Types of IE Projects

Steve Snelling

Boeing Co. (*retired*)

Institute of Industrial & Systems Engineers (IISE)
IISE - Industry Advisory Board (IAB)
IISE Fellow

stephen.r.snelling@gmail.com

7 Types of IE Projects

- Operations Review
- Root Cause Analysis
- Out of Sequence Work (Travelers)
- Material Handling Analysis
- Production Parts Shortages
- Facility Layouts
- Ergo/Safety Mitigations

Operations Review

- Definition: *"An initial review or survey of the existing operations components or manufacturing activities of a product, department, plant, or division."*
  - An Operations Review may be the first step in performing an overall operations improvement, or it can also be a stand-alone assessment.
  - A Lean Manufacturing Assessment (LMA) is a special type of Operations Review

- An Operations Review will usually start with some **Tours** & **Direct Observations** (with some **Digital Pictures**), that may also include some **Time Studies**. It also will rely on several focused **Informational Interviews**. Some **Data Analysis** will be needed to document the current conditions that are measurable, and maybe a **Value Stream Map**.
- **Some Benchmarking** or at least similar Operations comparison, may be required – as part of the Operations Review.
- If an LMA, it may include a **5S score chart**, and **Spaghetti chart.**
- The report may include a **Comparison** (of past performance vs. current performance), and maybe a **Gap-to-Goal chart**. If it identified several items to work on, a **FMEA** ranking of the choices may be helpful. Often a list of **Plus & Minus** items will be part of the **Assessment Findings/Conclusions**.

Root Cause Analysis

- Definition: *"An analysis of the underlying reasons for a single re-occurring problem (or several problems), that will result in solutions that can be tested, prior to implementation."*
  - A Defect Reduction (or elimination) is a common Root Cause Analysis problem.

- The initial activity will usually include some **Tours** of the areas affected, including **Direct Observations**, and some **Digital Pictures**.
- Then some **Informational Interviews** with the process owners, and several types of **Data Analysis**, that may include **Pareto Charts**, and a **Defect Locator Chart** (if it's a defect reduction problem).
- This may result in the construction of a **Cause/Effect Diagram** and the creation of a **5-Whys Analysis** chart. Plus any **Test/Trials** run or any **Benchmarking** (if done).
- The report may include the **Findings & Conclusions**, any **Comparisons Chart,** and results from any Tests/Trials on the possible solutions, and any Benchmarking (if done). Then the **Results Implemented**.
- A full **Follow-up** and **Additional Implementation** may occur later, if a more complex solution is involved.

Out of Sequence Work (Travelers)

- Definition: *"An analysis of the reasons why some scheduled work is regularly being performed late (out-of-position). Once the underlying reasons have been identified, it will require solutions to be implemented, and monitored (to ensure the condition does not re-occur)."*
  - Out of Sequence Work is often referred to as "Travelers".
  - If the Traveler condition cannot be eliminated, a work-around may be required, such as the implementation of a Traveler cart for special parts staging & a Traveler crew trained to work these jobs out-of-position.

- The initial activity will usually include a **Tour** of all the surrounding work, some **Direct Observations** of the Out of Sequence Work, some **Informational Interviews**, and some **Data Analysis**.
- Then the use of a **Precedence Diagram** and **Process Flow Chart**, along with some **Time Studies** will help identify the actual sequence of all the jobs.
- The use of a **5-Whys diagram** and a **Cause/Effect diagram** may help identify the underlying conditions, and some **Benchmarking** may help identify solutions.
- The report will include **Findings & Recommendations**, and if a **Work-Around is Needed**.

Material Handling Analysis

- Definition: *"An analysis of various material handling activities performed within a facility (or between facilities), to look for process improvements and overall efficiencies."*
  - It may include a review of the type of material handling methods and any interim staging procedures, as well as point-of-use considerations.

