

Enhancing Supplier Accountability in Automotive Spare Parts Division

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ABSTRACT

Automobile manufacturing firms rely heavily on their suppliers for timely production of vehicles. Hence, the ownership and responsibility of the suppliers' delivery to the firm increases. However, following the 80-20 rule, suppliers too tend to cater to the firms that give them a fair share of business, along with a continuous flow. Some suppliers are able to adhere to these norms of providing the parts the purchasing firm demands; however, several are unable to do so. The issues of line stoppage, delays, and non-conformance of production arise because of delays, deficits, and no-show of critical parts. Thus, many firms not only resort to the ABC (Activity-Based Classification) of parts to test their inventories, but also classify their suppliers on a similar categorisation, depending on several parameters of deliverability, quality, and costs. This paper aims to highlight the poor performing suppliers' reasons for poor performance, and suggests several solutions for improvement, after performing a historical analysis and performing gemba. The short-term solutions of alterations in plans and vendors allow room to achieve 100% delivery from the vendors, while long-term solutions of system ERP requirements allow management intervention to seek system software that eliminate non-value added (NVA) activities that are manual and are moved to an ERP system instead.

Keywords: Spare Parts Division, Product Lifecycle, Vendor Opportunity Loss

INTRODUCTION AND LITERATURE REVIEW

Procurement officials are at the mercy of their vendors when it comes to purchasing a smaller quantity of parts, as vendors consider this a small and thus negligible share of business. This is a key criteria of opportunity lost at production, and thereby, a possible sale. It is also a key loss for the vendors if cumulatively checked in terms of lost monetary revenue flow. Thus, OEMs continue to purchase excess parts, thereby causing higher build-up of inventory, or struggle to negotiate with vendors on the minimal quantities. This is particularly a scenario viewed in the spare-parts division of a firm, wherein smaller quantities are required, and in some cases, parts are bought and kept for a longer duration for fear of obsolescence leading to unavailability. Zhang, Huang and Yuan (2021) discuss the "right to repair" and with its awareness, customers choose to repair rather than purchase a new product. Products such as electrical appliances, white goods, and vehicles fall under this category so manufacturers have begun to plan the inventory of these products' spare parts. While its availability has to be ensured, even the holding costs have to be reduced. Thus, spare-parts divisions are taking a rapt interest in their planning process for procuring these parts, especially for those that are non-standardised and not available locally. Standardising parts at large not only

ensures lower holding of inventory and similar designs of products, but also allows room for maintenance, without the headache of procuring a special part or keeping a specific part in production for a longer than required duration. This is further discussed in the white paper by Ananya Pritam Gogoi (2018). Internationally sourced parts with longer lead times require the SPD purchaser to plan well in advance and also hold some inventory in case of emergencies. Part availability at an SPD is proportional to the customer's satisfaction level after sales. Thus, Zhang, Huang and Yuan (2021) discuss the different planning techniques. This paper looks at the product lifecycle of a 4-wheeler in India, followed by the categorisation of critical parts vendors on the basis of their past performance, with a key parameter of delivery reliability. Analysing the reasons for non-adherence to scheduled parts delivery leads us to the root causes of constraints that the vendor and purchaser experience on a regular basis. Correlating these findings with monetary losses for the vendor is used as a bait to ensure that even those vendors with a smaller frequency of order cycles can be made to address the importance of the client and the purchasing quantity, thus leading to a smoother purchase.

With major advancements in technology and product modifications, there are certain assemblies and parts

that become obsolete, and are therefore not procured for the manufacturing of vehicles. However, the stop in production does not imply that the vehicles which were already sold are not functioning or banned for usage. Hence, at customer service points these vehicles' spare parts are to be made available, the sticky wicket being, that since production has stopped, the quantity of procurement reduces drastically. Additionally, the demand for these parts is staggered and dependent on how soon the vehicle is nearing its end of life or in cases of accidents. This makes it a constraint for the firms to procure the parts in a timely fashion, as the supplier would focus his energies towards producing those parts that are voluminous and continuous in nature. With the negotiating muscle at the suppliers' end, the firms' procurement specialists face constraints of no receipt of items to low quantities against the desired requirements. Ensuring a reduced lead time and also procurement time, Shrehari and Srinivasan (2017) describe the need for lead time reductions and define the methods for the same. While spare-parts divisions would function differently, the need for time reductions and reducing opportunity loss remain a key factor for business operations. Therefore, as discussed and highlighted by Vargas and Cortes (2017), the planning method, as well as a need for Minimum Order Quantities (MOQ) are paramount, even in an SPD. The selection of MOQ is briefly mentioned in Cheng, Choi and Chow (2012) to ensure quick response supply chains. The following

section describes the interactions of the customers with the SPD during its entire lifecycle, thereby amplifying its importance in customer satisfaction and the role the purchaser plays.

