

A Seminar Report
ME 711: Manufacturing Planning and Control

QUICK RESPONSE MANUFACTURING SYSTEMS

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LIST OF ABBREVIATIONS

ERP	: Enterprise resource planning
FTMS	: Focus Target Market Fragment
JIT	: Just In Time
MCT	: Manufacturing Critical-path Time
MRP	: Material Requirements Planning (MRP)
MRP-II	: Manufacturing resource planning
NPI	: New Product Introduction
POLCA	: Paired-cell Overlapping Loops of Cards with Authorization
QR	: Quick Response
QRM	: Quick Response Manufacturing
Q-ROC	: Quick Response Office Cell
TBC	: Time-based Competition
WIP	: Work in advance

1. INTRODUCTION

1.1. Preview of Quick Response Manufacturing (QRM)

Quick Response Manufacturing (QRM) is a companywide procedure to cut lead times in all stages of fabricating and office operations. It can bring your items to the market more rapidly and offer assistance you compete in a quickly changing fabricating field. It will increment benefit by lessening fetched, improve conveyance execution and move forward quality.

QRM's overarching center on time as the directing administration technique is in a perfect world suited for companies advertising high-mix, low-volume, and custom-engineered items. In reality, numerous companies making profoundly customized items and/or a tall changeability in their item blend have utilized QRM as an expansion to existing Incline, Six Sigma, and other enhancement endeavors.

The main focus is to shorten the time between orders being received till delivery. While still being able to plan a thing to meet specific client needs, it can go without a doubt encourage to consolidate diminishing the time required to bring an unused thing to the market.

QRM persistently looks for after the reducing of lead time in all viewpoints of operations. Responding to your customers' needs by rapidly planning and manufacturing things customized to those needs is another principle.

Though JIT (or incline to fabricate) centers on the tenacious interest (persistent enhancement) of eliminating non-value-added waste to make strides quality, decrease cost (and decrease lead time), Quick Response Manufacturing centers on the persistent interest of lessening lead times all through your operation to progress quality, diminish cost, and eliminate non-value included waste.

The QRM focus is on the whole trade, from acquiring through item delivery. This incorporates decrease the time required to endorse any engineering changes, optimize the supply chain, lessening the time required to buy order. The objective isn't to work speedier, but to dispense with waste and put needs on the right targets.

How QRM Goes Beyond Lean – A Ten-Point Summary

Factor	Lean Approach	QRM Approach
1. Origin	Derived from the Toyota Production System . Works best for high volume, repetitive production.	Designed from the ground up for low-volume and custom-engineered products. (Also enables you to compete with low-wage countries.)
2. Dealing with Variability	Tools such as Takt Time, Standard Work and Level Scheduling target the elimination of <i>all</i> variability.	Eliminate dysfunctional variability. Strategic variability provides competitive advantage: exploit it using QRM tools.
3. Driver and Metrics	The driver is the elimination of waste. Metrics based on seven types of waste; this measure the “micro” impact in seven areas, but may not give insight into “macro” system-wide waste. Hard to evaluate the success of projects when seven measurements are involved.	The driver is the elimination of lead time , identified by the Manufacturing Critical-path Time (MCT) metric. Encourages global view of waste throughout the extended enterprise. MCT provides a unified measure of system-wide waste and a single metric for improvement projects.
4. Cell Design	The cell structure is rigid , based on Standard Work, Takt Time and linear flow. Highly effective for repetitive production.	QRM cells are flexible and allow multiple flows for higher variety. Emphasis is on teamwork, ownership, and cross-training.
5. Material Control	Use Kanban for material control. Simple, visual system and works well for high-volume parts, but creates excess inventory for low-volume parts, and cannot be used for custom-engineered parts.	Use POLCA for material control. Builds on cellular structure and your MRP system. Slightly more complex than Kanban, but works equally well for high-volume, low-volume, and custom parts.
6. Material Planning	Replace Material Requirements Planning (MRP) with Kanban. Again, not practical for low-volume or custom parts.	Build on your existing MRP system, but simplify it to a “high-level” MRP system and supplement it with POLCA for material control.
7. Capacity Planning	Use Takt Time for planning capacity at operations. Takt Time is calculated solely from production targets. Simple and easy to understand, but not applicable to high-variability environments.	Strategically plan for spare capacity. Include job variability and lead time targets to decide the amount of spare capacity needed (e.g. more spare capacity in higher variability operations).
8. Supply Management	Emphasis on waste reduction tends to be local and inward focused. Not clear how to extend to supply chain. Takt time and Kanban may not be the right tools for extended and global supply chains.	Focus on lead time reduction results in a global outlook through time-based supply management – for example, revising goals of supplier improvement programs and rethinking sourcing decisions.
9. Companywide application	Message not clear to nonmanufacturing areas; seven lean wastes may not apply in other areas. Key tools such as Takt Time and Kanban also stem from shop floor operations. Not clear how to apply them to nonmanufacturing operations.	Being responsive to customers provides a unifying goal for the whole enterprise. QRM approach can be used in all areas. Specific tools for office operations, including Focused Target Market Segments (FTMS) and Quick Response Office Cells (Q-ROCs).
10. Decision-Making and Justification	The ongoing struggle to convince executives to change policies. Local waste elimination focus may not provide sufficient justification. May require new accounting methods (“Lean Accounting”).	Teaches executives about the huge financial impact of time; encourages time-based decision-making and financial justification. Small adjustments to existing accounting system are sufficient.

