THE LEAN ENTERPRISE ACADEMY

Discussion Paper

Building a Business Case for Lean:
Why is it so hard to see the financial impact of lean?

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Building a Business Case for Lean

Why is it so hard to see the financial impact of lean?

The problem with identifying the bottom line impact of lean is disturbing on two fronts; firstly because if we cannot measure the impact properly then we probably cannot direct it effectively either and secondly, because failure to make a predictable impact is likely to lead to the marginalisation and the eventual demise of the lean deployment.

Laying the blame for the dilemma at the door of the accountants is quite popular and this is not the first time that this body has been accused of being unhelpful.

Certainly it is uncommon for accountants to be involved in the early days of a lean implementation. This may be because they are not invited but also because many will content themselves with the idea that embarking on a lean programme to remove waste will somehow work through to cost reductions. And it is fair to say that until recently few people questioned whether removing waste was synonymous with reducing cost.

Before we examine the current role of accountants and accounting practice in valuing lean activity however we should make some observations about waste removal. If we use the analogy of a house most of us can relate to that.

Imagine that you want to remove waste in your home and decide to relayout to reduce the waste of transportation. In addition you use 5S to keep only those things essential to day to day living closest to you. By the combination of these two actions you manage to free up a least two rooms of living space!

Now the crunch, how much have you saved? We would suggest nothing. OK if you twist our arm and your imagination maybe, just maybe, there could be a small incremental amount for less heating and light. But actually if you really want to impact your bottom line then you have to EXPLOIT the improvement.

The most powerful way might be to rent out one of these rooms! But the main point is that waste removal is not synonymous with cost reduction. Waste removal releases capacity; it might be the capacity of space, or of people's or machine time etc., etc, but to move the improvement to the bottom line requires further steps.

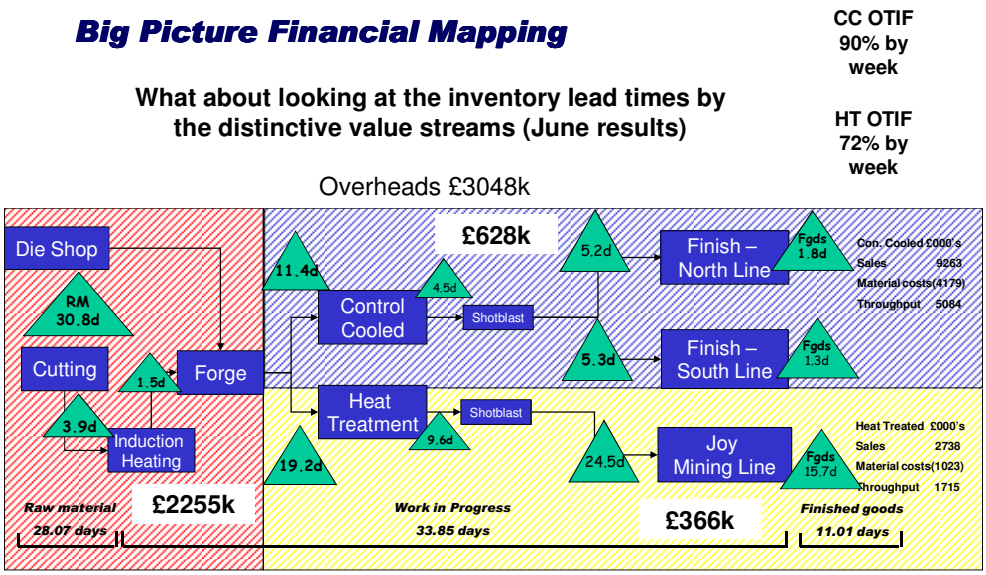
So we cannot level this criticism at the accountants; it was not they who encouraged lean programmes to focus on organisation and space saving.

The question we frequently hear is "why can't our accountants value our improvement activity"? This is plainly the WRONG QUESTION.

The right question is why don't we use money to help us direct lean to make the biggest impact?

In Flow Costing we use Big Picture Financial Mapping (BPFM) to elevate the fact that financial results are the CONSEQUENCES of how we manage the business.

The following are extracts from real BPFM for early experimenters with this method.



Here we are really trying to make Cause and Effect more explicit. It was clear to us a number of years ago that adding a little accounting data to a map could be a powerful way to influence lean practitioners on where to make an impact on the bottom line.

In the above example we need to ask why our On-Time-In-Full (OTIF) performance is so poor when there is so much inventory around, including finished goods? And why is the "Heat Treatment" value stream taking so much longer than the "Control Cooled" value stream; with worse OTIF? Go to the Gemba and find out!! Making interventions here can yield significant benefits.

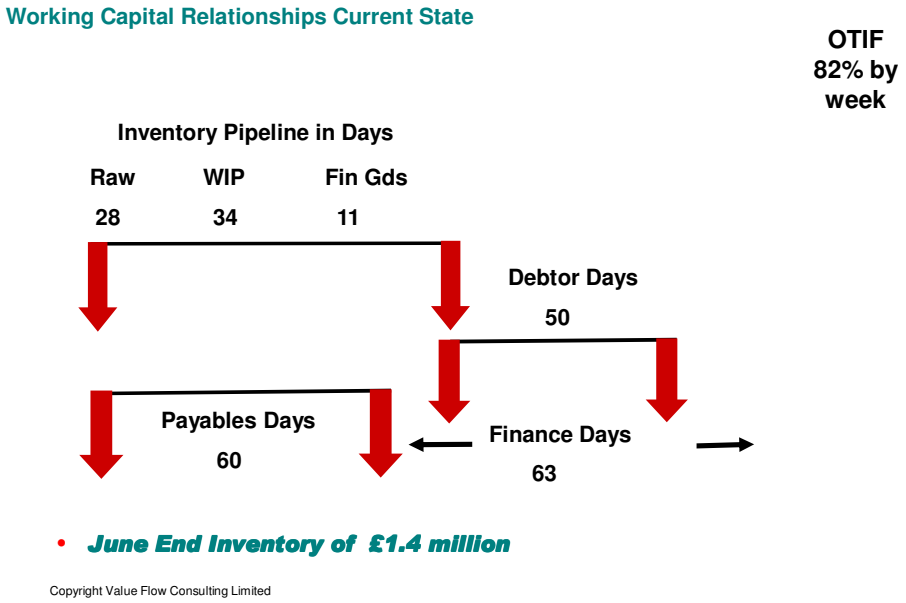
Please note that we are combining accounting and operational data which we are at liberty to do under a "management accounting" banner. So what's the difference between Financial and Management Accounting and why should any lean practitioner care? Answer: it is important because one system is at best a distraction if not downright misleading.

