Pointers on Operations Management and Control for RBI Grade B

Lean manufacturing
- Systematic method originating in the Japanese manufacturing industry for the minimization of waste without sacrificing productivity
- Lean manufacturing attempts to make obvious what adds value, through reducing everything else
- Derived mostly from Toyota Production System

Lean manufacturing techniques
- **Single minute exchange of die**
  - It provides a rapid and efficient way of converting a manufacturing process from running the current product to running the next product. This rapid changeover is key to reducing production lot sizes and thereby improving flow, reducing production loss and output variability
- **5s methodology**
  - 5S is a workplace organization method that uses a list of five words, "Sort", "Set In order", "Shine", "Standardize" and "Sustain"
  - The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order
- **Heijunka**
  - **Leveling the type and quantity of production** over a fixed period of time
  - This enables production to efficiently meet customer demands while avoiding batching and results in minimum inventories, capital costs, manpower, and production lead time through the whole value stream
  - The Heijunka box allows easy and visual control of a smoothed production schedule
- **Value stream mapping**
  - lean-management method for analyzing the current state and designing a future state for the series of events that take a product or service from its beginning through to the customer with reduced lean wastes as compared to current map
  - A value stream focuses on areas of a firm that add value to a product or service, whereas a value chain refers to all of the activities within a company

Toyota production system
- An integrated socio-technical system, developed by Toyota, which comprises its management philosophy and practices.
- Developed by Taiichi Ohno and Eiji Toyoda

Other RBI Grade B notes on: https://skidha.home.blog/
• Originally called Just-In-Time (JIT) production
• Main objectives of the TPS are to **design out overburden and inconsistency, and to eliminate waste (muda)**
• **8 kinds of wastes** that are addressed in the TPS (first 7 given by Taiichi Ohno)—
  o Waste of overproduction (largest waste)
  o Waste of time on hand (waiting)
  o Waste of transportation
  o Waste of over-processing or undertaking non-value added activity
  o Waste of stock at hand (inventory)
  o Waste of movement
  o Waste of making defective products
  o Waste of underutilized workers (not part of 7 wastes given by Taiichi Ohno)
• 2 main conceptual pillars
  o **Just-in-time** – meaning "Making only what is needed, only when it is needed, and only in the amount that is needed"
    ▪ methodology aimed primarily at reducing times within production systems as well as response times from suppliers and to customers
  o **Jidoka** – (Autonomation) meaning "Automation with a human touch"
• JIT, Kanban, Heijunka, Jidoka, Kaizen etc are all made use of here

**Pull production - Kanban, CONWIP, JIT systems**
• Push vs Pull production strategies
  o **Push**: control information flow is in the same direction of goods flow; the production order is scheduled and the material is pushed into the production line
  o **Pull**: Succeeding node makes order request for preceding node. Preceding node reacts by producing the order, which involves all internal operations, and replenishes when finished; he start of each product assembly process is triggered by the completion of another at the end of production line. This pull-variant is known for its ease of implementation
• **Kanban**
  o **Scheduling system** for lean manufacturing and just-in-time manufacturing (JIT)
  o Also developed by Taiichi Ohno
  o The system takes its name from the **cards** that track production within a factory
  o A goal of the kanban system is to **limit the buildup of excess inventory** at any point in production. Limits on the number of items waiting at supply points are established and then reduced as inefficiencies are identified and removed.
- Kanban cards are a key component of kanban and they signal the need to move materials within a production facility or to move materials from an outside supplier into the production facility. The kanban card is, in effect, a message that signals a depletion of product, parts, or inventory. When received, the kanban triggers replenishment of that product, part, or inventory. Consumption, therefore, drives demand for more production, and the kanban card signals demand for more product—so kanban cards help create a demand-driven system.

- **CONWIP (Constant Work In Progress)**
  - Also a pull-oriented production control systems
  - CONWIP is a kind of single-stage kanban system and is also a hybrid push-pull system

**Kaizen or Continuous improvement**
- Concept referring to business activities that continuously improve all functions and involve all employees from the CEO to the assembly line workers
- The Japanese word kaizen means "change for better"

**Total Quality Management (TQM)**
- Consists of organization-wide efforts to "install and make permanent climate where employees continuously improve their ability to provide on demand products and services that customers will find of particular value"
- "Total" emphasizes that departments in addition to production (for example sales and marketing, accounting and finance, engineering and design) are obligated to improve their operations; "management" emphasizes that executives are obligated to actively manage quality through funding, training, staffing, and goal setting
- Quality is defined by customers' requirements
- Top management has direct responsibility for quality improvement
- Increased quality comes from systematic analysis and improvement of work processes

