Introduction to Methods Engineering and Operations Analysis

Sections:

1. Evolution and Scope of Methods Engineering – part 1
2. How to Apply Methods Engineering – part 1
3. Basic Data Collection and Analysis Techniques – part 2
4. Automation and Methods Engineering – part 2

Introduction to Methods Engineering and Operations Analysis

1. Evolution and Scope of Methods Engineering

Methods Engineering

- **Analysis** and **design** of **work methods and systems**, including the tooling, equipment, technologies, workplace layout, plant layout, and work environment
- Other names for methods engineering:
  - Work study
  - Work simplification
  - Methods study
  - Process re-engineering
  - Business process re-engineering

Objectives in Methods Engineering

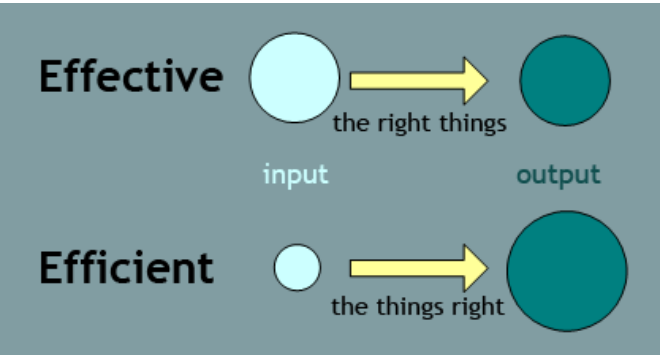
- Increase **productivity** and **efficiency**
- Reduce cycle **time**
- Reduce product **cost**
- Reduce **labor** content

Other Objectives

- Improve **customer satisfaction**
- Improve product and/or service **quality**
- Reduce **lead times** and improve **work flow**
- Increase **flexibility** of work system
- Improve worker **safety**
- Apply more **ergonomic** work methods
- Enhance the **environment** (both inside and outside the facility)

Operations Analysis

- **Study** of an operation or group of related **operations** for the purpose of **analyzing** their **efficiency** and **effectiveness** so that **improvements** can be developed
- Objectives in operations analysis
  - Increase **productivity**
  - Reduce **time** and **cost**
  - Improve **safety** and **quality**
- Same basic objectives as methods engineering



Methods Engineering

Can be divided into two areas:

1. **Methods analysis**
2. **Methods design**

Methods Analysis

- Concerned with the study of an **existing method or process**
- Objectives:
  - **Eliminate** unnecessary and non-value-adding work elements
  - **Combine** elements and operations
  - **Rearrange** elements into more **logical sequence**
  - **Simplify** remaining elements and operations

Methods Design

Concerned with either of the following situations:

1. **Design** of a **new method or process**
   - Required for new product or service and there is **no existing precedent**
   - Method must be **designed from scratch**, using best existing practice for similar operations
2. **Redesign** of an **existing method or process** based on a preceding methods analysis

Introduction to Methods Engineering and Operations Analysis

2. How to Apply Methods Engineering

Systematic Approach

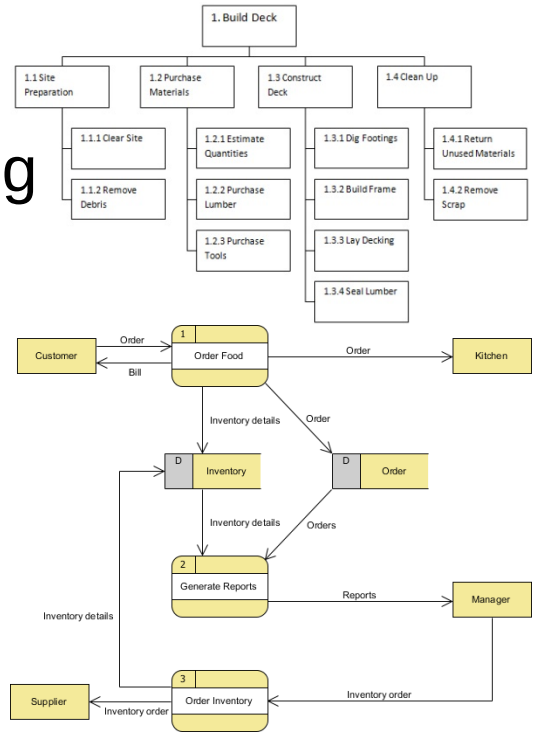
1. **Define** the problem and objectives
2. **Analyze** the problem
3. **Formulate** alternatives
4. **Evaluate** alternatives and **select** the best solution
5. **Implement** the best method
6. **Audit** the study
   - A systematic approach is more likely to yield **operational improvements** than an undisciplined approach

