CUSTOMERS WHO JUST CAN'T WAIT : HOW TO SERVICE THEM QUICKLY AND EFFECTIVELY

Don Nicol, Mercia Software Limited

How to improve the efficiency of your business through a new approach to planning, facilitated by a change to the trading relationship with your customers and suppliers. A Quick Response system based on automatic stock replenishment.

In today's business environment many major manufacturing and distribution companies are investing substantial sums of money towards improving the efficiency of their computer systems to facilitate the implementation of new operational practices within the business.

INTEGRATED INFORMATION SYSTEMS

The new technologies that have emerged from the computer revolution have enabled companies to expand in size and complexity. It would be impossible to manage today's major businesses efficiently without the assistance of the computer to organise and manage business transactions. The first step in the business computerisation process was the integration of the data for operational functions. Accounting systems lead the way, combining the various manual sub-ledgers operating units to produce a view of the financial status of any desired element of the business. Ready access to consolidated information and a 'real time' view of the latest profit performance is now a default requirement.

Beyond the accounting systems, came attention to other functions, MRPII, JIT and DRP entered the vocabulary of the modern business manager. This new approach to the planning techniques for the manufacturing and distribution functions was also accompanied by substantial cultural change. Those companies that have successfully implemented MRPII have achieved enormous improvements in internal efficiency and that has had positive effect on the company's results. All elements of the organisation have learnt to understand, not only their own role in the total business process, but the role of the other functional groups. They have come to realise the effect of their decisions on others and to consider the 'flow on' effect of their actions.

INTEGRATED COMMUNICATIONS

EDI has been another revolution. The new communications and computer developments have facilitated rapid exchange of data between trading partners, improving customer service levels through a reduction in lead times and greater accuracy in communications.

POOR CUSTOMER SERVICE, HIGH PRODUCTION COSTS AND INVENTORY LEVELS

Despite all these developments we find that within many of the organisations that have taken on board these approaches to business management, the frustration with the unpredictable nature of customer demand, unsatisfactory levels of customer service and more than desirable inventory levels still persist. Production costs remain higher than expected, primarily because of unplanned changes to the production schedule in an attempt to meet customer service objectives or to recover from shortages of raw materials.

Some things have changed. One of the most significant developments to emerge out of the quest by organisations to achieve new and competitive standards in business management, has been the concept of continual improvements and the acceptance of change. This does not mean we do not question the reason for change, quite the reverse, our attitude is to question the status quo.

The investments in computer technology have improved the accuracy with which business transactions are tracked. EDI reduces communication time and errors by doing away with repetitive data entry. Bar code systems reduce the incorrect coding of stock movements. Our planning systems, however, have not benefited from these advances.

PLANNING SYSTEMS LAG BEHIND

Many of the customer service problems could be rectified through an improved planning process. There is a limit to which diligent planning can be effective when working within the confines of one organisation. To improve the accuracy of the planning process it must extend beyond the organisation itself to the customer at one end and the supplier at the other. So what, you may say, this is what we all know, but we have not found a way to effectively do it yet!

To a large degree, planning is done in isolation. The information required for effective planning of materials to give our customer the service they expect from us, is collected in a subjective manner. Generally, it is the responsibility of the sale force to interpret the results of their sales activity and customer intentions to a forecast or a validation of the forecast. Sales estimates of future demand are generally quite precise when considering the annual demand brands or product groups. Unfortunately that does not help the materials planners very much, and it is of little relevance to the customer. Both of these parties are interested in the line item in the warehouse.

So what can be done to improve this practice.

In the consumer market, the demand for most items is reasonably predictable. It certainly may be seasonal but at the supermarket shelf the off take of an item is reasonably steady. Customers purchase in approximately the same quantities. Most people buy one jar of coffee at a time, very rarely does a customer enter the store with the view to purchasing three cases of coffee, and even more unlikely is that two or more customers will do that.