PRODUCT LIFECYCLE MANAGEMENT APPROACH TO A 4-WHEELER

Stark (2015) discusses the need for an effective way to capture a product's lifecycle. PLM or Product Lifecycle Management is used to capture a product's journey from inception to its death, or simply put, from its ideation to its dis-use/discardation/obsolescence. The first novel attempt undertaken is to capture a vehicle's product lifecycle with a viewpoint from the vehicle's ideation, and its impact and interaction with the SPD, to its obsolescence/dis-use and the parts availability thereafter in the SPD for other similar vehicles. This is encapsulated over a period of ten years, and viewed from the customer's point of view and the analogous interactions with the SPD. The product's state is accordingly categorised as in use/over-used, or not in use. For the sake of simplicity, to ensure the SPD's role persists, the paper has eliminated disuse as a state; however, the same is mentioned in the interactions. Stark (2015) highlights what the product lifecycle management system is and where to use it, while several other papers also discuss its servitisation.

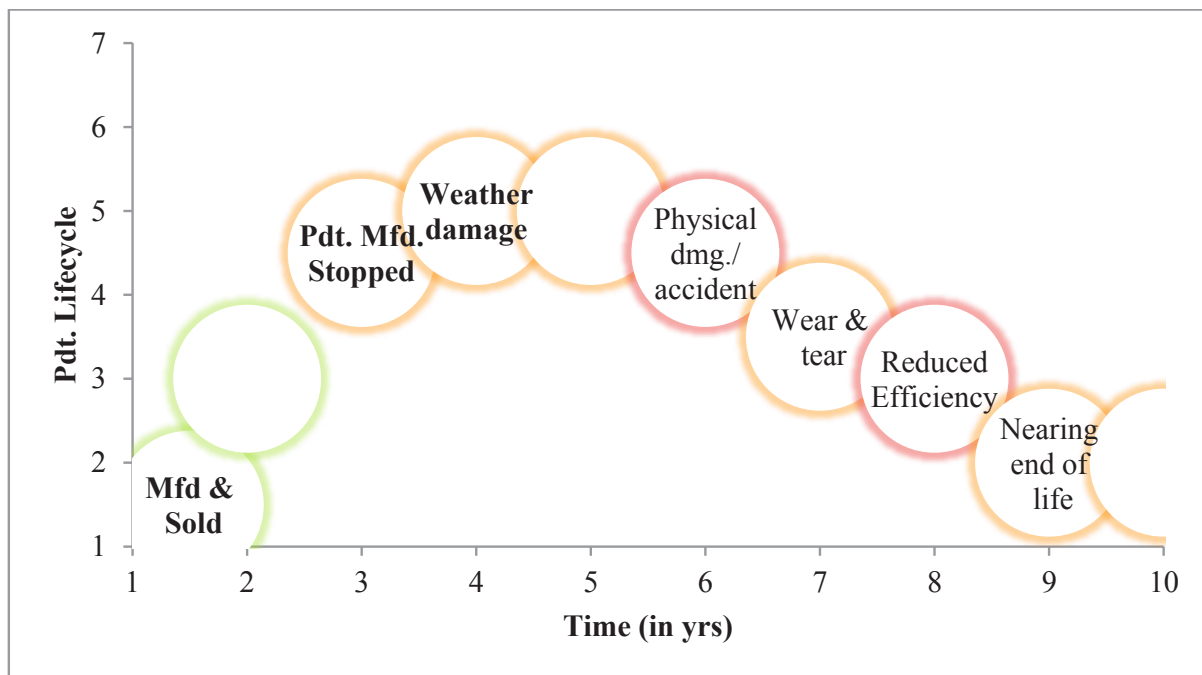


Fig. 1: Product Lifecycle

Table 1: Product Lifecycle and Product's States Year-Wise

Time	Product	Customer	SPD	Product State
1	Manufactured and sold	Bought		Used
2	Undergoes maintenance	Sends for annual maintenance	First interaction	Used
3	Manufacturing discontinued	Continues to use	Receives excess parts from firm	Used
4	Undergoes weather damage	Visits SPD	Sends damaged parts	Used
5	Half-life	Sends for annual maintenance	Procures extra parts for products. That would be ending their lives	Used
6	Meets with an accident	Sends for servicing and maintenance	Sends replacements for damaged parts	Used
7	Undergoes wear and tear	Sends for annual maintenance	Changes parts, if any	Over-used
8	Efficiency reduces	Sends for annual maintenance	Procures extra parts for products. That would be ending their lives	Used
9	Reaches end of life	Sends for annual maintenance	Procures extra parts for products. That would be ending their lives	Used
10	Discarded	Sold at second-hand store		Used

