Construction Performance and Planning

Strategic Construction Management (COMA 6102)

Denamo Addissie

9 Septmber 2019

OUTLINE

- Project management evaluation
- Performance measurement
- Benchmarking
- Process mapping
- Lean construction

Productivity

- By popular definition productivity simply refers to the general efficiency of an organization or individual
- The output of any aspect of production per unit of input
- Economic measure of output of a worker, machine, or an entire national economy in the creation of goods and services to produce wealth
- In the business world, productivity measures investment in capital, such as buildings, machines, raw materials & in labour against the profits from the sale of the product

Productivity

- A company that most minimizes input and maximizes output has the highest productivity
- A total concept that addresses the key elements of competition i.e. innovation, cost, quality and delivery
- Should be viewed as value adding in addition to optimizing
- Construction is a labour intensive process
- Manpower is one of the productive resources in construction
- Construction productivity largely depends upon human performance
- Reliable measures of productivity is output per work-hour being achieved by workers

Why is Productivity Important?

- Extremely vital performance measurement tool within the construction industry
- Due to size of construction industry productivity trends carry immense consequences for the economy as a whole
- Productivity growth is important to an individual enterprise, an industry or an economy
- Construction industry accounts for 3 – 8% of the GDP in most countries

Why is Productivity Important?

- Productivity improvement in construction industry may have a significant impact on improving GDP
- Productivity growth is the key determinant of international competitiveness in the long term
- Improving relative productivity growth improves a country's competitive position
- The construction industry – most challenging and demanding still many opportunities for productivity improvement

Factors having adverse effect on productivity

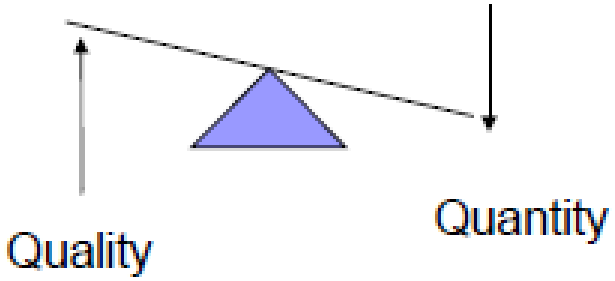
- Overtime and or Fatigue
- Errors and omissions in plans and specifications
- Multitude of change orders
- Design complexity and Design completeness
- Stacking of trades
- Dilution of supervision
- High accident rate
- Jurisdictional disputes
- Work rules and restrictive work practices
- Availability of skilled labour
- Reassignment of manpower from task to task
- Material location – above ground level/above floor level
- Adverse temperature or weather
- Inadequate lighting

PERFORMANCE MEASUREMENT

- Regulations of various types
- High absenteeism
- High turnover
- Material shortages
- Ground water level
- Attitude of the workforce
- Crew size and composition
- Economic conditions & level of unemployment
- Size and duration of the project
- Timeliness of decisions
- Impractical QA / QC tolerances
- Uncontrolled breaks
- Time of the day & day of the week
- Inadequate temporary facilities: parking, change / rest rooms etc

