

QRM – AN ENABLER ON THE ROAD TO AGILITY?

Quick Response Manufacturing - Part 1

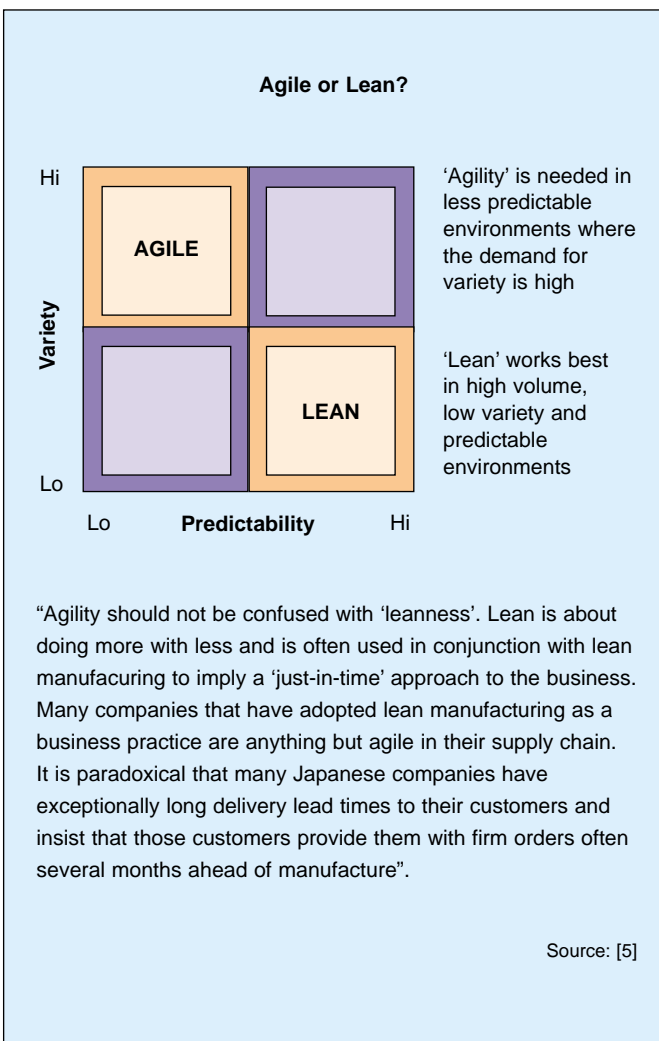
Lindsay Harding, MIOM, Strategem

Whilst making every effort not to throw another buzz-word into the frame, to add to the Lean vs. Agile debate [1] which has been ongoing for some time, the QRM philosophy is not getting sufficient 'airplay' within the UK. A concern is that the term 'Quick Response' was being used several years ago and therefore may be perceived as 'old hat'.

Rajan Suri of the USA makes the following statement, "Lean Manufacturing is all the rage today. Yet Lean Manufacturing and its relatives - JIT and Flow Methods - are based on the Toyota Production System, a strategy perfected by Toyota 30 years ago. How can we expect to get ahead by adopting 30-year-old strategies?"

Today, a few mid-western companies are proving that, in some emerging markets, a new company-wide strategy called Quick Response Manufacturing (QRM) can be far more powerful [2].

The Lean approach has undoubtedly had a huge impact on many industries (automotive in particular) with massive improvements evident in many circumstances (steady 'flow' of demand etc) [3]. The ability of lean processes to adapt in spiky unpredictable demand was however less impressive, hence Agility coming to the fore. The four-quadrant chart below, which will likely be familiar to readers, summarises this point succinctly.

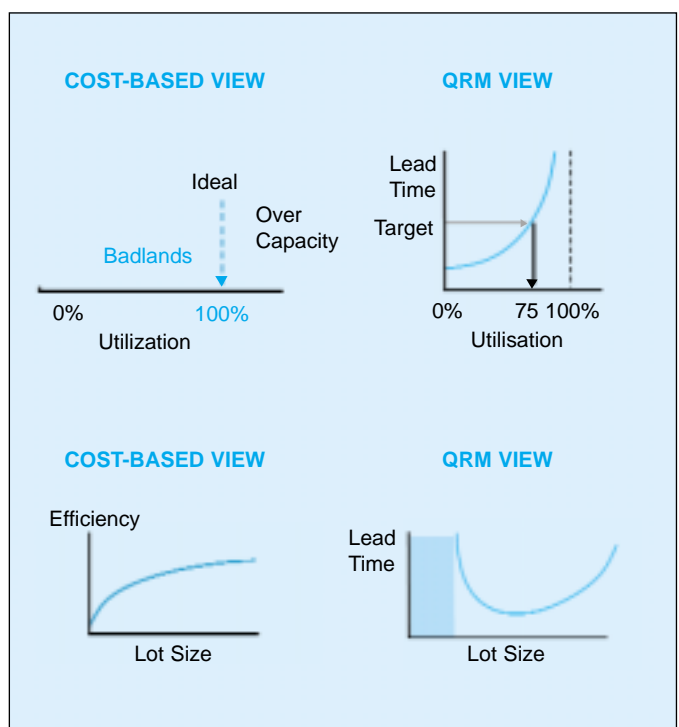


Unfortunately to date, unlike lean there [4] has not been a toolbox developed for companies to adopt when pursuing the Agility approach, although it is widely appreciated that work is currently being undertaken at Cranfield School of Management in this area.

I believe the tools and techniques developed by Professor Rajan Suri of the University of Wisconsin-Madison, USA could play a major role in the quest for achieving Agility. In 1993 Suri established the Centre for Quick Response Manufacturing at the university, and the industrial membership stands at more than 40 companies (including the likes of Ingersoll Machine Tools, Senior Flexonics, Alcoa, Hufcor, John Deere and Trek Bicycles).