Fig. 1 and Table 1 capture a glimpse of a manufactured 4-wheeler’s product lifecycle in India. It also depicts the interventions by the SPD and the interactions of the customers with the SPD indirectly by visiting after-sales service centres and receiving the replacement of parts, or purchase of parts when it is rendered damaged or reaches its end of life. While the product can be re-sold by the user any time during the entire product lifecycle with/without

the knowledge of the manufacturer, it is kept out of scope for this particular research.

This paper aims to explore the practical challenge of procuring parts by a Spare-Parts Division (SPD) where the SPD contributes to a very small portion of the share of business for the suppliers, among the suppliers’ clientele.

PROCESS OF PROCUREMENT IN THE SPD

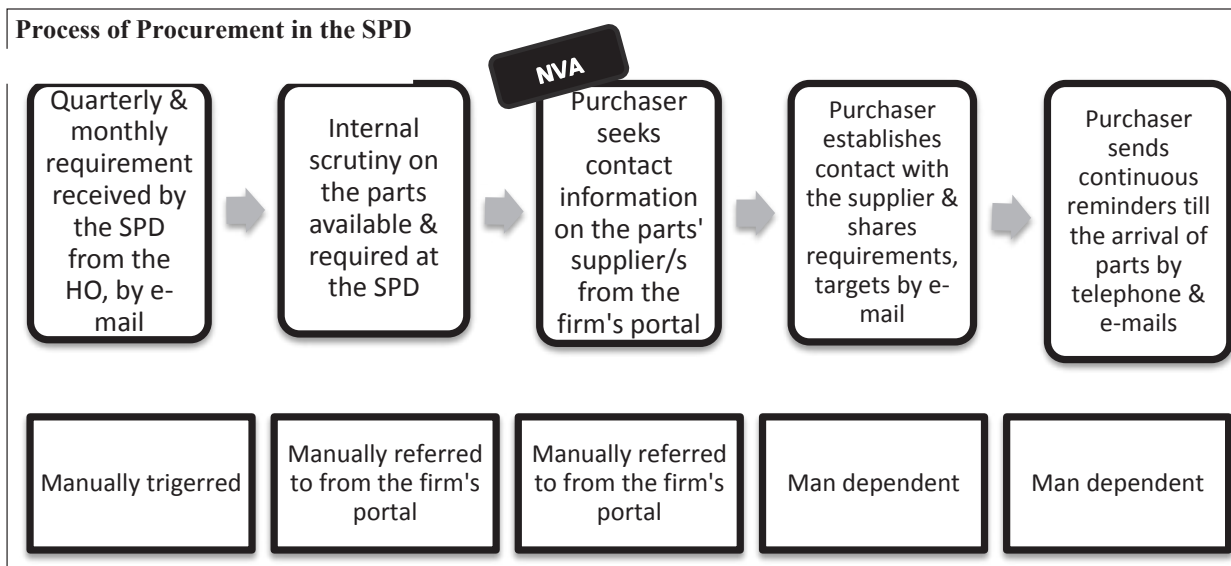


Fig. 1: Procurement Process Flow in SPD

SUPPLIER SELECTION

The firm has an internal categorisation of suppliers on the basis of the firm’s business share (monetarily), the quantity

of parts, the suppliers’ capacities, and their past performance on their quality and timely delivery. This categorisation terms suppliers as A, B, C, or D, with A being the best suppliers, and C and D requiring areas for improvement.

Research Scope: For this study, C and D category suppliers were selected, with their past three months' performance as historical data. Five suppliers were selected, along with the required quantities' schedule for the month of July, 2014.

Table 2: No. of Parts Required by SPD from C & D Category Suppliers and their Contribution (in %), for the Month of July, 2014

Sr. No.	Supplier Name	Quantity of Parts Required (in No.)	% Contribution for July 2014 against Total Quantity of Required C & D Category
1	AE	30	31%
2	PPP	22	23%
3	PD	20	21%
4	SE	17	18%
5	SMA	07	7%
Total		96	100%

Note: The suppliers supply distinct parts for different rates; for the sake of simplicity, the total parts are populated.

It can be observed following the Pareto analysis that a crux of the contribution lies between the four suppliers, purely on the basis of the quantities.