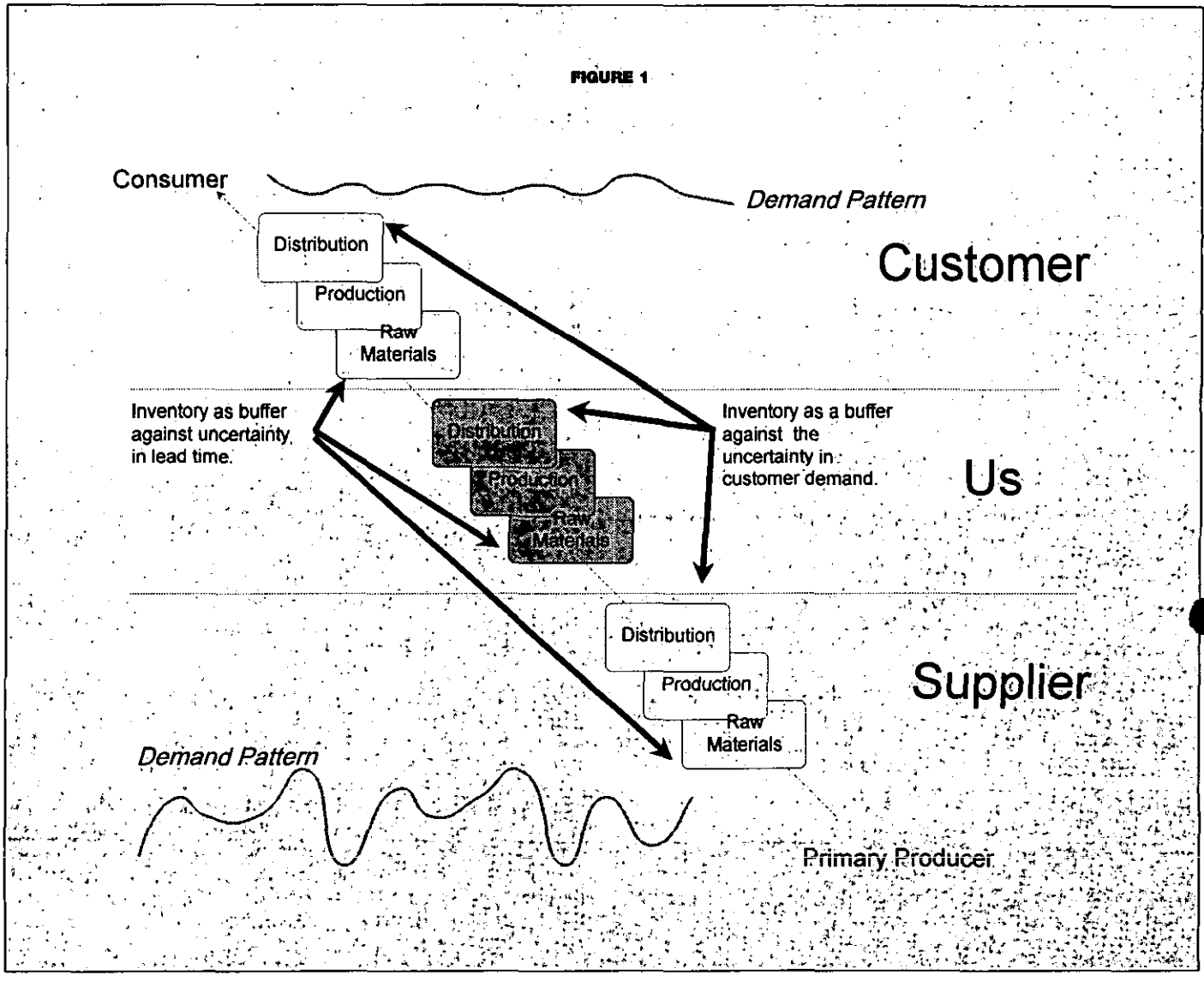
There may be changes in the customer buying patterns as a result of discounts and promotional activity. We generally know about this and the supplier is usually the driving force behind the changed demand pattern. Therefore these changes in demand can be included in the forecast, particularly if they are significant.

Figure 1. overleaf, depicts a typical supply chain. The demand for the item at the supermarket shelf (consumer) is reasonably steady. It may be higher in the summer than winter if it is a soft drink or ice cream but the extent of the seasonal demand pattern can readily be determined with the proper statistical tools. This forecast may show a trend from the current level of sales depending on the stage in the product's life cycle and the forecasting tool should reflect this.

RETAILERS CONTROL THEIR OWN DISTRIBUTION NETWORKS

Within the supermarket there is inventory of the item on the sales display shelf so that the consumers may select the quantity of the item they require.

FIGURE 1



In the store attached to the supermarket are some reserves of the item that are used to replenish the shelf when the quantity on display falls below a predefined level, 'the reorder point'. At this stage in the chain, the quantity of shelf space allocated to the item is driven by the level of customer demand and the commercial arrangements between the supplier and the supermarket proprietor. The replenishment lead time between the back room and the shelf is very short.

