

WORLD-CLASS MANUFACTURING PRACTICES - THE BEST STRATEGY FOR INDIAN MANUFACTURING ORGANISATIONS TO ENDURE IN NEW MILLENNIUM

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ABSTRACT

In new millennium, the increased level of globalization and competition is forcing the Indian firms to gain competitiveness, this 'improved competitiveness' in its broadest context is referred as manufacturing excellence. If a firm continues to excel in manufacturing, it may dominate world markets, in which case it would be called a "World-Class Manufacturer". Economic activity today is becoming globalised more significantly.

To compete successfully with World-Class Manufacturers in this dynamically changing environment, firms must adopt World-Class Manufacturing Practices. Maskell states that World-Class manufacturing is a very broad term which generally includes focus on product quality, JIT Production techniques, workforce management and agility in meeting customer requirements.

This paper is a descriptive effort to review the concept of World-Class Manufacturing. In the next part the paper talks about the strategic importance of adopting the World-Class Manufacturing Practices for Indian organizations to endure in fierce competition given by the Global players. Also the comprehensive plan for formulating and implementing the strategic plan for WCM is given.

Keywords: World-Class Manufacturing Practices, globalization, Indian organizations.

INTRODUCTION

Of late, the environment facing developing countries has become increasingly more turbulent, dynamic and complex. In new millennium, the increased level of globalization and competition is forcing the Indian firms to gain competitiveness, this 'improved competitiveness' in its broadest context is referred as manufacturing excellence. If a firm continues to excel in manufacturing, it may dominate world markets, in which case it would be called a "World-Class Manufacturer". Economic activity today is becoming globalised more significantly.

To compete successfully with World-Class Manufacturers in this dynamically changing environment, Indian firms must adopt World-Class Manufacturing Practices. It will not be exaggeration to say that the best Strategy for Indian Manufacturing Organizations to endure in New Millennium is adoption of World-Class Manufacturing Practices.

Manufacturing is not merely the conversion process that takes place on the shop floor, but a whole lot of activities preceding and following it, like materials management, equipment and tooling, material handling, assembly, quality control, maintenance, planning, MIS and human resources (Prabhala 1994). For continues success in a competitive market, continuous improvement in all areas of activity is essential.

The origins of World-Class manufacturing can be traced back to 1926, when Toyoda Sakichi of the Toyoda Spinning and Weaving Company invented an auto-activated loom, fulfilling a 25-year dream (Ohno 1992). World-Class manufacturing was developed largely by Taiichi Ohno, VP of Toyota and Shigeo Shingo, Industrial Engineering Consultant.

Maskell states that World-Class manufacturing is a very broad term which generally includes focus on product quality, JIT Production techniques, workforce management and agility in meeting customer requirements.

The goals of World-Class Manufacturing efforts include maintaining market share, improving profitability and improving the firm's ability to compete in a global market place (Montgomery et al 1996)

This research paper is a descriptive review of the concept of the concept of World-Class Manufacturing. The key objective of this paper is to emphasize the strategic importance of World-Class Manufacturing Practices. In the next part the paper talks about the strategic importance of adopting the World-Class Manufacturing Practices for Indian organizations to endure in fierce competition given by the Global players.

World Class Manufacturing is a different set of concepts, principles, policies and techniques for managing and operating a manufacturing company. It is driven by the results achieved by the Japanese manufacturing resurgence following World War II, and adapts many of the ideas used by the Japanese in automotive, electronics and steel companies to gain a competitive edge. It primarily focuses on continual improvement in quality, cost, lead time, flexibility and customer service.

World Class Manufacturing is a process-driven approach where implementations usually involve the following philosophies and techniques:

- Make-to-order/JIT Manufacturing
- Small lot sizes
- Families of parts
- Doing it right the first time
- Cellular manufacturing
- Poka-yoke
- 5 – S

- 6 – Sigma
- Total Quality Management (TQM)
- Total preventive maintenance (TPM)
- Quick changeover/Single Minute Exchange of Dies (SMED)
- Zero Defects
- Just-in-time (JIT)
- High employee involvement
- Cross functional teams
- Multi-skilled employees
- Visual signaling
- Statistical process control (SPC)

Companies engaging in World Class Manufacturing strategies focus on improving operations, strive to eliminate waste and create lean organizations. This often results in higher productivity. But these companies also focus on speed of total throughput from order capture through delivery setting new standards for delivery without the heavy dependence on inventory. Sequential methods of performing work are being replaced with concurrent methods to compress time, and functional and hierarchical divisions of duties are being replaced by team-driven activities.

