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# Annexure IV – The Pull system

## Do I require the Pull technique?

- ✓ Cash flows are tight.
- ✓ Sales forecasts are unreliable.
- ✓ The right part at the right time and at right location is usually a pipe dream.
- ✓ High inventory and stock outs co-exist.
- ✓ Obsolescence/ write offs are high for products with lesser shelf life.
- ✓ Often, the slow moving inventory is flushed out by offering heavy discounts.
- ✓ Stock outs seem to wander from one location to another
- ✓ The range of products offered at a location is much smaller than the portfolio.
- ✓ Priorities are unclear
- ✓ Most of the times actions are taken only after a delay has occurred pushing everyone in a fire fighting mode
- ✓ Paying premium freight is quite common.
- ✓ Top management is spending too much time on fire fighting rather than on developmental issues.
- ✓ People down the line do not respond to the market needs the way top management wish they should.
- ✓ Delegation and owning up responsibilities by people is difficult.

If your firm faces many or most of these issues, then it is time you evaluate the application and benefits of this technique to your organisation…

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## Why Forecast?

Thus, the need for forecast is to answer the question **Where to stock and how much to stock?**

The supply chain needs to be prepared in advance to respond to the market demand in future.

Customers have a tolerance time for a given category of product. A person may have a tolerance time of a minute for soap or toothpaste; whereas it could be a few days for a car.

The plant does not have enough capacity to produce the requisite quantities of products within the customers' tolerance time. **Hence there is a need to know the level of expected demand in advance.**

Second reason is that the customers are away from the plant. **Therefore, there is a need to keep the stocks ready and close to the customers whenever there is a demand.**

Thus, the two reasons for forecasting are the need to know the location of the stocks and the level of the stocks needed to fulfil the market demand.

## Where do I place my inventories?

In a typical distribution environment, the conventional wisdom has been to place the inventories as close to the customer as possible e.g. at the dealer. The implicit assumption is that the closer the inventories are to the customer, better is the availability.

However, the availability is influenced by other factors, forecasting being one. There is another factor which affects availability. ***It is the comparative accuracy of the forecast at various levels in the supply chain hierarchy.***

Let us take a closer look at what determines the accuracy of the forecast or variations in the demand at various levels in the supply chain.

A dealer may sell ten numbers of a product today and may not sell anything at all tomorrow. The variation in the demand is, therefore, higher.

If we look at the total demand for a product on all the dealers in a given region for a given period, an interesting thing emerges. All the dealers in the same region cannot

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have their lowest sale on the same day. Similarly, all of them cannot have their highest sale on the same day.

Thus, the effect of peak at one dealer would be somewhat dampened by lesser sale at other dealers in the same region. This leads to lesser variation in the regional demand pattern over a period of time.

Therefore, the average demand within a region has lesser degree of variance from the mean value compared to that at a dealer for the same period of time.

In other words, the fluctuations in demand at a retail store for a given product are far more severe than the fluctuations in demand for the same product at the regional warehouse.

Simply put, the accuracy of the forecast is better at the regional level than at the dealer level. Taking the logic further, the accuracy of the forecast would be still better if we were to aggregate the demand at an all India level.

**This is known as effect of aggregation in statistics.**

It is clear that higher the fluctuation in the demand, higher is the chance that the forecast would be off the mark. Therefore, if we were to keep higher inventory at the dealer, there is a high chance of accumulating slow moving inventory or of facing shortages.

This is validated by what we observe in reality. Dealers are almost always complaining about squeeze on cash flows and slow moving inventories. At the same time, they are bitter about shortages of products that are selling in the market.

There are other factors such as promotions and other policies which encourage a dealer to accumulate more inventories. However, the problem is aggravated by the severity in demand fluctuations.

## How do I order or place indents?

In the forecasting way of working, the orders and indents are based on **the forecasted demand.** This results in pushing of materials in to the system even though there may not be a demand in the immediate future.