1.2 Overview of QRM Principles

1a. Traditional Belief: Everyone will have to work faster, harder and longer hours, in order to get jobs done in less time.

1b. QRM Principle: Find whole new ways of completing a job, with the focus on lead time minimization

2a. Traditional Belief: To get jobs out fast, we must keep our machines and people busy all the time.

2b. QRM Principle: Strategically plan for spare capacity – plan to operate at 80% or even 70% capacity on critical resources.

3a. Traditional Belief: In order to reduce our lead times, we have to improve our efficiencies.

3b. QRM Principle: Measure the reduction of lead times and make this the main performance measure. Eliminate traditional measures of utilization and efficiency.

4a. Traditional Belief: We must place great importance on “on-time” delivery performance by each of our departments and our suppliers.

4b. QRM Principle: Stick to measuring and rewarding reduction of lead times.

5a. Traditional Belief: Installing a material requirements planning (MRP) system will help in reducing lead times.

5b. QRM Principle: Use MRP for high level planning and coordination of materials. Restructure the manufacturing organization into simpler product oriented cells. Complement this with POLCA, a new material control method that combines the best of push and pull strategies.

6a. Traditional Belief: Since long lead time items need to be ordered in large quantities, we should negotiate quantity discounts with suppliers.

6b. QRM Principle: Motivate suppliers to implement QRM, resulting in small lot deliveries at lower cost, better quality, and short lead times.

7a. Traditional Belief: We should encourage our customers to buy our products in large quantities by offering price breaks and quantity discounts.

7b. QRM Principle: Educate customers on your QRM program, and negotiate a schedule of moving to smaller lot deliveries at reasonable prices.

8a. Traditional Belief: We can implement QRM by forming teams in each department.

8b. QRM principle: Cut through functional boundaries by forming a Quick Response Office Cell (Q-ROC), which is a closed-loop, collocated, multifunctional, cross-trained team responsible for a family of products aimed at a focused target market segment, and empower the Q-ROC to make necessary decisions.

9a. Traditional Belief: The reason for implementing QRM is so that we can charge our customers more for rush jobs.

9b. QRM Principle: The reason for embarking on the QRM journey is that it leads to a truly productive company with a more secure future. Also, lower cost/price, higher quality and shorter lead times result in highly satisfied customers.

10a. Traditional Belief #10: Implementing QRM will require large investments in technology.

10b. QRM Principle #10: The biggest obstacle to QRM is not technology, but “mindset.” Management must recognize this and combat it through training. Next, companies should engage in “low-cost” or “no-cost” lead time reductions, leaving expensive technological solutions for a later stage.

2. HISTORY

2.1 Background

QRM is established in the concept of Time-based competition (TBC) spearheaded by Japanese undertakings in the 1980s and to begin with, defined by George Stalk Jr. in his 1988 article entitled Time – The Next Source of Competitive Advantage. Time-based competition is a broad-based competitive technique emphasizing time as the major figure for accomplishing and keeping up a maintainable competitive advantage. It looks to compress the time required to propose, create, make, showcase and provide items. QRM advocates a companywide center on brief lead times that incorporate speedy reaction to request existing items as well as unused item and plan changes. This combination has driven to the usage of QRM in numerous high-mix, low-volume companies.

