

INNOVATION IN SUPPLY CHAIN MANAGEMENT

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Accelerating the supply chain creates strategic advantages in both delivery and product and process development. Technological innovation and information technology have now multiplied the productivity of individuals thousands of times in the last two generations.

On the other hand our limited vision of the final benefits of such inventions as the transistor by William Shockley is no more evident than statements by people like Bill Gates in 1981 that ***"640k of memory should be enough for anybody"***, or IBM's CEO in 1943 who said ***"the total market for computers will probably be no more than 5"***.

The message here is that while in hindsight it is very easy to smile at the predictions by some of the greatest minds of the century, in reality it must be recognised that our intelligence is limited and the rate of change and generation of information is so great that many of us do not see the potential benefits of the available technology until it is too late. This is the case with the technology that is currently available for supply chain integration.

In addition, as far as Australia is concerned, we have particular problems. Whilst we can all be proud of the outstanding growth rate we have been able to sustain in the last three to four years, and our resilience in fighting off the Asian crisis after the collapse of the Thai Baht in 1997, it is sobering to realise that we still have a problem with our current account. This problem first began during the profligate spending of the Whitlam Government in 1972 to 1975. We have still not recovered from this.

In essence, Australia's current deficit is cycling between 4% and 6% of GDP per year and the net debt has remained high at 44% of GDP for 7 years. The astute use of monetary policy and fiscal policy by the federal government has failed to solve the intrinsic structural problem. The main weapons have been interest rates, monetary policy and the control of government spending, fiscal policy. However everytime we reduce interest rates, the domestic demand rises and we import more and the current account blows out even more.

Australia is exceptionally lucky that the world is flush with capital, particularly the western world, after the withdrawal of money from Asia and this in essence has led to or assisted in keeping interest rates down which in turn has kept inflation down.
What happens when this money flows back into Asia?

Our basic problem in Australia is one of poor international competitiveness and low commodity prices. We can do little about the latter but we can do a lot about creating strategic advantages to improve our competitiveness. The first step is to

recognise what technology can do for us and to focus on the way we can use it in the current global economy.

An area begging attention is the redesign of the supply chain. The first step is to change the mindset of our Australian companies to focus on the world market and not simply the domestic one. Whilst many companies are currently doing this there are many that aren't. Value added goods can be manufactured in Sydney, sold over the internet at very high margins and quickly airfreighted to their destination anywhere in the world. How many people in Sydney are doing this at the moment? How many companies have developed strategic partnerships with their customers to sell to the world?

To take advantage of the new technological opportunities, the process of supply of goods and services to the world must however be under tight control and management must be able to use the plethora of information available. Management needs to continuously raise the bar and not simply focus on the methods of the past. Strategic issues need to be linked to an improved operational effectiveness and this means that boards must understand statistical process control and process integration and clearly focus on the strategies needed to improve global supply.

The question now is how do you do it?

The methods are well established and available to all of us but don't appear to be used by many. It all goes back to Dr. Ono, the Toyota and Canon system and the work of Dr. W. Edwards Deming. Pioneers in the application of these techniques and measures have been such companies as Canon, Honda, Toyota and Panasonic and in general the telecommunications and automotive industries worldwide. Much of this has been discussed in great detail by the \$US5M study of the world's automobile industry in the book "The Machine that Changed the World".

So what are some of the rules that we can apply to the supply chain to create the strategic advantages of integration and reduction in lead time? How can we improve customer relationships by delivering better and faster?

That is what this paper is about. The objectives of supply chain integration are to supply superior quality goods faster, with more efficient processes and in essence be more responsive to the perceptions of the marketplace and be able to change directions at will. Some of the consequences of supply chain integration using say, lean manufacturing techniques were supplied by Dr. Ono and Dr. Deming result in:

- Reduced inventory at all sites of the supply chain
- Reduced costs
- Faster processing speeds
- Reduced lead times
- Reduced warehouse costs
- Reduced obsolescence
- Greater responsiveness to customer changes
- Electronic links to suppliers and customers
- Continuous flow of products and information
- Speeding up the development cycle
- Continuous flow not MRP overload

It is a sad fact unfortunately in the complex manufacturing environments that exist in most Australian manufacturing companies with a large number of products passing through non-synchronised manufacturing processes, that people think the basic rules of supply chain integration and lean manufacturing do not apply.

The purpose of this paper is to illustrate 21 rules that can be applied to manufacturing in various degrees in all plants and be extended not only internally but externally right throughout the whole of the supply chain.

This requires a paradigm shift in thinking. We have to be smarter, we have to respond to globalisation's new rules. Everyone in the company must contribute, everyone in the supply chain must contribute, new ideas must be applied, tried and improved upon. We must innovate and prosper or stagnate and disappear.

All of the principles to be discussed are well established. I often wonder why Dr. Ono found it necessary to travel to the United States and to say that the techniques he developed for Toyota resulted from the American supermarket way of doing business because lo and behold the techniques were always available to him at his local sushi bar.

The 21 rules which can be applied at all elements both internally and externally inside a supply chain are given below:

1. Demand equals supply
2. Equal batches every time
3. First in first out
4. Load levelling and good materials handling
5. Demand to the pacesetter process
6. Supermarkets
7. Even mix of the pacesetter
8. Minimisation of waste
9. Maximisation of value added
10. Preventive action not rework
11. Maximising percent run
12. Linking and matching processes or groups
13. Minimising variation
14. Reducing inventory at all levels
15. Application of single minute exchange of dies (SMED)
16. Application of statistical process control to all processes
17. Aiming for continuous flow
18. Aiming for continuous innovation
19. Pull not push
20. Synergising human relationships and teaming
21. Extending the principles to the total supply chain where they are applicable

Discussion of the 21 Ideas

1. Demand equals supply

In complex manufacturing environments, it is very often difficult to see how we can match demand and supply or sales and production. The best way to approach this is

to find a constriction in the process and use this as a method of calculating total throughput. Recognition must be given to the fact that the relationship between working process cycle time and throughput is not simple. Also that once working process approaches or goes beyond a critical level the cycle time will go up and in fact throughput may decrease, although theoretically it should remain constant.

