

## **AUTOMOTIVE SUPPLY CHAIN AND LOGISTICS**

This briefing will examine:

- How and why automotive supply chains have become more complex
- The international nature of supply chains and the role of emerging markets
- How complexity in supply chains has been facilitated by visibility tools
- The implications of the re-negotiation of NAFTA and Brexit for vehicle manufacturers
- Why costs have risen although remained static as a proportion of COGS
- Growing awareness of supply chain risk.

The automotive supply chain and logistics industry has undergone a period of significant change over the recent past and in the coming years may become unrecognisable driven by trends often referred to as 'Industry 4.0'.

These trends include the likely widespread adoption of electric vehicles (EVs) with all the attendant disruption which this will have on engine production and spare parts logistics, to name just two key areas. In 5-10 years' time automotive supply chains are likely to look very difficult, although with the billions of dollars already invested in existing plants and production processes, change may be slower than many believe.

Future scenarios for the automotive supply chain and logistics industry will be dealt with in future briefings and TI's report, 'Automotive Logistics and Supply Chain 2018', published in January, will feature a detailed analysis of the impact of Electric Vehicles upon the automotive manufacturing industry.

Rather this briefing will focus on many of the key trends which are impacting upon the industry right now, which, even without the influence of 'Industry 4.0', are hugely significant in their own right.

### **Supply Chain Complexity**

Since Ti published its first report on the Automotive Logistics industry in the mid-2000s, supply chains have become much more complex. Part numbers have proliferated due to the increasing variety of models, new plants and the development of emerging countries as major consumer markets.

This has also increased the complexity of logistics systems and flows required to support these strategies especially on an international basis. For some Vehicle Manufacturers (VMs) who use global component suppliers, regional logistics networks in Asia and Latin America serve to consolidate shipments before they are shipped to plants in Europe or North America. In the case of Ford, for example, logistics providers consolidate parts for its Romanian assembled 'Ecosport' model in India, Brazil, China and Thailand before they are shipped to the port of Constanta and then moved overland to Craiova to a de-consolidation centre.

Whilst inbound logistics for European and North American plants has become more internationalized, not least due to higher levels of high tech components imported from Asia, assembly of vehicles has become dispersed throughout the world. Global VMs now have a much wider range of production facilities in many emerging markets, tapping into local demand and using more localized supply chains in an attempt to reduce 'landed cost' prices of components.

Tier suppliers have followed the VMs into new markets which has also meant that they have had to deal with similar levels of complexity. They have also increased in scale in the same way as the VMs.

Consolidation of brands in the industry has also led to complexity: VW acquired seven brands in the past 20 years at the same time as trebling the number of its plants to 120 as well as increasing model variety from 100 to 300 (*Automotive Logistics*, 2017). One automotive executive calculated that the vehicle combinations which could be built in the German market is estimated at 10<sup>25</sup>.

One of the practical problems this has caused is that this has meant changes to material flows as it has become impossible to store the entire range of parts within a plant.

The higher levels of complexity have been facilitated by greater supply chain visibility. This has meant that supply chains have been able to get leaner, as there is more confidence that shipments will be delivered when they are supposed to be. At the same time, supplier delivery windows have been getting smaller.

However, visibility is still not complete and progress has been a disappointment to many in the industry. EDI and Advance Shipping Notes (ASNs) underpin much of the way in which suppliers and carriers communicate and the use of paper documents in some emerging countries is still widespread. Compared with the immediate access to real time updates which other sectors such as e-retailing, for example, are accustomed to, the automotive sector has lagged behind. Systems which have been in use for many years have had add-ins bolted on to provide some level of interface with more up-to-date cloud technologies.

Telematics and sensors may well fill the gap between expectation and delivery although this will require a step change reduction in the cost of the new technologies.

Big data will play an increasingly important role in logistics systems as low cost sensor technology becomes ubiquitous. This will allow companies to predict potential disruptions and plan accordingly, with ordering potentially being automated to avoid bottlenecks.

### **Emerging markets**

How the major VMs have dealt with the fast growing consumer markets in the emerging world has been one of the defining trends of the past decade. From obscurity in the 2000s, China now dominates the market in terms of vehicles produced, accounting for over a quarter of global output. Other emerging markets in the top ten include India, Mexico, Brazil and Thailand.

According to consultancy, PwC AutoFacts, the worldwide the number of cars sold worldwide will grow by 25% over the next six years. This growth is expected to be driven by 'untraditional' markets with India and South East Asia forecast to grow by 65%.

The pattern of trade in finished vehicles also continues to change with exports from South Korea and Japan increasingly heading for emerging markets rather than the North America, as US markets are served by local production. Despite being a huge market, China has few exports or imports proportionate to its size. That said, the absolute numbers are still high and it hard not to see it having a big impact on future trade flows.

Japan, formerly the second largest producer, although still large, has seen volumes shrink as Japanese manufacturers choose lower cost locations to build their vehicles. The announcement of the closure of production lines at Honda's Sayama assembly plant could be said to be a sign of things to come. Once

Honda's largest assembly facility, the move is highly symbolic. As well as over-capacity, Honda has said it wants to invest in new facilities which can accommodate electric vehicles.