A few contend that Quick Response Manufacturing varies from Quick Response (QR) strategies utilized in the attire industry and the fast fashion market. QRM is a company-wide administration procedure appropriate to a wide assortment of businesses, while QR fundamentally stands for a particular commerce demonstrate in a specific industry. In any case, the imperative contrast to note is that QR was a competitive industry activity presented in the US Material Industry in 1984 as a implies of progressing efficiencies in fabricating and supply chain forms and as such was one of the most punctual pioneers of putting into hone time-based competition earlier to Stalk's seminal article. Hence QR crossed the conventional boundaries of the organization and was not constrained to a single organizational productivity advancement such as that pushed by advocates of QRM. In this regard, the Material Industry activity was inventive and visionary in its application of QR strategies over the supply chain.

2.2 Development

The concept of Quick Response Manufacturing (QRM) was, to begin with, created in the late 1980s by Rajan Suri, at the time teacher of Industrial and Systems Building at the College of Wisconsin-Madison. Combining developing scholarly investigate in Time-based Competition (TBC) with his claim perceptions from different lead time diminishment ventures, Suri conceived QRM as a concept embracing a persistent accentuation on lead time lessening that has a long-term effect on each angle of the company.

In 1993, Suri, along with a few U.S. Midwest companies and scholarly colleagues at the College of Wisconsin-Madison, propelled the Center for Quick Response Manufacturing, a consortium committed to the advancement and usage of QRM standards in an industry setting. Proposed by Suri, the recently coined term "Quick Response Manufacturing" (QRM) means the modern strategy. QRM extends basic principles of time-based competition while including these new aspects:

- Clarification of the misunderstanding and misconceptions managers have about how to apply time-based strategies
- Companywide approach reaching beyond shop floor to other areas such as office operations and the supply chain
- Focus on implementation and sustainability
- Focus on manufacturing enterprises
- Inclusion of basic principles of systems dynamics to provide insight on how to best reorganize an enterprise to achieve quick response
- Manufacturing Critical-path Time (MCT) metric to measure lead times
- New material planning and control approach (POLCA)
- Novel performance measure
- Singular focus on lead time reduction
- Specific QRM principles on how to rethink manufacturing process and equipment decisions
- Use of cellular organization structure throughout the business with more holistic and flexible cells

Suri's proceeded research into QRM through industry ventures along with excited reactions to different articles on lead time diminishment issues driven him to create a comprehensive hypothesis on executing speed in a fabricating company, covering all zones in the venture. He defined his hypothesis in the book *Fast Reaction Fabricating: A Companywide Approach to Decreasing Lead Times* (1998), giving a system for the usage of QRM in fabricating companies.

3. CORE CONCEPTS

QRM strategy comprises four core concepts:

3.1 Realizing the Power of Time.

Customarily, U.S. fabricating firms have centered on the scale and fetched administration techniques based on the division of labor hones formalized by Frederick Winslow Taylor and spearheaded by Henry Ford.

From the time-based viewpoint of QRM, the tall degree of labor specialization and various leveled division structures at simply cost-based organizations have these negative impacts on lead times:

- Focus on effectiveness and asset utilization empowers laborers and directors to construct excesses, abating the reaction to client requests
- Hierarchical communication structures including different administration levels require a noteworthy sum of time to resolve indeed schedule issues
- Low ability levels lead to moo quality and tall levels of rework.
- Making expansive item amounts to stock leads to tall stock, regularly inclined to stock out of date quality – when put away items have to be disposed of since of showcase or building changes
- Products and item orders require long courses through various departments
- Trying to play down expensive machine setups, directors and specialists resort to running huge bunch sizes. Expansive clump sizes result in long run times, taking off other occupations holding up and expanding lead times

All these components contribute to long lead times, eventually coming about in squandering all through the undertaking such as intemperate determining, arranging, planning, assisting, and work in advance (WIP), wrapped up merchandise costs and out of date quality. This increment the generally costs and lower the organization's competitiveness.

