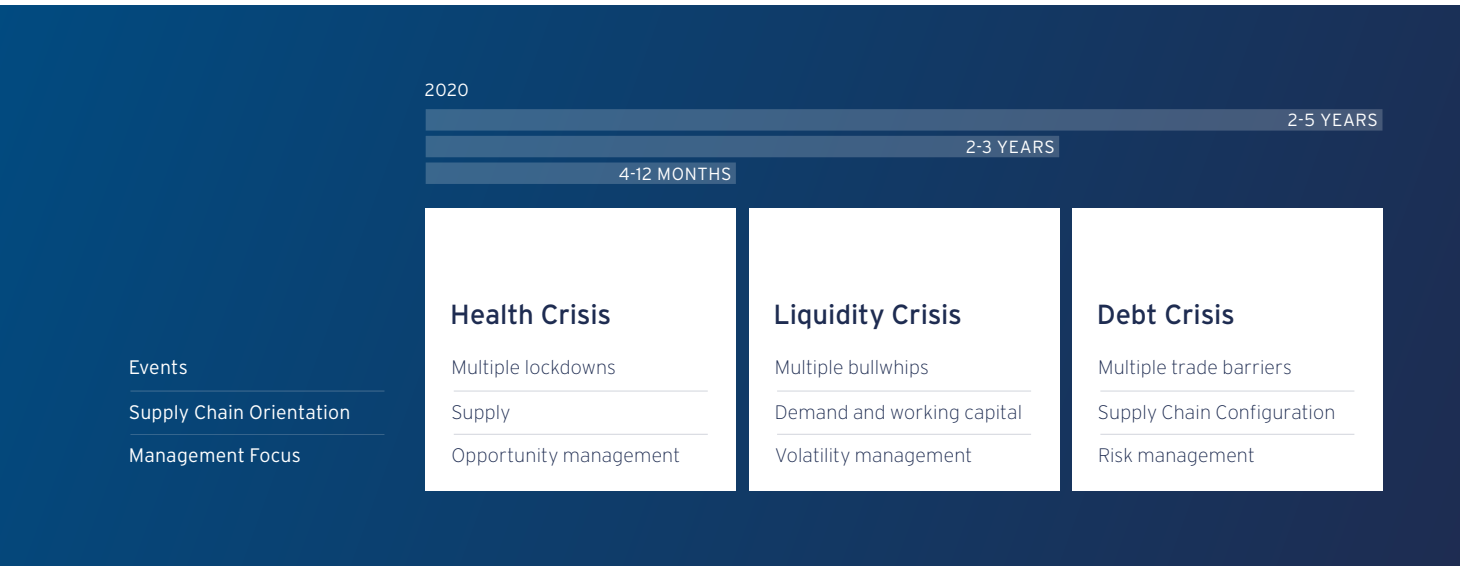
Corona Crisis is just a starter

A different crisis

If we compare the current crisis with the credit crisis of 2008/2009, there are quite a few differences. For a start, in 2008 the crisis originated with the banks. Now it has been triggered by lockdowns, resulting in the closure of companies and falling demand from consumers. Moreover, new behavioural patterns are emerging due to travel restrictions that could have long-term structural effects. But despite these differences, we can still learn from the credit crisis. If we look a bit deeper, we can identify similar patterns and build upon the lessons learned a decade ago.



A crisis with multiple faces

Phase 1: Health crisis

The first phase of this crisis is the health crisis, which has led to multiple lockdowns worldwide. The COVID-19 virus is not yet under control. Daily life is disrupted; governments have shut down shops, factories and many societal activities. The main focus of organizations is to secure supply. In some industries – like food and medical – the main challenge is to scale up supply, whereas in other industries – like automotive – the challenge is how to cope with immediate reductions in demand and supply. The recovery after the shutdowns in this phase will require special attention. Starting up a supply chain as complex as the ones in the automotive industry can be problematic. In this recovery phase, the management focus needs to be on opportunities: How can we secure sustainable supply, both now and in the near future?