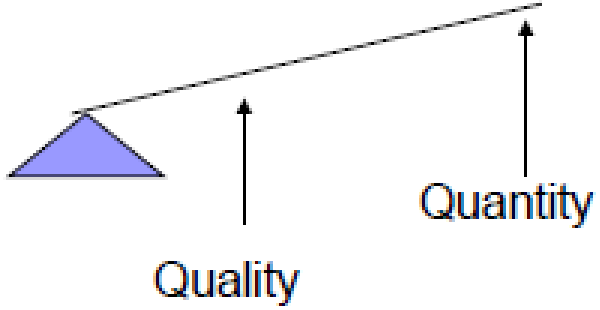
Quality and Productivity

- Folklore
- Outmoded relationship



True Relationship

Modern view of Relationship



Improvement of Process – TQM

Leads to greater uniformity of product

Reduces mistakes and rework

Reduces waste of manpower, machine,time and materals

Increases output with lowered cost

Other Benefits

Better competitive position

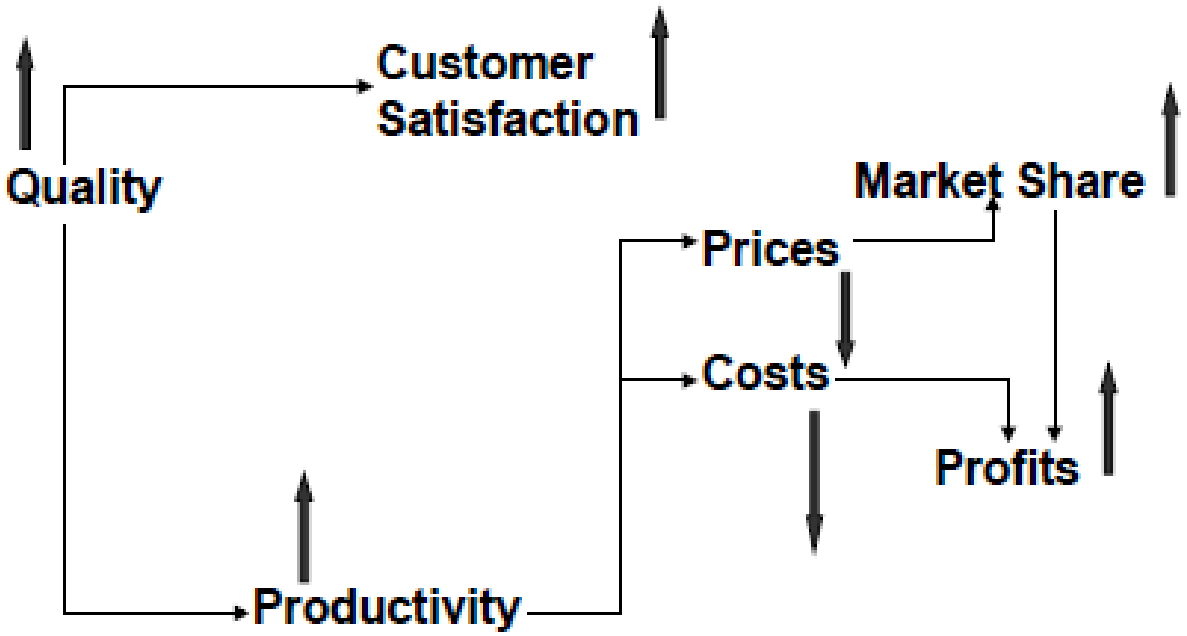
Happier people on the job

More jobs

Improved morale

Quality and Productivity

- Deming's Quality Chain Reaction



Improve Quality → Costs decrease because of less rework, fewer mistakes, delays, snags, better use of machine, time and materials → Productivity improves

Productivity and Safety

- Worldwide – construction industry produces more injuries than other industries
- Construction industry – often criticized for poor performance (low productivity, waste, health and safety problems)
- Strongest relations exist between work organizational factors, working conditions & health & absenteeism
- Research shows that occupational safety and health improved (less health complaints and less accidents) when working conditions and work organization ameliorated
- Improving safety improves productivity

Methods of Improving Productivity

The following factors can lead to the improvement in productivity:

- Training programs for labour
- Incentives in contract for good performance
- Enough tools in working place and proper planning
- Optimizing site facilities
- Availability of resources
- Competition between crews, areas or shifts
- Good supervision and optimum manpower
- Short interval scheduling
- Innovative materials and equipment
- Time lapse film analysis for critical activities
- Cost reporting and work sampling of critical activities

PERFORMANCE MEASUREMENT

- Time and motion studies to improve efficiency, reduce fatigue and work smarter
- Safety programs
- Use of precast and prestressing concrete elements
- Critical path method of planning, scheduling and control
- Value engineering
- Worker motivation programs
- Constructability review of design
- Standardization
- Preplanning activities
- Effective utilization of sub-contractors

Major causes leading to poor productivity

- Congestion
- Sequencing
- Lack of materials

A high variability in the unit productivity value is an indication of poor productivity and a low variability indicates good productivity

Productivity Benchmarking

- Benchmarking is a systematic process of searching for the best practices, innovative ideas and highly effective operating procedures that lead to superior performance