Objective: To procure 100% parts from C & D vendors for the month of July.

RESEARCH METHODS AND ANALYSIS

Primary Research

Past Data Analysis

Historical data of the required quantities against the deliveries made were collated and analysed for the months of April, May, and June, 2014.

Table 3 captures the business impact of the opportunity lost because of a deficit or non-delivery of parts obtained by the purchaser from the C & D category suppliers. As observed in the Pareto quantity-wise from Table 2, Table 3 depicts an interesting finding of the impact due to the monetary value, i.e., the rate of the parts. It can be observed here that the rate of parts manufactured by the supplier SE are the highest, with the parts required falling in second place. It can be easily noted that the priority differs for a supplier against that of a purchaser, and hence, there is a difference in reliability and delivery of parts. Naturally, the highest loss for a vendor would be the highest rate and highest quantity, as seen, which is the SE supplier.

Table 3: Vendors' Business Impact

Sr. No.	Supplier Name	Quantity of Parts Required (in No.)	Quantity of Parts Delivered (in No.)	Avg. Rate of Parts (in INR)	Vendor's Business Impact (in INR)		
					Anticipated	Actual	Lost
1	AE	23	0	3,422	78,706	0	78,706
2	PPP	52	22	15,047	7,82,429	3,31,034	4,51,395
3	PD	24	06	14,843	3,56,230	89,058	2,67,172
4	SE	51	07	1,27,983	65,27,129	8,95,881	56,31,248
5	SMA	19	0	5,491	1,04,323	0	1,04,323
Total							65,32,844

Fig. 3 depicts the supplier's loss as encapsulated in Table 3 by means of analysing historical data. Major losses are encountered by SE and PPP, and thus, once purchasers make the vendors aware of the opportunity lost in non-adherence of deliveries, they will be in a position to rectify, prioritise, and cater to the delivery plans that the suppliers have shared and chase. As re-affirmed by Vargas & Cortes (2017), the planning horizon and methodology

are key in streamlining business efficiencies. The paper also discusses the need to address opportunity losses. While planning methods are a sophisticated solution and the next step in ensuring an A supplier performance, kaizen and root cause analysis would first yield several simple solutions to constraints, which would later be a stepping stone in arriving at a planning mechanism and time duration.