Phase 2: Liquidity crisis

According to economists around the world, the second phase – when the direct health effects of the coronavirus health crisis have subsided and the economy is no longer in lockdown – will be dominated by a global recession: massive unemployment, a fall in consumer confidence, low consumption, reduced travel and lack of investment. We believe that, as a result, severe liquidity problems will occur in all companies, except maybe those that coincidentally benefit from the crisis (e.g. e-commerce/tech companies). We will call this the liquidity crisis. Banks will become increasingly reluctant to lend. The first signs are already visible, and this will of course worsen the liquidity crisis.

This phase will share similarities with the credit crisis of 2008/2009. Companies will have a strong need to reduce their working capital, which will result in active de-stocking by lowering their inventory buffers. At the same time, demand for luxury goods will decrease, resulting in reactive de-stocking of supply chains for those goods. These two effects combined will cause severe bullwhip effects in long supply chains such as automotive, especially upstream, in the coming years.

The management focus should be on predicting and managing this volatility. The winners will be the companies that succeed in being proactive in the new, volatile world: those who can anticipate in terms of capacities and inventories better than their competitors.

Phase 3: Debt crisis

We will call the third phase the debt crisis. Governments are currently incurring huge debts to support their economies, and those debts will have to be paid back somehow. It is not yet clear how governments will address this, but it may lead to international tensions, protectionism and trade barriers. Organizations will have to deal with this and possibly rethink their supply chain configurations. The main management focus will be on strategic supply chain risk management. Ongoing developments like automation and 3D printing will intensify this.

In summary, we are likely to face multiple crises in the coming years. What has started with the health crisis will be followed by a liquidity crisis and eventually we will probably have to deal with a debt crisis too. These phases are not carved in stone, however, and may overlap in terms of time, geographic area and intensity. We believe that each phase has its own dynamics and will need its own approach:

- Opportunity management during the coronavirus health crisis: Focus on ‘prepare and respond’
- Volatility management during the liquidity crisis: Focus on ‘predict, prepare and respond’
- Risk management during the debt crisis.

In the next section, we will take a deeper dive into the first two phases. Because of the high level of uncertainty, we will not address the debt crisis in this paper.

The winners will be the companies that succeed in being proactive in the new, volatile world: those who can anticipate in terms of capacities and inventories better than their competitors.

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Create flow with opportunity management

	Health Crisis	Liquidity Crisis	Debt Crisis
Events	Multiple lockdowns	Multiple bullwhips	Multiple trade barriers
Supply Chain Orientation	Supply	Demand and working capital	Supply Chain Configuration
Management Focus	Opportunity management	Volatility management	Risk management

Phase 1: Health crisis

The first phase of the coronavirus crisis is the health crisis. The management focus needs to be on opportunities: How can we secure sustainable supply, both now and in the near future?

Impact reduction

In times of crisis, the first priority is impact reduction. Organizations tend go into survival mode and focus on fast decision-making in 'war rooms': improving end-to-end visibility, supporting key suppliers, strengthening the cash flow, intensifying demand sensing, using more top management escalations, creating faster S&OP/S&OE cycles and reducing discretionary spending (investments, consultancy, training).

In the first few weeks of the coronavirus crisis, we saw this happening in all market segments that were hit, including within most of the companies in the automotive supply chain. Because of the upstream and downstream lockdowns, the automotive supply chain is completely out of balance, with oversupply in some parts of the chain and shortages elsewhere. There is a lot of uncertainty surrounding countless production, sales and purchasing orders, meaning that planning departments are struggling to decide what to do – where to move forward and where to cancel.

This unstable and confusing situation poses a problem for a smooth recovery. Companies need to prepare and create more control over their supply chains. But how should individual companies act? An 'intelligent push' based on 'opportunity management' offers a structured way out, as we explain in more detail below.

Intelligent push:
How to get your supply chain flowing again

At the start of the recovery phase following the coronavirus crisis, companies upstream in the automotive supply chain will not yet have a reliable demand signal. Therefore, they can forget about their normal forecasting as input for the rest of their supply chain planning, and they can forget about S&OP or S&OE based on solid demand plans.