Financial accounting has developed a series of concepts, conventions and rules which serve the outside interested party. Many of these rules are of a statutory nature and can vary from one country to another. These must remain in the accounting department.

When we refer to management accounting, then we can forget regulatory rules. For instance there is no statutory period over which they must be produced and although it is quite common to find monthly management accounts, shorter periods are often found. Neither is the content prescriptive in the same way as financial accounting statements. Management accounts can focus on specific areas like the contribution from products, the performance of different locations, divisions or departments. Management accounts will often include non-financial information to highlight certain aspects of the running of the business, e.g. employee turnover.

In the management accounting territory we can get back closer to what Taiicho Ohno had in mind when he explained that in lean all we are trying to do is "reduce the time it takes from when we commit money to raw materials to when we collect money

from our customers". Flow Costing uses the following chart to scope out the potential for this improvement in terms of time and money. These are the two lowest common denominators to any lean application.



Unfortunately in almost all instances, manufacturing companies are using the same accounting structure to facilitate the production of financial accounts as they are to populate management accounting reports.

The "vehicle" for facilitating this bridge between the separate internal and external customers of accounting information, is the calculation of the product cost. To develop an "accurate product cost" is quite a seductive proposition. Firstly it is a legal requirement in order to value inventory in a standard manner, which ultimately effects profit and potentially taxes on them. And of course, a long held belief is that selling prices and other decisions should be based around the cost of a product.

However there are significant downsides of working out unit or product costs. This list is not exhaustive: -

- Conventional accounting systems encourage overproduction by their clumsy interpretation of the "value added" principle as "each time I make something I add value to the business" when plainly it should be "each time I sell something I add value to the business".
- They do not recognise the importance of bottlenecks, constraints or pacemaker processes.
- They encourage local efficiency creating "islands of excellence".
- They have little or nothing to say about lead times.
- They promote the idea that the bigger the batch the lower the unit cost.
- They encourage "cost reductions" which often prove to be "mirages".

This latter point is particularly important; if the removal of waste is actually the freeing up of capacity then how can we use monetary data to examine the best way of turning this new won capacity into bottom line impact?

The following slide is used in Flow Costing applications and lifted from a real life situation. The purpose is to confirm priorities, in other words it is a way of reminding the organisation of the relative monetary importance of differing aspects of the business.

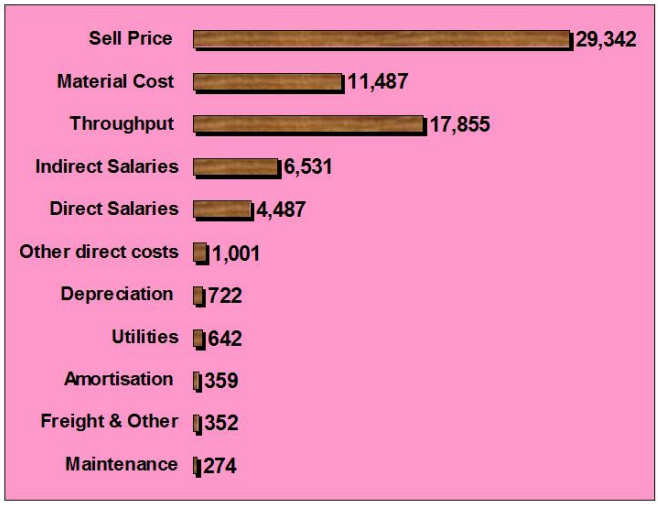
Key Drivers

Profit and Loss Actual 2009 £000's

Sales	586,833
Material Cost	229,732
Throughput	357,101
Indirect Salaries	130,622
Direct Salaries	89,744
Other direct costs	20,028
Depreciation	14,438
Utilities	12,830
Freight & Other	7,034
Amortisation	7,178
Maintenance	5,483
Profit	69,744

Sensitivity Analysis

A 5% Change for better effects the bottom line by: -



No one, particularly in the current financial climate is critical of being cautious about spending and taking every opportunity to save, but this simple analysis confirms that the wealth producing aspects of this business lie in creating new sales volumes and adding product or service innovations for which the customer is willing to pay better prices. *Pareto exists so use it!!*

How can we see the real cost of how we use today's capacity?

In manufacturing from a quality perspective we examine the part to see how well the process is working. In Flow Costing we examine the inventory to see how well we are using the capacity. We can think of inventory as the intermediary between demand and capacity. When these two are better synchronised the lead time is shorter and the outcome is fewer inventories which releases much needed cash. And this explains our obsession with analysing the inventory; it is a rich source of understanding about the way demand and capacity are being managed.

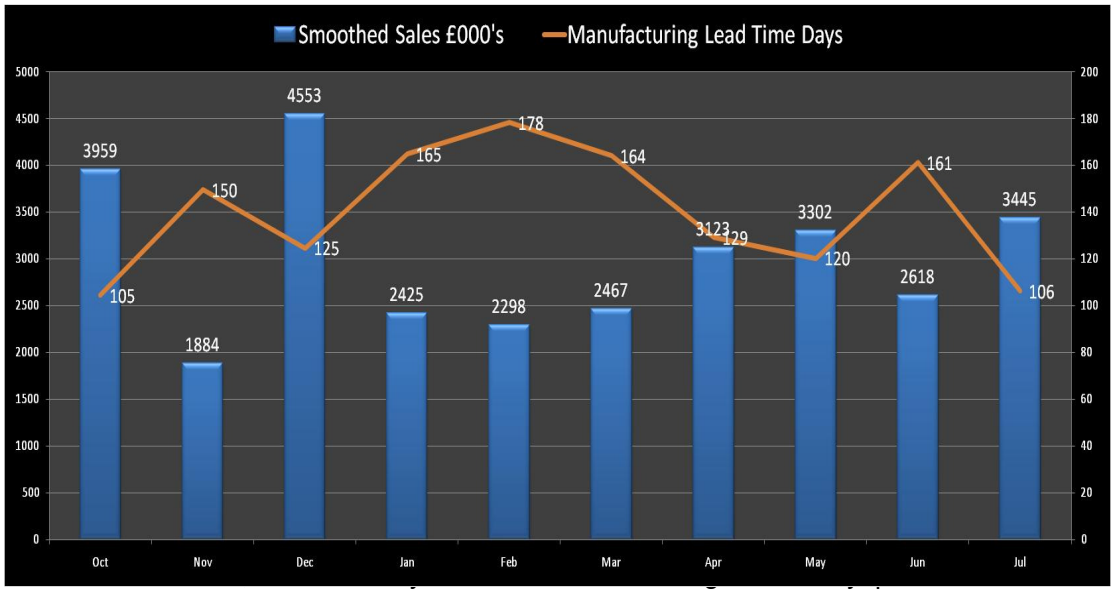
Well managed would mean the due date performance to the customer will be very high and the inventory relatively low. Poorly managed and there are often a combination of too much too soon and too little too late leading to poor service and longer lead times which jeopardise future throughput.