VMs in emerging markets have not only ramped up their production volumes but have become much smarter in the way they have organised their logistics. China has seen the most radical improvements, with VMs replicating Western milk round systems and consolidation.

### **Automating logistics systems**

Many parts of the automotive supply chain are still dependant on manual labour and automation has still to replace reliance on large logistics workforces. Only specific warehouses have become automated, for example in warehouses focused on the storage and supply of small loads. Transport networks have also been slow to evolve. This may be partly due to a conservative approach to change – stability in automotive supply chains is seen as critical.

Another reason for the lack of progress is perhaps an unwillingness for VMs to invest in expensive new assets when using scalable labour resources carries less risk. In the future, warehouse automation will lead to an impact on balance sheets rather than on a variable profit-and-loss account. Seasonality and cyclicity in demand will mean that labour will play an important role in logistics systems for some time to come.

That is not to say that there has been no investment. Audi uses Automated Guided Vehicles (AGVs) for some of its processes and the Mercedes Benz FLOW pilot (flexible logistics optimised warehouse) provides parts to the production line where and when needed.

However, automation could be a major factor in improving efficiencies in the future. Audi uses what it calls 'Supermarket 2.0' robots to bring shelves of components to pickers (similar to an approach employed by Amazon) who then use pick-by-light or pick-by-sound technology to reduce errors.

### **Trade**

The development of global automotive supply chains has also been hindered by on-going trade restrictions. Protection of markets, especially in emerging regions, causes delays and costs, not least due to volatility on a day-by-day basis. South America and Russia are examples of the use of trade for political purposes which have impacted detrimentally on VMs who have been developing long term strategies for these markets.

- NAFTA

NAFTA renegotiations commenced in August creating a large amount of uncertainty over the future trade relations between Mexico, Canada and the United States. North American automotive supply chains have become reliant on the 'frictionless' movement of components and finished vehicles throughout the region and there are concerns that the 'death' of NAFTA would hit VMs hard. Much of vehicle production in Mexico relies on major components - including items such as engines and gear-boxes - made in the US. The reverse is also true, with Mexican plants acting as sources for parts for US production. Unravelling this supply chain structure would be possible but expensive and would have a major impact on rail and road freight across the US.

For those hoping for minimal disruption to North American supply chains, the part of renegotiations probably generating the most angst is mooted changes to 'Rules of Origin'. From a US perspective, these specify that for a good to be imported tariff-free from Canada or Mexico, a certain proportion of its value must be produced within NAFTA. The proportion of regional content required varies by good. For

a car, 62.5% of its value must have been produced within NAFTA to be exported tariff-free to the US from Canada or Mexico.

Even in the event NAFTA unravels, about half of what Mexico exports to the US would still cross the border without incurring tariffs. Nevertheless, some forecasts assert that export and import volumes would fall by 15% and 16% respectively if NAFTA ends and a trade war ensues, implying significant supply chain disruption.

- Brexit

The results of Brexit upon the UK and European automotive logistics industry are still unclear and there will be no resolution until the conclusion of trade talks. Tariffs and any change to the status of 'Rules of Origin' regulations could be a significant cost threat to the UK economy.

If a free trade agreement is concluded between the EU and UK, UK exporters would have to declare to EU customs authorities the proportion of their goods which include sub-components that have been imported from outside the EU. Below a certain threshold and the goods would qualify for preferential treatment; above and they would face the full tariff.

However, the importance of the UK to EU exporters is often overlooked – it is certainly not just one-way traffic and many of the European VMs will be just as keen to see a workable deal concluded as any UK exporter. It is also unlikely that trucks will be stopped at border transit points, such as Port of Dover. More likely clearance will occur online, at least for the major VMs and their Tier 1 suppliers, with systems being bonded.

A report by the UK's Automotive Council, 'Growing the Automotive Supply Chain – Local Vehicle Content Analysis', found that 44% of all components used by UK car makers now come from domestic suppliers, compared with 41% in 2015. Indeed, local content has grown from just 36% in 2011 which the report's authors say represents compound growth of 60% by value sourced from UK first-tier suppliers between 2011 and 2017.

The report does not specify what proportion of imports comes from within the EU but, based on other sources and dependent on the make and model of car being produced, it would seem likely that the 'European' content now amounts to under a quarter of total value. With modern cars increasingly reliant on high tech components, the Asian content is likely to increase and EU content diminish over time.

There are, of course, implications for the European and UK road freight industry in particular. Such a shift will inevitably support UK domestic hauliers at the expense of European cross-channel operators. This will be compounded by the growth in UK port-centric distribution, trucking containers full of Asian-originating automotive parts to manufacturing facilities from ports. International freight forwarders will also benefit although there is anecdotal evidence to suggest that some VMs, including Ford, have reinforced their in-house customs experts, rather than relying on third parties.

What is of more importance, however, is that the UK automotive sector continues making successful models with high levels of productivity. This will ensure that all types of operator, domestic or international, will benefit in the long term.