World Class Manufacturers are those that demonstrate industry best practices. To achieve this company should attempt to be best in the field at each of the competitive priorities - Quality, Price, Delivery speed, Delivery reliability, Agility and creativity. Indian Organizations should therefore aim to maximize performance in these areas in order to maximize competitiveness. However, as resources are unlikely to allow improvement in all areas, organizations should concentrate on maintaining performance in 'qualifying' factors and improving 'competitive edge' factors.

The below mentioned figure indicates, how the manufacturing excellence leads the organizations to World-Class Manufacturer status.

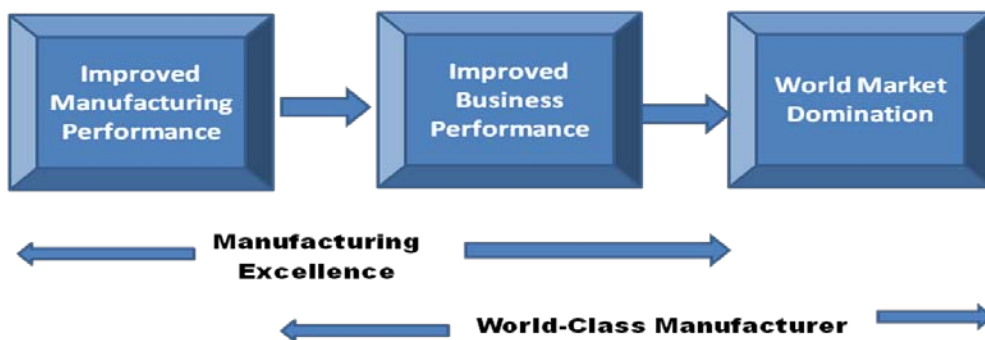


Figure 1. Manufacturing Excellence and WCM

World-Class Manufacturer is the recognition of an organization as a benchmark by its industry sector and, for some aspects, by other industry sectors. World Class organizations consistently deliver exceptional performance, frequently in excess of expectations. The essential characteristic of a World Class organization is that it is continuously improving its performance.

There are 3 principles behind World Class Manufacturing -

- The first is what is known as **Just in Time** or **Lean Manufacturing**, the step by step elimination of waste. Waste in this sense is defined as any activity that adds cost but not value to the end product such as excess production, stock, idle work in progress, unnecessary movement and scrap.
- The second is **Total quality**, a culture of intolerance to defects both in the processes and also information such as bills of material and stock records. Total quality is often these days called **Six Sigma** which uses total quality and lean manufacturing techniques to attempt to reduce rejects to 3.4 per million parts produced.
- The final principle is the principle of **Total Preventative Maintenance** where, whenever practical, a preventative maintenance programme means that unplanned stoppages due to equipment failure are minimized.

Important World-Class Manufacturing Practices: Birds eye view 6-Sigma

6-Sigma refers to a quality improvement and business strategy concept started by Motorola in the United States in 1987. In statistical terms, 6-Sigma is the abbreviated form of 6 standard deviations from the mean, which mathematically translates to about 2 defects per billion. Thus, strictly speaking, your process is said to have achieved 6-sigma if it is producing no more than 2 defects per billion parts produced.

No company is probably nearly perfect enough to achieve this quality level. Consequently, the term 6-Sigma in the industry has somehow taken on the equivalent defect rate of 3.4 ppm, which in reality corresponds to roughly 4.5 sigmas. Thus, in the industry today, a person speaking of 6-sigma is most likely referring to a quality level equivalent to 3.4 defects per million.

Regardless of how one wishes to use the term 6-sigma, though, it is apparent that its purpose when its concept was first incepted is to make processes as consistent as possible in order to reduce the defect rates of their outputs. Consistency of meeting customer specifications as well as the probability of meeting them consistently in the future is the essence of 6-sigma.

6-Sigma has evolved into a continuous, disciplined, and structured process of improving operations to make products that are consistently meeting customer requirements. In effect, 6-Sigma no longer simply means excellent finished products, but more importantly, excellent processes, services, and administration. When Motorola started 6-Sigma in the 80's, it was applied to repetitive manufacturing processes. Presently, however, the use of 6-Sigma is well-established in almost all aspects of doing business in a wide range of industries.