QRM proposes that an enterprise-wide center on decreasing lead times will result in enhancements in both quality and fetched. Disposing of the time-consuming – and frequently self-reinforcing – hones portrayed over can lead to huge taken a toll investment funds while progressing item quality and client responsiveness. Thus, on an administration level, QRM

advocates an attitude alter from cost-based to time-based considering, making brief lead times the measuring stick for organizational success.

QRM's solid center on lead time diminishment requires a comprehensive definition of lead time. To achieve this, QRM presents Fabricating Critical-path Time (MCT). It is based on the standard basic way strategy; characterized as the commonplace sum of calendar time from when a client makes an order until then, to begin with, a piece of that order is conveyed to the customer.

A metric planned to calculate squander and highlight openings for advancement, MCT gives an assessment of the time it takes to fulfill an order, measuring the longest critical-path length of order-fulfillment activities.

3.2 Rethinking Organization Structure

QRM changes conventional useful offices into an organization comprising of "QRM Cells." In spite of the fact that the cell concept has been known for a few time, QRM Cells are more adaptable, more all-encompassing, and apply exterior the shop floor as well.

QRM requires four principal auxiliary changes to convert a company organized around cost-based administration methodologies to a time-based center:

- **Functional to Cellular:** Functional departments must be dissolved. In their place, QRM cells become the main organizational unit. QRM cells are more flexible and holistic in their implementation compared to other cell concepts and can be applied outside the shop floor
- **Top-down Control to Team Ownership:** Top-down control of processes by managers and supervisors in departments needs to be transformed to a decision-making structure in which QRM cells manage themselves and have ownership of the entire process within the cell
- **Specialized Workers to a Cross-trained Workforce:** Workers need to be trained to perform multiple tasks
- **Efficiency/Utilization Goals to Lead Time Reduction:** To back this modern structure, companies must supplant cost-based objectives of proficiency and utilization with the overarching objective of lead time decrease

3.3 Exploiting System Dynamics

By getting managers to get it how capacity, group sizes, and other components affect lead times, QRM empowers them to make progress choices that result in shorter lead times. In QRM, the product-focused cell structure has to be complemented by a careful understanding of framework flow in arrange to make superior choices to diminish lead times. Based on standards of framework elements, QRM recognizes tall utilization of machines and labor as well as running expansive group sizes as major impediments to lead time lessening.

- **Create spare capacity:** Many cost-based organizations aim for machines and labor to be utilized at close to 100% of capacity. QRM criticizes this approach as counterproductive to lead time reduction based on queuing theory, which shows that high utilization increases waiting times for products. In order to be able to handle high variability in demand and products, QRM advises companies to operate at 80 percent capacity on critical resources.
- **Optimize batch sizes:** Common effectiveness measures empower a generation of parts in expansive clump sizes. From the QRM point of view, huge bunch sizes lead to long holding up times, tall WIP and stock, and eventually long lead times. Long lead times, in turn, result in different shapes of squander and expanded fetched as depicted over. In this way, QRM empowers endeavor to endeavor towards group sizes that minimize lead times.

3.4 Implementing a Unified Strategy Enterprise-wide.

QRM is not fair a shop floor approach, it is connected all through the ventures. This incorporates fabric arranging and control, obtaining and supply chain, citing, arrange handling and modern item improvement. QRM gives a single, binding together approach for the whole venture. QRM emphasizes time-based considering all through the organization, making a bound together administration methodology for the whole undertaking. Amplifying past conventional endeavors to optimize shop floor operations, QRM applies time-based administration standards to all other parts of the organization.