### **Order to delivery times**

Build-to-order (BTO) (as opposed to build-to-stock) has become the most popular method of production for many VMs. According to some estimates, BTO can account for up to 60% of production volumes. It is

undeniable that this concept has played a critical role in reducing the amount of vehicles built which then sit at a dealership until discounted heavily enough to be sold. However, it is not entirely good news. Order to delivery times are not short and customers can wait several months for their personalized car. Given that in theory actual manufacturing needs only takes a couple of days, the rest of the time is spent in order processing and final delivery.

#### Factors reducing lead times

- Localization of production
- Improved transport infrastructure
- The 'Amazon' effect, driving faster fulfilment through higher customer expectation

#### Factors increasing lead times

- More internationalized supply chains (both inbound and finished vehicle)
- Higher proportion of Asian-sourced high tech components
- Greater complexity of parts and vehicles
- International knockdown operations

In the end, the production strategies adopted by the VMs will be influenced by how much customers will be willing to pay for the quick delivery of automobiles personalized to their particular taste. In this trade off, VMs must also factor in the costs of inventory holding, transport costs and, of course, flexible production processes.

#### Logistics costs

Increased supply chain complexity has led to higher logistics costs although not necessarily a higher proportion of cost of goods sold (COGS). The increases have also been driven by a rise in driver and fuel costs as well as increases in road tolls.

Transport costs have also risen as part of the move towards JIT and greater out-sourcing within supply chains. Parts are now moved over greater distances from suppliers to VM plant as well as more frequently.

However, the rise of these costs has been offset to a degree by increased efficiencies which have led to stable and in some cases lower logistics costs per vehicle. Fill and utilisation rates have improved and network engineering, for example by sharing capacity across multiple brands, has helped.

VMs have also sought to:

- standardize logistics operations between plants
- increase monitoring of logistics providers
- use local rather than global suppliers where possible and
- optimise freight flows.

Companies have also re-structured their business organizations in an attempt to reduce logistics costs per vehicle. For example, at Mercedes Benz where previously responsibility for logistics had been maintained at a plant level, a new structure was created to merge plant logistics with broader capacity planning and inbound/outbound logistics with a director reporting to the board.

In China logistics costs may have become a more important part of the cost of a vehicle, but this is partly due to the price of vehicles falling significantly over the last few years. From being a luxury item,

of which logistics costs were only a small proportion, they are now mass market and logistics is far more important. Against this, costs have been helped downwards by the improvement in transport infrastructure which has made supply chains far more efficient, both in terms of inbound and the distribution of finished vehicles.

The potential risk for 'premium' freight movements has also increased due to supply chain complexity. Getting it wrong can be very expensive, although lucrative to the companies involved in chartering special air movements, for example. VMs have attempted to reduce these costs through an increased awareness of external threats (such as strikes or blockades, for example) as well as reviewing the internal reasons behind the use of premium services. Ford, for instance, ensures that a spend of more than \$10,000 on premium freight has to be signed off by senior management and not seen as routine expenditure.

### **Risk**

There have also been improvements in terms of identifying the true cost of risk to supply chains. Following some major natural disasters in the early part of the decade, VMs have now built departments dedicated to assessing the impact of potential disruption. Single sourcing was a particular issue highlighted by the Japanese tsunami in 2011 when multiple VMs found that they relied on a single paint manufacturer whose production had been halted by flooding. Better visibility of tier suppliers has resulted.

In terms of logistics, Ford and DHL have shared telematics data on inbound European routes which allows them to monitor and avoid, if possible, disruption to transport caused by natural disasters, for example. In the US, BMW uses a system which allows it to monitor every inbound truck to its Spartanburg, SC plant. Each truck represented on a dashboard screen is colour coded depending on its status: whether on track; delayed (but enough inventory on hand that it isn't critical) and delayed (with critical implications due to low inventory levels). If a truck misses a milestone, emails can be sent which will allow planners to consider using alternatives.

The same principle has also been applied to container shipping and airplanes carrying BMW shipments. Overlaid on the telematics data is information from external sources, such as weather forecasts and traffic congestion monitoring applications.

### **Conclusion**

The automotive industry has changed dramatically over the past years as demand in emerging markets has soared; the industry has consolidated and supply chains have become far more complex and internationalized. The industry has become vulnerable to volatile trade relations although it is far better today at identifying and costing supply chain risk. Costs have risen, and will continue to rise, but most VMs believe they have done a good job of maintaining these costs as a proportion of COGS despite increased levels of complexity. Visibility tools have also improved but systems built on old technologies lack the adaptability and flexibility of those in other sectors.

Whilst it could be considered that many of these trends have been transformative, it may be that future observers see them as a mere precursor to the root and branch changes which face the industry. VMs are directing an increasing amount of their investment towards the development of electric vehicles and varying levels of autonomy. As indicated at the beginning of the article, these issues will be dealt with in far more detail in Ti's report, Automotive Supply Chain and Logistics 2018.

## About Ti Insight

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