6-Sigma encourages leanness, simplicity, and doing things right the first time, so that wastes and corresponding costs are avoided. Statistics-based problem solving, results-orientation,

and quantifiable top and bottom-line returns are also ingredients of 6-Sigma. Lastly, 6-Sigma is driven by the voice of the customer.

Lean Manufacturing

Lean Manufacturing, or Lean Production, refers to a business concept wherein the goal is to minimize the amount of time and resources used in the manufacturing processes and other activities of an enterprise, with emphasis on eliminating all forms of wastage. It is basically the fusion of various management philosophies designed to make operations as efficient as possible. Business philosophies invoked by lean manufacturing include Just-in-Time (JIT) Manufacturing, Kaizen, Total Quality Management (TQM), Total Productive Maintenance (TPM), Cellular Manufacturing, and the like. The roots of lean manufacturing can be traced to Japan, or more specifically, Toyota.

Lean manufacturing operates on three principles:

1. 'Muda', or waste, is bad;
2. Manufacturing processes must be closely tied to the market's requirements;
3. Company should be seen as a continuous and uniform whole that includes its customers and suppliers, a concept known as 'value stream'.

Lean manufacturing is not merely a tool - it is a way of life that all members of an organization must appreciate, and practice.

The basic elements of lean manufacturing are:

1. Just-in-time, higher efficiency manufacturing through the principle of 'continuous product flow' (also known as 'single piece workflow');
2. Continuous improvement of processes along the entire value chain, primarily in terms of quality and cost;
3. Setting up of multi-functional and multi-skilled teams at all levels to achieve its goals.

Lean manufacturing is, in essence, the 21st century's upgraded version of the 20th century's 'mass-production' philosophy.

Among these elements, the most eye-catching is perhaps the 'continuous product flow', which entails the redesign of the production floor such that a product is manufactured progressively from one workstation to another with minimal waiting time and handling operations between stations. This may mean the dedication of an entire process line to a group of similar products, or a group of products that undergo similar processing. The equipment and worktables are arranged in a 'streamlined' lay-out that keeps production continuous and efficient. Such a manufacturing set-up is also known as 'cellular manufacturing'. Attention to machine maintenance, up-time, and utilization is also a 'must.'

According to lean manufacturing, the following are forms of 'waste' and should be eliminated:

1. Waiting;

2. Staging of inventories;
3. Transport of inventories;
4. Overproduction;
5. Over processing
6. Unnecessary motion;
7. Defective units.

By adopting a production floor that conforms to continuous product flow, these wastes can be reduced. Another technique is through the practice of 'customer pull', which means that only products that are immediately needed by the customer (or the next station) must be produced. Thus, a station needing inventories to process should be the one to 'pull in' these inventories from the previous station.

Kaizen, or the Japanese concept of 'continuous improvement', is a major influence on lean manufacturing. This is why lean manufacturing promotes teamwork among multi-skilled, multifunctional individuals at all levels to effect the continuous achievement of process improvements toward zero non-moving inventories, zero downtimes, zero paper, zero defects, and zero delays all throughout the organization.

Benefits of lean manufacturing:

1. Waste reduction, and therefore, production cost reduction;
2. Shorter manufacturing cycle times;
3. Lower manpower requirements;
4. Minimal inventories;
5. Higher equipment utilization and manufacturing capacity;
6. Improved cash flow;
7. Higher product quality and reliability; and
8. Better customer service.

Total Quality Management (TQM)

Total Quality Management is a structured system for managing the quality of products, processes, and resources of an organization in order to satisfy its internal and external customers, as well as its suppliers. Its main objective is sustained (if not progressive) customer satisfaction through continuous improvement, which is accomplished by systematic methods for problem solving, breakthrough achievement, and sustenance of good results (standardization).

There is no standard or hard-line procedure for implementing TQM. Every company can practice TQM in a manner it sees best for its organization. However, a company's TQM program must always be structured and internally standardized, i.e., everyone within an organization must practice TQM in the structured manner set forth by management.

Most companies today have chosen to adopt a TQM program that's patterned after an already established TQM model, e.g., the Deming Application Prize, the Malcolm Baldrige Criteria for Performance Excellence, the ISO Series of Standards, etc.

TQM may be considered as a collection of principles and processes that have been proven to be effective in business quality management over time. It goes back to the teachings of Drucker, Juran, Deming, Ishikawa, etc, who each have studied and developed ideas for improving organizational management.

A very simple model of TQM consists of the following steps:

1. Company reviews the needs of its customers and if these are being delivered by the company;
2. Company plans the activities needed (both day-to-day and long-term activities) to meet these customer needs;
3. Company establishes and stabilizes the processes required to deliver the products and services needed by the customer;
4. Company implements systems to further improve its processes, products, and services.