But the automotive supply chain cannot restart unless the right inventories are in place. This means that individual companies will have to make procurement and production plans on a different basis. In our opinion, and in view of the lessons from the 2008 crisis, this can only be based on the surplus or shortage of your products in the complete downstream supply chain. We call this the 'inventory gap'. The inventory gap is caused by imbalances in the supply chain, for instance because of lockdowns. The position and sequence of these lockdowns have a big impact on the situation you are facing.

The planning department needs to estimate the downstream inventory gap by comparing the cumulative loss on production volumes at the car manufacturer against your company's cumulative volume loss. Needless to say, this should take account of the lead-time effects and the ramp-up pace of the car manufacturer.

That analysis will reveal your inventory gap. Is your downstream supply chain too empty, or is it overflowing? If it is relatively empty, you need to ramp up quickly – even without demand signals. If it is full, you have some slack. In that case, applying opportunity management will help you to make wise use of the extra time.

Opportunity management: A shift in focus

The recovery phase is full of uncertainties. Can your suppliers deliver the right components when you need them? Are transport and logistics services available when you need them, and at an affordable price? How much overcapacity do you have? Are you able to ship the products to your customers quickly if they need them suddenly?

All these uncertainties need to be managed in an intelligent way. You should make use of windows of opportunity, even if they occur earlier than normally planned. Relocate the components and products in your supply chain so that they are as close as possible to the desired location. We call this 'pushing your supply chain when possible': ordering, producing and transporting earlier than the deadline as a way of managing the uncertainties.

The opportunity matrix: only push when it really ads value

However, pushing your supply chain will put severe pressure on your working capital. Therefore, you should only push it when it really adds value. The following opportunity matrix can support you in making these decisions. Plot all the components and products on the following two axes:

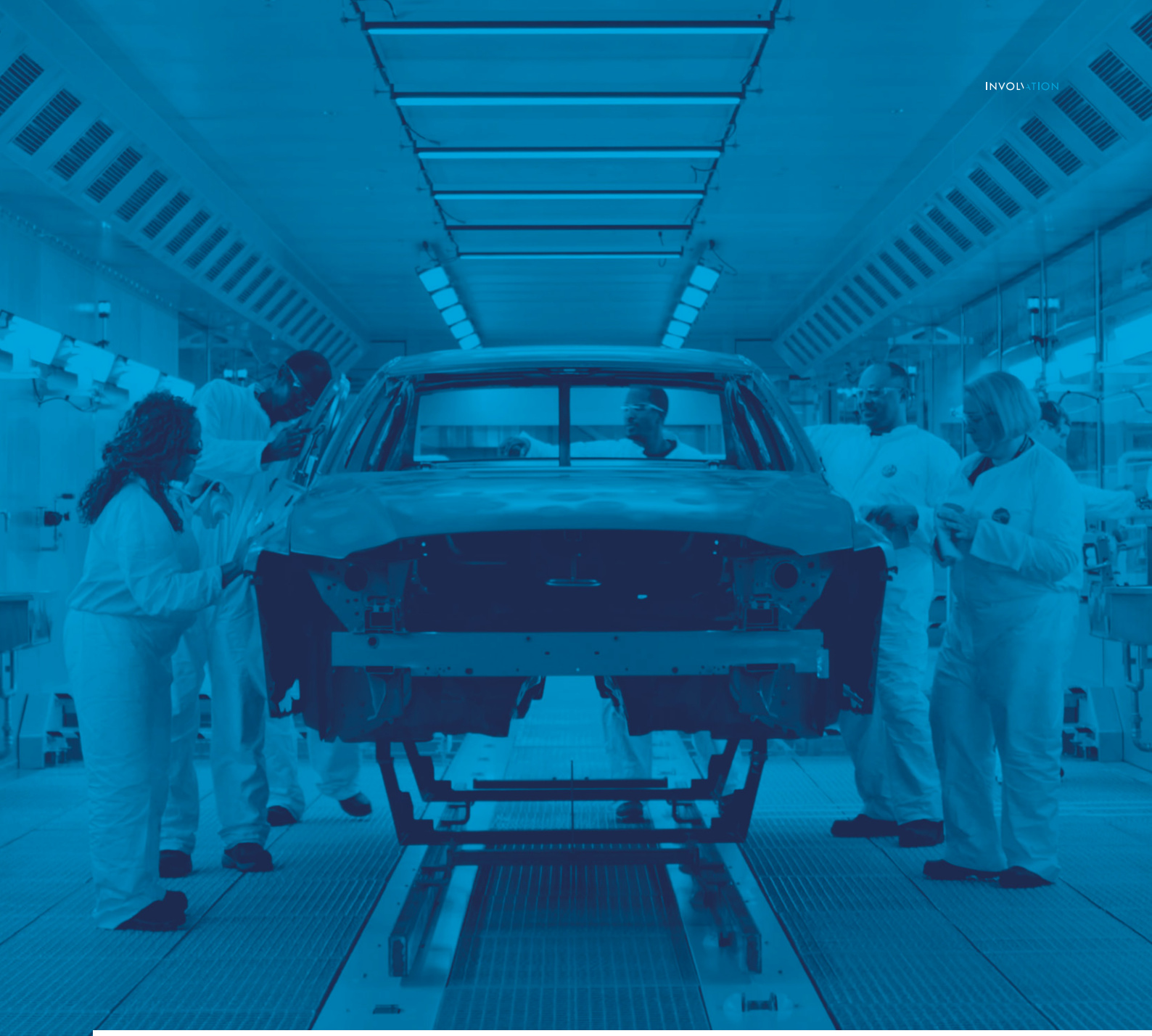
- How much supply risk do I expect (capacity constraints, logistics constraints, lockdowns, border crossings, long distances, no alternatives)?
- How much value/revenue is at risk if I don't have this product or component? (This can be either your own revenue or your customer's)

