Surname and initials: Theresa Bowen

Student number: 21631123

Individual submission: Contact session: *6-Short*

Topic(s): *Lean Operations, Maintenance and Reality*

Name of my organization: Centre for Governance (C-Gov), NWU

A pseudonym to be used (as discussed in class): N/A

Nature of business: Higher Education Department of North-West University

Brief (one paragraph) description of the scope of the business that I analyze:

The core business of the Centre for Governance (C-Gov) is:

-to apply the academic expertise at the North-West University and elsewhere in a sustainable manner so as to make a positive impact on the public sector, with a particular focus on the local government sector of the North West Province;

-to present appropriate short learning and formal programmes of distinction in an innovative and cost-effective manner;

-to initiate and facilitate consultative interventions;

-to launch initiatives (such as seminars, conferences, and winter/summer schools) where public service problems can be addressed and

-to examine, with the relevant research entities, problem areas in the public sector, and to devise possible solutions and suitable recommendations.

By submitting this on eFundi, I declare that this submission is my own work!

Chapter 16
Lean Operations

Lean Operations

Lean operations- eliminates waste through
- continuous improvement
- focus on exactly what customer wants

Just-in-time (JIT) -Continuous and forced problem solving
- focus on throughput and reduced inventory

Toyota Production System (TPS) -Focus on continuous improvement, respect for people, and standard
- *competitive advantage= increased overall returns*

Seven wastes-Overproduction
- Queues
- transportation
- inventory
- motion
- over-processing
- defective product.

5Ss -A Lean production checklist:
- sort
- simplify
- shine
- standardize
- sustain

U.S. managers often add two additional *S* s to the 5 original ones: *safety* and *support/maintenance* .

Variability - deviation from the optimum process
= delivers perfect product on time, every time.
JIT + inventory reduction= tools identifying
- causes of variability

Throughput -rate - units move through a process

Manufacturing cycle time -time between the arrival of raw materials and the shipping of finished products

Pull system - concept - material being produced when requested and moved when needed
= pull systems use signals to request production and delivery from supplying stations to stations that have production capacity available

Lean and the Toyota Production System

Kaizen - focus on continuous improvement.

Kaizen event - members of a work cell or team
- meet to develop improvements in the process.

Toyota recruits, trains, and treats people as knowledge workers. They are empowered. TPS employs aggressive cross-training and few job classifications

Lean Organisations

Lean operations tend to share the following attributes:
respect and develop employees by improving job design, providing constant training, instilling commitment, and building teamwork; *empower employees* by pushing responsibility to the lowest level possible; *develop worker flexibility* through cross-training and reducing job classifications; *build processes* that destroy variability; *develop collaborative partnerships with suppliers* to help them accept responsibility for satisfying end customer needs; and *eliminate waste by performing only value-added activities.*

Gemba or **Gemba walk** -Going - where the work is performed.

Lean in Services

- features of Lean operations apply to services just as they do in other sectors. Forecasts in services may be very elaborate, with seasonal, daily, hourly, or even shorter components.

Lean and Just-in-Time

Supplier partnerships -Suppliers and purchasers work together = remove waste and drive down costs for mutual benefit. Some specific goals of supplier partnerships are
- *removal of unnecessary activities*
- *removal of in-plant inventory*
- *removal of in-transit inventory*
- *obtain improved quality and reliability*

Consignment inventory - arrangement in which the supplier maintains title to the inventory until it is used

Concerns of suppliers in suppler partnerships include:
1- diversification
2- scheduling
3- lead time
4- quality
5- lot sizes

Lean layout tactics include building work cells for families of products, including a large number of operations in a small area, minimizing distance, designing little space for inventory, improving employee communication, using poka-yoke devices, building flexible or movable equipment, and cross-training workers to add flexibility

Lean inventory - The minimum inventory necessary to keep a perfect system running. The idea behind JIT is to eliminate inventory that hides variability in the production system. *Lean inventory tactics* include using a pull system to move inventory, reducing lot size, developing just-in-time delivery systems with suppliers, delivering directly to the point of use, performing to schedule, reducing setup time, and using group technology.

$$Q_p^* = \sqrt{\frac{2DS}{H[1 - (d/p)]}} \quad (16\text{-}1)$$

Using Equation (16-1), for a given desired lot size, Q, we can solve for the optimal setup cost, S:

$$S = \frac{(Q^2)(H)(1 - d/p)}{2D} \quad (16\text{-}2)$$

Lean scheduling tactics include :
communicate schedules to suppliers, make level schedules, freeze part of the schedule, perform to schedule, seek one-piece-make and one-piece-move, eliminate waste, produce in small lots, use kanbans, and make each operation produce a perfect part.