Inventory as an absolute number is of little use. Tell us you have £10 million and all we can say is that is more then £9 million and less that £12 million. Setting a target for reduction in isolation is dumb.

We need to give inventory a “time dimension” to enable us to speculate about our future state. Days of Sales Cover is sufficient to begin the task of quantifying the scope for improvement. Tell me you have 30 days worth and show me the trends over the last few months and we have a good foundation.

By reducing inventory to “time” in this way we are actually providing a more natural bridge between lean manufacturing and service applications. Certainly lead times manifest themselves more tangibly in manufacturing applications with physical inventory but ironically service centred organisations have a much more heightened awareness regarding lead times; quite naturally because their customers are often part of the queue and can become quite voluble!

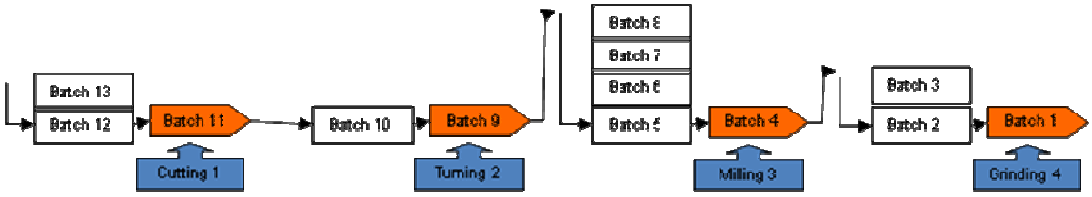
Check out the chart below showing lead times in a recent manufacturing application and we could speculate about the profanities we would hear if components could talk about the queues they are in!!



There is a significant role for lead time compression in Quality, Engineering Change, Operating Expense, Investment, Due Date Performance and Finished Goods Holding as the next few charts show. Each of these DIRECTLY impacts capacity and therefore the bottom line.

