Auto Supply Chain in India-a mishmash of "Push" and "Pull" methods?

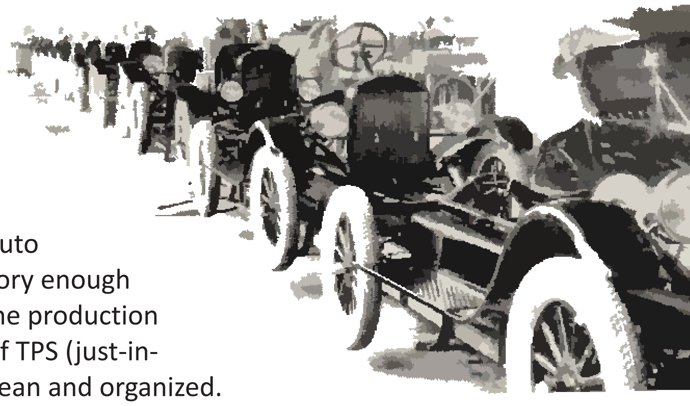
Analyze if the Auto supply chains have really implemented ***JIT*** *or* ***just-in-time*** *manufacturing principles.*

An Inspiring History

The operational practices of almost every player in the Automobile and Auto component industry are greatly influenced by the pioneering innovations of Henry Ford and Taichi Ohno. Henry Ford used space as "forced" limitation in the shop floor layout to ensure rapid flow of inventory. Piled up inventory in the allotted space, forced a cascading stoppage of the entire line, and this simple mechanism ensured that everyone focused on flow rather than just producing to utilize capacity of individual workstations. The "assembly line" concept, a simple mechanism helped Ford create a benchmark in producing the model T car – the total lead-time to produce a model T was 81 hours (from raw material mining to loading a car for dispatch). Ford was hugely successful with the model T, and became the most dominant car manufacturer during the 19th century.

Later, Taichi Ohno, inspired by the working of super markets in US, created the concept Kanban cards, which did the same magic as Ford's innovation of space limitation in an environment of large variety SKUs. The card or a physical bin (dedicated to an SKU) was an indication of quantum inventory of a specific SKU. As per the process, the card or the bin is released only when the succeeding work center consumes the quantity in the card or the bin. No one is allowed to manufacture or move inventory without the trigger of a Kanban card or availability of the bin. This ensured focus on flow (as opposed to just work center utilization) in an environment of wide variety of SKU.

The physical bins or the cards could then be used to set up a process of ongoing improvement. The plant can keep reducing the number of Kanban cards, which will in turn expose the various flow problems in the plant. Other tools and techniques were invented to ensure plants could remove the obstacles to flow, like setting up of reduction techniques, standardization, 5 s, etc. The entire manufacturing system is now famous as the Toyota Production System. It is also known as just-in-time manufacturing. The operational practices of TPS helped Toyota produce highly reliable cars yet affordable for the masses. By the late 20th century, Toyota had built a decisive competitive edge in the market. It was able to make strong inroads in the US market, previously held by the big three of the US auto market.