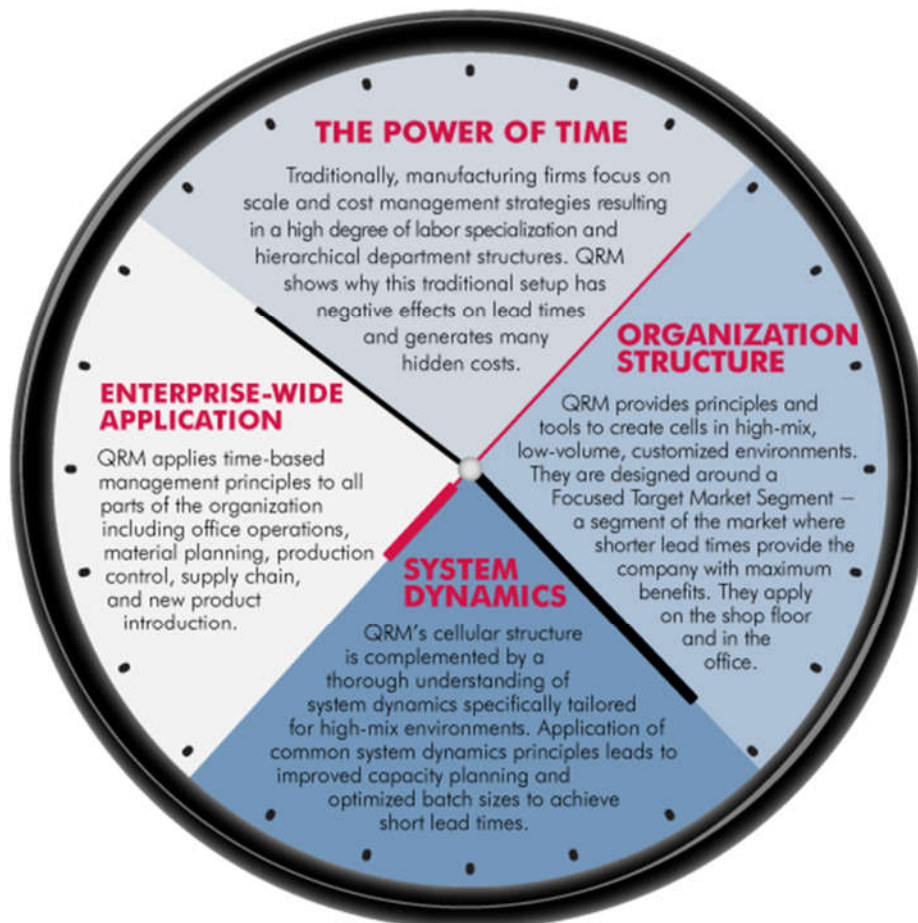
- **Office Operations:** QRM recognizes office operations such as citing, designing, and planning and order preparing as major supporters to lead times. To accomplish brief lead times in the office environment, QRM recommends actualizing a few changes concurring to the time-based approach portrayed over. The fundamental prerequisite

for reorganizing office operations in QRM is the arrangement of a Quick Response Office Cell (Q-ROC) around a Focus Target Market Fragment (FTMS). In their center on closed-loop, collocated, multifunctional, cross-trained groups, Q-ROCs are comparable to QRM Cells. Q-ROCs, like QRM cells on the shop floor, break down functional offices and can total jobs through different useful steps.

- **Material Planning:** QRM criticizes commonly used material planning and scheduling systems such as Material Requirements Planning (MRP), Manufacturing resource planning (MRP II), and Enterprise resource planning (ERP) for not incorporating system dynamics in their analysis and not accounting for the cost of long lead times. QRM recommends simplifying existing MRP systems to a Higher Level MRP (HL/MRP) concerned with high-level planning and coordination of material and not with detailed scheduling of operations.
- **Production Control:** To coordinate and control flow within the QRM structure of cells and HL/MRP, QRM utilizes POLCA (Paired-cell Overlapping Loops of Cards with Authorization). POLCA is a card-based shop floor control system, designed as the QRM alternative to Kanban. POLCA differs from commonly used Kanban systems in the type of signal it sends to move jobs/material through the shop floor. POLCA constitutes a capacity signal, showing that a cell is ready to work on a new job, whereas Kanban systems rely on inventory signals designed to replenish a certain quantity of parts. For this reason, POLCA works well for low-volume and/or custom products.
- **Supply Chain:** QRM empowers companies to work with providers to decrease their MCT. Long supplier lead times can bring about "covered up" costs such as tall stock, cargo cost for surge shipments, impromptu engineering changes making out of date stock, and diminished adaptability to reply to demand changes. QRM suggests that MCT is included as a noteworthy calculate in sourcing choices.
- **New Product Introduction:** QRM highlights key points of interest of fast New Product Introduction (NPI). Applying the MCT metric to the NPI handle gives important data on the current NPI execution. Based on these discoveries, QRM empowers directors to reconsider cost-based choices in terms of their effect on the NPI MCT. For illustration, cost-based obtaining approaches can result in long acquiring times for model materials, in turn deferring the NPI.