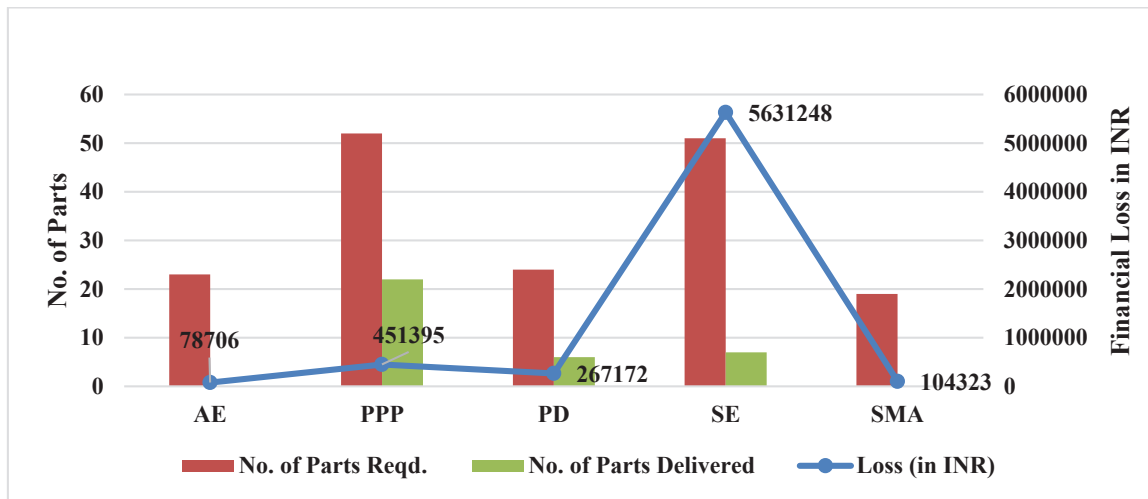


Fig. 3: Supplier’s Financial Loss due to Deficit &/or No Delivery of Parts

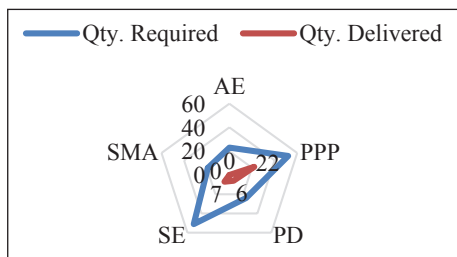


Fig. 4: Variance in Qty. Req’d. and Qty. Delivered for all Suppliers

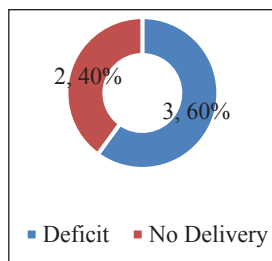


Fig. 5: C & D Category Suppliers’ Non-Adherence to Delivery Plan

Fig. 4 and 5 re-affirm the belief of differences in the required and actual parts received at the purchasing firm’s end. With a positive correlation of 0.788, while there is a relation between the actual and required parts, an ideal state would require them to be a positive 1 to achieve the same further root causes needed to be dealt with. All C & D vendors have a deviation from the required parts, unlike the A category. To achieve that status the purchasing firm, as well as the vendors, need to address the constraints.

Correlations (+0.998) show higher the rate higher the loss, and high variance between quantities ordered and received. About 40% of the parts were not delivered and 60% were deficit, as concluded from the pie chart in Fig. 5. None of the C & D suppliers were able to meet the requirements; hence, they were rightly categorised as C & D suppliers by the purchasing firm. It was also found that one vendor had stopped business and was insolvent; therefore, there was no communication, as well as an implied result of no parts being received.

Vendor Visits

- Performing a gemba at the suppliers’ end and conducting meetings with the suppliers led to positive responses, as well as an understanding of the root cause of the lack of desired quantities and timely deliveries.
- As observed in Table 2, the maximum contribution of parts to be procured from C & D category suppliers for the month of July, 2014, was AE, with 31% as the contribution.
- Some parts that AE supplied were used for international business, and hence, if required would contribute to a longer dispatch transit time, making it a critical supplier.
- However, despite repeated attempts to establish contact with AE’s representatives via e-mails, telephone, and personal visits, there was no response from their end. This inaccessibility was increasing the delays for prioritised requirements in the international business of the firm.

Independent meetings with the procurement and purchase managers brought the following constraints to the forefront with respect to untimely deliveries. The internal

constraints were broadly categorised under four heads: data sanitisation, process, financial, and intangibles – morale.

Table 4: Purchasing Firms' Constraints (Root Cause Analysis)

Sr. No.	Category	Nature of Constraint	Operational Impact	Business Impact
	Data Sanitisation			
1	Incorrect e-mail ID to which the communication of required parts are sent to the supplier by the buyer	Non-value added activity of searching for the correct point of contact and establishing communication	<ul style="list-style-type: none"> Time wasted in searching for the correct e-mail ID New employee may not know whether it is correct/incorrect, leading to further delays in procurement 	<ul style="list-style-type: none"> Internal part information may reach incorrect department/personnel, leading to the threat of data misuse and compromise
2	Supplier has discontinued the production of a part; however, the firm's portal still enlists it as the supplier	Non-value added activity of searching for the correct supplier and establishing communication	<ul style="list-style-type: none"> Time wasted in searching for the correct supplier for part procurement New employee may not know whether it is correct/incorrect, leading to confusion on delivery, as the former supplier may ignore the requirement while the purchaser may be anticipating the parts' delivery unless informed, or experience a zero delivery 	<ul style="list-style-type: none"> Internal part information may reach incorrect department/personnel, leading to the threat of data misuse and compromise Impacts the customer service for not being able to arrange a part
3	Incorrect part number in the firm's portal	Non-value added activity of searching for the correct part number and then checking for its available and required quantity, thereafter placing the order to the supplier	<ul style="list-style-type: none"> Time wasted in searching for the correct part number and then placing the requirement on the basis of present stock New employee may place the order on the incorrect part number 	
	Process			
1	The firm purchases from suppliers when an internal lock-in period or criteria of MOQ and time to consume are met. If not, then the purchasing decision moves to another date	Process constraints	<ul style="list-style-type: none"> The time range for the next period to purchase parts is fixed; hence, if a part is required urgently within the waiting time period, parts cannot be procured, leaving the customer waiting for a part 	<ul style="list-style-type: none"> Impacts the customer service for not being able to arrange a part
	Financial			
1	Untimely payments made to the supplier from the firm's end	Unethical business practices	<ul style="list-style-type: none"> Suppliers may refuse to send further parts on time or discontinue business with the firm Purchasers may have to look for alternate suppliers and re-initiate the procedure to establish supplier relations 	<ul style="list-style-type: none"> Reduced brand value among suppliers in the market Impacts the customer service for not being able to arrange a part
	Intangible – Morale			
1	Lack of incentive for consistent good performing suppliers	Disinterest towards the firm	<ul style="list-style-type: none"> Poor morale may lead to less pro-activeness by the suppliers 	<ul style="list-style-type: none"> Suppliers may invest their energies towards other rewarding firms with a priority
2	Frustrated suppliers because of excessive calls and follow-ups from the purchasers	Disinterest towards the firm	<ul style="list-style-type: none"> Suppliers may discontinue to take the purchasers' attempts seriously and even stop answering calls 	<ul style="list-style-type: none"> Impacts the business relations of the suppliers, creating an unhealthy and counter-productive atmosphere

