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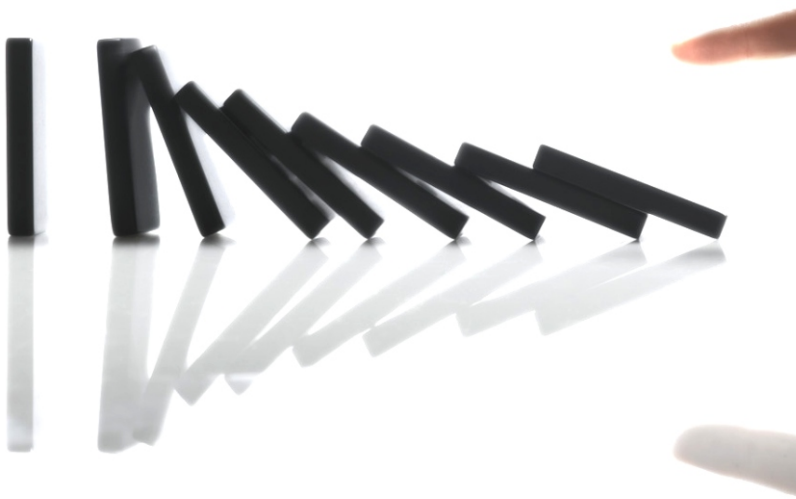
The Cascading Effect!

Managing New Product Development Projects in Auto Component Industry



by **Abhijit Jha** and **Satyashri Mohanty**

With the rising consumption power of the population, the Indian automobile market has grown leaps and bounds in the last two decades. The choice set available before an auto customer has grown many folds. For example, three decades back Indian car buyers had just two models to choose from. Today there are at least 100 models of passenger cars available in the market. The same growth story is there in other segments like two wheelers or even the commercial vehicle segment.

The growth in choice set is primarily fuelled by the entry of many OEMs in the market. With each player launching new features and models, the others in the market try to match it and at same time react with their innovative features. This has led to a spiraling growth in launches of new models and re-launches over the last decade. Consequently, the pressure to increase the rate of new product launches has gone up dramatically for almost every player in the business. At the same time, the need to react to competition is an added pressure to reduce the overall lead-time to launch a new product.

The Approach of OEMs to manage the challenge

While on one side, there is increased pressure to reduce overall new product development lead-time, on the other hand, the reliability of delivery and lead time of key vendors like tooling has not improved over the years. Yes, there are few cases of extra-ordinary efforts to crash lead-time, but the perception of new product development managers in OEMs about vendor performance and lead-time has not improved over time. *(In the mind of development managers, the perception of vendor lead-time is always guided by typical experience and not by one of extra-ordinary event).*

As a result there is increased pressure to complete designs as fast as possible to give vendors adequate time. This has forced Auto OEMs to introduce more unplanned “concurrent working” in their projects. Most of the time, it is initiation of work without necessary stage gate approvals and specs in the hope that changes will be minimal or negligible. So there are cases of tooling design of some components starting (at times even corresponding castings initiated) while the stage gate of design integration of complete assembly is not over. Similarly, at times, designs of assembly line automation start before the corresponding component design is finalized. This triggers a cycle of “vertical rework” where the designs of supporting tools and machines for a specific component design undergoes a rework. At times, the vendors who are supposed to develop tooling and machines for a component also request changes in component design to ensure manufacturability. This adds to the loop of “vertical rework”.

With many components having interfaces with each other in the final assembly, changes in one also triggers “horizontal rework” with other interfaced components and their associated vendors. So instead of gaining on time, this way of unplanned concurrent working triggers a cycle of design iterations and frequent rework of both kinds. It is not uncommon to detect interference issues very late in the development process, which in turn, at times, leads to rejections of tools with development starting all over again.

One of the key challenges of such unplanned concurrent actions, wherein a resource group hands over incomplete work to a different group to trigger an early start of subsequent tasks, is keeping a memory track of the remaining work. Such actions are always taken under pressure of time but when the successor work starts, even with incomplete information, the pressure of supplying remaining information reduces dramatically for the resources supplying the initial work. If such resource groups have other urgent work packets to be attended, they usually forget about the remaining work, till it becomes a fire. So when they attend to the remaining work, further rework is generated due to pressure of time.

The sharing of resources across projects and uncontrolled concurrency aggravates the rework and iterations as resources lose track of the pending work on tasks passed over to downstream departments.