All products in the upper right corner of the matrix need to be pushed when possible. In the lower left corner, you don't push at all – just wait until the last minute. The products in the other two quadrants need to be managed intelligently by balancing the working-capital impact with the risks.

Prepare and respond

During the coronavirus health crisis phase, it is key to prepare yourself and respond as effectively as possible. Forget about normal forecasting in this phase and focus on opportunities for supply and production instead. In our view, this means an 'intelligent push' based on 'opportunity management'. Essentially, opportunity management is all about:

- Creating flow
- Creating insights into (potential) constraints
- Accelerating decision-making
- Making use of opportunities



The winners will be the companies that succeed in being proactive in the new, volatile world: those who can anticipate in terms of capacities and inventories better than their competitors.

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Volatility management: Predict, Prepare, Respond

	Health Crisis	Liquidity Crisis	Debt Crisis
Events	Multiple lockdowns	Multiple bullwhips	Multiple trade barriers
Supply Chain Orientation	Supply	Demand and working capital	Supply Chain Configuration
Management Focus	Opportunity management	Volatility management	Risk management

Phase 2: liquidity crisis

Volatility management during the liquidity crisis

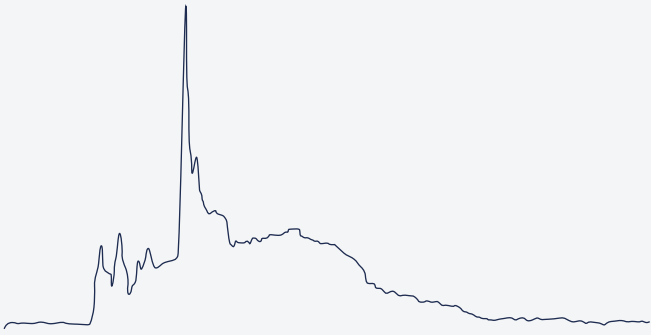
Once the direct health effects of the coronavirus health crisis start to subside and the economy is no longer in lockdown, we will move into the second phase: the liquidity crisis. The three main activities of volatility management in this phase are:

1. **Predict** volatility by building a forecast model based on supply chain characteristics, end-market demand and underlying assumptions and trends
2. **Prepare** for the right decision-making and action-taking
3. **Respond** with the right decision-making and action-taking

This section focuses on predicting. In the next section, we dive deeper into the 'prepare' and 'respond' steps.