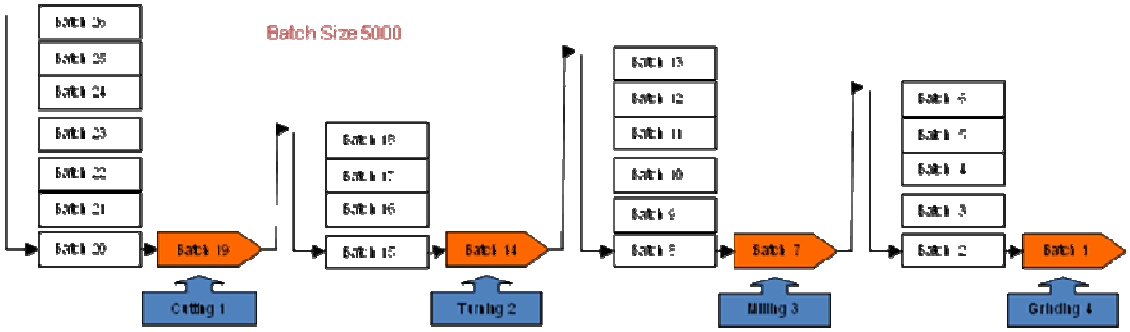
SHORT LEAD TIME

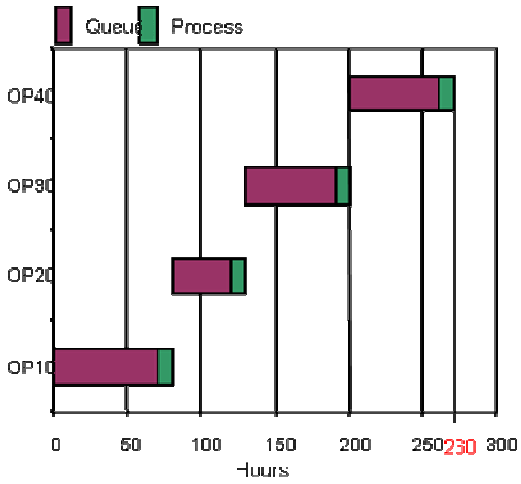
Batch Size 2500

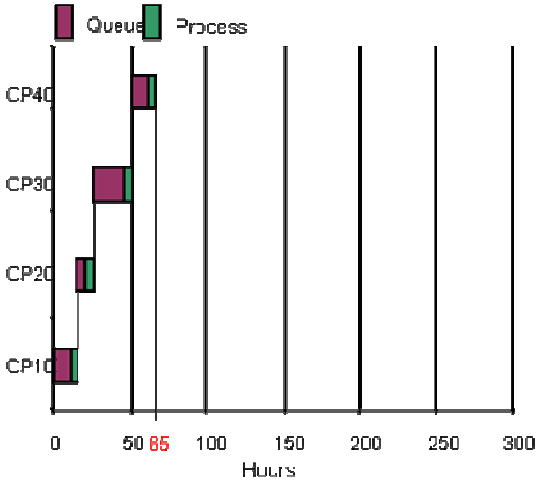


LONG LEAD TIME

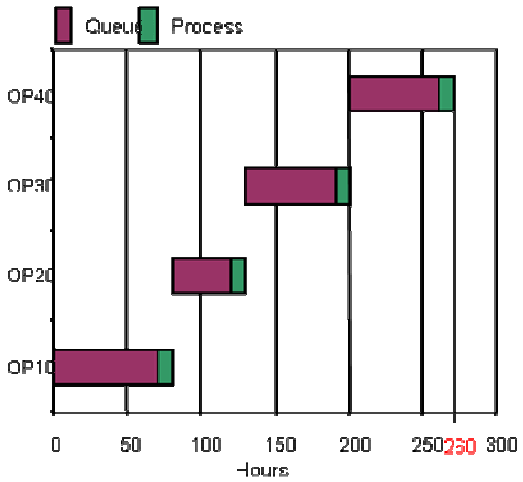
Batch Size 5000

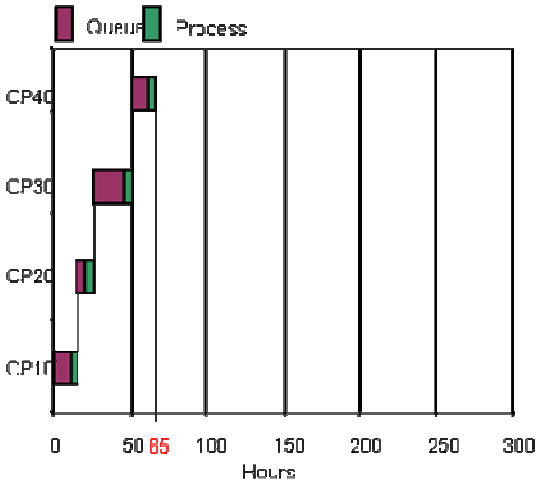






The Quality Impact

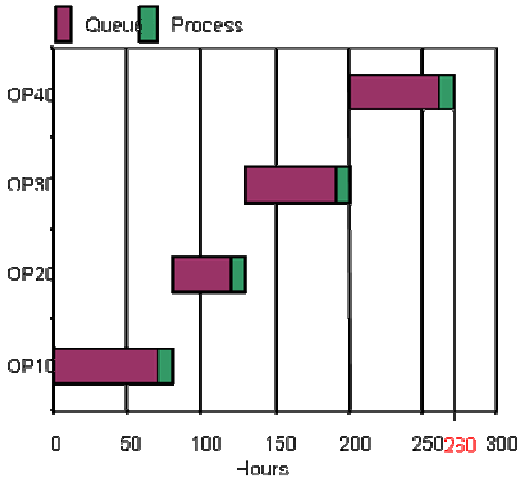


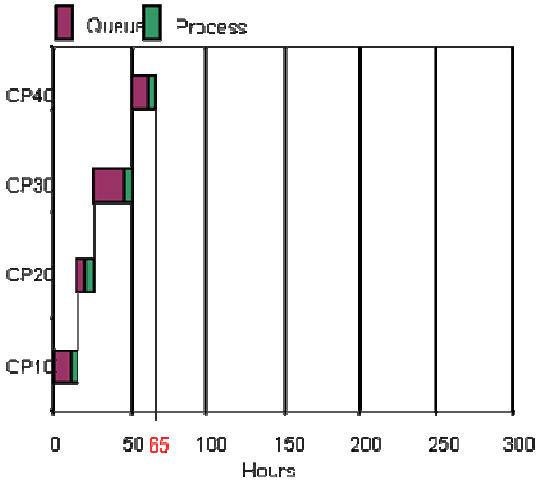


Defects are detected days or weeks after the problem occurred. What are the chances of recreating the circumstances in which the error happened and building a proper countermeasure?

Defects are detected hours after the problem occurred. You might even be able to stop the process before the entire batch is contaminated

The Engineering Impact

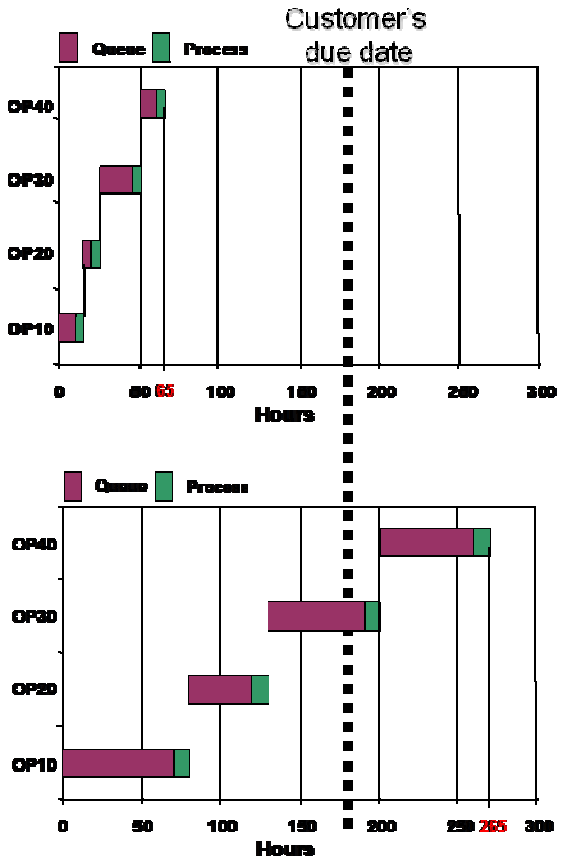




The improved product process will not be available many days or weeks after engineering make the change. How important is speed to market to you? Why do you think you have an Inventory provision for obsolete stock?