- Purpose of Benchmarking
- a) Analyze the operations to
- - Identify the critical cost components and areas for improvement
- - Reduction in the cycle time of activities

- b) To get knowledge of the competition & industry leaders
- c) To incorporate the best of the best – learn & emulate the best
- d) To gain superiority over competitors

Types of Benchmarking

- Internal

- Comparison among similar operations within one's own organization

- Competitive

- This is comparison to the best of the direct competitors

- Functional

- Comparison of the methods with the companies with similar processes in the same function outside one's country

Types of Benchmarking

- **Generic**

- Comparison of work processes to others who have innovative, exemplar work processes

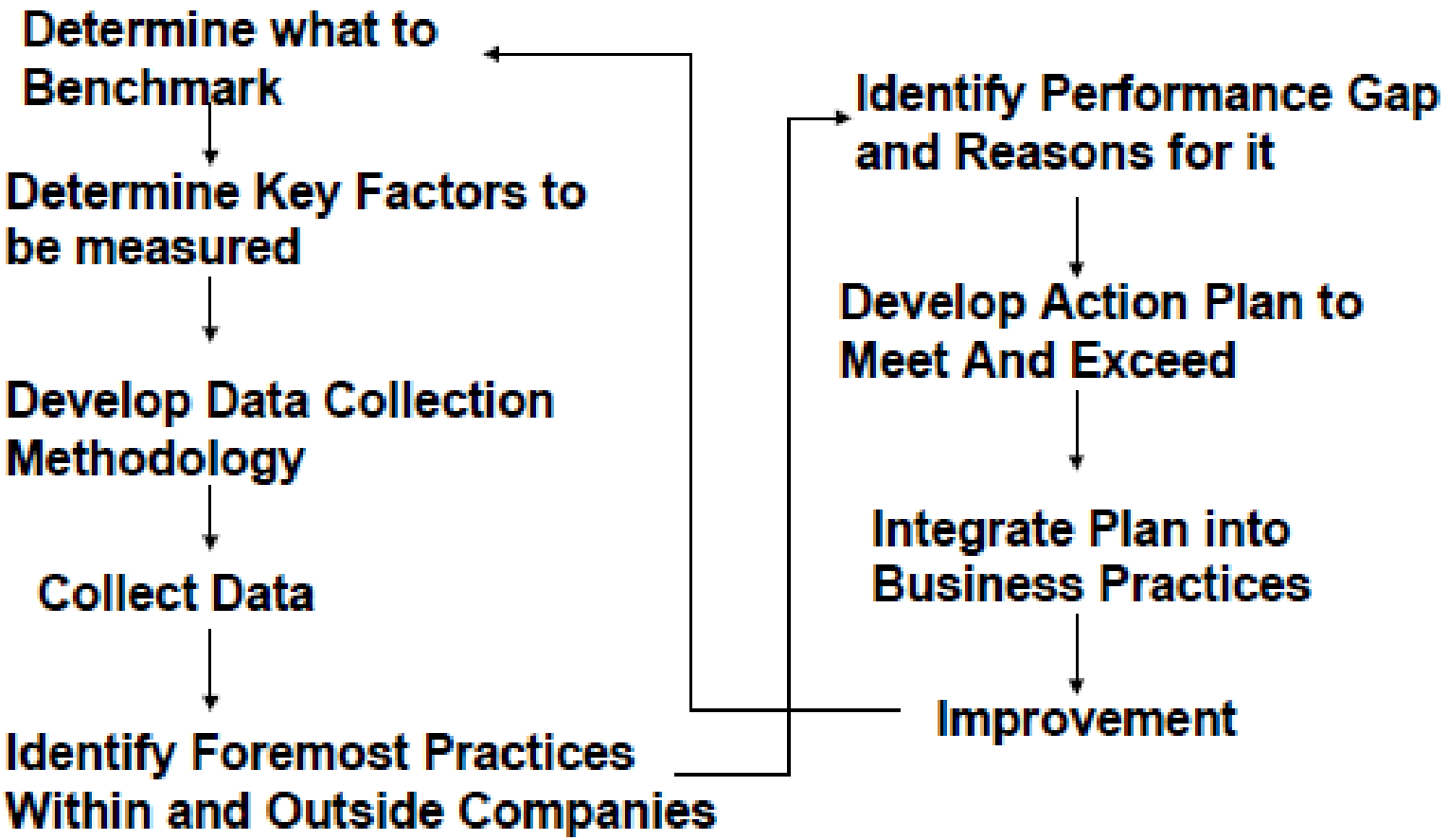
- Cooperative

- Contacting the best in class firms and asking them for knowledge sharing

- **Collaborative**

- A group of firms sharing knowledge about a particular activity

Benchmarking Roadmap



Benchmarking Scope

- Products and Services
- Business Processes
- Performance Measures

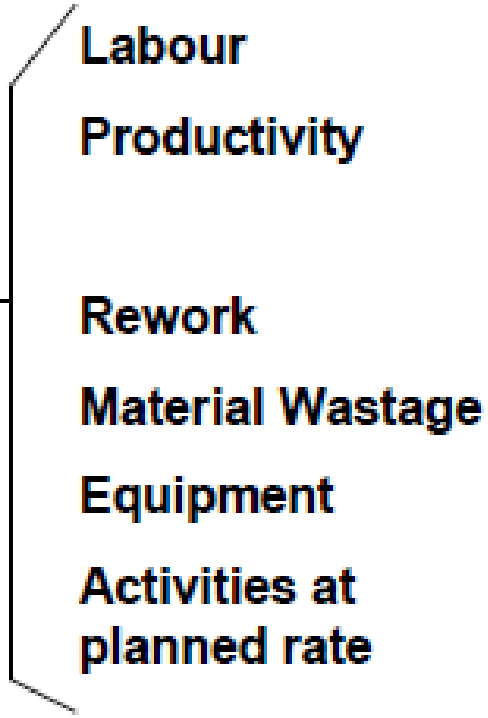
Performance Indicators

- Benchmarking is essentially for continuous improvement of any organization
- Parameter for benchmarking should be based on Key Performance Indicator (KPI)
- There can be many KPI's in the construction industry to measure the job performances

Key Performance Indicators

A few major ones are listed below

- Cost
- Scheduled Duration
- Quality
- Scope of work
- Procurement
- Construction
- Planning
- Engineering Design
- Operational Health & Safety
- Sub-contracts



Benchmarking in Context of Construction Industry

Major portion of buildings project cost consists of the following activities

- Concreting
- Formwork
- Masonry
- Reinforcements

Labour productivity can be benchmarked very well based on these four activities

Labour Productivity for Formwork

- Depends on factors like:

- Type of Formwork system used
- Quantity of formwork used
- Type of Structure
- Shifting methods
- Labour skills
- Resource availability
- Safety and other issues

Labour Productivity for Formwork

- Depends on factors like:

- Type of Formwork system used
- Quantity of formwork used
- Type of Structure
- Shifting methods
- Labour skills
- Resource availability
- Safety and other issues

Labour Productivity for Masonry

Depends on factors like

- Size of Block
- Method of shifting
- Lead and shift
- Labour skill
- Type of Structure
- Safety and other issues

Labour Productivity for Reinforcement

- Depends on the factors like
- Diameter of bar
- Bar bending schedule
- Quantity of reinforcement
- Method of transport
- Availability of bar bending and cutting machine
- Skill of labour
- Type of Structure
- Safety

Labour Productivity for Reinforcement

- Depends on the factors like
- Diameter of bar
- Bar bending schedule
- Quantity of reinforcement
- Method of transport
- Availability of bar bending and cutting machine
- Skill of labour
- Type of Structure
- Safety

PROCESS MAPPING

- Process mapping is a term used to describe any activities involved in identifying what a business or department does, who is responsible for doing it, the standards to which it should be done, and how successes will be measured.

- This process is used in many types of businesses to help companies ***streamline their production, increase profitability, reduce waste***, and much more.

- The activities used for process mapping are part of the overall quality management of the business.

- When done correctly, the process map will look at an objective and help measure it against the company's overall objectives to ensure that all work being done helps achieve the business goals.

Why Process Mapping?

- Training - The process maps can be a key component of training new employees. The maps can be given to them so they can see how things should be done.