It can be observed that a majority of constraints lie in the hygiene and discipline of data sanitisation of maintaining and updating supplier and part records at the firm’s end.

A similar exercise was carried out with the suppliers, which is shown in Table 5.

Table 5: Suppliers’ Constraints (Root Cause Analysis)

Sr. No.	Category	Nature of Constraint	Operational Impact (Purchaser’s Side)	Business Impact (Purchasing Firm’s Side)	
	Financial (Supplier Side)				
1	Monetarily higher valued products are given a priority	Financial	<ul style="list-style-type: none"> Longer waiting times for the financially low-valued parts at the purchaser’s end 	Impacts the customer service for not being able to arrange a part on time	
2	Priority given to OEM orders as monetary deductions are made on the basis of late &/or poor performance	Financial	<ul style="list-style-type: none"> Longer waiting times for part procurement 		
3	Plant shut down due to financial constraints	Financial	<ul style="list-style-type: none"> Unsure of part delivery 		
Human Resource					
1	Absenteeism or shortage of manpower during holiday seasons	Manpower constraints	<ul style="list-style-type: none"> Impacts part delivery 	Impacts the customer service for not being able to arrange a part on time	
Technology					
1	Technological malfunctions in the assembly line	Technology	<ul style="list-style-type: none"> Delay in production, leading to delayed part delivery 		
Operations					
1	Previously delayed orders are prioritised; hence, present schedules are delayed	Operational planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 	Impacts the customer service for not being able to arrange a part on time	
2	Delay in procurement of raw material from suppliers’ suppliers	Increased production lead time	<ul style="list-style-type: none"> Longer waiting times for part procurement 		
3	Defective/incorrect material procured by the supplier from their supplier	Non-value added activity of re-initiating purchase of parts	<ul style="list-style-type: none"> Longer waiting times for part procurement 		
4	Capacity not in tandem with the number of orders taken	Operational planning	<ul style="list-style-type: none"> Shortage of parts Longer waiting times for part procurement 		
5	Incorrect parts delivered to the firm	Logistical planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 		
6	Parts delivered to an incorrect location	Logistical planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 		
7	Misplaced invoice/documents; hence, material not accepted by the firm	Logistical planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 		