Note that Steps above constitute a cycle, and may be iterated indefinitely for continuous improvement.

Principles of TQM

- ✓ Quality can and must be managed.
- ✓ Everyone has a customer to delight.
- ✓ Processes, not the people, are the problem.
- ✓ Every employee is responsible for quality.
- ✓ Problems must be prevented, not just fixed.
- ✓ Quality must be measured so it can be controlled.
- ✓ Quality improvements must be continuous.
- ✓ Quality goals must be based on customer requirements.

Total Productive Maintenance (TPM)

Total Productive Maintenance (TPM) refers to a management system for optimizing the productivity of manufacturing equipment through systematic equipment maintenance involving employees at all levels. Under TPM, everyone is involved in keeping the equipment in good working order to minimize production losses from equipment repairs, assists, set-ups, and the like.

In the 1970's, the concept of 'productive maintenance' emerged, rolling into one system the following: preventive maintenance, equipment reliability engineering, equipment maintainability engineering, and equipment engineering economics. Under this system, the technical or engineering group still has the main responsibility for equipment maintenance.

The concept of 'true' TPM wherein everyone from the operator to top management owns equipment maintenance came about shortly after. TPM embraces various disciplines to create a manufacturing environment wherein everyone feels that it is his or her responsibility to keep the equipment running and productive.

Under TPM, operators no longer limit themselves to simply using the machine and calling the technician when a breakdown occurs. Operators can inspect, clean, lubricate, adjust, and even perform simple calibrations on their respective equipment. This frees the technical workforce for higher-level preventive maintenance activities that require more of their technical expertise. Management should also show interest in data concerning equipment uptime, utilization, and efficiency. In short, everyone understands that zero breakdowns, maximum productivity, and zero defects are goals to be shared by everyone under TPM.

Aside from eliminating equipment downtimes, improving equipment productivity, and zeroing out defects, TPM has the following goals: improvement of personnel effectiveness and sense of ownership, reduction of operational costs, reduction of throughput times, and customer satisfaction down the road.

TPM has 8 key strategies: 1) Focused Improvements (Kaizen); 2) Autonomous Maintenance; 3) Planned Maintenance; 4) Technical Training; 5) Early Equipment Management; 6) Quality Maintenance; 7) Administrative and Support Functions Management; 8) Safety and Environmental Management.

TPM eliminates 6 big losses: 1) Breakdowns, which can result in long, expensive repairs; 2) Set-ups, conversions, and changeovers; 3) Idling and minor stoppages; 4) Reduced equipment speed; 5) Defects and Rework; 6) Start-up Losses.

TPM requires the mastery of 4 equipment maintenance techniques: 1) Preventive Maintenance to prevent breakdowns; 2) Corrective Maintenance to modify or improve an equipment for increased reliability and easier maintenance; 3) Maintenance Prevention to design and install equipment that are maintenance-free; and 4) Breakdown Maintenance to repair equipment quickly after they break down.

Just-In-Time (JIT) Manufacturing

Just-In-time manufacturing, or **JIT**, is a management philosophy aimed at eliminating manufacturing wastes by producing only the right amount and combination of parts at the right place at the right time. This is based on the fact that wastes result from any activity that adds cost without adding value to the product, such as transferring of inventories from one place to another or even the mere act of storing them.

The goal of JIT, therefore, is to minimize the presence of non-value-adding operations and non-moving inventories in the production line. This will result in shorter throughput times, better on-time delivery performance, higher equipment utilization, lesser space requirement, lower dpm's, lower costs, and greater profits.

JIT finds its origin in Japan, where it has been in practice since the early 1970's. It was developed and perfected by Taiichi Ohno of Toyota, who is now referred to as the father of JIT. Taiichi Ohno developed this philosophy as a means of meeting customer demands with minimum delays. Thus, in the olden days, JIT is used not to reduce manufacturing wastage,

but primarily to produce goods so that customer orders are met exactly when they need the products.

JIT is also known as lean production or stockless production, since the key behind a successful implementation of JIT is the reduction of inventory levels at the various stations of the production line to the absolute minimum. This necessitates good coordination between stations such that every station produces only the exact volume that the next station needs. On the other hand, a station pulls in only the exact volume that it needs from the preceding station.