2. *Equal batches every time*

This is a load levelling process which leads to optimum mixing over a chosen period. It doesn't mean that all different products have an equal batch size but it means that we should find the optimum batch size and continuously work at reducing it.

3. *First in first out*

At first this appears to be absolutely obvious, however, most companies that I have investigated think that they do it but in fact they don't.

4. *Load levelling and good materials handling*

This is related to equal batches every time and the aim is to level the load and smooth out production of various linked processes.

5. *Demand to the pacesetter process*

The total planning process should send the demand to the pacesetter. What is the pacesetter process? It is usually the bottleneck. Processes upstream of the bottleneck could be regarded as supermarkets, whereas processes downstream could be part of the **quick response** or **pacesetter** system.

6. *Supermarkets*

The basic principle of the supermarket is that minimum stock is held, stock is visual, emptying of a bay or container immediately signals the need to pull a new product through to fill that gap like a Kanban system.

7. *Even mix of the pacesetter*

This once again is very similar to the comment for load levelling the essence of it being said separately here is that it applies to both pacesetter processes and to supermarkets. The concept is to get away from the idea of maintaining large amounts of inventory between processes.

8. *Minimisation of waste*

The important part about this principle is that waste is not only material but is time, space, money, tampering, double handling, breakdowns, band-aid solutions, setups, cleanups, idle time and inventory.

9. *Maximisation of value added*

The first thing to do is to look at the total value added during the process and relate it to the throughput time. Production processes should not be overloaded and optimum work in process should be calculated and no extra work should be fed into a system if it goes beyond the optimum work in process (WIP).

10. *Preventive action not rework*

This is the most misunderstood quality principle in the whole of the western world. When ISO9000 was released in 1987, the relevant clause was called *corrective action*, the word *prevention* was almost nonexistent. In 1984 the error of their ways was realised and introduced it by saying not **corrective** action but **preventive and**

corrective action. Unfortunately auditors of quality systems have still not caught up with the meaning of this. Travel to Japan and you will know that they inspect or monitor during the operation (this is the control process). Inspection after the event probably does not exist. Principles are that you prevent things going wrong so there is no rework to correct what has gone wrong. Honda is the best illustration of this and it is the reason why despite tremendous escalation of the value of the Yen they are still able to float in Australia a car like the CRV for roughly \$30,000. Compare it with the cost of similar German cars.

11. *Maximising percent run*

There has to be an assiduous focus on increasing the percent run as a total of the time available. This means that all other parts of the process, like setup, breakdown, idle and cleanup.

12. *Link and matching processes or groups*

This at first seems obvious but it should be remembered that the efficiency of a system equals the mathematical product of the individual parts or processes.

13. *Minimising Variation*

This particular element has been discussed in great detail in a range of papers by Dr. Deming. Conceptually many people found it difficult to understand this but if you look at the variation in the aggregate in the end of the supply chain it is very much less than the variation further up the supply chain and the reason for this is the intervention of the flow back of the information being modified by people to cope with inefficient systems or high or low inventory.

14. *Reducing inventory at all levels*

Where processes are not directly linked or synchronised due to differences in throughput, it is better to run without inventory between processes and have some idle time and share inventory between various major companies that may be in the supply chain on one side not both.

15. *Application of single minute exchange of dies*

Reduce the setup time using the techniques which have been established by Shigeo Shingo.

16. *Application of statistical process control to all processes*

A total supply chain will not behave in a predictable fashion if individual processes are not under statistical process control. This means that we must aim for minimising variation, already discussed and focus on becoming perhaps a 7sigma company.

17. *Aiming for continuous flow*

The basic tenet of all good supply chains is to keep the product moving once value has been added.

18. *Aiming for continuous innovation*

Innovation means *newness*, we have to always be focusing on new ways to do everything.

19. *Pull not push*

Pull systems reduce the work in process, costs, aim at continuous work in progress goes beyond the ordinary MRP system.

20. *Synergising human relationships and teaming*

Nothing will work unless the people pull together as a team which is synergistically working towards well defined objectives.

21. *Extending the principles to the total supply chain where they are applicable.*

All of the principles that have been discussed can be operated inside a company or extended to all ends of the supply chain. There is little point in only working inside the company particularly if the two ends of the supply chain are not under reasonable control as they will then stifle further development of the company.

Application of the Above Principles

The first stage in applying the 21 rules above is to carry out an audit of the company and analyse products in terms of their streaming capability, and also analyse the machinery and equipment to look at their capability and the possibility of process linking and then calculate the optimum throughput and optimum work in process. This can then be developed to a customer quick response system which is based on **replacement** not **forecasting**. Such a system therefore cuts down on the error and speeds the throughput through the system with minimum inventory.

Conclusions

Despite worldwide statements about Australia's growth rate outstripping the United States, it is sobering to remember that the US\$ is still much higher in value than the A\$ and Australia's CAD is still 4%-6% GDP per year. (44% GDP total!)

The application of the 21 rules described here will enhance productivity, reduce inventory and enable the quick response system to find customers and improve service levels and profit. The focus will then become flexible manufacturing - we all need to lift our game!