So, in conclusion, QRM builds on the basic principles of eliminating waste and improving efficiency, while also incorporating principles unique to QRM. These include:

- **Laser-like focus on lead time reduction in manufacturing.**
 - Rethinking the manufacturing process and equipment decisions, to put the focus on lead time reduction.
 - Focusing all aspects of the organization, from the shop floor to the front office, and including vendors in the supply chain, on quick responses and reducing lead times.
- **Training managers on using time-based strategies.**
 - Linking business strategies to functional strategies.
 - Measuring performance in “time” units instead of monetary units.
 - Using the principles of system dynamics to achieve a quick response.
- **The cell-based system of manufacturing.**
 - Implementing the Paired-Cell Overlapping Loops of Cards with Authorization (POLCA) planning and control method.
- **A focus on implementation and sustaining changes that reduce lead times.**
- **Using Manufacturing Critical-path Time (MCT) to measure lead times.**



4. IMPLEMENTING QRM

When a company actualizes QRM, the process of decreasing lead times ought to be embraced all through the organization. The company ought to too incorporate investigation methods and apparatuses, and a step-by-step technique to accomplish the required decrease in lead times.

QRM is frequently actualized by two sorts of businesses. The to begin with sort is a company that produces profoundly designed fabric in little clumps. The other sort of company to execute QRM is one that does not require to build each thing but has an exceptionally huge number of diverse things with a profoundly variable request for each.

Actualizing QRM requires that the entire organization gets it and its portion of the process. In the expansion, both administration and workers ought to get it the fabricating frameworks that input at the company, particularly those that influence lead times.

But, lead times are not continuously decided by fabricating forms. The buy of crude materials, a back office work, will trigger a lead time and portion of the QRM arrangement will incorporate diminishing lead times of non-manufacturing forms. The QRM will, hence, cover all zones such as obtaining, shipping, back and human resources.

Hence, in summary to implement Quick Response Manufacturing we go by following knowledge and finally implement.

- Knowing the Power of Time
 - Knowing the many hidden costs of long lead times and the power of short lead times
 - Discovering the pitfalls of traditional methods and how QRM provides a new approach to lead time reduction
 - Evaluating your organization(s) through short QRM quiz (*Appendix 1*)
 - Group workshop on waste due to long lead times
- QRM in Production
 - Defining product families and implementing cells for low-volume or customized production
 - How to time-slice shared resources
 - Group workshop on implementing cells
 - Group workshop: lead time reduction using rapid modeling tool

- **QRM and Your Money**
 - QRM impact on bottom line; time-based project justification
 - Accounting strategies
- **Material Planning Strategies and Tools for QRM**
 - Capacity planning: key relationships between utilization and lead time
 - Strategies for developing effective lot sizes
 - High-level MRP scheduling
 - Why standard kanban (pull) methods may not be effective for highly customized or low-volume products
 - How POLCA, a card-based shop floor control system, speeds the flow of jobs in these situations
- **Applying QRM in the Office**
 - Defining product families for office operations
 - How to create office cells to streamline cost estimating, order processing and product engineering
- **Conquering Obstacles to QRM**
 - Rethinking traditional efficiency and utilization measures
 - Examining case studies and examples to see how it's done
 - Identifying obstacles to implementing QRM and how to overcome them
- **Implementing QRM**
 - Management mindset (cost-based versus time-based decisions)
 - Performance measures to support QRM
 - Steps to successful implementation
 - Group workshop: implementation of QRM in your organization

5. BENEFITS OF QRM

There are a number of significant benefits resulting from implementing quick Response Manufacturing. Three of the most important are:

- **Increased customer satisfaction:** We're in an exceedingly competitive world in which holding up time is squandered time. On the off chance that you can dependably convey the items the client needs, and do so rapidly, you'll have more joyful clients who return to purchase from you once more.
- **Increased cash flow:** By conveying items to clients faster, you get paid speedier and you're by and large cash stream increments. This gives you more adaptability and a more prominent capacity to reply to showcase changes.
- **Beating the competition:**
Quick Response Manufacturing drives advancement and anticipates a company from resting on its trees while a competitor innovates and takes absent clients. The persistent center on assist diminishing lead times pushes an organization to ceaselessly be improving, which comes about in made trides quality, unused item highlights, and a center on being near to and serving clients.