The JIT system consists of defining the production flow and setting up the production floor such that the flow of materials as they get manufactured through the line is smooth and unimpeded, thereby reducing material waiting time. This requires that the capacities of the various work stations that the materials pass through are very evenly matched and balanced, such that bottle necks in the production line are eliminated.

Another important aspect of JIT is the use of a 'pull' system to move inventories through the production line. Under such a system, the requirement of the next station is what modulates the production of a particular station. It is therefore necessary under JIT to define a process by which the pulling of lots from one station to the next is facilitated.

Kanban Systems

Kanban systems are often associated with JIT implementation. In fact, some people have the misimpression that JIT requires the use of a kanban system. Having a kanban system is not a strict requirement of JIT implementation, but their use as a tool for practicing JIT has become quite popular owing to its simplicity.

A kanban is a card attached to the carrier or container of a lot used to match what needs to be produced in a work station and what needs to be delivered to the next station. As mentioned, a JIT system is basically a 'pull' system, which means that what needs to be produced in a particular station depends on what the next station needs. Ultimately the production is therefore modulated by end customer orders. Kanbans, which contain information about the lots and quantities involved, are therefore used to facilitate the execution of this 'pull' system. With this 'pull' system, no parts that can not be processed in succeeding stations will be produced.

Kaizen

Kaizen, a Japanese term that basically translates to 'continuous improvement' or 'change to become good', is a management concept originated by the Japanese in order to continuously effect incremental changes for the better, involving everybody within the organization from workers to managers. Kaizen is aimed at producing more and more value with less and less wastes (higher efficiency), attaining better working environment, and developing stable processes by standardization.

This never-ending process of achieving small improvements within the company everyday is in contrast to trying to achieve breakthrough results from a large improvement once in a while. Kaizen as a management technique is therefore more suitable for organizations with a

collective culture that is trying to achieve long-term gains from a continuous supply of small and less radical contributions from its employees.

Kaizen implementation is said to operate on the following principles: 1) that human resources are the company's most important asset; 2) that success can not be achieved by some occasional radical changes alone, but more so by incremental yet consistently arriving improvements; and 3) that improvements must be based on a statistical or quantitative study of the performance of the process.

Thus, under Kaizen, everyone is a valued contributor to the company's success, and must therefore be given the necessary education and training in order to contribute in his or her own way on a continuous basis. Everyone in the organization must genuinely believe in the idea of Kaizen and strive to achieve one small goal at a time, each of which is considered a step towards the company's over-all success.

Every person must therefore be willing to: 1) learn; 2) communicate; 3) be disciplined; 4) get involved; and 5) change in order to maximize gains from Kaizen. Management must also be able to support this Kaizen structure by aligning resources, metrics, rewards, and incentives to Kaizen principles, encouraging all employees to contribute in their own ways.

Management programs that promote Kaizen include but are not limited to the following: 1) employee suggestion systems; 2) recognition systems for employees who exert effort for continuous improvement; 3) group-oriented suggestion or improvement systems like Quality Circles (small groups that perform quality improvement activities); 4) JIT; 5) 5-S; 6) Total Productive Maintenance; and 7) Total Quality Management.

Kaizen's Business Tenets:

1. Not a single day should pass without any kind of improvement anywhere in the company.
2. Improvement strategies must be driven by customer requirements and satisfaction.
3. Quality must always take a higher priority over profits.
4. Employees must be encouraged to recognize problems and suggest improvements to address these problems.
5. Problems must be solved by a collaborative and systematic approach through cross-functional teams.
6. Process-oriented thinking (as opposed to results-oriented thinking) must be practiced by everyone, so that every process gets continuously improved from time to time.

5 - S

The **5S Process**, or simply "5S", is a structured program to systematically achieve total organization, cleanliness, and standardization in the workplace. A well-organized workplace results in a safer, more efficient, and more productive operation. It boosts the morale of the workers, promoting a sense of pride in their work and ownership of their responsibilities.

"5S" was invented in Japan, and stands for five (5) Japanese words that start with the letter 'S': Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. Table 1 shows what these individual words

mean. An equivalent set of five 'S' words in English have likewise been adopted by many, to preserve the "5S" acronym in English usage. These are: Sort, Set (in place), Shine, Standardize, and Sustain.