- Problem Solving - When there are problems in the process, it will be much easier to see exactly where they are taking place. This can help find solutions to the problems much more quickly.

- Standardization - Standardization is a great way to eliminate waste and ensure consistency throughout all shifts, all facilities, and anywhere else where there would otherwise be variation.

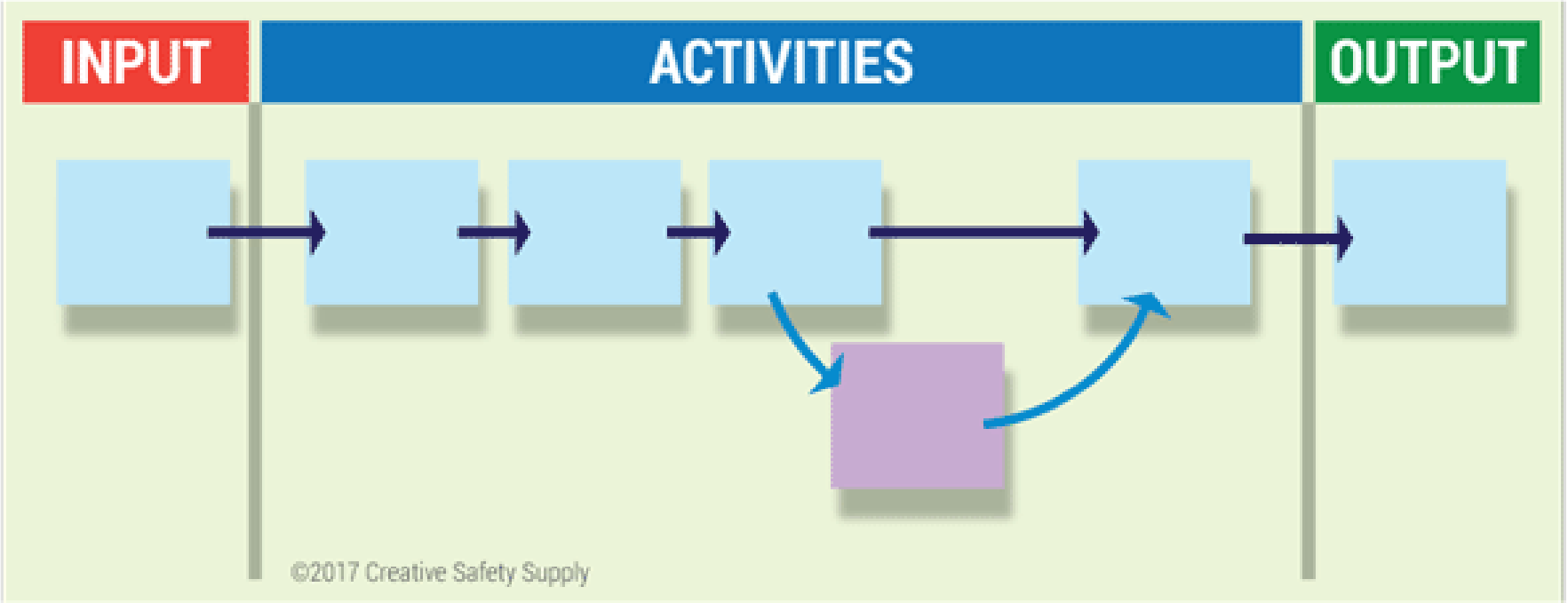
Why Process Mapping?

- Big Picture - When a good process map is in place, everyone can see the big picture. This helps each individual department, or even each employee, see where they fit into the overall scheme of things.