This gives rise to other undesirable situations such as fire fighting to adjust to the actual demand and to overcome the artificial shortages created by the mismatch in demand and supply.

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There is another effect of uncertainty. The users in the supply chain tend to order more than what they need, because they know that the system is unable to overcome the mismatch between demand and supply. Therefore, the idea is to order on the higher side just to ensure that at least a part of the demand would be fulfilled. Also, there is a hope that the excess stocks will be useful in emergencies, which are common anyway in such a system.

**Another effect of forecasting at each level is that the ordering lead time increases.** Each level in the supply chain would want to be very careful in deciding the ordering pattern to provision against all possible emergencies etc. This means that by the time the total demand is placed on the plant or the supplier, precious time has been lost.

Each level also adds certain amount of cushion in the ordering quantity as we have seen earlier.

**The combined effect is that there is a wave of large inventory passing through the system followed by lean cycle. This feast and famine syndrome adds to the conviction of the operating personnel that there is more and more need to have an accurate forecast.**

We have already seen that it is impossible to have an accurate forecast at a part level. Anyway the forecast, howsoever accurate, does not help much in solving our problem of how much to stock and where to stock in the first place.

**To conclude, forecasting does not effectively help in solving the problem of where to keep the stocks. It does not help to solve the problem of how much to stock, either.**

**Complex forecasting models have not been proven to be more accurate than relatively simple models[1].**

The answer to the problems of unpredictability in demand as well as supply does not lie in improving accuracy of the forecast or in sophisticated and complex forecasting solutions.

So what is the answer then?

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## Order on a Pull basis rather than Push:

Let us, for a moment, assume that the availability of stocks at the upper link is not an issue i.e. stock buffers are maintained at each link.

Instead of ordering on a forecast basis, what if each link was to order exactly what is being sold? Ordering on a pull basis would, at least, reduce the chances of accumulation of slow moving stocks.

In case of ordering on a pull basis, the ***orders are placed on the upper link to refill what was sold*** i.e. they are to simply replenish what was sold rather than to push materials in the supply chain. This ensures that the supply keeps on adjusting to the demand quickly. Also, chances of accumulating slow moving inventory come down significantly, since, what ever is being re-ordered is based on the actual demand and ***not the forecast***.

Every time an order is placed on a given link, it is supplied from the stock buffer. An order to replenish what was sold is promptly placed on the upper link in the chain. The upper link would satisfy this demand from its own buffer and place another order on its upper link. This continues all the way up to the supplier or the manufacturing plant.

This way, every link in the entire chain is supplying exactly what is being sold to the end-customer. The entire supply chain is thus continuously aligned to the market demand. The chain as a whole becomes much more responsive to the demand in the market.

The net effect is that there is a smooth and rapid flow of materials from the supplier to the end-customer. Also, this flow keeps on adjusting itself according to changes in the demand. Therefore no matter what unpredictable behaviour occurs in the demand, the supply chain is able to perform well. This is a rather desirable situation for any supply chain.

Another way of looking at this situation is to state that there is no longer a need to forecast on a long horizon. This is very useful since, ***the accuracy of forecast for a week is far better than the accuracy of forecast, say, for three months.***

The ordering from each link to the upper link must be a daily exercise to ensure that the information about the demand is propagated throughout the chain all the way to the source as soon as possible.

However, the replenishment from an upper link to the lower link need not be daily. It would be dependent on the considerations of logistics and the volume of business

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generated by the lower link. The stock buffer at each link would satisfy the demand by the time it receives the next replenishment for the materials.

Thus the key is Order Daily and Replenish Frequently **(ODRF).**

## What about availability?

**The basic assumption in ODRF is that the availability is not a problem at any link in the supply chain.** Availability is both in terms of sufficient quantity as well as in terms of number of materials available.

**One must not lose sight of the fact that one of the difficulties in the supply chain is poor availability.** Then the question is how we ensure that this problem is resolved. Failure to effectively address this problem would mean that the advantages of ordering on Pull basis are lost.