The smarter supermarket shelf replenishment systems are able to operate on a 'push' basis. That is they track the shelf inventory by re-coding sales of each item at the check out. Periodically, the shelves are re-stocked to the maximum.

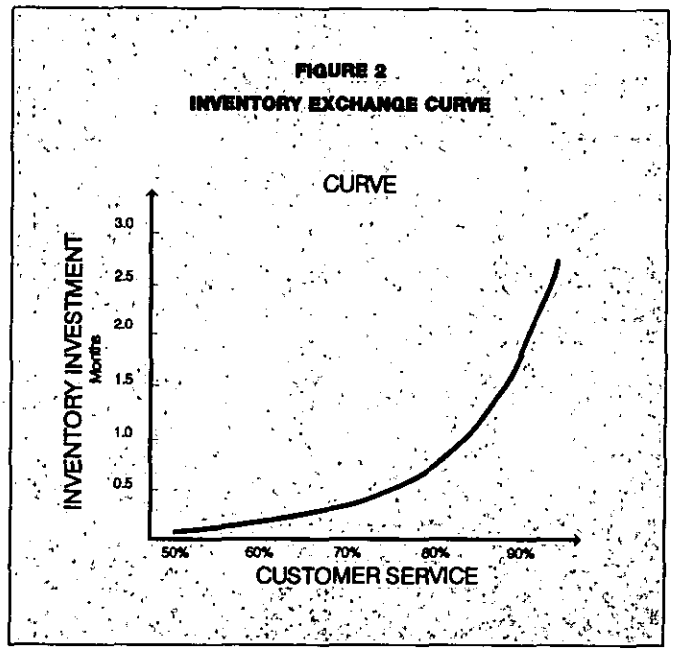
The replenishment quantity can be determined through a calculation without having to physically count the stock and the stock can be reconciled when the shelves are filled by counting the number of empty slots or the amount of over *supply after re-stocking. A re-order point system may* be used to trigger the replenishment however many items within a supermarket are managed so that all of the shelves are full at the start of the day. This push process may apply between the supermarket and the distribution centre and operate on the similar principal.

THE TRADING RELATIONSHIP AND CUSTOMER SERVICE.

The nature of the trading relationship between customer and supplier can stand in the way of a better method for managing customer service. When it comes to the supplier's replenishments of the retailer's distribution centres, all this rather rational process breaks down. In general, the buyer will decide when to purchase and in what quantity. The buyer's decision to order from the supplier is influenced by existing stock levels, forecasts of future sales, company policy and customer service levels. With the appropriate tool it is possible for the buyer to determine the optimum safety stock for each item and re-order on the supplier when the inventory falls on or below this point. The quantity and frequency of the orders are influenced by many factors such as incentives placed on the buyer by the supplier to purchase more than would otherwise have been the case. These incentives may be associated with short term discounts, impending price increases or promotional activity.

THE SIZE AND TIMING OF A CUSTOMER ORDER

In many instances, the supplier has little notice of the quantity and timing of a customer's order. The customer may choose to order a month, a week or a day's worth of his requirements at any one time. The customer's usage of the item may be quite steady but when the supplier analyses the customer's demand for the item it appears quite "lumpy". This lumpiness is caused by the buyer's procurement pattern. In order to maintain customer service, the supplier may choose to hold safety stock or expedite production. Calculating the correct amount of safety stock can be done by analysing the variability in the demand pattern for the item. Decision support tools are available to assist businesses in determining the correct balance between expediting costs and inventory buffers, often referred to as an inventory exchange curve.



For example, an inventory exchange curve showing the relationship between safety stock and expediting costs. We could plan to interrupt the master production schedule six times per year for a group of 21 SKU's at cost of, say, £20,000. To provide perfect service this will result in 94% of the demand being serviced from inventory and the remainder of the demand serviced as a result of expediting production. The following table shows the effect of expediting cost on safety stock.

Cost of expediting	Safety Stock	Number of expediting occurrences	Value of potential backorders	Service from stock based on sales value	Service from stock based on shortages
£15,000	£1,468,180	9.12	£1,921,422	90.73%	97.44%
£16,813	£1,546,575	7.92	£1,608,745	91.64%	97.77%
£18,400	£1,620,203	6.90	£1,357,151	92.95%	98.06%
£20,379	£1,689,919	6.03	£1,151,757	94.02%	98.30%
£22,572	£1,756,341	5.29	£982,200	94.90%	98.51%
£25,000	£1,819,832	4.65	£840,982	95.63%	98.69%

In figure 1, it can be seen that each party along the supply chain holds the inventory as a buffer against the uncertainty in the customer demand and the variance in the supply lead time.