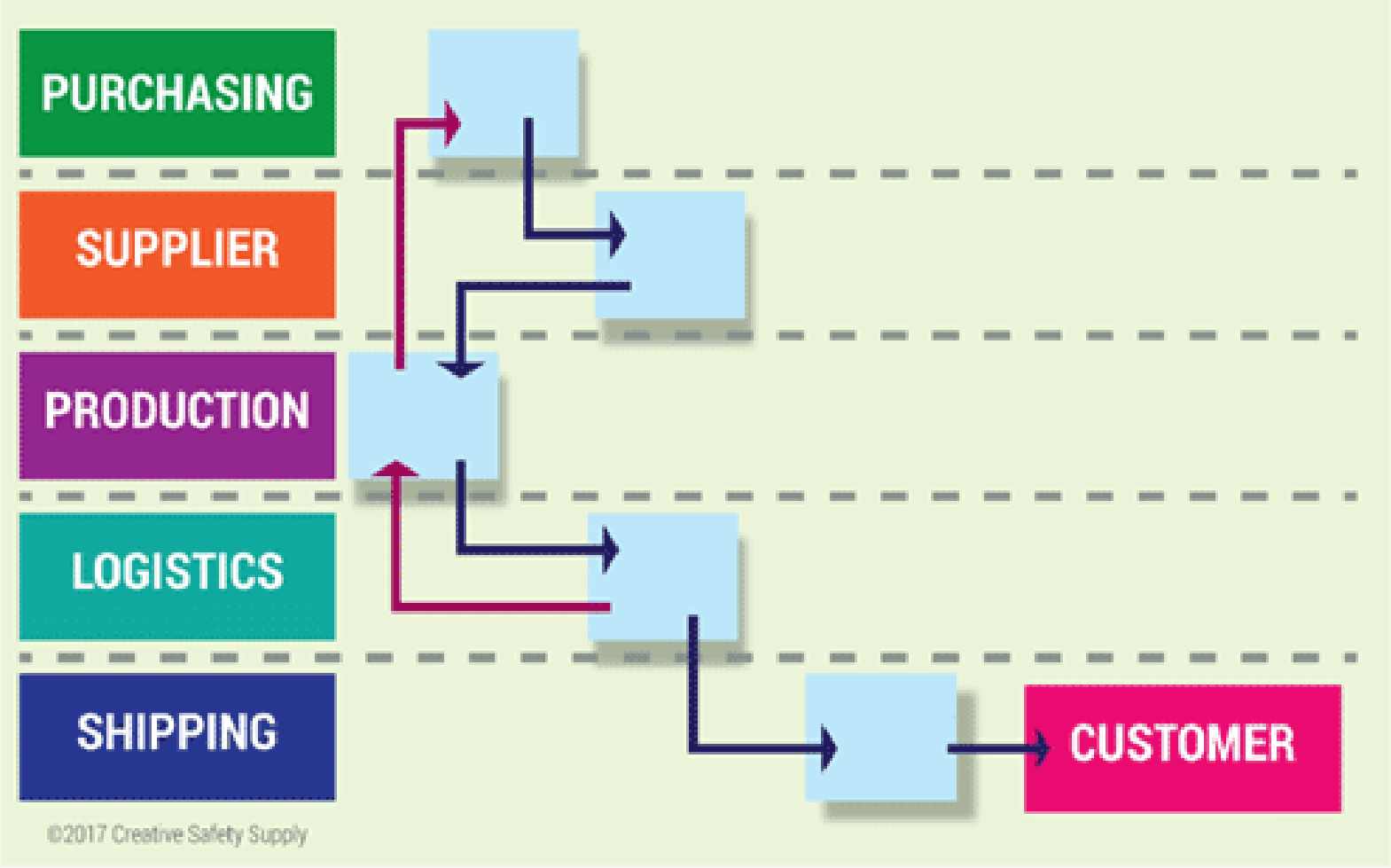
- Compliance - In industries with regulations, a process map can be used to ensure everyone is in compliance with those regulations at all times. The map itself can even be given to inspectors to show how things are done to prove compliance.

- Team Involvement - When creating a process map for a company, all employees need to contribute by working on the steps they are involved in. This team involvement can help keep people engaged and even identify improvement opportunities that may exist.

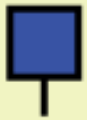
PROCESS MAPPING



PROCESS MAPPING



PROCESS CHART SYMBOLS

Name	Symbol	Action	Example
Operation		Adds value		Saw, cut, paint, solder, or package
Transport		Moves some distance		Convey, forklift, OTR truck
Inspect		Checks for defects		Visual inspect, dimensional inspect
Delay		Temporary delay/hold		WIP Hold, Queue
Storage		Formal warehousing		Warehouse or tracked storage location
Handle		Transfer or sort		Repackage, transfer to conveyor
Decide		Make a decision		Approve/deny purchase

©2017 Creative Safety Supply

Construction vs Manufacturing



VS



- In manufacturing, finished goods generally can be moved as a whole to retailers or end customers.
- Construction, on the other hand, deals with larger units that cannot be transported.