Earlier, we have seen that the forecast accuracy improves as we aggregate more and more. Thus, if we were to forecast at an all India level, the accuracy would be the best we can hope for. Hence, it is desirable to keep ***majority*** of the stocks at a ***Central Warehouse (CWH)*** which would cater to all other links down the hierarchy. The forecast being more accurate here, the chances of stock outs are far less at the CWH. The chances of accumulating slow moving inventory are also less for the same reason.

We must ensure that all the materials or SKUs are stocked at the Central warehouse. This will, in turn, ensure that no matter where the demand is and how small it is, we will always have stocks for all materials to satisfy it. ***This ensures that a large range of parts can now be offered to the market without actually having to stock every material at every link.*** E.g. the fast movers can be stored at the dealer as well as the CWH. Whereas the slow movers can be kept only at the CWH and supplied to the dealer whenever there is a demand.

The variations in the demand, as well as in supply, are absorbed by the stock buffers placed at each link in the change. This reduces the fire fighting in the system and therefore, the operation becomes much easier to manage.

Another advantage is that the links down the line need to stock only as much as is needed during the transport lead time from the upper link to itself. E.g. a regional warehouse needs to have stocks sufficient for, say, 15 days demand. This is because the lead time from the CWH to the regional warehouse is equal to transport lead time, since the CWH has sufficient stocks to replenish immediately.

This still leaves us with one crucial question.

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## How do we ensure that the stock buffers are neither too high (poor cash flow) nor too low (lost sales) at all times at all locations?

All along, managers have been struggling the question of how much do we stock? Since, the demand and supply have inherent variations; we have a conflict of high inventories versus stock outs. How do we ensure that we neither have stock outs nor have high inventories irrespective of the variations in demand and supply?

The stock buffers at each link protect the chain from variations in demand and supply. They also work as an early warning signal of the changes in demand and supply.

E.g. if the buffer starts depleting at a given link, it means that there is now a real chance of a stock out. Conversely, if a buffer starts piling up, it means that there is now a chance to reduce the stocks without jeopardising the availability. Therefore, we need to have a mechanism that will modify the stock buffer levels according to the changes in demand as well as in supply.

The stock buffer is divided in to three parts for monitoring. Green is when more than 66% stocks are available, Yellow is between 66% and 33% whereas Red is when the stock goes below 33% threshold.

We also need a monitoring mechanism that would report on the buffer status for each SKU-location combination in the supply chain. This will ensure that we focus on expediting only those items that are in Red. Any instance of buffer going in Red would also indicate that something is deviating from the planned or expected behaviour. This necessitates that we investigate the cause thoroughly and minimise or eliminate the root cause of the penetration. This would lead to steady improvement in the chain as a whole.

**In order to have an agile supply chain, it must be ensured that the stock buffers at various locations are constantly monitored and modified when necessary. This is known as Buffer Management.**

The answer is to have strategically placed buffers at each link, to order and replenish frequently and in buffer management.

### References:

1. IEBM Encyclopaedia of Marketing, Michael J Baker (Ed.), International Thompson Business Press, 1999, p 278-290

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## What benefits does the TOC Pull solution provide to your organization?

- ✓ Availability at all locations will potentially improve to the tune of 95 - 98%
- ✓ Inventory can potentially reduce to 50-60%
- ✓ Offer a larger range of products with high availability without having to stock each product at each location.
- ✓ Have a supply chain that will quickly react to the market demand without getting in to fire fighting i.e. have an agile supply chain.
- ✓ Provide a system that will give common priorities to all resources in line with satisfying the customer
- ✓ Provide a system to monitor progress and take corrective actions proactively.
- ✓ Provide a system of ongoing improvements to focus the improvement efforts
- ✓ Provide right financial and operational measurements in line with achieving system goal.
- ✓ The team's morale and effectiveness will improve because they will be operating in an environment that is comfortable with uncertainty and that avoids micro management.
- ✓ Senior management time will be freed up for more developmental activities rather than fire fighting activities.