

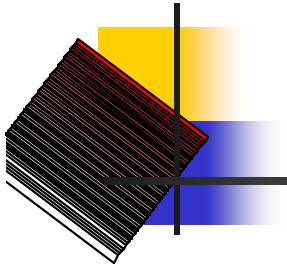


Lean Production

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✍ Lean Production

✍ Kaizan

✍ TQC

✍ JIT

✍ TPM

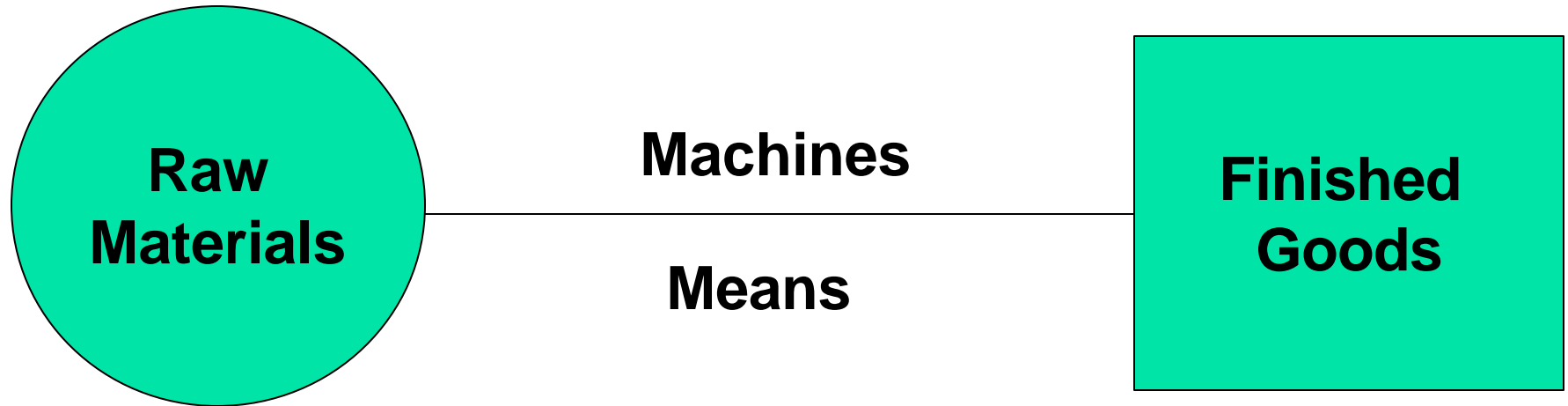


Production Managers Role

- ✍ Q- uality
- ✍ C- ost
- ✍ D- elivery
- ✍ S- afety
- ✍ E- nvironment



Production Management





Aims

- ✍ Good quality goods
- ✍ At low prices
- ✍ With ease
- ✍ And speedily



What is Lean Production?

- ✍ Lean is about doing more with less: less time, inventory, space people and money.
- ✍ Lean Manufacturing (also known as the Toyota Production System) is, in its most basic form, the systematic elimination of waste - overproduction, waiting, transportation, inventory, motion, over-processing, defective units - and the implementation of the concepts of continuous flow and customer pull.



Lean Production

- ✍ Five areas drive lean manufacturing/production:
 - ✍ cost
 - ✍ quality
 - ✍ delivery
 - ✍ safety, and
 - ✍ morale.
- ✍ Just as mass production is recognized as the production system of the 20th century, lean production is viewed as the production system of the 21st century.

Benefits of Lean Production



- ✍ Establishment and mastering of a lean production system would allow you to achieve the following benefits:
- ✍ Waste reduction by 80%
- ✍ Production cost reduction by 50%
- ✍ Manufacturing cycle times decreased by 50%
- ✍ Labor reduction by 50% while maintaining or increasing throughput
- ✍ Inventory reduction by 80% while increasing customer service levels
- ✍ Capacity in current facilities increase by 50%



Benefits

- ✍ Higher quality
- ✍ Higher profits
- ✍ Higher system flexibility in reacting to changes in requirements improved
- ✍ More strategic focus
- ✍ Improved cash flow through increasing shipping and billing frequencies
- ✍ However, by continually focusing on waste reduction, there are truly no end to the benefits that can be achieved

Basic Elements of Lean Manufacturing



- ✍ The basic elements are waste elimination, continuous one piece workflow, and customer pull. When these elements are focused in the areas of cost, quality and delivery, this forms the basis for a lean production system.
- ✍ The lean production concept was to a large extent inspired by the Kaizen - the Japanese strategy of continuous improvement. Employee empowerment and promotion among them of a way of thinking oriented at improving processes, imitation of customer relationships, fast product development and manufacturing, and collaboration with suppliers are the key strategies of leading lean companies.