The improved product process will be available in hours. Much less obsolete inventory

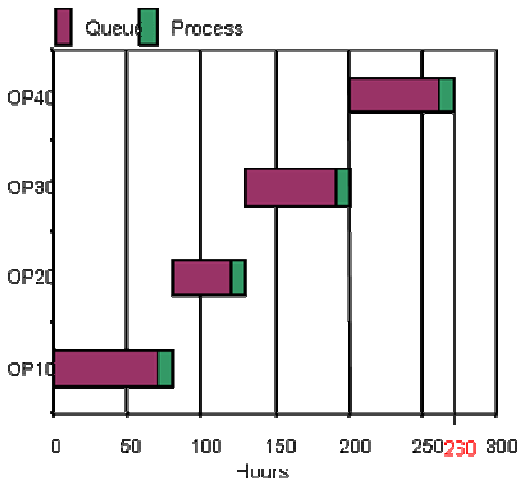
The Margin Impact

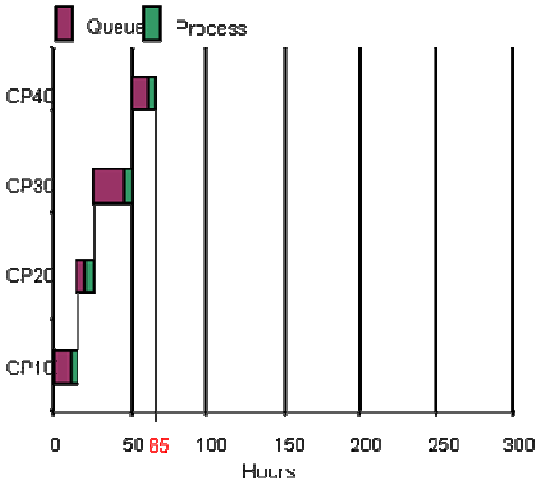


If the manufacturing lead time is shorter than the customer expectation no premium money will be required

If the manufacturing lead time is longer than the customer expectation then changing priorities expediting premium freight and overtime will be the penalty

The Investment Impact

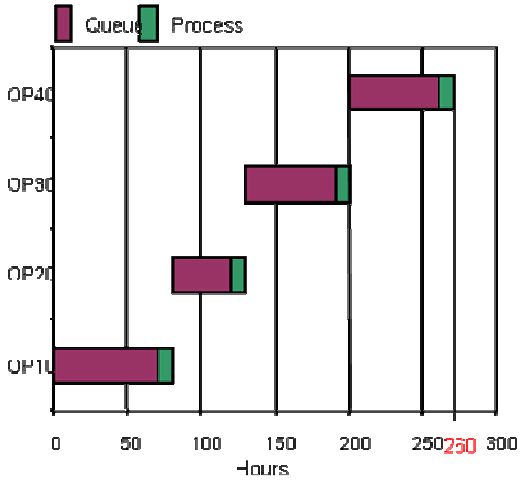


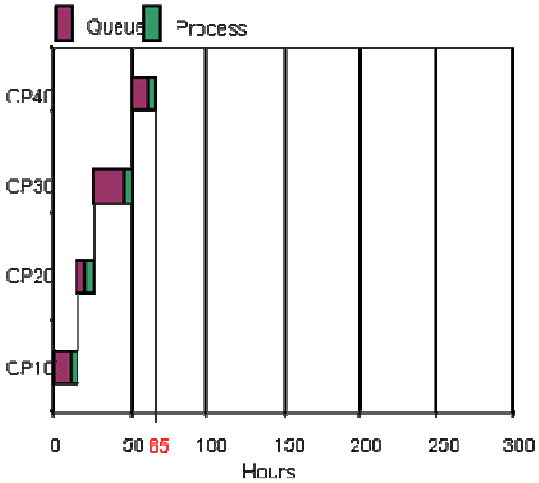


Where the lead times are longer pressure to ship puts the last operations under peak load typically at important times like "month end". To cope with this peak, extra capacity is often laid down which is not required for most of the time

When a little flows all the time peaks are smoothed out and the extra investment is not required

The Due Date Performance Impact

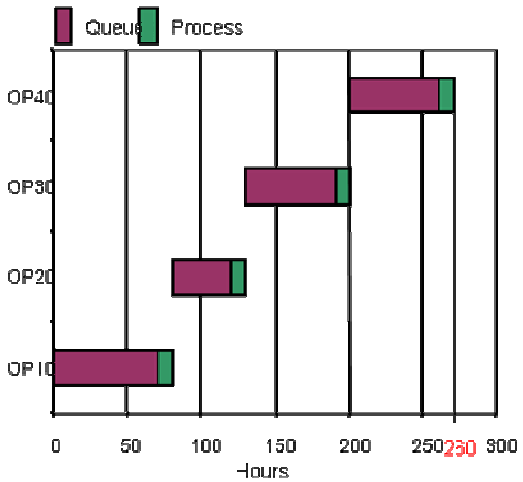


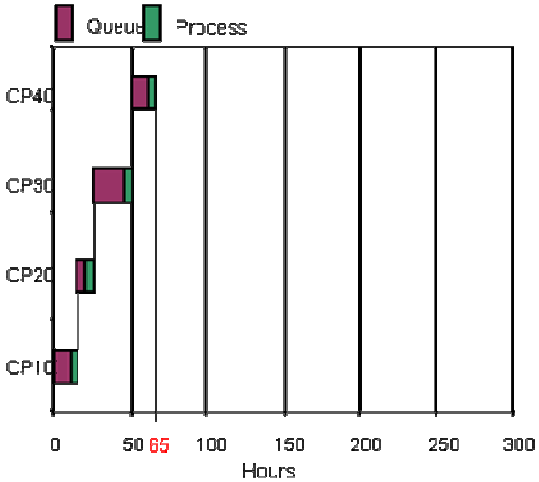


If the lead time here is 5 weeks then they are launching today what the customer has indicated they want in 5-6 weeks time. So the customers have 5-6 weeks to change their minds and they will because their customers change their minds on them. To everyone in production it looks like no one knows what is going on as quantities change regularly

Customers know much more clearly what they want over the next few days. The shorter the lead time the more certain that what you are launching is really required

The Finished Goods Impact





In many environments of which make to stock is the most obvious the lead time through the process is an important element of the calculation of finished goods holding. The longer the lead time the larger the finished goods have to be because it has to survive demand consumption during the longer replenishment period.

If the lead time is shorter not so much finished goods is required because they can be replenished more frequently

These 6 competitive edge factors were identified many years ago, but are still for the large part unrecognised and do not feature prominently enough in the business case for lean implementations. Each of the 6 does not apply in every application but neither do the benefits of shorter lead time end there.

Shorter lead times are the route to fewer stock losses; and less obsolescence costs. You would be less exposed to exchange fluctuations (although these could be positive as well as negative) but most businesses prefer certainty.
Space is likely to be freed up and significantly in the pre assembly buffer area of large assembly plants and in warehouse of make to stock environments.
To reduce lead time significantly requires a greater understanding of capacity (at least greater than the average ERP system) so that decisions like investment in capital expenditure will be more likely to deliver the desired results.
There is less operating expense if the company gets to grips with labour flexibility and where to prioritise the introduction of flexibility will be more apparent.