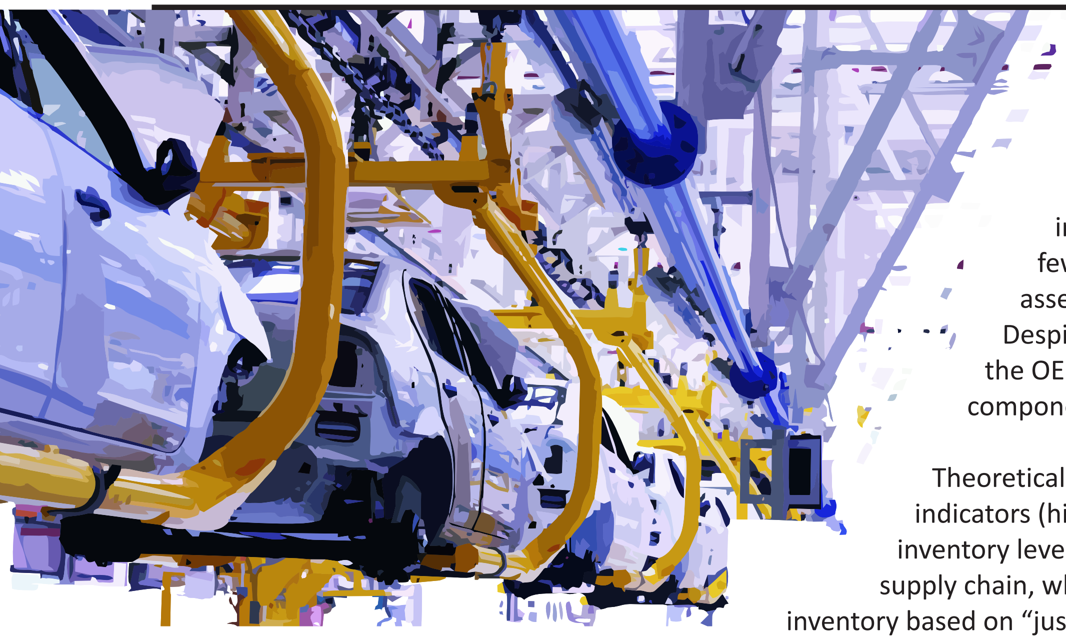
Learning from History

Most auto plants in India have some form of Kanban system or restricted bins (or restricted carriages to hold SKUs). Some plants deliberately limit space to force flow of inventory. For example, the purchase material store in many OEM and tier I auto component organizations have space limitation to carry inventory enough to cover few shifts of production. With minimal inventory on the production floor and the incoming stores, implementation of other tools of TPS (just-in-time manufacturing) like 5 s, cellular layout most plants look clean and organized. Visually, these clean plants give the impression that years of effort has gone into implementing the best of flow systems and that the auto OEMs' supply chains are very stable.

Is it really the case?

The stability of a supply chain can be gauged by two parameters – the level of expediting and the stability of inventory profile in the chain. To understand the level of instability, one needs to first appreciate the complexity of an auto supply chain. Auto plants, whether an automobile plant or a tier I component plant, are mostly assembly-oriented. Each end SKU requires a multitude of parts to arrive together for assembly. Non-availability of a single feeding part can delay the assembly of the SKU. The level of stability of a plant is directly indicated by the availability of complete kits for planned assembly schedule. Higher the kit coverage (number of days of planned production for which kits are complete), more stable the plant. Our research and experience in the Indian Auto Industry shows that most auto OEMs and component manufacturing plants suffer greatly from poor kit coverage. It is not uncommon to have many incomplete kits of SKUs at a day level, particularly for the SKUs that are being demanded immediately by the customer. Purchase managers struggle to get kits for a day. Frequent rescheduling due to incomplete kits further aggravates the kit availability problem. Purchase manager of the OEM or even the purchase manager of a component vendor is on an expediting mode throughout the day, trying to somehow get adequate kits to meet the production plan of the day. The schedules of production are not stable even for a day at times even for a shift.

Most auto supply chains in India do not have the stability of schedules. At the same time, the inventory of the entire supply chain goes haywire from time to time. For example, during every economic downturn the dealer inventory of the OEMs balloons up many times, and the reaction of OEMs for production correction usually has a significant lag (about 6-7 months of lag in production corrections). This leads to a **"bull-whip"** effect, and the inventory goes haywire for many players in the chain. At the same time, every month end the level of inventory of the auto OEM drops with a huge spike in last week dispatches.



Similar inventory problem exists with the component vendor, whose warehouses usually have a month's inventory even when they are few hours away from the assembly plants of the auto OEM. Despite having a month's inventory, the OEMs do not seem to have the component SKU they need for the day.

Theoretically speaking, instability indicators (high expediting and varying inventory levels) should not be seen in a supply chain, which is supposed to move inventory based on "just in time", only on a pull trigger like availability of space or a bin.

We need to analyze if the Auto supply chains have really implemented JIT or just-in-time manufacturing principles or is it the case of few visible "props" in the shop floor.

Limitation of space or bins makes the supply chain extremely sensitive to flow issues when the demand is widely fluctuating. Toyota has been able to deal with the challenge of deliberate limitations of bin by a process of standardization and deliberate smoothening of the demand (at an SKU level) on the customer.

But most Indian Auto OEMs has not been able to impose the smoothening of SKU demands across time horizons, and hence are severely exposed to the problem of wide fluctuation at SKU level. At the same time, changing Euro norms have increased the rate of new product introduction at a component level.

When new components are replacing old ones frequently, the number of bins have to be re-defined frequently – which in turn makes it impossible to be on a process of ongoing improvement (the baseline of the number of bins is not fixed to bring about a continuous process of reduction of bins to expose the flow problems). In this environment, strictly following bin-availability-based-production in the entire chain is nearly impossible. So they have made a compromise, used the bins to move inventory between component vendor and OEM, but not used it to trigger production at tier I vendor. If the bin is not used to trigger production, then one has to bear the brunt of high inventory. So the "solution"that most auto OEMs have devised is forced the weaker partner in the chain to provide the required protection. The auto OEMs keep inventory enough to cover few shifts of production at their incoming stores and insist their tier I vendors to keep adequate stocks at warehouses near their assembly lines. The stocks are produced not based on a pull trigger (of a bin or a card) but based on a "push" as per forecasted schedules of OEM.