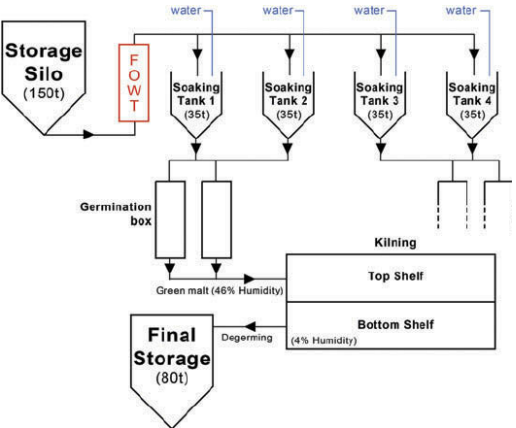
Techniques of Methods Engineering

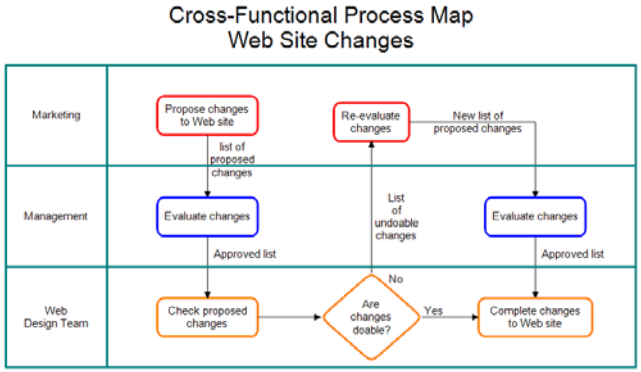
- Data gathering and statistical tools
- Charting and diagramming techniques
- Motion study and work design
- Facility layout planning
- Work measurement techniques
- New approaches

Charting & Diagramming Techniques

- Network diagrams
- Traditional industrial engineering charting techniques
  - Operation charts
  - Process charts
  - Flow diagrams
- Block diagrams
- Process maps







Motion Study and Work Design

- Concerned with **basic motions** of a human worker **while performing** a given task
- Examples of basic motion elements:
  - Reach
  - Grasp
  - Move
  - Release
- Guidelines for work design include “principles of motion economy”

Facility Layout Planning

- **Facility layout** refers to:
  - **Size** and **shape** of a facility
  - **Arrangement** of the different departments and equipment within the facility
- Problem area includes:
  - Design of a **new facility**
  - **Installing** new equipment, **retiring** old equipment
  - **Expanding** (or contracting) an existing facility

Work Measurement Techniques

- Four basic work measurement techniques:
  1. Direct time study
  2. Predetermined motion time systems (PMTS)
  3. Standard data systems
  4. Work sampling
- **PMTS** and **work sampling** can be used in methods engineering to make **improvements** in the **work methods**

New Approaches

- **Lean production**
  - Based on the **Toyota production system**
  - Embraced by **U.S. companies** due to its success at Toyota
- **Six Sigma** and other quality-focused programs
  - Widely adopted in industry for improving **quality of work processes**

Selecting Among Alternative Proposals

- Need for a **systematic procedure** to decide among alternative proposals
- To begin, **list** the technical features and functional specifications for the application
  - **Must features**
  - **Desirable features**
- Criteria matrix to evaluate alternatives
  - **Drop** candidates that do **not satisfy "must features"**
  - Develop **scores** for **desirable features**

Evaluation of Robots for Welding

	Industrial Robot Candidates			
	Model A	Model B	Model C	Model D
Must features:				
Continuous path control	OK	OK	OK	OK
Six-axis robot arm	OK	OK	Not OK	OK
Walkthrough programming	OK	OK	OK	OK
Desirable features:				
Ease of programming (0-9)	6	4		6
Capability to edit program (0-5)	4	2		5
Multi-pass features (0-4)	2	2		2
Work volume (0-9)	5	8		6
Repeatability (0-5)	5	2		4
Lowest price (0-5)	4	5		3
Delivery (0-3)	1	1		3
Evaluation of vendor (0-9)	6	5		8
Totals:	33	29		37