Lean Production Overview

- ✍ Non-value added activities or waste are eliminated through continuous improvement efforts
- ✍ Focus on continuous improvement of processes - rather than results - of the entire value chain
- ✍ The lean manufacturing mindset: concept, way of thinking - not techniques; culture - not the latest management tool
- ✍ Continuous product flow is achieved through physical rearrangement and system structure & control mechanisms
- ✍ Single-piece flow / small lot production: achieved through equipment set up time reduction; attention to machine maintenance; and orderly, clean work place

Applications of Lean Production

- ✍ Lean techniques are applicable not only in manufacturing, but also in service-oriented industry and service environment. Every system contains waste, i.e. something that does not provide value to your customer. Whether you are producing a product, processing a material, or providing a service, there are elements which are considered 'waste'. The techniques for analyzing systems, identifying and reducing waste, and focusing on the customer are applicable in **any system, and in any industry.**



Application

- ✍ Lean thinking may also be applied for getting rid of bureaucracy in your home office. To run your home office more effectively and faster you may need just as little as 10% of its current staff. Only executives who have a direct involvement with finding, keeping, or growing customers as well as key support staff - accountants, tax, legal and human resources people - should stay. Others can be rehabilitated by sending to an operating unit.



Characteristics

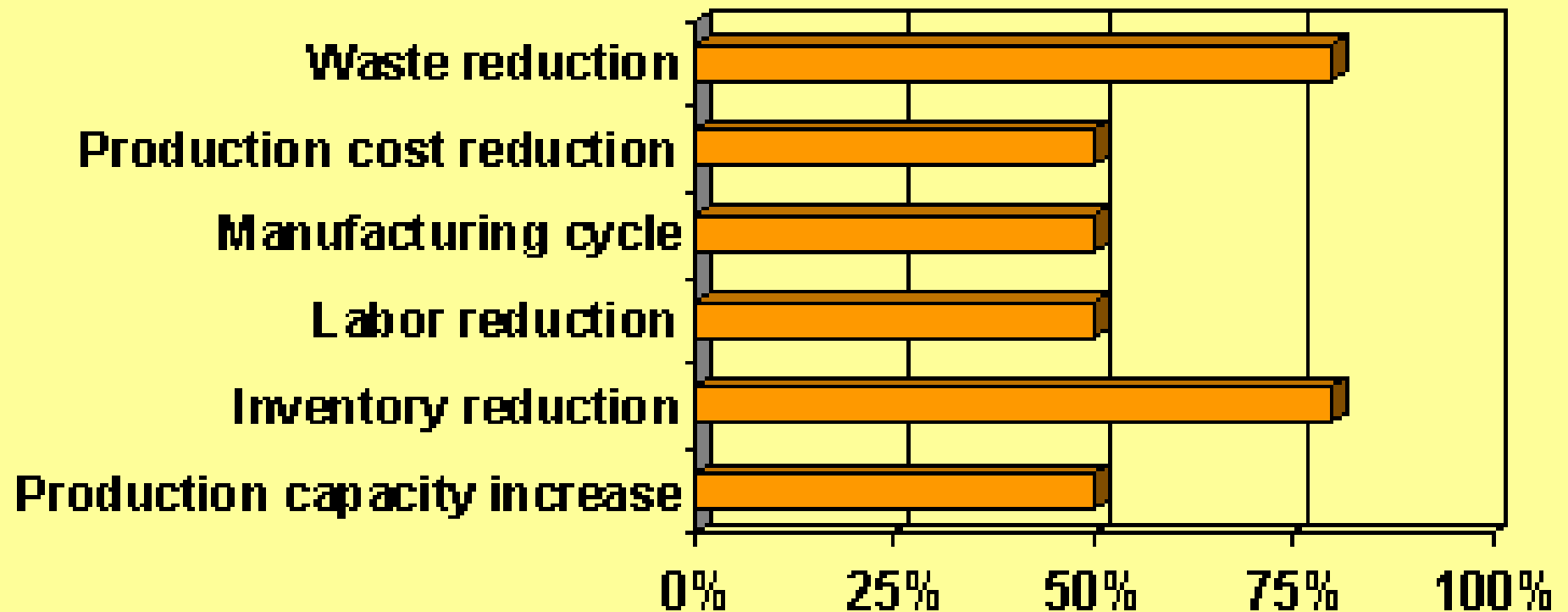
- ✍ Integrated single piece continuous workflow
- ✍ Close integration of the whole value chain from raw material to finished product through partnership oriented relations with suppliers and distributors.
- ✍ Just-in-time processing: a part moves to a production operation, is processed immediately, and moves immediately to the next operation
- ✍ Short order-to-ship cycles times; small batch production capability that is synchronized to shipping schedules
- ✍ Production is based on orders rather than forecasts; production planning is driven by customer demand or "pull" and not to suit machine loading or inflexible work flows on the shop floor.