Many Auto OEMs intuitively understand the problem and try to deal with the problem with cross-functional dedicated teams for each project, which continue to work till the start of production. A dedicated team has better control over such unplanned concurrent working than a multi-project environment where resources are shared across projects.

The Effect on Auto Component Vendors

While the Auto OEMs can afford the luxury of cross-functional dedicated teams for every project, most vendors cannot afford to have dedicated teams.

To get the best utilization of critical resources, they have an environment of multi-project where resources are shared amongst different projects. Shared resources with different customers driving their own priorities for their respective projects, create an environment of potential conflicts. The source of such conflicts is the frequent requests for expediting, coming from different OEM customers for an auto component vendor.

In order to understand the source of frequent expediting requests from OEM, we need to understand the flow of NPD process in OEM and their impact on component vendors.

Most new vehicle development projects, at OEMs, starts with a clay model followed by a computer based 3D model to check interferences, usability of standard parts and validation of overall costing.

Out of many parts going into a vehicle, there some which are designed by the OEM (like outer panels), while others are designed by vendors (like engine parts). The designs supplied by each of the vendor has to be integrated with other designs to check for validity of assembly and cost targets. This process involves several iterations to get the combination right. For example, in an engine, this could involve creating/validating an assembly from designs of about 50+components. Getting the right assembly at the target cost is about selecting the best combination from multitude of possible alternatives. Interactions with multiple different component vendors (and multiple vendors for the same component) for getting designs, coupled with the need to integrate and meet the specs and cost targets can lead to a situation where, at times, the final 3 D model can get over soon and in many situations, it might take many weeks for finalization. As a result, for an individual component vendor, he would get a phase of highly varied period of interruption before he gets a feedback on his design model. He may get a feedback almost immediately or maybe after months.

Similarly the order for the next stage, a prototype (done for many vendor designed parts) may come immediately or at times, after many months. Even the proto, which is supplied, may call for a rework, which in turn may also come after many weeks/months or maybe the very next day. The gap between a valid proto and the order for pilot lot of components may also vary widely due to the same reasons.

The interruptions and the variability of interruption between phases, forces the auto component vendors to keep many projects open at any point of time. Over the last decade, the number of open projects are increasing at an alarming rate, as each OEM is simultaneously managing many new products to take care of the increased load. Many open projects, with each project entering into a dormant phase(as perceived by the auto component vendor) and then suddenly moving to the same or next phase, followed by another dormant phase create an environment where resources are continuously shuffled. When a project enters a dormant phase for a long time, the level of urgency also multiplies by the time the project re-enters the active phase, as the auto OEM always tries to maintain the same start of production date as conceptualized initially. So the priority system that works for auto component vendor is “who shouts the loudest.”

Consequently prolific bad multi-tasking of design resources is almost an industry norm. The situation is worsened by the iteration of designs till the integration phase; actual vehicle fitment trial with proto samples. Once the design validation phases of many projects are delayed, the rule of emergency creeps and frequent priority changes are also inevitable for vendor development resources for tooling development phase, that are also supporting different component projects.

In an environment of continuous fire fighting, and the pressure of time, the auto component vendor also adds fuel to the fire by taking short cuts. Designs are started without complete understanding of customer application area. At the same time, the designs are handed over to the development team without complete understanding/evaluation of manufacturability. At the same time, incomplete designs are passed on to the vendor. The frequent priority changes create further de-synchronization of various parts and overall assembly is always found waiting for some or other part, which in turn is then expedited creating de-synchronization of parts supplied to other projects. At the time of testing, it is not uncommon to find a product failing to meet specs. Then design and development starts all over again on fast track, which in turn delays the other projects in the system.

Pressure of time is very high by the time project enters the last phase of start of supplies. Under the, pressure, at times, the component supplies are started without solving all teething production and quality problems. Production takes over components, which have still not stabilized, which in turn wastes the production capacity. The component vendor also takes a huge risk on warranty costs due to some teething quality problems pending with the component supplied to OEM. Loss of production capacity and unreliable

supplies puts the auto component vendor in a loop of continuous chaos and conflict between regular production managers and those involved in new product development. The pressure to deliver the next project, keeps many such non-stabilized components in the production system where the project work is still not perfectly complete.

Is there a light at the end of the tunnel?

At first sight the situation looks hopeless for the component suppliers. Is there any way out of this mess? Are the reworks and capacity wastages solely due to the OEMs? Does the way the suppliers manage their own projects, under the above circumstances, deteriorate the situation further?