Table 1. S Definitions

Japanese Term	English Equivalent	Meaning in Japanese Context
Seiri	Tidiness	Throw away all rubbish and unrelated materials in the workplace
Seiton	Orderliness	Set everything in proper place for quick retrieval and storage
Seiso	Cleanliness	Clean the workplace; everyone should be a janitor
Seiketsu	Standardization	Standardize the way of maintaining cleanliness
Shitsuke	Discipline	Practice 'Five S' daily - make it a way of life; this also means 'commitment'

Seiri

The first step of the "5S" process, seiri, refers to the act of throwing away all unwanted, unnecessary, and unrelated materials in the workplace. People involved in Seiri must not feel sorry about having to throw away things. The idea is to ensure that everything left in the workplace is related to work. Even the number of necessary items in the workplace must be kept to its absolute minimum. Because of seiri, simplification of tasks, effective use of space, and careful purchase of items follow.

Seiton

Seiton, or orderliness, is all about efficiency. This step consists of putting everything in an assigned place so that it can be accessed or retrieved quickly, as well as returned in that same place quickly. If everyone has quick access to an item or materials, work flow becomes efficient, and the worker becomes productive. The correct place, position, or holder for every tool, item, or material must be chosen carefully in relation to how the work will be performed and who will use them. Every single item must be allocated its own place for safekeeping, and each location must be labeled for easy identification of what it's for.

Seiso

Seiso, the third step in "5S", says that 'everyone is a janitor.' Seiso consists of cleaning up the workplace and giving it a 'shine'. Cleaning must be done by everyone in the organization, from operators to managers. It would be a good idea to have every area of the workplace assigned to a person or group of persons for cleaning. No area should be left uncleaned. Everyone should see the 'workplace' through the eyes of a visitor - always thinking if it is clean enough to make a good impression.

Seiketsu

The fourth step of "5S", or seiketsu, more or less translates to 'standardized clean-up'. It consists of defining the standards by which personnel must measure and maintain

'cleanliness'. Seiketsu encompasses both personal and environmental cleanliness. Personnel must therefore practice 'seiketsu' starting with their personal tidiness. Visual management is an important ingredient of seiketsu. Color-coding and standardized coloration of surroundings are used for easier visual identification of anomalies in the surroundings. Personnel are trained to detect abnormalities using their five senses and to correct such abnormalities immediately.

Shitsuke

The last step of "5S", Shitsuke, means 'Discipline.' It denotes commitment to maintain orderliness and to practice the first 4 S as a way of life. The emphasis of shitsuke is elimination of bad habits and constant practice of good ones. Once true shitsuke is achieved, personnel voluntarily observe cleanliness and orderliness at all times, without having to be reminded by management.

Poka Yoke (Mistake Proofing)

Poka Yoke is a quality management concept developed by a Matsushita manufacturing engineer named Shigeo Shingo to prevent human errors from occurring in the production line. Poka yoke (pronounced "poh-kah yoh-kay") comes from two Japanese words – "yokeru" which means "to avoid", and "poka" which means "inadvertent errors." Thus, poka yoke more or less translates to "avoiding inadvertent errors".

Poka yoke is sometimes referred to in English by some people as "fool-proofing". However, this doesn't sound politically correct if applied to employees, so the English equivalent used by Shingo was "error avoidance." Other variants like "mistake proofing" or "fail-safe operation" have likewise become popular.

The main objective of poka yoke is to achieve zero defects. In fact, it is just one of the many components of Shingo's Zero Quality Control (ZQC) system, the goal of which is to eliminate defective products.

Poka yoke is implemented by using simple objects like fixtures, jigs, gadgets, warning devices, paper systems, and the like to prevent people from committing mistakes, even if they try to! These objects, known as poka yoke devices, are usually used to stop the machine and alert the operator if something is about to go wrong.

Anybody can and should practice poka yoke in the workplace. Poka yoke does not entail any rocket science - sometimes it just needs common sense and the appropriate poka yoke device. Poka yoke devices should have the following characteristics: 1) useable by all workers; 2) simple to install; 3) does not require continuous attention from the operator (ideally, it should work even if the operator is not aware of it); 4) low-cost; 5) provides instantaneous feedback, prevention, or correction. A lot of Shingo's poka yoke devices cost less than \$50!

Poka yoke is at its best when it prevents mistakes, not when it merely catches them. Since human errors usually stem from people who get distracted, tired, confused, or demotivated, a good poka yoke solution is one that requires no attention from the operator

World-Class Manufacturing - Strategic Perspective

➤ India's Global Competitiveness and Manufacturing Excellence

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As per the **Global Competitiveness Report 2011**, India is ranked at 56th position out of 141 countries. In 1994 we were at 35th position. India's decline in competitiveness is shocking. This explains that we have to go far for achieving the better positions.

