**Lean Systems**

**Knowledge Check**

**Weekly Learning Objectives**

* Identify the characteristics and strategic advantages of lean systems
* Describe how lean systems can facilitate the continuous improvement of processes.
* Understand kanban systems for creating a production schedule in a lean system
* Explain the implementation issues associated with the application of lean systems

**Key Concepts**

* Toyota Production System uses a set of tools and procedures that are a part of the process of continuous improvement.
* The process of continuous improvement is a foundation of the learning organization.
* Lean systems require constant improvement to increase efficiency and reduce waste.
* Toyota created a system that allows employees to experiment to find ways to find better ways to do their jobs. The company teaches employees at all levels how to use the scientific method to solve problems.
* Four principles of TPS:
  + All work must be completely specified as to content, sequence, timing, and outcome.
  + Every customer-supplier connection must be direct, unambiguously specifying the people involved, the form and quantity of the services or goods to be provided, the way the requests are made by each customer, and the expected times in which the requests will be made. Customer-supplier connections can be internal (employee to employee) or external (company to company).
  + The pathway for every service and product must be simple and direct. That is, services and goods do not flow to the next available person or machine, but to a specific person or machine. With this principle, employees can determine, for example, whether a capacity problem exists at a particular workstation and then analyze ways to solve it.
  + The above three principles define the system in detail by specifying how employees do work, interact with each other, and how the workflows are designed. However, these specifications are actually “hypotheses” about the way the system should work.
  + The fourth principle, then, is that any improvements to the system must be dome in accordance with the scientific method., under the guidance of a teacher, the lowest possible organizational level.
  + The scientific method involves:
    - Clearly stating a verifiable-hypotheses: “if we make following specific changes we expect to achieve this specific outcome.
    - The hypothesis must then be tested under a variety of conditions. This process is monitored by a “teacher” who is often employee’s supervisor.
    - Employees learn the scientific method and eventually become teachers of other.
    - Managers are advised to coach employees only- not to fix their problems for them.
  + These principles are actually very difficult to emulate and implement
  + This system requires a high degree of regimentation and sometimes stresses the workforce.
* Characteristics of lean systems:
  + Pull method of workflow
  + Quality at the source
  + Small lot sizes
  + Uniform workstations loads
  + Standardized components and work methods
  + Close supplier ties
  + Flexible workforce
  + Line flows
  + Automation
  + Five S

**Key Definitions:**

**1. Lean systems:** Operations systems that maximize the value added by each of a company’s activities by paring unnecessary resources and delays from them.

**2. Just-in-time (JIT) philosophy:** The belief that waste can be eliminated by cutting unnecessary capacity or inventory and removing non-value-added activities in operations. Partnership of suppliers and purchasers that remove waste and drive down costs for mutual benefit.

**3. Push method:** A method in which production of the item begins in advance of customer needs.

**4. Pull method:** A method in which customer demand activates production of the service or item. A concept that results in material being produced only when requested and moved to where it is needed just as it is needed.

**5. Poka-yoke:** Mistake proofing methods aimed at designing fail-safe systems that minimize human error.

**6. Lot:** a quantity of items that are processed together.

**7. Set-up:** The group of activities needed to change or readjust a process between successive lots of items.

**8. Single digit set up:** The goal of having a setup time of less than 10 minutes.

**10. Mixed-model assembly:** A type of assembly that produces a mix of models in smaller lots.

**11. Five S:** A methodology consisting of five workplace practices: sorting, strengthening, shining, standardizing, and sustaining-that are conducive to visual controls and lean production.

**12. Kanban:** A Japanese word meaning card” or “visible record” or a ”signal” that refers to cards used to “pull” parts and control the flow of production through the factory.

**13. Value Stream Mapping**: A qualitative lean tool for eliminating waste or Muda.

**14. Seven wastes:** overproduction, queues, transportation, inventory, motion, over-processing, defective products.

**15. Variability:** Any deviation from the optimum process that delivers perfect product on time, every time.

**15. Lean operations:** eliminates waste through a focus on exactly what the customer wants.

**16. Throughput:** the time required to move orders through the production process, from receipt to delivery.

**17. Manufacturing cycle time:** The time between the arrival of raw materials and the shipping of finished products.

**18. Consignment inventory:** an arrangement in which the supplier maintains title to the inventory until it is used.

**19. Level schedules:** Scheduling products so that each day’s production meets the demand for that day.

**20. Kaizen:** A focus on continuous improvement.