For answers, we need to understand what an Auto component company can do and what it cannot do.

What an Auto Component Company cannot do?

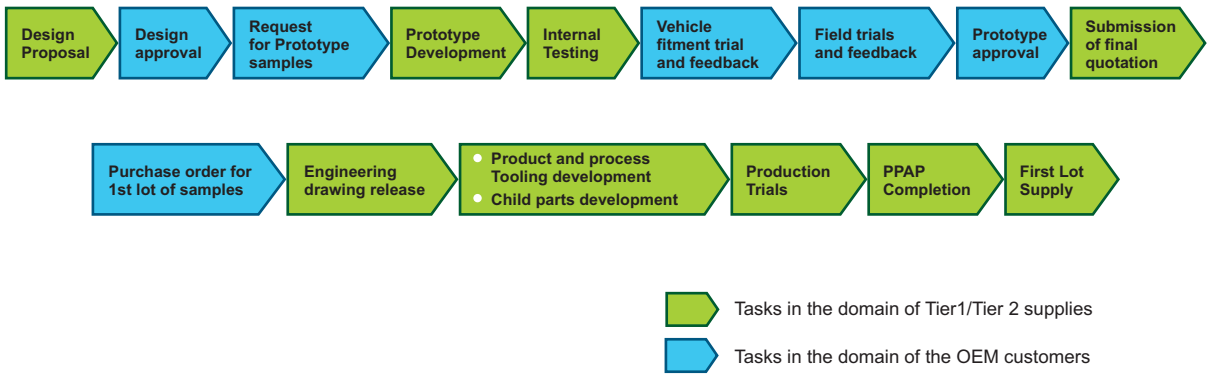
Auto component companies cannot influence the interruption time between phases of the project. The progress of component projects depends on the interim milestones set by the OEMs, Suppliers cannot do anything other than subordinating to that pace. *(If they do not subordinate to the pace particularly in the initial phases of the project, they may be out of contention for the new part).*

So there is a portion of the lead-time, which is clearly outside their locus of control. At the same time, there will be requests for rework on some phases, which is primarily triggered by the OEM's way of working. An auto component vendor should be prepared to meet the urgent requirements of auto OEMs without falling into the trap of frequent priority clashes and associated bad multitasking which actually delays every other project in the environment of component vendor.

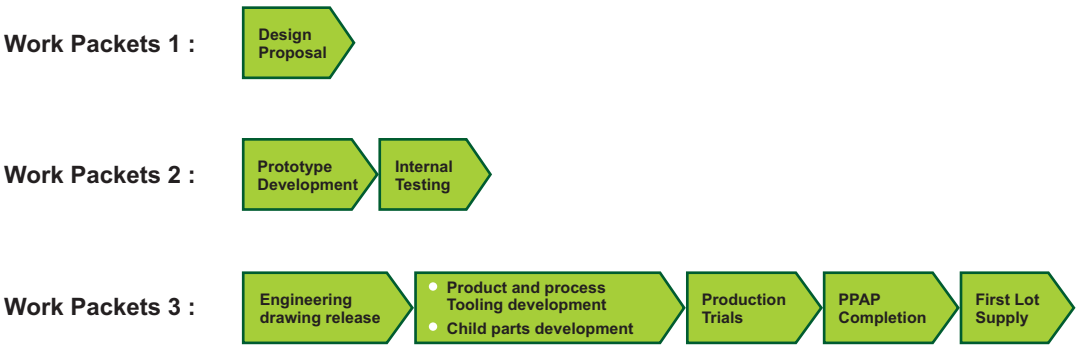
What Auto Component Company can do?

Auto component can however speed up a portion of the component project, which is within their locus of control, and at the same time, can minimize their own internal generated rework. The various independent work packets can be conceptualized by understanding the overall flow of new component development project both in the OEM and the Component vendor organization. The flow is as given below. The various independent work packets are as given below:

Typical project plan of a new component development



Definition of work packets



An auto component vendor has to decouple itself from the issues of OEM's and still deliver a fantastic service. The way to do it is achieve the following two objectives for the delivery of the independent work packets to OEMs

1) Dramatically reduce the lead time of independent work packets (almost more than half of current levels)
2) Reduce the queue of waiting work packets dramatically(by about 1/3rd of current levels) and always maintain the queue at that level.

The above objectives requires an ability to produce more than the current levels with same set of resources.Output of more packets results in less waiting time for new requests from the Auto OEM customers and at the same time, lower lead times for the independent work packets improves the chances of auto component companies getting the new component business.