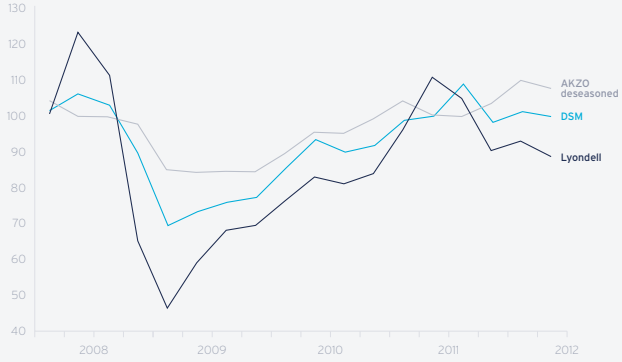
Parallels with the 2008 credit crisis

The liquidity crisis will show similarities with the credit crisis of 2008. Directly after the bankruptcy of Lehman Brothers, the interest rates hit an all-time high and business credit dried up overnight. Companies worldwide had an acute liquidity problem and had to revert to steering on cash. This included reducing costs (investments, payroll, maintenance), reducing their operating working capital (longer payment terms to suppliers, shorter payment terms to customers) and, above all, reducing inventory.



Libor interest rate
The panic after Lehmann Brothers failed in September 2008 caused the Libor interest rate to peak sharply and made banks stop lending.

This active inventory reduction caused a composite bullwhip effect through the deep layers of industry supply chains, which pushed many companies out of business. The further upstream they were, the more they suffered.

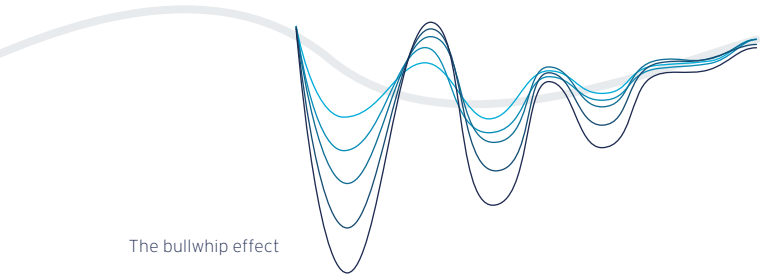


Stock depth example
Quarterly turnover data 2008-2010 for LyondellBasell, DSM & AkzoNobel

This time it will be slightly different; rather than there being a sudden trigger, the gradually deepening recession will cause a series of waves. Unemployment will grow to levels not seen since the 1930s. There will be an unprecedented decline in consumer spending – and not only in capital goods, but in everything apart from food and other necessities. As a result, companies will lose income while their fixed costs continue. They will quickly run into liquidity problems, and again they will respond by reducing their inventory. This de-stocking will cause a downward bullwhip effect that will move in the upstream direction. So despite a different and more gradual trigger, the resulting effect is the same; the second phase of the coronavirus crisis has some strong parallels with the 2008 credit crisis.

The bullwhip effect is back

Involvation has organized 'The Supply Chain Game' for hundreds of companies around the world for many years now, and every time we see the same thing: a sudden change in the end-market demand leads to large upstream variations. Lack of visibility of the end-to-end chain leads to exaggerated decisions upstream, especially when the lead times are long. This is what is called the 'bullwhip effect'.



The bullwhip effect

Restarting these supply chains will require enough stocks for production purposes. This will require the inventories to be rebuilt. This extra demand will create an upward bullwhip effect, which will again move in the upstream direction. Prolonged and possibly repeated lockdowns in various parts of the world will interrupt supply chains, leading to shortages (moving downstream), stockpiling and forced closures. However, this will not be a global phenomenon, but rather specific per supply chain.

The best recovery strategy is independent of the exact timing and pattern of market recovery. It is much more important to know the current status of the supply chain in terms of inventory surpluses or shortages and cumulative lead times. As already mentioned, this is especially true for companies that are further upstream, such as those in the chemical or semiconductor industries. Companies that are further downstream should carefully manage their upstream pipeline, because shortages may appear.