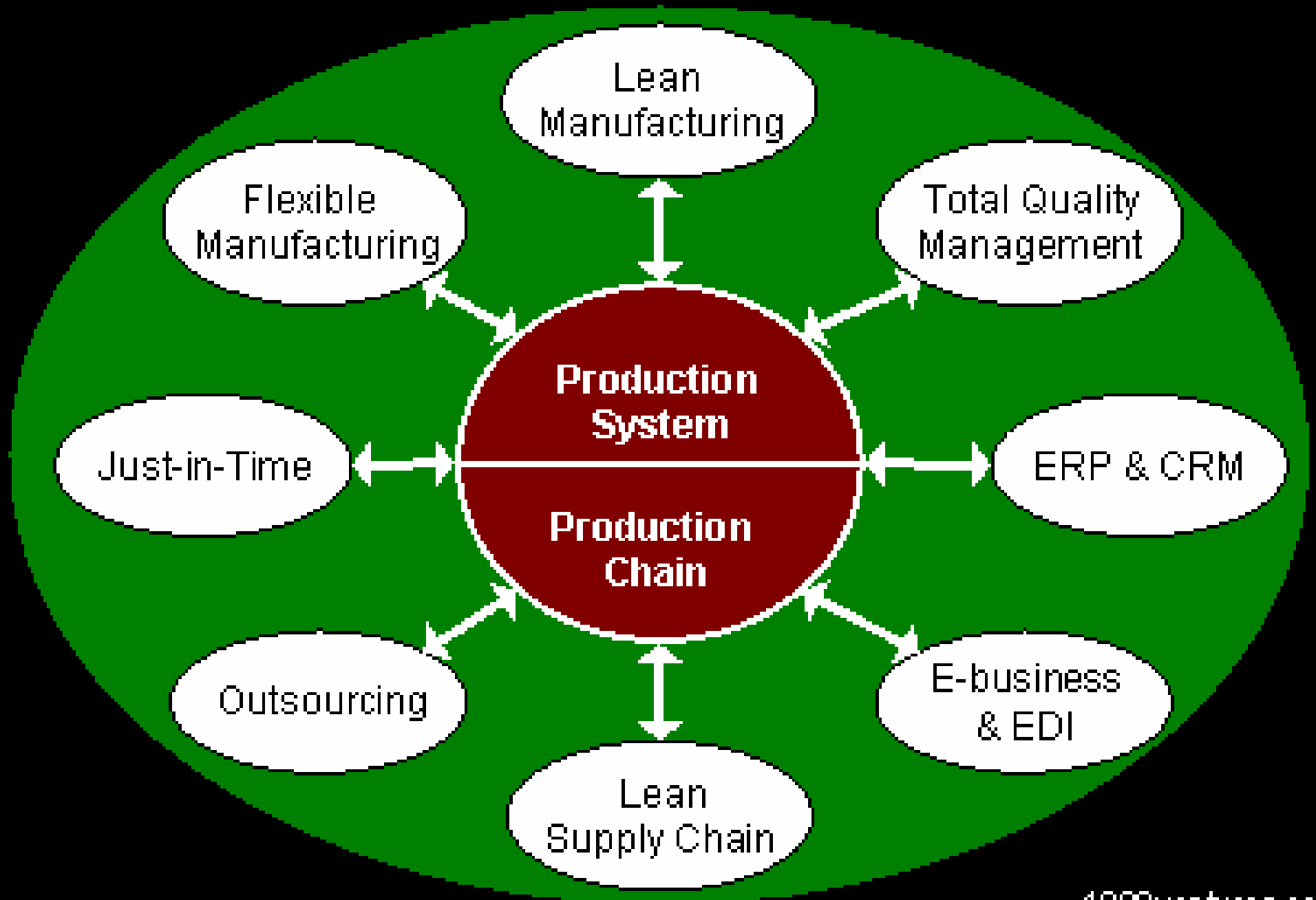
Characteristics

- ✍ Minimal inventories at each stage of the production process
- ✍ Quick changeovers of machines and equipment allow different products to be produced with one-piece flow in small batches
- ✍ Layout is based on product flow
- ✍ Total quality control. Active involvement by workers in trouble shooting and problem solving to improve quality and eliminate wastes.
- ✍ Defect prevention rather than inspection and rework by building quality in the process and implementing real time quality feedback procedures.
- ✍ Team based work organizations with multi skilled operators empowered to make decisions and improve operations with few indirect staff.