We have ample availability of cheap labour but according to Chandra “Experience, market share and technology innovations are greater determinants of cost leadership than the cheap labour” (Chandra and Shukla 1994). Superior product quality, design innovations, robust delivery performance, customization and excellent after sales service are the distinctive manufacturing characteristics needed to gain competitive advantage.

Indian policy became gradually liberalized in mid-1980's. This opened new challenges and opportunities to Indian organizations. Industry started seeking export market; competitive advantage can not be built nor sustained solely by export market orientation. Development of domestic market is a vital determinant of the competitive advantage of an industry (Porter 1990).

The basic question is how competitive are Indian manufacturing firms? Today's competitive environment is much dynamic compared to past. Indian manufacturers are facing competition from Export's and MNC's. Today they need to cater same quality to domestic and export market. Traditionally, Indian firms have followed an opportunistic approach rather than competence-based approach.

Thus the real challenge facing Indian manufacturing is to improve substantially on several dimensions – quality, technology, shop floor practices, supply chain co-ordination and cycle time – simultaneously and that too in short duration. Indian manufacturing is under pressure to demonstrate manufacturing excellence, and to progress faster on the road to World-Class Manufacturing for sustained profitability and growth.

➤ **Problems in the Manufacturing Industry**

- a. **Problem of Co-ordination:** Once strategy is finalized company must initiate mechanism for managing product complexity and demand uncertainty. The challenge of managing product complexity is to improve *productivity* (mass production) and challenge of market uncertainty is to improve *flexibility* (mass customization).
- b. **Need for control:** To manage market uncertainty, planning and control is required. Management by hierarchical planning and control copes with uncertainties by adaptation to environment and optimization of controller parameter.
- c. **Fragmented Information Infrastructure:** Today, the manufacturing industry is still striving for stability of its production system as a major organizational goal. Therefore in most manufacturing firms, *change management* is not yet considered a permanent objective. Whichever way task co-ordination is managed, a seamlessly integrated information system is a must. However, information processing is still very fragmented even in computerized applications.
- d. **Insufficient Processability of Available Information:** Most companies are still not organized for fast decision-making process. Departments are still managed according to their own sub-goals rather than to real organizational goal.

➤ **Strategic Use of IT in Indian Manufacturing**

With rapid change in IT and manufacturing technology, firms are getting increasingly interested in managing the strategy-technology connection to develop new ways of achieving competitive advantage (Applegate et al 1996). Today’s emphasis on competing through manufacturing may stimulate firms to reassess their alignment of IT strategy with business strategy. New ideas concerning how IT can change the way firms compete are being explored. Indian organizations should change their mindset to consider information as a strategic resource and information management as an organizational issue rather than a technological one. Use of IT should be in alignment with the manufacturing strategy and manufacturing strategy must be derived from business strategy.

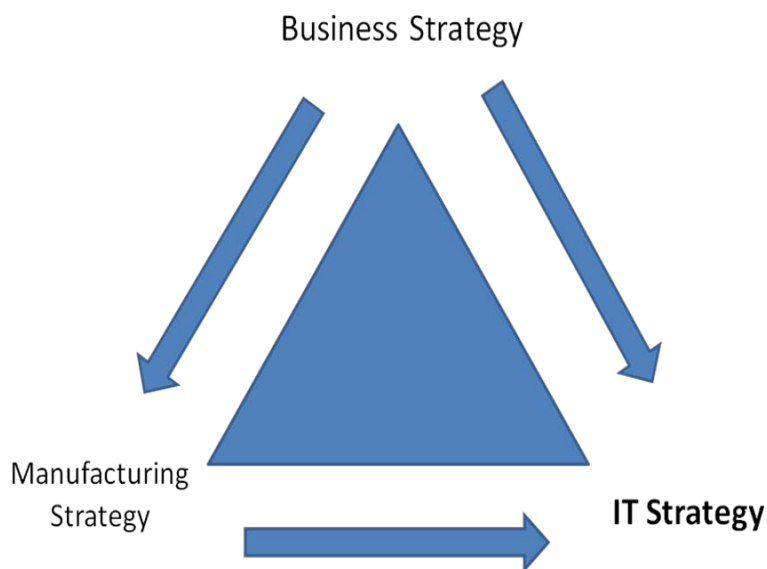


Figure 2. Aligning Business, manufacturing and IT Strategies

Leading India towards World-Class Manufacturing – The Cutting Edge Strategy in the New Millennium!