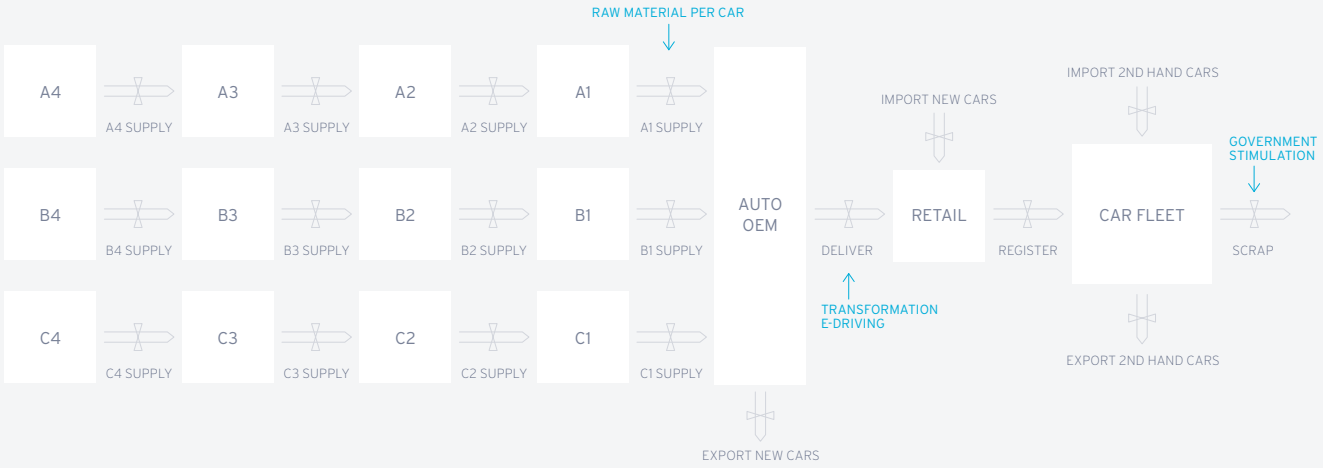
Predict: Modelling as a basis

In this phase, it is key for organizations – especially for those who are upstream in the value chain – to gain insight into:

- Demand in the end market
- Number of echelons (tiers) between themselves and the end market
- Stock levels in the downstream supply chain
- Lead times in the chain
- Relevant supply chain aspects including capacities, limitations in production and storage, substitution , multiple end markets, parallel chains and other chain-specific or sector-specific factors.

These are all key ingredients to build a model in order to simulate demand, flows and stocks in the chain, prepare scenarios and make the right decisions about inventory, production capacity and logistics. Organizations that do this well can outperform competitors and create sustainable competitive advantage.

Involvation and Flostock have used their combined supply chain and modelling knowledge, acquired in the 12 years since the 2008 credit crisis, to build a supply chain model for the automotive industry. This model can be used to study, understand and predict demand for upstream companies. The model is based on stocks and flows in system dynamics, in the same way as the proven and scientifically documented models that Flostock built in 2009-2011. This model has proven its value in the previous crisis. Upstream companies can benefit hugely from knowing when to stop/restart producing, when to reduce/build inventory and when to cover their needs for raw materials.



Example structure of a model

Create your predictive model

When modelling this crisis, we have three advantages compared to 2008/2009:

- ✓ We already have the modelling tools and over ten years' experience in using them
- ✓ We can cooperate with several tiers across the supply chain. This reinforces the accuracy of the model
- ✓ We can derive many of the settings for the current model (lead time, response time, etc.) from the 2008/2009 crisis.

In addition, this is such a grave and chaotic crisis that companies are very interested in cooperating, and every additional company improves the calibration of the model.