RECOMMENDED SUGGESTIONS

Table 6: Tactical Suggestions

Sr. No.	Category	Nature of Constraint	Operational Impact	Suggestions
	Data Sanitisation			
1	Incorrect e-mail ID to which the communication of required parts are sent to the supplier by the buyer	Non-value added activity of searching the correct point of contact and establishing communication	<ul style="list-style-type: none"> Time wasted in searching for correct e-mail ID New employee may not know whether it is correct/incorrect, leading to further delays in procurement 	<ul style="list-style-type: none"> A technical portal and mailing software system that pulls the inventory of parts at the SPD and its delivery date post-order placement Five days prior to the scheduled delivery date, the system should send reminder emails to the suppliers
2	Supplier has discontinued the production of a part; however, the firm's portal still enlists it as the supplier	Non-value added activity of searching for the correct supplier and establishing communication	<ul style="list-style-type: none"> Time wasted in searching for the correct supplier for part procurement New employee may not know whether it is correct/incorrect, leading to confusion on delivery, as the former supplier may ignore the requirement, while the purchaser may be anticipating the parts' delivery unless informed or they experience zero delivery 	<ul style="list-style-type: none"> If no response to the email is received by the purchaser, then the purchaser gets a warning two days prior to the delivery date The purchaser proceeds to telephonically check and/or physically visit the suppliers
3	Incorrect part number in the firm's portal	Non-value added activity of searching for the correct part number and then checking for its available and required quantity, thereafter placing the order to the supplier	<ul style="list-style-type: none"> Time wasted in searching for the correct part number and then placing the requirement on the basis of present stock New employee may place the order on the incorrect part number 	<ul style="list-style-type: none"> An allowance of maximum two days post the delivery date can be given to account for unforeseen circumstances; thereafter, supplier deductions should commence as penalties for delays
Process				
1	The firm purchases from suppliers when an internal lock-in period or criteria of MOQ and time to consume are met. If not, then the purchasing decision moves to another date	Process constraints	<ul style="list-style-type: none"> The time range for the next period to purchase parts is fixed; hence, if a part is required urgently within the waiting time period, parts cannot be procured, leaving the customer waiting for a part 	<ul style="list-style-type: none"> Review the 'lock-in' period quarterly Discretionary purchase of long lead time parts, especially those with international geographic locations
Financial				
1	Untimely payments made to the supplier from the firm's end	Unethical business practices	<ul style="list-style-type: none"> Suppliers may refuse to send further parts on time or discontinue business with the firm Purchasers may have to look for alternate suppliers and re-initiate the procedure to establish supplier relations 	<ul style="list-style-type: none"> Match the vendor payment cycle with the firm's accounting cycle
Intangible – Morale				
1	Lack of incentive for consistent good performing suppliers	Disinterest towards the firm	<ul style="list-style-type: none"> Poor morale may lead to less proactiveness by the suppliers 	<ul style="list-style-type: none"> Vendor awards and internal mentorship for C & D category vendors by A & B, to enhance and improve their conditions On achieving improvements, A & B category suppliers could be rewarded with logistical waivers and technical/business mentorship from the firm when the suppliers consider expansion with respect to R&D, and so on
2	Frustrated suppliers because of excessive calls and follow-ups from the purchasers	Disinterest towards the firm	<ul style="list-style-type: none"> Suppliers may discontinue to take the purchasers' attempts seriously and even stop answering calls 	

Table 7: Tactical Suggestions and Actionables at the Purchasing Firm’s End, Depending upon Suppliers’ Decisions

Sr. No.	Category	Nature of Constraint	Operational Impact (Purchaser’s Side)	Suggestions (Purchasing Firm’s Side)
	Financial (Supplier Side)			
1	Monetarily higher valued products are given a priority	Financial	<ul style="list-style-type: none"> Longer waiting times for the financially low-valued parts at the purchaser’s end 	<ul style="list-style-type: none"> Plan along with the firms’ internal OEM schedule to increase the quantity, thereby increasing the monetary value in totality for the supplier Plan and share the SPD requirement for a year and three years’ projection, to emphasise the business partnership and monetary aspect
2	Priority given to OEM orders, as monetary deductions are made on the basis of late &/or poor performance	Financial	<ul style="list-style-type: none"> Longer waiting times for part procurement 	<ul style="list-style-type: none"> Initiate monetary deductions as penalties for delays and so on
3	Plant shut down due to financial constraints	Financial	<ul style="list-style-type: none"> Unsure of part delivery 	<ul style="list-style-type: none"> Explore alternate suppliers as back-ups
Human Resource				
1	Absenteeism or shortage of manpower during holiday seasons	Manpower constraints	<ul style="list-style-type: none"> Impacts part delivery 	<ul style="list-style-type: none"> Plan according to seasonality and seek a tentative holiday calendar from the suppliers’ end to accommodate buffer purchases during the non-holiday season
Technology				
1	Technological malfunctions in the assembly line	Technology	<ul style="list-style-type: none"> Delay in production, leading to delayed part delivery 	<ul style="list-style-type: none"> Include during quality supplier audits
Operations				
1	Previously delayed orders are prioritised; hence, present schedules are delayed	Operational planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 	
2	Delay in procurement of raw material from suppliers’ suppliers	Increased production lead time	<ul style="list-style-type: none"> Longer waiting times for part procurement 	<ul style="list-style-type: none"> Seek an RCA from the supplier
3	Defective/incorrect material procured by the supplier from their supplier	Non-value added activity of re-initiating purchase of parts	<ul style="list-style-type: none"> Longer waiting times for part procurement 	<ul style="list-style-type: none"> Seek an RCA from the supplier, audit and review
4	Capacity not in tandem with the number of orders taken	Operational planning	<ul style="list-style-type: none"> Shortage of parts Longer waiting times for part procurement 	<ul style="list-style-type: none"> Suggest increasing the shift duration, manpower, skill, and speed to match capacity
5	Incorrect parts delivered to the firm	Logistical planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 	<ul style="list-style-type: none"> Part manual with part code and description to be shared with suppliers as and when updated regularly
6	Parts delivered to an incorrect location	Logistical planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 	<ul style="list-style-type: none"> Data sanitisation
7	Misplaced invoice/documents; hence, material not accepted by the firm	Logistical planning	<ul style="list-style-type: none"> Longer waiting times for part procurement 	<ul style="list-style-type: none"> Digitise documents; the logistic partner to share/show the digital copy at entry