The same is the case with dealers – they get inventory as per sales targets of OEMs. It is not aligned to the actual rate of secondary sale. Most auto OEMs in India do not have a Kanban system for inventory movement between dealer and the OEM as the demand fluctuations across time horizons for an SKU is high, and they have not been able to enforce smoothening of SKU demand on the market.

An ineffective connotation of Push and Pull
As a result, most auto supply chains turn into botched up combinations of a push system with few "visible" elements of pull system mechanisms in restricted locations of the supply chain. Tier I and tier II vendors operate on forecasted schedules provided by the OEM every month. Due to plant scheduling and material

planning based on a monthly or a weekly forecast of the OEM, the vendors' ability to respond quickly to OEMs' daily production plan changes is restricted. Therefore, they fail to meet changing requirements at a daily level. Many auto component vendors analyze their performance based on initial monthly plans of the OEM and give themselves high marks. At the same time, issues such as rescheduling, search for missing components and daily expediting requests remain on the problem lists of both the OEM and the tier vendor.

The way forward

How does one improve the auto supply chain? Most OEMs and auto component vendors have an ineffective supply chain where inventory at finished goods level is many times higher than inventory of the incoming component level. This is despite the fact that the component level holds highest form of aggregation (same component can be used across many end SKUs). It is not uncommon to find that components required to complete an SKU are missing while the same component has already been used up in an SKU that is not likely to be dispatched in the near future. One can argue that the same component could have been used to produce what is required rather than produce what is not required. If one can reverse the inventory pattern at OEM, an OEM stands to gain a lot without changing the way all tier vendors work.

We know that an auto component vendor has already invested in space for maintaining buffers for OEM. So, if we are able to have the right inventory profile at a daily level, then an OEM can still enjoy low inventory of component while having good availability of the feeding components.

If one wants to move an entire auto supply chain from push to a pull system, implement **just-in-time manufacturing** in its true sense, the best place to start is the demand side of the auto OEM. We can reduce the demand spikes from dealer level by moving inventory from the OEM to the dealer only based on consumption and not as per a sales target. Consumption-based movement also requires one to hold higher aggregated inventory at the central warehouse, as compared to the dealers. Production at the OEM can also be based on consumption from the warehouse and not on the sales forecast. Pull-based planning along with a periodic process to change the inventory norm based on changes in the observed sale rate (as compared to supply rate) can help auto OEMs to practically implement pull systems without having to resort to forced smoothening of demand at SKU level on the customer.

When one OEM changes over to pull-based movement of inventory at the dealer level, the immediate impact would be better smoothening of load on the plant and subsequently on the multiple tiered component vendors. *(This article does not get into details of how a pull-based system can be implemented at the OEMs, this is subject for a separate article. The focus of this article is component vendors).*

In the current paradigm of push- based functioning, most auto component vendors are expecting improved forecast accuracy from the OEM as an answer to the puzzle. The OEMs, however, believe that component vendors need adequate capacity buffers to absorb any kind of variation. Is there a way out of this conflict?

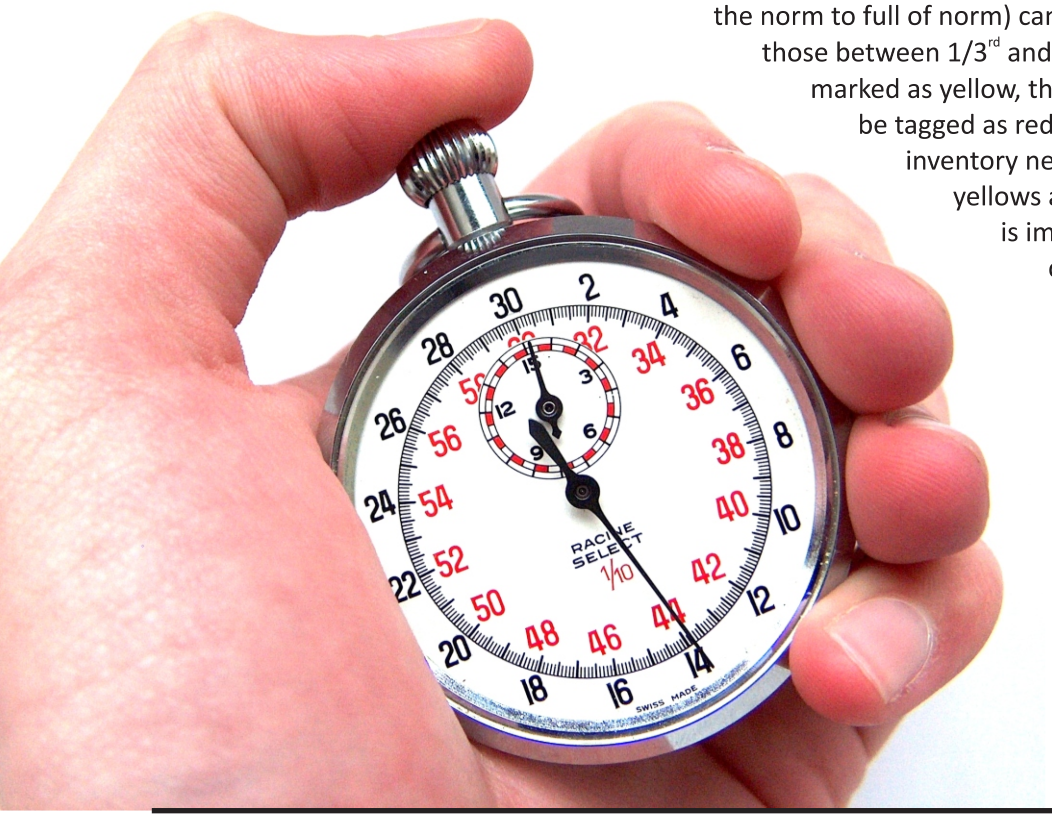
Forecasts can never be accurate at a component level – the OEM's component requirement is dependent not just on the vehicle offtake forecasts but also on the impact of production schedules changing due to incomplete kits. It is nearly impossible to mathematically model the vicious loop of rescheduling decisions to find out the forecasts for the component requirement with any reasonable accuracy. So, the only way out for component vendors is to shift from push-based production to pull based production, even though one has a monthly schedule of offtake from the auto OEM.