3 steps to creating a predictive model:
1 - Observing We gather relevant information about the value chain (echelons, lead times, stock levels, etc.) and we observe what is happening in the chain
2 - Modelling We input all the relevant information into the model and calculate the upstream demand based on various scenarios for end-market demand
3 - Prediction We analyse and predict the expected volatility, e.g. the timing, length and amplitude of peaks and troughs in demand

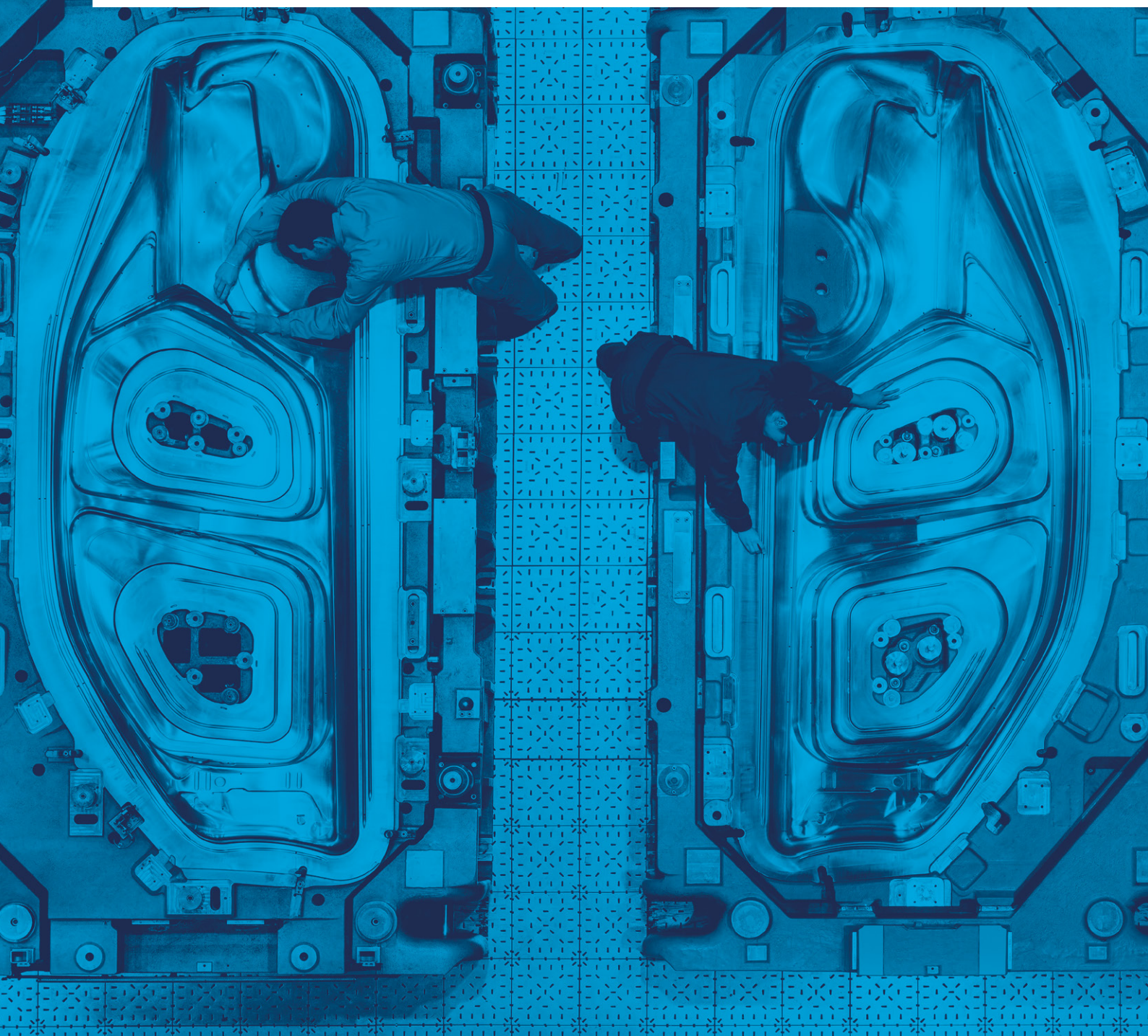
The outcomes of the prediction step are the first part of 'volatility management', which we also refer to as Predict.