➤ **Generic Manufacturing Strategies:** Organizations are basically facing Product and Process changes. Furthermore these two changes are either stable (slow, evolutionary, predictable) or dynamic (rapid, revolutionary, unpredictable). A matrix can be built in which each of these combinations defines a strategic business model appropriate to the conditions (Figure. 3). Based on this matrix the Indian organizations can –

1. Asses its competitive position,
2. Continuously choose a strategic business model,
3. Clarify how to strategically align business and IT strategies.

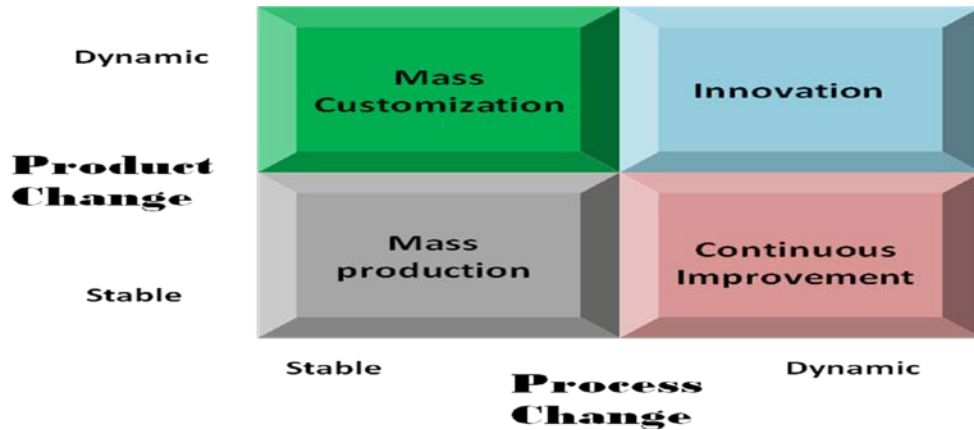


Figure 3. Manufacturing Strategies for Change

- **Issues in Strategic Planning for WCM:** Effective Business Strategy can only be developed by fully integrating manufacturing decisions into strategic planning process. To accomplish this following issues are to be addressed –
 - a. Firms don't realize need of Strategic Planning
 - b. Non involvement of line managers in Strategic Planning
 - c. Lack of planning orientation in manufacturing culture.
 - d. Lack of IT usage as a strategic resource.
- **The Strategic Plan for WCM:** To lead an organization towards World-Class Manufacturer Status is possible by following method.
- ❖ **Step 1. Examining the Strategic Position**
 - a. Strengths and weaknesses
 - b. Industry bases of competition
 - c. Global competitive position
 - d. Industry structure and dynamics
 - e. Industry maturity
- ❖ **Step 2. Setting Up the Planning Team**

Select members of strategic planning team. This team must be perfect blend of skilled and experienced managers and young, aggressive champions.
- ❖ **Step 3. Assessment of the Company's Current manufacturing Capabilities**

This step should not taken for granted as many companies are not aware of true capabilities company-wide.
- ❖ **Step 4. Assesing the competition**

Find out as much information about global competitors.

❖ *Step 5. Creating the Future Path*

Find out, where it is possible to go in the future. Which is the road? What are the technologies to be followed? What competitors have done?

❖ *Step 6. Setting Manufacturing Strategy Objectives*

New Product lead time, Inventory turnover, Manufacturing lead time, Quality, Agility, Customer Service, Waste, Return on Assets etc.

❖ *Step 7. Develop Objective Achievement Plan and Identify Necessary Tools*

Formulate Objective Achievement Plan. Also select the methods and tools to be used.

❖ *Step 8. Gaining Top Management Commitment*

❖ *Step 9. Creating the Implementation Programme*

Convert the plan into tasks and projects. And these projects are implemented. Company must take strategic action and invest money to remain competitive.

CONCLUSION

From all above discussion it is clear that, the increased level of globalization and competition is forcing the Indian firms to gain competitiveness, this 'improved competitiveness' in its broadest context is referred as manufacturing excellence. To compete successfully with World-Class Manufacturers in this dynamically changing environment, firms must adopt World-Class Manufacturing Practices. As the world is becoming 'global market' the standards applied to 'World-Class performance' are becoming increasingly expected by customers and buyers. But this requires a systematic analysis and formulation and implementation of strategies to become World-Class Manufacturer. And doing this only will help the Indian Manufacturing organizations to endure in the new millennium.

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