The overall impact in the order fulfilment process from applying lean based upon lead time compression is in the order of 5% to 20% in our experience. It does of course depend upon the opening position and whether a parallel growth strategy has been thought through.

For Service applications the impact of shorter lead times are: -

- Better performance to customer expectations.
- Higher quality of service, i.e. less failure demand.
- Faster introduction of new options for customers.
- Less queuing.
- Higher reputation; a firm foundation for growing service offerings.

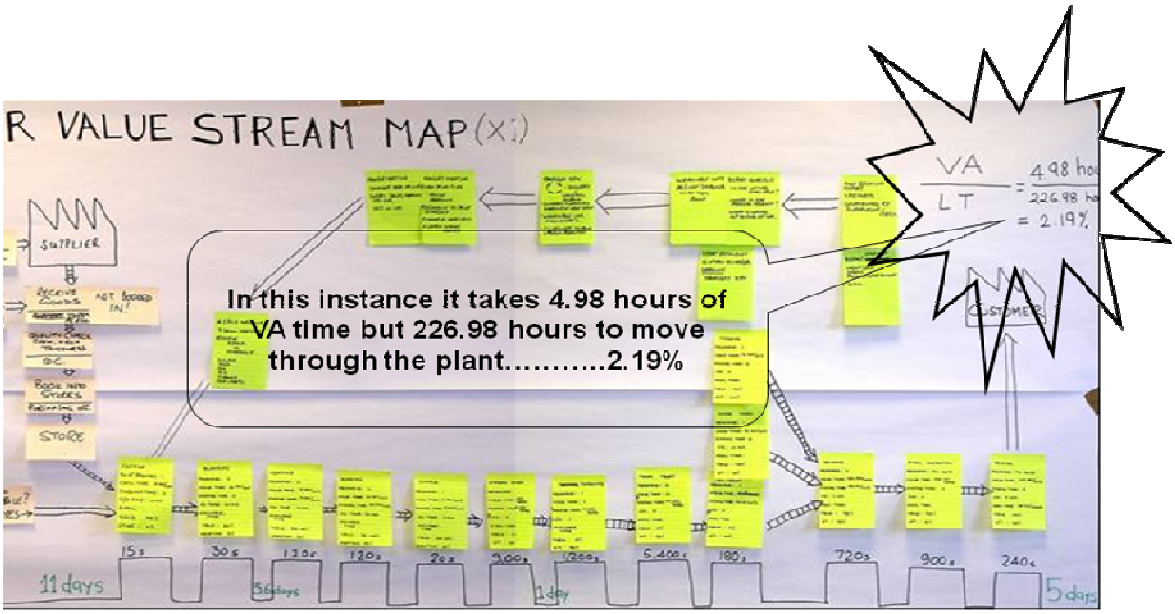
Flow Costing

When we talk of “building a business case” the intuitive reaction is to look to the people in the organisation who manage the money to assist us. These are known as accountants, although the reality is that we are quite capable of explaining the business case ourselves and we have demonstrated the main factors above. There is nothing complicated in the way we have depicted the money and relationship of demand capacity and inventory that you could not reasonably take on yourself. If there is an accountant or two curious enough to want to assist and become involved so much the better.

However we do not build a business case every day. We are suggesting it is done periodically in line with the future state development plans, which may have time horizons of 3 or 6 or even 12 months duration depending upon the degree of difficulty taken on.

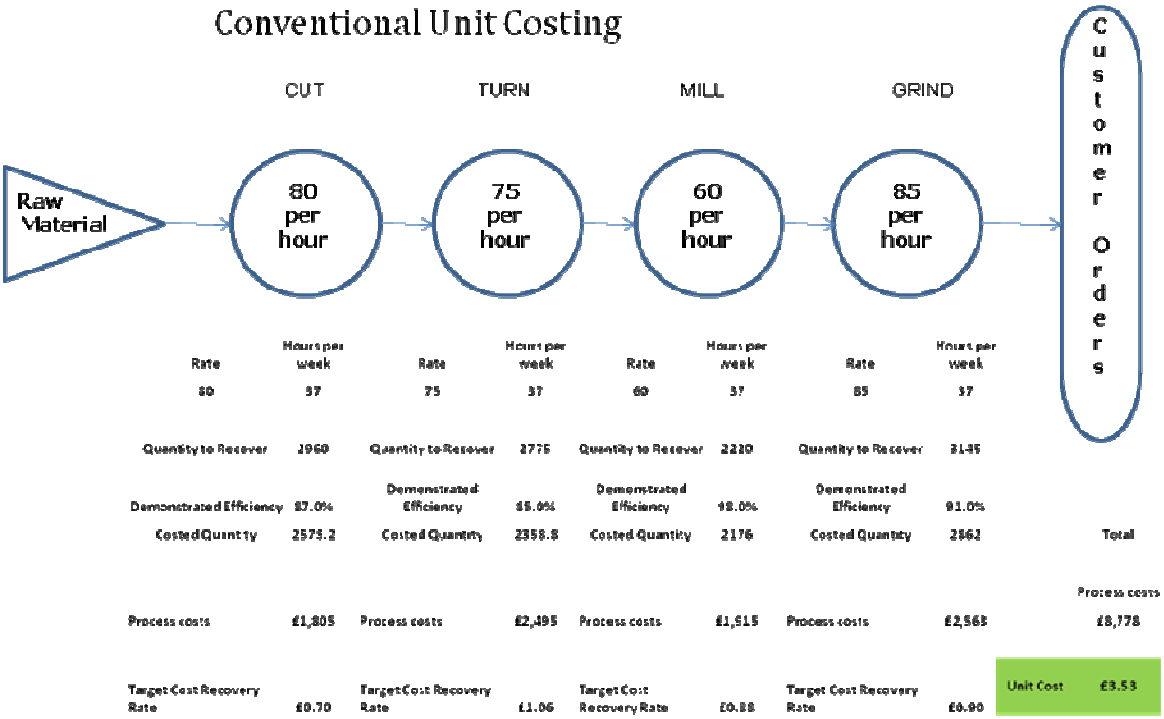
So what of day to day activity and the plotting of smaller steps and interventions? Here we use the Flow Cost. The concept is quite simple and emerged from observations made during value stream mapping (VSM) events.