So, instead trying to adhere to a monthly schedule provided by the OEM, they need to produce to actual off take from the warehouse. To cut down on disruptions in the plant at a daily level, they need to have a buffer level which protects them from maximum consumption during supply lead-time. Consumption from the buffer level (or the norm level) can be the trigger for daily production. The norm level is the artificial lock – no one is allowed to move inventory or produce above the norm (like use of space or reacting to Kanban cards).

However, if supply lead-time is high, the level of demand spikes imposed on the plant is high. To minimise the impact of spikes, it is important to reduce the supply lead-time. Most auto component vendors actually have short production lead-time but the supply lead-time goes up due to unavailability of various feeding components (procured from tier II vendors). The problem is aggravated by lack of adequate space at the purchase stores. There is a need to have adequate space for ensuring good availability of feeding components. The feeding component inventory (of tier II vendors) should be enough to accommodate the demand during the supply lead-time of feeding-component. Procurement triggers should not be based on forecasts but on daily consumption. Once adequate inventory buffers are available for the feeding component (incoming components from tier II vendors), the supply lead-time for component of tier I vendors comes down.

The level inventory for incoming feeding inventory can go up in the short term, but the finished goods inventory can come down dramatically – there should be net reduction in total supply chain inventory for the tier I vendor. Once all sub-components are available on a daily basis, the ability of production to respond to changing requirements is greatly enhanced as the spike gets smoothened too.

Since the offtake at the component level will vary, the level of available inventory at finished component warehouse of the tier vendor will be different as compared to the buffer level. For example, on a daily basis, some SKUs will have low stocks compared to the norm while others will have high stocks. The level of stocks as compared to the norm can be used as a priority system for production and dispatch. An SKU with actual stocks closer to the norm (between $2/3^{rd}$ of the norm to full of norm) can be tagged as green, while those between $1/3^{rd}$ and $2/3^{rd}$ of the norm can be marked as yellow, those below $1/3^{rd}$ of the norm can be tagged as red. SKUs that are at red level of inventory need to be prioritized over the yellows and greens. The priority system is important, as reacting to consumption of even small quantities might be difficult due to set up and other production considerations. The color system gives plant flexibility to take decisions on production. The same color system can be used to understand if sales rate is higher than supply rate and can be used as a trigger to change the norms. *(Ideally, in a stable system, most SKUs should stay in the yellow zone).*



The same color based priority system can be implemented for feeding components to the incoming side. One can work on a process of on-going improvement by helping suppliers (tier II vendors) to reduce their supply lead-time, which in turn will reduce the level of inventory at the tier I vendor. Our experience of implementing the above system over a one-year period has shown that the total inventory turns can be improved from an average of six rotations in a year to about 18 in a year. But this requires sustained effort with a partnership-based approach to help each tier II vendor to improve his lead-time. It is important to build win-win partnerships with vendors and let go of the promiscuous relationship based just on price reductions.

As they say, win-win and lose-lose are the only practical possibilities in every relationship. Win-lose is just a temporary phase which deteriorates to lose-lose within no time. So the only way to ensure Win for us is to ensure the Win for the other party in relationship.