For medium and little businesses centered on conveying customized items to their clients, Quick Response Manufacturing gives system and strategies to drive victory. It's not a simple way, as it requires a tenacious commitment to lessening lead times, but the rewards are well worth the effort.

- Less cash required to run the plant as there aren't numerous crude materials and wrapped up goods.
- It's less demanding for them to get a great position in the advertise share as speedy reaction times will pull in customers.
- High turnover of stock levels as generation frameworks are made on demand.
- Smaller bunches are made; this implies that there are lower capacity costs.
- Reducing the fetched of quality by minimizing squander and by giving more duty to generation teams.

6. DISADVANTAGES OF QRM

Despite have many pros of Quick Manufacturing System, there are few disadvantages of QRM which are discussed below:

- A need of supply will make the producer can issues when attempting to meet client demand.
- Customers may have to wait longer for their product to be produced and delivered as one will not be ready made.
- Highly subordinate to providers/suppliers to respond to demand
- Managing the QRM prepare can be troublesome (overseeing the duties of staff).
- May result in decline in the quality among products as manufacturerers try to speedily produce.
- The Expansive variety in the request will cause issues on the off chance that the producer can't respond to the tall generation volume rapidly enough.

8. CASE STUDIES

1. Nicolet Plastics, USA:

In 2009, Nicolet realized that customers were increasingly sourcing their high-volume plastic parts offshore to reduce costs. The company also observed that although the high-volume business was leaving, the low volume business was not. Management began looking for a manufacturing strategy that supported the needs of short-run, complex-part customers, and decided that QRM fit their goals perfectly. After initiating QRM in 2010, the most impressive impact of QRM has been on Nicolet Plastics' earnings before interest and taxes (EBIT). The EBIT for 2012 alone was roughly equal to the EBIT for the 10-year period from 2000 through 2009 combined.

2. Alexandria Extrusion Company (AEC), USA:

AEC provides custom aluminum extrusions. In 2002, it decided to implement QRM as AEC's competitive strategy. By 2012, AEC had reduced its lead time for extrusions by 83%, from six weeks to five days, and realized a 58% increase in revenue per square foot. Even during the economic downturn in 2008/09, AEC was able to grow. Starting at a sales level of around \$40 million in 2002, AEC (now called Alexandria Industries) recorded sales of over \$100 million in 2012.

3. Phoenix Products Company, Milwaukee, USA:

It manufactures industrial lighting for applications that include lighting of mines, shipyards and monuments. Ten years ago Phoenix was struggling with long lead times, late deliveries, and rising costs, all of which provided opportunities for competitors from low-cost countries. In 2004, QRM was adopted as the company strategy. By 2013, lead times across all product lines had been reduced by 50% along with impressive improvements in metrics. Compared with 2004, by 2013 Phoenix had achieved a 70% increase in revenue per labor hour, and a 30% reduction in overhead. During the same period Phoenix gained substantial market share: its sales grew at an average annual rate of 12.4%, versus 2% for the industry as a whole.

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Appendix: QRM QUIZ

Quiz on Implementing QRM

Developed by Rajan Suri
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For each statement below, ask yourself: Would the key managers in my company consider this statement to be True or False? Mark your responses in the boxes, then compare them with the answers given in the text.

1. Everyone will have to work faster, harder, and longer hours, in order to get jobs done in less time.

☐ True ☐ False
2. To get jobs out fast, we must keep our machines and people busy all the time.

☐ True ☐ False
3. In order to reduce our lead times, we have to improve our efficiencies.

☐ True ☐ False
4. We must place great importance on "on-time" delivery performance by each of our departments, and by our suppliers.

☐ True ☐ False
5. Installing a Material Requirements Planning (MRP) System will help in reducing lead times.

☐ True ☐ False
6. Since long lead time items need to be ordered in large quantities, we should negotiate quantity discounts with our suppliers.

☐ True ☐ False
7. We should encourage our customers to buy our products in large quantities by offering price breaks and quantity discounts.

☐ True ☐ False
8. We can implement QRM by forming teams in each department.

☐ True ☐ False
9. The reason for implementing QRM is so that we can charge our customers more for rush jobs.

☐ True ☐ False
10. Implementing QRM will require large investments in technology.

☐ True ☐ False