**Total Productive Maintenance (TPM)**
- System of maintaining and improving the integrity of production, safety and quality systems through the machines, equipment, processes, and employees that add business value to an organization
- TPM focuses on keeping all equipment in top working condition to avoid breakdowns and delays in manufacturing processes
Agile manufacturing

- Term applied to an organization that has created the processes, tools, and training to enable it to respond quickly to customer needs and market changes while still controlling costs and quality. It's mostly related to lean manufacturing.
- In lean manufacturing, the company aims to cut all costs which are not directly related to the production of a product for the consumer. Agile manufacturing can include this concept, but it also adds an additional dimension, the idea that customer demands need to be met rapidly and effectively. In situations where companies integrate both approaches, they are sometimes said to be using "agile and lean manufacturing".
- Companies which utilize an agile manufacturing approach tend to have very strong networks with suppliers and related companies, along with numerous cooperative teams which work within the company to deliver products effectively.

Cost of Quality

- Cost of quality is generally classified into 4 categories
  - **Prevention costs**: Cost incurred to prevent (keep failure and appraisal cost to a minimum) poor quality. Example: New product review, quality planning, supplier surveys, process reviews, quality improvement teams, education and training.
  - **Inspection/Appraisal costs**: Cost incurred to determine the degree of conformance to quality requirements (measuring, evaluating or auditing). Example: Inspection, testing, process or service audits, calibration of measuring and test equipment.
  - **Internal failure costs**: Cost associated with defects found before the customer receives the product or service. Example: Scrap, rework, re-inspection, re-testing, material review, material downgrades
  - **External failure costs**: Cost associated with defects found after the customer receives the product or service. Example: Processing customer complaints, customer returns, warranty claims, product recalls.

Six Sigma

- Six Sigma (6σ) is a set of techniques and tools for process improvement. It was introduced by American engineer Bill Smith while working at Motorola.
- Jack Welch made it central to his business strategy at General Electric.
- Six Sigma strategies seek to improve the quality of the output of a process by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes.
• **Origin of the name**: The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates—specifically, within how many standard deviations of a normal distribution the fraction of defect-free outcomes corresponds to. Motorola set a goal of "six sigma" for all of its manufacturing.

• Six sigma process results in **only 3.4 defects per million**

**Poka-Yoke**

• Japanese term that means "mistake-proofing" or "inadvertent error prevention"

• Any mechanism in any process that helps an equipment operator avoid mistakes. Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur.

**Ishikawa Diagrams**

• also called **fishbone** diagrams, herringbone diagrams, cause-and-effect diagrams, or Fishikawa) are causal diagrams that show the causes of a specific event.

**Control** *(from Chapter 18 of the book Management by Stephen Robbins 11th edition)*

• Process of monitoring, comparing, and correcting work performance

• Effective controls ensure that activities are completed in ways that lead to the attainment of goals

• Control is important, therefore, because it’s the only way that managers know whether organizational goals are being met and if not, the reasons why

• The control process is a three-step process of measuring actual performance, comparing actual performance against a standard, and taking managerial action to correct deviations or to address inadequate standards

• **Organizational Productivity** is the amount of goods or services produced divided by the inputs needed to generate that output

• **Organizational effectiveness** is a measure of how appropriate organizational goals are and how well those goals are being met

**Feedforward/Concurrent/Feedback Controls**

• Managers can implement controls **before** an activity begins, **during** the time the activity is going on, and **after** the activity has been completed. The first type is called feedforward control; the second, concurrent control; and the last, feedback control

• **Feedforward control**
  - **most desirable** type of control
  - prevents problems because it takes place before the actual activity
for example, scheduled preventive maintenance programs on aircraft done by the major airlines

The key to feedforward controls is taking managerial action before a problem occurs. That way, problems can be prevented rather than having to correct them after any damage

- **Concurrent control**
  - takes place while a work activity is in progress
  - The best-known form of concurrent control is **direct supervision**, also known as Management by Walking Around
  - All managers can benefit from using concurrent control because they can correct problems before they become too costly

- **Feedback control**
  - Most popular type of control relies on feedback
  - The control takes place after the activity is done. That’s the major problem with this type of control. By the time a manager has the information, the problems have already occurred, leading to waste or damage
  - Advantages
    - feedback gives managers meaningful information on how effective their planning efforts were
    - feedback can enhance motivation

- **Financial controls** – used by companies through formulating Budgets, calculating various accountancy ratios to estimate liquidity, debt etc

- **Balanced scorecard** - way to evaluate organizational performance from more than just the financial perspective; typically looks at four areas that contribute to a company’s performance: financial, customer, internal processes, and people/innovation/growth assets

- **Information controls** - Management information system (MIS) is a system used to provide managers with needed information on a regular basis