Prepare and respond for final decision-making

After Predict, the next step is to evaluate the prediction, decide which actions should be taken and then execute them. These are the Prepare and Respond steps in volatility management. Different scenarios – including opportunities and constraints – must be prepared, quantified and discussed for the final decision-making. All the relevant decision-making elements should be brought into the Sales & Operations Planning (S&OP) process.

We believe that the whole process of effective and efficient decision-making should take place in a Bullwhip Response Team. We discuss how to organize and set up such a team in the next section of this paper.

So despite a different and more gradual trigger, the resulting effect is the same; the second phase of the coronavirus crisis has some strong parallels with the 2008 credit crisis.



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Organizing your Bullwhip Response Team

Create a Bullwhip Response Team

To face the crisis, organizations should create a cross-functional team with representatives from different disciplines – including Sales, Supply Chain, Operations, Purchasing and Finance – to make operational and tactical decisions. We call this the 'Bullwhip Response Team'. This team should consist of people with the right leadership skills, positional power, credibility and expertise. Needless to say, they need the support and backing of the senior management team.

Effective and efficient decision-making

The main focus of the Bullwhip Response Team is make the right decisions and take the right actions. Therefore, this team needs to:

1 - Predict which challenges lie ahead

The team must explain the background of the current volatility so that everyone – including at C-level – understands what is happening. They should analyse and predict the expected volatility in terms of the timing, length and amplitude of peaks and troughs. As mentioned above, modelling of the value chain is essential for this level of understanding.

2 - Prepare for the right decision-making and action-taking

Preparation is key for the right decision-making. Therefore, the team should map potential constraints during high volatility and investigate which constraints can be stretched (and to what extent). It is also important to prepare and quantify alternative scenarios.

3 - Respond effectively to upcoming challenges

This entails integrating the above-mentioned decision-making elements into a process like Sales & Operations Planning (S&OP) or Integrated Business Planning (IBP) for effective and efficient decision-making.

Needless to say, these three phases are interlinked and it is important to use the learnings from earlier phases.

Next step: Building resilient supply chains

Over the coming years, there will undoubtedly be a lot of uncertainty for organizations in the automotive industry. Opportunities, volatility and risk management are key in managing these uncertainties. The next step is to make your supply chain resilient in order to cope with unexpected changes in the market. But it all starts with learning how to predict, prepare and respond!

It all starts with learning how to predict, prepare and respond!

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About us

INVOLVATION
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Involvation is a leading consultancy and implementation firm that is focused on improving supply chain design and management. We are specialized in:

- Supply chain strategy
- Sales & Operations Planning (S&OP)
- Integrated Business Planning (IBP)
- Demand and supply planning
- Production planning and scheduling

The vast majority of our projects include realization and change management aspects, and all our consultants have many years of line management experience. Thanks to our focus on supply chain management, we are recognized as thought leaders in all our areas of expertise.

flostock
stock & flow analyses

Flostock builds models based on System Dynamics principles, using the proprietary Flostock method. This allows a simulation model to be built that includes the inventory behaviour across an entire supply chain. The concept is unique and has already received coverage in numerous journals and newspapers, including the Financial Times and ICIS Chemical News. Our insights have been adopted in the curriculum of Wharton, MIT and at least six European universities. McKinsey identified our approach as a best practice in the crisis. Volatility is our specialty.

What makes us unique?

Involvation and Flostock decided to combine Involvation's broad supply chain planning expertise (consultancy, learning & development and interim management) with Flostock's highly specialized volatility modelling expertise (bullwhip effects, pork cycles, Lehman waves, runaways). What makes us unique?

- ✓ We have developed a proven and scientifically documented multi-tier forecasting model
- ✓ We have access to end-market demand data
- ✓ We are focused on the automotive supply chain
- ✓ Our network effects create a better model:
  - In-depth availability of data
  - In-depth understanding of the supply chain
- ✓ We have an outstanding track record on S&OP/IBP services
- ✓ We take a very practical approach
- ✓ We deploy very experienced senior consultants with a management background

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