Typical Benefits of Lean Production



Components of Lean Production System





Reduced Setup Cost and Times

- ✍ (for semi-versatile machinery such as big stamping presses) - from months to hours thus making small-lot production economically viable; achieved by organizing procedures, using carts, and training workers to do their own setups,



Small-Lot Production

- ✍ Allowing higher flexibility and pull production (or just-in-time manufacturing)



Employee Involvement and Empowerment

- ✍ - organizing workers by forming teams and giving them training and responsibility to do many specialized tasks, for housekeeping, quality inspection, minor equipment repair and rework; allowing also them time to meet to discuss problems and find ways to improve the process



Quality at the Source

- ✍ - total quality management (TQM) and control; assigning workers, not inspectors, the responsibility to discover a defect and to immediately fix it; if the defect cannot be readily fixed, any worker can halt the entire line by pulling a cord (called jidoka)



Pull Production

- ✍ or **Just-In-Time (JIT)** - the method wherein the quantity of work performed at each stage of the process is dictated solely by the demand for materials from the immediate next stage; thus reducing waste and lead times, and eliminating inventory holding costs

Continuous Equipment Maintenance



- ✍ - as pull production reduces inventories, equipment breakdowns must also be reduced; thus empowered operators are assigned primary responsibility for basic maintenance since they are in the best position to detect signs of malfunction



Multi- Skilled Workforce

- ✍ - as employees are empowered to do many jobs, they must be provided with adequate training



Supplier Involvement

- ✍ - the manufacturer treats its supplier as a long-term partners; they often must be trained in ways to reduce setup times, inventories, defects, machine breakdowns, etc. in order to enable them to take responsibility for delivering the best possible parts/services to the manufacturer in a timely manner.

Strategy of Lean Production

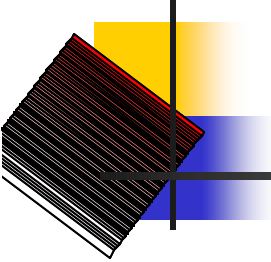


- ✍ Lean customer relationships
- ✍ Lean product development
- ✍ Lean manufacturing/order fulfillment
- ✍ Lean supply chain

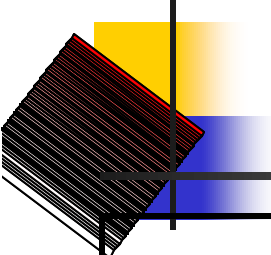
The Seven Wastes To Be Eliminated

- ✍ **Overproduction** and early production - producing over customer requirements, producing unnecessary materials / products
- ✍ **Waiting** - time delays, idle time (time during which value is not added to the product)
- ✍ **Transportation** - multiple handling, delay in materials handling, unnecessary handling
- ✍ **Inventory** - holding or purchasing unnecessary raw materials, work in process, and finished goods
- ✍ **Motion** - actions of people or equipment that do not add value to the product
- ✍ **Over-processing** - unnecessary steps or work elements / procedures (non added value work)
- ✍ **Defective units** - production of a part that is scrapped or requires rework.

Lean System Components and Best Practices

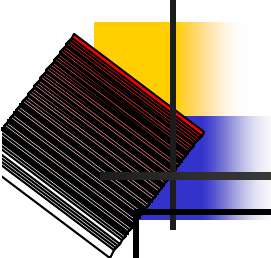
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- ✍ Cultural awareness
 - ✍ Workplace organization - 5S (sort - straighten - sweep - standardize - self-discipline) & visual control
 - ✍ Standardized work
 - ✍ Flexible operations
 - ✍ Employee empowerment and continuous improvement (see [Kaizen](#))
 - ✍ Quick changeover capability
 - ✍ [Total quality management](#) & total productivity maintenance
 - ✍ Error proofing
 - ✍ Material control
 - ✍ Level production

Comparison



	Traditional Manufacturing	Lean Manufacturing
Scheduling	Forecast - push	Customer Order - pull
Production	Stock	Customer Order
Lead Time	Long	Short
Batch Size	Large - Batch & Queue	Small - Continuous Flow
Inspection	Sampling - by inspectors	100% - at source by workers

Comparison



	Traditional Manufacturing	Lean Manufacturing
Layout	Functional	Product Flow
Empowerment	Low	High
Inventory Turns	Low - <7 turns	High - 10+
Flexibility	Low	High
COGS	High and Rising	Lower and Decreasing