Additionally, the construction industry has three other features that distinguish it from manufacturing: Onsite production, one-of-a-kind projects, and complexity

The Lean Enterprise Philosophy



The lean enterprise concept comprises a variety of production systems that share certain principles such as 5S, waste minimization, responsiveness to change, just-in-time, effective relationships within the value stream, continuous improvement, & quality from the beginning

Techniques in Lean Manufacturing



Toyota has developed the techniques that support the principles of lean production by the Toyota Production System (TPS) as a combination of methods with consistent goals: cost reduction, quality assurance, and respect for humanity to ensure sustainable growth

LEAN CONSTRUCTION



There are four main elements identified in TPS: Just-In-Time (JIT), Jidoka, workforce flexibility, and creative thinking.

Just-in-time is based on the concept that inventories are not valuable and should be regarded as waste; accordingly, units should be available only when required. 3 methods are associated with just-in-time.

1. The Kanban (Japanese for "card" or "sign") system is used to minimize inventories according to backward requests that flow through cards, baskets, or digital signals

2. Heijunka ensures that fluctuation in demand can be met by the right sequence of production in minimum batches

3. SMED (Single-Minute Exchange of Dies) is a system for dramatically reducing the time it takes to complete equipment changeovers. The essence of the SMED system is to convert as many changeover steps as possible to "external" (performed while the equipment is running), and to simplify and streamline the remaining steps.

LEAN CONSTRUCTION

Jidoka describes as "intelligent automation" or "automation with a human touch", a mechanism in a lean manufacturing process that helps a worker avoid (yokeru) mistakes (poka). Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur.

Maintaining a flexible workforce allows a company to match its labor requirements with the fluctuating level of demand for its product.

With a flexible machine arrangement, it is possible to rotate positions in the production line and adjust the size of the crew to the pace required.

Creative thinking offers continuous improvement through feedback and supports the continual improvement of a production line's daily tasks.

Moving from Lean Manufacturing to Lean Construction





1. Flow Variability



In lean manufacturing, the impact of fluctuating demand levels controlled by optimizing the sequence of products with minimum batch sizes are reduced, demand fluctuations can be managed by making small adjustments to the production volume and the resources allocated.

2. Process Variability



Autonomation (Jidoka) is the notion that immediate action should be taken to prevent defects at the source so that they do not flow through the process.

3. Transparency



In lean manufacturing, any resource that does not contribute to better performance is regarded as waste that should be eliminated from the system. The 5S's can be used to identify waste, eliminated and make transparency in plants.

4. Continuous Improvement





Continuous improvement cannot be associated with a specific technique. In fact, all techniques are set to drive continuous improvement via problem solving & creative thinking. However, in lean manufacturing, quality circles provide an opportunity for workers to actively participate in process improvement.

Semester Project

- Select an existing construction/consulting company
- Discuss the importance of Strategic Management for your company.
- Set ‘target’, ‘vision’, ‘mission’ and ‘goals’ for the company. (or critically comment if the company has already existing ‘target’, ‘vision’, ‘mission’, and ‘goals’
- Conduct SWOT Analysis for the company.
- Conduct strategic analysis for the company
- Adopt the four corporate strategy options to formulate a strategy to make the company competent/successful in the current market.
- Apply bench marking and process mapping tools.

Semester Project

- Prepare a report not exceeding 20 pages excluding annexes.
- The final submission document should include cover page, table of contents, theoretical background, references and annexes.
- Use paper size: A4; font: Arial /single spacing/; font size = 12 /computer typed, printed and bound
- The report should be submitted both in hard and digital copies.
- The prepared report shall be accompanied by a 15 minutes oral presentation. Presentation schedule would be provided separately.
- Evaluation rubrics of the report and presentation shall be provided separately.
- Date, time and place of submission and presentation f the project report: ***September 23, 2019***

Thank you!