QRM is more a mindset change than a manufacturing technique. Its origins lie in the Time Based Competition (TBC) strategy which extols using speed to gain competitive advantage, by delivering products or services faster than one's competitors. QRM takes this approach and focuses specifically on manufacturing to facilitate the rapid delivery of existing products and the rapid development and introduction of new products. The team at Wisconsin has developed operational methods which reduce lead-times, and allow fast response to unpredictable customer demands in a variety of industries - even those where product variants are excessive. Could these tools and techniques go some way to plugging the gaps which currently exist in the Agility approach? QRM involves principles aimed at the relentless pursuit of lead time reduction.

One of the most striking concepts emphasised in the QRM approach is that it suggests a business plan to operate at 80% (or even 70%) capacity on critical resources, suggesting that high utilisation can lead to a false sense of security. Typically, most efficiency measures work counter to lead time reduction. QRM suggests making lead time reduction the main performance measure, by de-emphasising or eliminating other measures.



The QRM text [6] illustrates this point by the way of the following example, comparing the output of two US companies, the first running at 90% utilisation of critical resources although only 70% net yield being realised due to scrap, defects and rework.

The company adopting QRM principles had targeted cell improvements to achieve 90% yield, overall even running at 80% capacity the net output was more impressive (with lower costs associated with overhead etc).

Net output for traditional company

$$= 0.90 \times 0.70 = 63 \% \text{ capacity}$$

Net output for QRM company

$$= 0.80 \times 0.90 = 72 \% \text{ capacity}$$

What differentiates QRM from many of the other manufacturing principles under their various guises is the what-if / simulation software 'MPX' for capacity analysis, and the new material planning and control approach called POLCA (Paired-cell Overlapping Loops of Cards with Authorisation) [2] and [6].

The MPX software developed at the Wisconsin QRM centre is an interrogation tool (based on Rapid Modelling Technology) residing upon a database, companies populate the package with their own information (BOMs etc) prior to testing various scenarios - 'what if we changed our shift pattern to ...?' etc allowing maximised throughput targeted at swift response to customer requests. QRM has attempted to address issues often omitted by other approaches, to this end the centre has developed algorithms for batch sizing and shop floor planning and control system (POLCA). At a later stage, both POLCA and MPX will be covered in more

Jit or Flow or Lean Manufacturing	QRM
Systematic elimination of waste leads to continuous improvement	Relentless reduction of lead time results in continuous improvement and elimination of waste
Create 'flow' by designing production lines so orders can proceed continuously without any backflows or stoppages. One-piece flow is the goal	Create cells based on families of products with similar operations. However, they need not have linear flow; products can go through cells in various sequences. One-piece flow is not necessary; small batches may be necessary as a consequence of the customised nature of products.
Support flow using <i>takt</i> time and level scheduling. Use detailed analysis of tasks and standardisation of work to achieve the balanced <i>takt</i> times throughout the production facility.	Support the ability to meet demand for widely differing products through organisational flexibility and techniques such as time-slicing, and by exploiting the understanding of system dynamics. Also, use different combinations of cells to create varying end-items.
Suppliers meet flow requirements via pull signals and flex fences.	Suppliers support quick response by changing their operations and via redefining their interactions with the customer.
Pull signals material replenishment: 'Sell one; buy one' or 'ship one; make one.' Implies there is a product ready in stock to sell, or there is a product in finished goods to ship. Hence inventory needs to be kept at each point in the supply chain. Too much inventory when there are a large number of end items. Doesn't work for custom-engineered products.	Tailored to companies that have a very high product variety or engineered products. Goal of QRM is not to start a job until there is an order for it. Uses a combination of push for material planning and release, and a modified pull approach to prevent congestion.
Best suited for providing custom combination of predefined options for a baseline product.	Strongest when used for custom-engineered products.
Requires relatively stable demand, and largely for replacement products.	Use to forge new market niches such as emerging segments with unpredictable and rapidly changing demand, or where products must be tailored to individual customers.
Emphasises on-time delivery as primary performance measure.	Primary measure is lead time reduction. On-time performance is achieved as a by-product of the strategy.
Source : [6]	

detail in the concluding part of this article - Quick Response Manufacturing Part 2.

SUMMARY

At first sight it would seem that QRM has a lot of similarity to lean manufacturing, and indeed, many of the tools and techniques associated with Lean are applicable within the QRM approach; cellular manufacturing, SMED, 5S. All have their place within a QRM company. Also approaches such as 'value stream mapping' are commonly utilised in the implementation of QRM.

Whereas Lean will focus on the elimination of non-value adding waste to improve quality, reduce cost and lead time, QRM focuses on the relentless pursuit of reducing lead times throughout the organisation to improve quality, reduce cost and eliminate non value adding waste. However, some enablers involved in Lean production, such as Kanban control systems are aimed at more level scheduling and are not always appropriate in industry, hence I believe there is a strong case for QRM.

Recognising that many of the constraints to lead time reduction lie, not just in manufacturing, but also in the business systems supporting and surrounding manufacturing. Because of this, QRM can be considered truly strategic and not simply tactical.

"Agility may take us beyond QRM, but many managers still do not support the core principles of QRM. After a company has mastered QRM it can target Agility and by then, the principles may be better understood"...Rajan Suri. [6]

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About the author

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Lindsay gained his MSc in Logistics & Supply Chain Management at Cranfield University and recent assignments have included managing the Supply Chain Clusters in Electronics and Medical Products sectors on behalf of the Welsh Development Agency. He previously worked for Mitel Telecom where he headed the Demand Planning team, whilst being heavily involved in the SAP implementation.