- The initial activity will usually involve **Tours**, some **Direct Observations**, several detailed **Process & Product Flows** which may be overlaid on **Facility Layout Drawings**. It also will usually involve some **Informational Interviews** of the material handlers, and **Point-of-Use** groups, with a focus towards creating **Just-In-Time** deliveries.
- Also some **Data Analysis** of the storage and staging, and any re-occurring delays, may be included in the analysis.
- Some **Benchmarking** of similar material handling activities may help generate solutions.
- If a complex material handling issue, it might be helpful to prepare a **Cause/Effect Diagram**, or a **5-Whys Diagram**.
- The report may include the **Findings & Conclusions**, and a **Corrective Action Plan.**

Production Parts Shortages

- Definition: *"An analysis of the underlying reasons for on-going parts shortages that are critical to production."*
  - A Production Parts Shortage may involve a review of Staging, Storage & Inventory procedures, and even Supplier related issues.

- The initial activity will usually involve **Direct Observations**, and **Informational Interviews** with the process owners & parts support groups, and also some **Data Analysis** of the parts shortages, to see how often it is occurring. This might include **Analysis** of **Staging**, **Storage** & **Inventory** procedures, and use of a **Process Flow chart**.
- If a complex issue, it might be helpful to prepare a **Cause/Effect Diagram**, or a **5-Whys Diagram**.
- If the condition is outside the immediate operations, it may be due to a Supplier condition. **Meetings with groups working with Suppliers** may help resolve the problem, or some **Supplier Visits** may be necessary.
- The report may include the **Findings & Conclusions**, and a **Corrective Action Plan.**

Facility Layouts

- Definition: *"A layout of a new facility, or a revision to an existing facility, that utilizes an optimized flow for the product or activity involved."*
  - The layouts will usually conform to the drawing system being utilized by the company. AutoCAD is the most common Facility Drawing system in use.

- The initial activity may be to first determine what is being added to or changed of an existing facility. This may involve some **Tours, Direct Observations**, and **Informational Interviews** of the process owner.
- Copies of **existing Layout Drawings** will be needed to review and verify the current layout.
- **New Measurements** will be taken of the existing area, to verify the layout condition and to note any stationary or fixed objects (which will not move).
- Then a variety of analysis tools & forms may be utilized to optimize the new layout: **From/To chart**, **Activity Relationship chart**, **Space Utilization chart**, and **Process Flow chart**.
- If there are multiple **Working Layout** alternatives a **Comparison Chart** may be useful, or even a **Simulation** performed, to determine the best layout (based on key factors such as cost, process time, staffing needs, etc.).
- The report will include the **Findings & Conclusions** along with the **New Facility Layout Drawings**.

Ergo/Safety Mitigations

- Definition: *"An analysis of specific ergonomic risks or safety conditions, and a plan to mitigate or eliminate the risk or condition."*
  - Usually this will be done in conformance with an existing site-wide ergo or safety program being utilized by the company.

- The initial activity will usually involve a **Tour**, and **Direct Observations** of the job, task, or area. Also I**nformational Interviews** of the process owner.
- A **Risk Assessment** is usually performed, using published Ergonomic data or Safety criteria, or the services of a trained Ergonomist or Safety Consultant. This will usually include **Some Measurements** being taken.
- Some **Benchmarking** of similar conditions and **Research** of useful **Mitigations** will usually be helpful, along with some **Test Trials**.
- The report may include the **Findings & Conclusions**, and any **Suggested Mitigations** to reduce or eliminate the ergo or safety conditions.
- The **Implementation** will put in place the mitigation and then **Monitor** the **Results** to see if the risk or condition has been eliminated or reduced.

In Summary

- Understand the different types of Industrial Engineering Projects, and the different methodologies used to conduct each type of project
- Spend time at the beginning of each new project, to develop a good project plan, in order to have a successful project
- Review your Objective & planned Methodology with your Internal Customer, before starting any detailed project activities
- Focus considerable effort on the Outcomes & Results for each type of project