REDUCE SAFETY STOCK THROUGH A CHANGE IN THE TRADING RELATIONSHIP

As we can see, much of the variability in the customer demand is caused by the buying patterns of the intermediaries in the supply chain. If the size and timing of a replenishment order could be controlled by the supplier, then the need to hold a safety stock at each side of the supply chain would be substantially reduced. If the supplier agreed with the customer to supply against a forecast, and minimum and maximum inventory levels at the customer's warehouse, inventory holdings for both parties would be substantially reduced.

QUICK RESPONSE - AUTOMATIC STOCK REPLENISHMENT

There is a form of quick response that does not involve the review and agreement of purchase orders with the customer. It works on the same mechanism that is used to replenish the supermarket shelves and the supplier's own regional warehouse. A process of 'push distribution' based on a forecast and an agreed inventory holding. The supplier can replenish on a schedule in synchronisation with the production schedule that itself was derived from analysis of the shipping requirements to the customer's warehouses.

The customer is invoiced on an agreed frequency based on the amount of stock removed from his warehouse. Periodic stock takes reconcile any discrepancies. The supplier takes ownership of the inventory in the customer's warehouse. This is not new inventory. It is a transfer of the storage location for inventory that was already being held in the supplier's warehouse waiting for the customer's order. There is less inventory, through a reduction in safety stock, as the uncertainty in the demand pattern has been substantially reduced. The supplier can reduce the size of the warehouse space for finished goods and thus achieve a cost saving. Production schedules can be more stable, resulting in fewer unplanned change overs and less expediting of raw material supplies.

For the customer this has many advantages. Inventory investment in regional distribution warehouses, or in the case of a manufacturer, raw materials, can be transferred to the supplier. Administration and purchasing costs are dramatically reduced.

There is little need to hold inventory as a buffer against the uncertainty in the supplier's lead time. The total requirement to provide warehouse space for these stocks is reduced. Where the customer is a manufacturer, real benefits come from reduced interruption to production plans as a result of a shortage in raw materials.

WHICH CUSTOMERS CAN PARTICIPATE IN A QUICK RESPONSE SYSTEM BASED ON AUTOMATIC STOCK REPLENISHMENT?

In most businesses the concept of developing a forecast for each customer for each product that they purchase, is not only impractical but would create an unmanageable set of data. A Pareto analysis on the customer base will no doubt reveal that 20% of the customers are responsible for 80% of the business or thereabouts. In many of the fast moving consumer goods businesses in Australia, the skew is far more dramatic with the retail sector dominated by a handful of major players. This narrows down the forecasting exercise to perhaps ten or so customers per State.

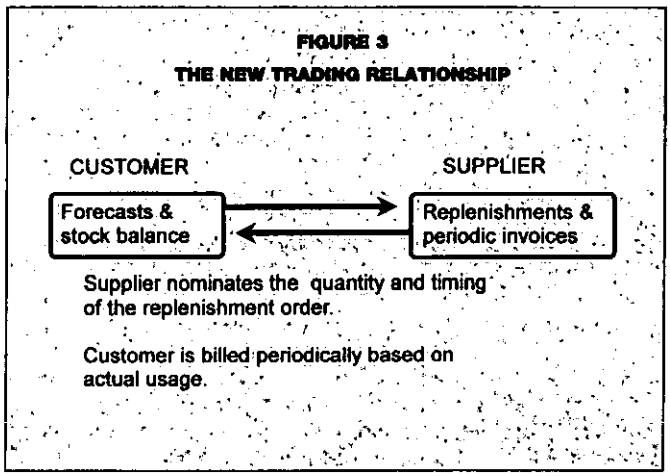
A similar analysis on products will no doubt reveal a similar distribution. Forecasts can be developed by the supplier using statistical techniques or passed down the EDI link from the customer. Forecast accuracy must be measured to enable the safety stock to be appropriately adjusted to match the service objectives agreed to by the parties. The EDI link must allow the supplier to obtain a regular snapshot of inventory levels for each item at the customer's warehouse.

The supplier will then need to use the techniques embodied within distribution requirements planning to determine shipment quantities and production requirements. From the production plans, MRP will determine a time phased schedule of raw material requirements that serves the forecast for the raw material supplier.