ACTION AND RESULTS

While Tables 6 and 7 discuss the various tactical changes and the same are incorporated, key actions undertaken are highlighted as follows, which ensured the positive change in C & D suppliers to overcome their delivery obstacles:

- As observed, AE contributed to 31% of the parts that needed to be procured; however, in spite of repetitive communication attempts, no response was received from the suppliers' end.
- Thus, it was decided to seek an alternate supplier, ME, and during the meetings, the part designs were shared with ME.
- It was then found that ME was capable of manufacturing only 2 parts, and hence, the search of another supplier continued.
- On further research, SE was found as a suitable replacement to AE as it agreed to supply 9 out of the 30 parts, and was willing to explore the manufacturing of other parts as well, on inspecting the designs. SE already had witnessed an opportunity loss to the tune of 56 lakhs; thus, adding more parts would make it concentrate on the purchasing firm's requirements, while also having a larger market share of business.
- By making adjustments towards the plan-sharing process and giving the suppliers a higher cumulative visibility of a quarterly plan (Aug.-Oct.), the suppliers PPP & PD started dispatching the ready products covering the entire quarter, thereby reducing the number of plans and purchase cycle, giving the purchasers the focus of procuring parts for the entire 3-month duration. This led the suppliers to prioritise the SPD's requirements, along with the OEM clients as well.
- It was observed that the minor modifications led to an inward of 46% of parts arriving from the C & D suppliers by mid-July and the target of 100% could be met in the near future as well.

Opportunity loss is a major concern for suppliers' business and as discussed in Wagner and Lindermann (2008), the SPD is usually a profitable business; however, if a majority of suppliers are categorised in C & D due to their lack of reliability and incessant failure to deliver, then both the purchasing firm and the suppliers have to cohesively work together to arrive at root causes, eliminate them, and ensure in the future to aim for 100% reliance of deliverability and appropriate plan-sharing

mechanisms that are timely.

IMPLICATIONS

Pradhan and Routroy (2018) discuss the need for visibility in the buyer-supplier relationship. This paper too throws light on the need for visibility, trust, and collaborative nature to ensure smooth procurement that does not compromise on the given deadlines. Several firms are now adopting ERP systems that allow the visibility of plans and different time periods against just one plan. Vargas & Cortes (2017) also emphasise the need for planning horizons, and SPD planners must ensure that vendors are convinced to send parts so that the supplier does not lose out on monetary earnings. This is a leverage used in this paper and we found it to be successful while negotiating with the vendors, by achieving 100% delivery from vendors. It is noteworthy to state that system refinements and process refinements go hand in hand, and thus, the ERP system should be deployed keeping in mind that critical information is shared without the need for chasing anyone.

Gemba should always be undertaken despite having all information, experience, and data, as one glance of the situation on the ground can aid in arriving at a solution more quickly. As witnessed in this research, gemba allowed more criteria to come to the forefront, especially in the case of the vendor that shut shop, and to identify an alternative vendor. The supplier capabilities, capacity, and space are all easy to establish, once visited. This allows the purchaser to plan his requirements by keeping in mind the vendor's capacity to produce and the need. Thus, transparent communication and visibility are key ingredients in assuring timely delivery of parts procurement and planning; this ultimately results in no production losses, and therefore, no sales loss and no loss of business for suppliers as well.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

While this paper explores the key impact of monetary and business share losses, other monetary impact, such as that of logistics, can also be studied. The paper lays a foundation in understanding the product lifecycle and analyses the SPD of a 4-wheeler. The same can be tested in 2-wheelers. While gemba and data analysis were used to arrive at negotiating parameters, to arrive at alternate vendors and convince vendors to deliver 100%, a model can be developed that simulates the same situation, to test

the result it displays and which can be further modified upon.

CONCLUSION

The paper successfully studies and analyses the automotive spare parts division's key poor performing suppliers, by categorising them and then analysing their part requirements, as well as the value of the parts they are to sell to the buyer. On carrying out analysis, monetary opportunity loss as well as reliability is tested, apart from several other softer constraints like visibility, timeliness, frequency of plan sharing, and so on. All these are ironed out and an ERP system for greater visibility and planning is recommended. The monetary opportunity loss is found to be a key lever in enhancing the supplier's ownership and accountability in ensuring part delivery.

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