How can we get more out from same resources?

The only way we can get more out from same resources is by nearly eliminating the significant wastage of time and capacity in NPD projects. One of the source of significant capacity wastage is the frequent priority changes and associated environment of bad multi-tasking. Bad multitasking forces multiple switches of tasks which in turn leads to set up losses as well as rework as each switch is likely to cause errors when one returns to complete the left over tasks. Each switch also adds up to the waiting time.

But we know that reason for such priority changes are urgent requests from customers, so how can we ensure a stable priority system?

When there are frequent priority shifts based on perceived level of “urgency”, the unwritten rule for getting work done is also about managing the perception. In such an environment, there are many requests with “false” signals of urgency both from within the auto component organization and even at times from managers in OEM NPD environment.

The first step to eliminate the switching costs due to frequent priority changes is to take all open independent work packets and prioritize them and form a queue in front of key resource groups like design and vendor development. Based on the capacity, we have to limit the number of open work packets at any

point of time. All other work packets have to be frozen. Once one work packet is completed, the next one from the frozen list (and then the new list) enters the active zone. This will reduce the bad multitasking substantially. The ones, which are outside the active zone, can be shuffled for priority issues; but the ones inside the active zone have to be finished to take the next one in, from the frozen or the new list. A master scheduler has to be appointed to ensure such queuing is set in place. Every stakeholder inside an auto component organization has to understand the paradigm to ensure that "false" priority signals are not generated and priority is as agreed by the entire organization. Once this step is implemented the output goes up significantly and within no time, the pending load from waiting or the inactive list starts dropping dramatically. Once the backlog reduces the pressure to manage OEM urgency reduces dramatically.

Even after implementing the WIP rule (the rule of limiting the number of work-in-progress tasks or independent modules), there is a chance that active work packets are interrupted due to the lack of information/ drawing/ documents/ approval etc. from internal and external sources, leading to waste of capacity of valuable resources. Hence, it is important to implement a full-kit rule simultaneously, where the resources are allowed to start work on a particular work packet if and only if, the full-kit necessary to start and complete that work packet is in place in advance. At the same time the criteria to end the work is also defined. The department heads or leaders should only certify whether the full-kit and exit criteria of a particular work packet are followed properly. The concurrency, if any, is predefined and not violated in execution at all. This is crucial as auto component vendor are in a multi-project environment. They cannot do the unplanned concurrency as is done by the auto OEMs, where resources are mostly dedicated to a project.

The key control points for component vendors are the starting of design and handing over of design between design department and the vendor development department. One of the important full kit points to start design is a clear understanding of the application engineering. Similarly the handover of design between vendor developments has to be in full kit after checking all aspects including the manufacturability. The resources ensuring the preparatory of the upcoming work should also be separate so that multi-tasking does not creep in, in the name of ensuring full kit. Maintaining a reduced work-in-progress rule, releases capacity to create a separate preparatory team.

Once these two simple rules are implemented, the amount of chaos in the system comes down drastically and excess capacity is revealed. Implementing of the above two steps usually results in an output increase of close to 3 to 4 times of original output. Within a short time, the queue of the frozen work packets in front of most of the resources reduces and then the rate of output becomes much higher than inflow or work. The waiting queue comes down dramatically. The NPD team of auto component vendor is then ready for processing any rework/ change request at the shortest possible time. OEM can come up with any urgent request of design proposal or prototype sample or PPAP supply at any time, and it is serviced very fast to their satisfaction (due to minimal waiting time).

With such experience, OEMs will start preferring a vendor more than others and very soon, the load of new product development can go up. The waiting work packets can go up significantly and lead time experienced by the OEM may again deteriorate. The system is likely to collapse when OEM starts expediting their projects and forcing activation of their projects, forcing the auto component vendor to open more WIP than the stipulated norm. Very soon the system will collapse to the old environment of bad- multitasking. In order to prevent the chaos from repeating, it is important that waiting queue should not go up beyond a level regardless of arrival rate of new work from OEMs. This means that auto component vendor should be ready for the next jump in output before the pending queue starts growing.

What can be the next jump? Just implementing a system, which forces some stability in priority system, can help in getting a significant jump in output by preventing the associated losses of forced switches and

rework. Once resources are not shuffled around, we can get more from them by having an execution system, which provides early warning signals for issues interrupting flow of active work packets.

How do we do that ? It is time to write a sequel to this article.