So let us look back at a VSM and make the link.



There can be many useful programmes that spring from mapping but one of the critical and most interesting outputs is the relationship between the Value Added (VA) or conversion time and the overall Lead Time (LT). VA is almost always a very small part of the overall LT as in the case above. In fact practically speaking this ratio of 2.19% is quite high it is often less than 1%!! And yet the product cost is worked out on the basis of this VA time.

If we look at how a Product or Unit Cost is worked out and contrast it with the Flow Cost it reveals a system that is more in tune with a Lean Organisation. Imagine we have a simple 4 stage process in manufacturing: -



Both methods start by collecting data on how much it takes to run the processes, which will normally include labour, tooling, consumables and possibly supervision and maybe even energy depending upon circumstances. In conventional product costing there will be overhead allocation to consider. This is not the case in Flow Costing. Overhead is not allocated back to production at all. Why bother? Allocation does not reduce the expense.

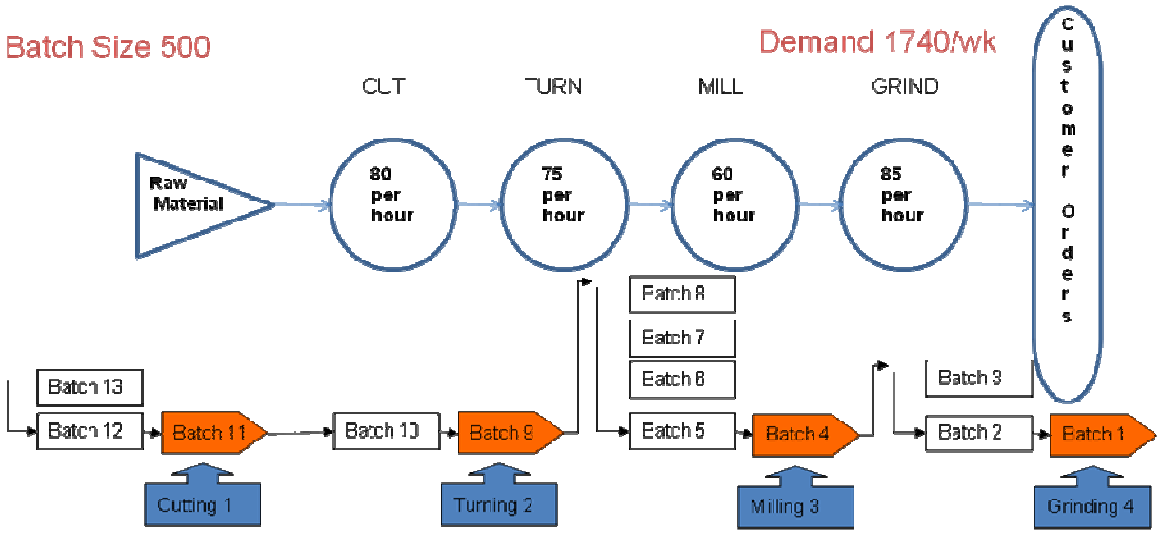
We do not want this “accounting nicety” to get in the way of the deeper discussion so for the time being let us assume that the process costs noted above (£1805, £2495, £1915 and £2563) exclude overhead. This is as far as we can tell the real money the business uses to satisfy the current demand (otherwise known as the capacity).

In conventional product costing the time available to produce the volume of parts is now used to work out a “Recovery Rate”. In the instance above the total parts available to be made in the time allowed has been degraded by “Demonstrated Efficiency”; more of that madness later.

The “Costed Quantities” are now divided into the Process costs and a Target Cost Recovery Rate is the result. And if we add up the results from each of our 4 processes we have a Product or Unit Cost of £3.53.

The “mechanics” and details may differ in your own organisation but this is substantially how products costs are arrived at.

Now let us add some other features to our picture of costing and in so doing make the links back to VSM.



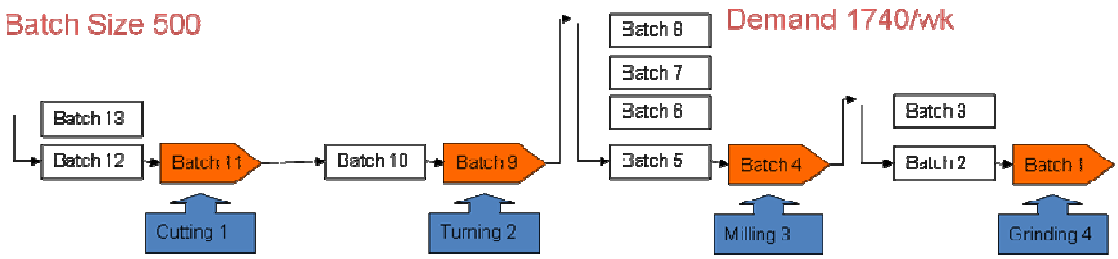
My goodness someone has thought to check on the demand! It is 1740 per week at present. And we have a batch size of 500.

The disposition of the work in progress is revealing; physical inventory does tend to accumulate in front of the slowest operation, i.e. Milling. And this production line will never produce more that 60 per hour as long as Milling stays on the same shift pattern as the others. *So much for "Efficiency" on non pacemaker processes!*

Given that we have data regarding cycle times we can do a rough cut calculation of the lead time. (There are a number of valid ways to work this out we just need to be consistent).

- 13 Batches in work in process.
- Cycle time per part 45 secs 48 secs 60 secs and 42 secs
- Processing 18.75 hrs + 12.5 hrs + 41.7 hrs + 17.5 hrs = 90.45 hrs
- Total manufacturing lead time 2.4 weeks

So like every mapping event we have a lead time far, far in excess of the cycle time for a part. We can however calculate the Flow cost now for comparison with the Product or Unit cost.