A NEW TRADING RELATIONSHIP

This process is a 'win-win' deal for both parties. It requires a substantial cultural change in the nature of the relationship

between suppliers and customers. The benefits to the bottom line are incentive enough for all the participants to challenge the status quo.



The tools are available to support this approach to materials management. Accurate forecasts can be created and managed with minimal input from sales and marketing staff. Forecast accuracy can be aligned with customer service objectives to ensure safety stock levels are correctly maintained in line with company policy. Distribution planning has advanced to allow a balanced inventory to be maintained throughout an entire network that may include customer warehouses. Production planning and MRP are well established in many large firms. Data transfer links are improving with 'open' computer systems and fast, flexible telecommunications.

These are the easy elements. The change in culture will be the hardest. Those that are exploring this area at the present time, are encountering 'red herrings' of all types. Some of the common ones are associated with the aspect of trust and test whether there is a genuine desire for the parties to work together for mutual benefit. The aspect of promotions and investment buying is one. Some customers are suggesting that they will trade the information from the check-out scanners in return for consignment stock. Those that agree to this deal without incorporating the other aspects of the process as described above will be disillusioned with the outcome. Forecasts based on scanning data is useful for determining long term sales, but shipments to the customer are not only based on sales demand, the inventory levels within the supply chain must be considered. The supplier does not have any control over the customer's internal distribution strategies.

With the process, as described in this paper, your customers will not have to wait to get your goods, they will already have them. You will supply them under your schedule in the quantities that best comply with your distribution and production constraints. You will be able to manage your stock at the customer site with enough inventory to accommodate that variability in the true demand. Inventory of both finished goods and raw materials will be at an unprecedented low level with customer service and business security at the best it has ever been.

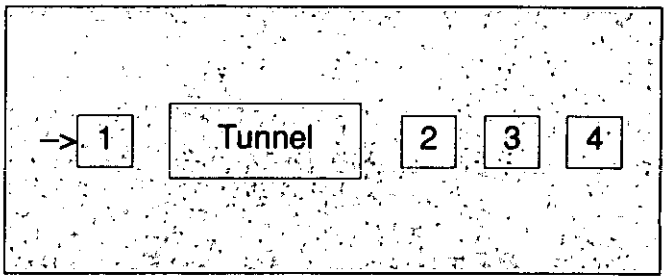
About the Author

Don Nicol is the Managing Director of Quick Response Technologies Pty. Limited (QRT) Australia, a leading software organisation that specialises in materials management. Mr. Nicol has worked as a consultant to major corporations in Australia and the UK on the development and implementation of integrated planning systems for forecasting, physical distribution, inventory management and production planning. He is an Associate member of BPICS and a member of APICS and regularly presents papers and provides independent consultancy in the field of materials management.

SIMON SAYS

Overall Cycle Time for Manual Assembly Line

Some help would be appreciated with a minor technical problem which concerns a manual assembly line as shown in the schematic diagram below.



Cycle times at each station are:

Station 1 = .32 minutes
Tunnel = .85 minutes
Station 2 = .37 minutes
Stations 3 and 4 are well inside Station 2 time.

The argument is this:

1. Should the tunnel cycle time count as part of the overall cycle, or
2. Once the process is underway, is the tunnel like a primed hosepipe and travel time is irrelevant so all that is needed is an allowance for start up and run out?

● **Simon Says** - The key question to answer is the rate at which parts can be processed through the tunnel and not the length of time one individual part takes to go through the tunnel.

Presumably all assemblies pass through each stage of the line singly, one after the other (including the tunnel).

Stage 1 process at 187.5 pieces per hour (60 ÷ 0.32)

Stage 2 process at 162.2 pieces per house

If the tunnel has to completely clear one part before the next one can be entered it processes only 70.6 parts per hour (60 ÷ 0.85) and this clearly limits the overall cycle time to this level output.

However, if the next part enters the tunnel at say 0.32 minutes after the previous one it can process at 187.5 pieces per hour and will not limit output rates through the other stages. You have not specified this time between successive parts entering the tunnel; let us use 't' minutes. The overall rate of production per hour for the assembly line will be the lowest out of 187.5 or 162.2 or (60 ÷ 't') parts per hour.

If 't' is greater than 0.37 then the tunnel restricts the overall rate of production to less than 162.2 parts per hour. Otherwise the rate equals 162.2 per hour.

Obviously with such a line there are considerations of stock build up between stages, lost time waiting at machines, and operators etc. in deciding how to operate. However hopefully this answers your principal question.