Level schedules -Scheduling products so that each day's production meets the demand for that day.

Kanban -The Japanese word for *card* , which has come to mean "signal"; a kanban system moves parts through production via a "pull" from a signal

$$\text{Number of kanbans (containers)} = \frac{\text{Demand during lead time} + \text{Safety stock}}{\text{Size of container}} \quad (16\text{-}3)$$

Lean quality -whereas inventory *hides* bad quality, Lean immediately *exposes* it.

Lean quality tactics include:
- using statistical process control, empowering employees, building fail-safe methods (poka-yoke, checklists, etc.), exposing poor quality with small lots, and providing immediate feedback.

Chapter 17
Maintenance and Reliability

The Strategic importance

Poor maintenance can be disruptive, inconvenient, wasteful, and expensive in dollars and even in lives. The interdependency of operator, machine, and mechanic is a hallmark of successful maintenance and reliability.

Good maintenance and reliability management requires employee involvement and good procedures; it enhances a firm's performance and protects its investment.

The objective of maintenance and reliability is to maintain the capability of the system.

- **Maintenance**- activities involved in keeping a system's equipment in working order.
- **Reliability** -The probability that a machine part or product will function properly for a specified time under stated conditions.
- The two main tactics for improving reliability are:
  1. Improving individual components
  2. Providing redundancy
- The two main tactics for improving maintenance are:
  1. Implementing or improving preventive maintenance
  2. Increasing repair capabilities or speed

Reliability

A system is composed of a series of individual interrelated components, each performing a specific job. If any *one* component fails to perform, the overall system can fail.

As the number of components in a *series* increases, the reliability of the whole system declines very quickly:

$$R_s = R_1 \times R_2 \times R_3 \times \ldots \times R_n$$

where *R* 1 5 reliability of component 1, *R* 2 5 reliability of component 2, and so on. Equation (17-1) assumes that the reliability of an individual component does not depend on the reliability of other components.

A .90 reliability means that the unit will perform as intended 90% of the time, and it will fail 10% of the time.

The basic unit of measure for reliability is the *product failure rate* (FR). FR(%) is the percent of failures among the total number of products tested, and FR(*N*) is the number of failures during a period of time:

$$\text{FR}(\%) = \frac{\text{Number of failures}}{\text{Number of units tested}} \times 100\%$$

$$\text{FR}(N) = \frac{\text{Number of failures}}{\text{Number of unit-hours of operating time}}$$

- **Mean time between failures (MTBF)** - expected time between a repair and the next failure of a component, machine, process, or product. **MTBF = 1 FR(*N*)**
- **Redundancy** - use of components in parallel to raise reliability. The reliability of a component along with its backup equals:

ability of a component along with its backup equals:

(Probability that 1st component works) + [(Prob. that backup works) × (Prob. that 1st fails)]

Maintenance

- **Preventive maintenance** -Involves routine inspections, monitoring, servicing, and keeping facilities in good repair.
- **Breakdown maintenance** -Remedial maintenance that occurs when preventive maintenance fails and equipment/facilities must be repaired on an Emergency or priority basis.
- **Infant mortality** -The failure rate early in the life of a product or process.

  Consistent with job enrichment practices, machine operators must be held responsible for preventive maintenance of their own equipment and tools. Reliability and maintenance are of such importance that most Maintenance systems are now computerized.
- Costs of a breakdown that may get ignored include:
  1. The cost of inventory maintained to compensate for downtime
  2. Downtime, which can have a devastating effect on safety and morale and which adversely affects delivery schedules, destroying customer relations and future sales
- **Autonomous maintenance** -Operators partner with maintenance personnel to observe, check, adjust, clean, and notify.

  Employees can predict failures, prevent breakdowns, and prolong equipment life.

  With autonomous maintenance, the manager is making a step toward both employee empowerment and maintaining system performance.

Total Productive Maintenance

- **Total productive maintenance (TPM)**
  - Combines total quality management with a strategic view of maintenance from process and equipment design to preventive maintenance.
- Total productive maintenance includes:
  1- Designing machines that are reliable, easy to operate, and easy to maintain
  2- Emphasizing total cost of ownership when purchasing machines, so that service and maintenance are included in the cost
  3- Developing preventive maintenance plans that utilize the best practices of operators, maintenance departments, and depot service
  4- Training for autonomous maintenance so operators maintain their own Machines and partner with maintenance personnel

Three techniques that have proven beneficial to effective maintenance are simulation, expert systems, and sensors.

Nature of business:

C-Gov is a department in the NWU, which offers formal, as well as skills development courses to individuals who work in the Public Sector.

What is there about the topic that I would like explained further in class?

None, thank you.