- Operating Expense of the System £8778 per week
- Product exposed to the money it takes to run the system for 2.4 weeks or 12 days
- 2.4 weeks x £8778 = £21067.2
- Divide the Total System Cost by the demand (sold) 1740 = Flow Cost of £12.11

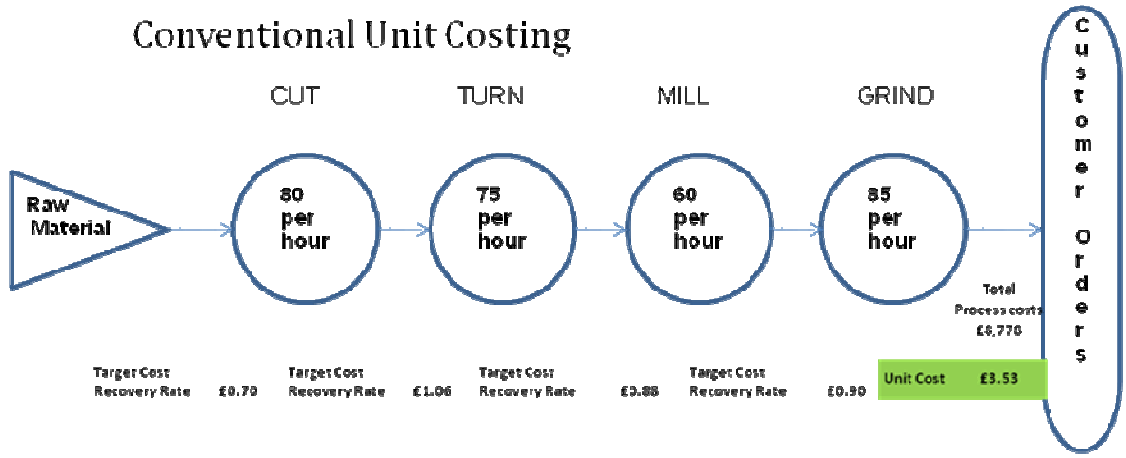
The calculation of the flow cost hinges upon the lead time rather than the process time. The Flow Cost is the time the product or service has taken or been exposed to the money it takes to run the system. The longer it hangs around the greater the cost. The shorter the lead time the less it is exposed so the smaller the Flow Cost. We can easily apply a similar logic to Warehouses where pallets of goods hang around for week after week.

Flow Cost versus Product Cost

You have to admit the calculations are not hard, so what of the implications for a Lean Enterprise?

There follows a comparison of costing methodologies in relation to some typical Lean interventions: -

Introduction of a Pull system to put a cap on work in progress.
Apply 5S, including standard work in progress.
Set up reduction to modify batch sizes.



Lean Intervention

- Pull system
- Real 5 "s"
- SMED

Impact on Unit Cost

- One off cash increase
- No impact
- Increases unit cost

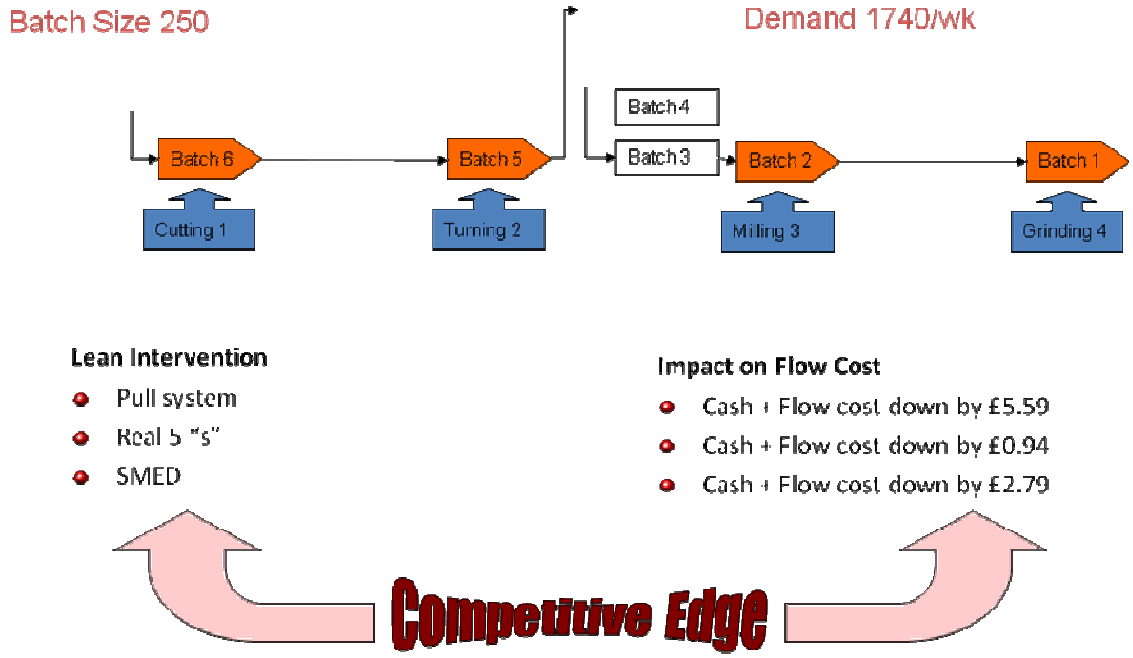
Conventional costing is "immune" to these changes. In fact because of a quirk of double entry book keeping reducing work in progress by these 3 means will actually result in lower perceived profits. This is a well known phenomena but nobody does anything about it!!

It would be funny if it was not so tragic; imagine how many good lean programmes have been derailed because of inflated inventories and the clumsiness of the financial accounting definition of value added!

Just to “heap on the agony”; check on the impact of conventional costing if we were to buy a new Cutting Machine which worked at 160 per hour…….. sad isn’t it!

What of Flow Costing?

Because Flow Costing responds positively to lead time compression it encourages these activities.



The cash and the Flow Cost reduction are only the iceberg; do not forget the 6 Competitive Edge Factors as well!

So if we really want to do justice to the legacy left by Ohno we need a costing system which penalises the queuing time of 99% rather than focussing on speeding up the 1%. Flow Costing which uses lead time to calculate Flow Cost does exactly that. It has been labelled “tongue in cheek” as “Inactivity Based Costing” because it penalises delay.

Flow Costing is not for accountants. Although it would be nice if a few more joined in. It is designed for lean practitioners to help them focus and to promote the right lean behaviours.

Dan Jones and John Darlington