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Industrial Engineering Tools

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INDUSTRIAL ENGINEERING TOOLS

By Lucas Santos

At the end of this unit, students will be able to

1. Develop their technical vocabulary.
2. Create an engineering action plan at the company they work.
3. Apply engineering tools in a second language (English).

Before you read:

1. Which Industrial Engineering tools do you apply at the company you work at on a daily basis?
2. How efficient are these tools? What changes did they bring to the workplace? Describe them.
3. What types of technology are involved in these tools?
4. What is the process like for the implementation of a new tool at the workplace? What are the company's requirements?

Reading:

Vocabulary: As you read the following, identify the twelve (12) vocabulary words listed below in the reading.

Project	Assist
Management	Deadline
Delay	Collaborative
Efficiency	Design
Task	Schedule
Tool	Measure

PROJECT MANAGEMENT
Companies from different sectors have been investing in the execution of **projects** with the purpose of producing exclusive results and creating competitive differences due to the need to respond to the competitive pressures of the current market. While there are different definitions for the word "project," one of the most widespread is presented in the Project Management Body of Knowledge (PMBOK), which states that a project is a temporary effort to create a unique

product, service, or outcome. Projects and operations can be defined differently. Projects are temporary and exclusive. Operations are continuous and repetitive.

Project **management** consists of applying techniques, knowledge, and skills to make a project run efficiently and successfully. Project management is based on a strategy for organizations that requires them to unite project results with business objectives; thus, they become better competitors in their markets. Using project management tools minimizes nonconformities and avoids **delays** in. project steps. An organization that has good project management can improve decision making, promote more productive and collaborative work environment, minimize risks, and maximize resource **efficiency**.

Project management software, also called Project Information Management Systems (PMIS), plays an important role in supporting scope, time, and other areas of a project. This software enables individuals or teams to monitor projects from conception through execution, providing relevant information to project managers and other team members, as well as resource scheduling, budget management, time and vendor management, **task** assignment, quality control, and documentation.

PROJECT MANAGEMENT TOOLS

Several **tools** can be used to support project management. One is Work Breakdown Structure (WBS), which is a procedure of hierarchically decomposing tasks and work deliverables into smaller elements that will be performed by a project team, which makes management easier. Each element of this decomposition is called a work package, which can be scheduled, monitored, controlled, and estimated to cost. WBS works to identify risks, deliverables, project managers, and to define its scope.

Other tools that support project time management are the calendar and Gantt chart. The Gantt chart is a resource that **assists** in the planning, control, and analysis of a project's processes and activities. It is a visual and easy-to-understand tool that allows you to visualize the progress of different steps throughout the life cycle of a project. Each activity has information such as dates, assignees, priorities, duration, percentage of execution, and their dependencies. The Gantt chart helps the project team better understand their tasks and **deadlines**, facilitating personal organization and ensuring greater project management efficiency.

To support knowledge management and communication among project members, knowledge exchange forums can be adopted as they improve communication between those involved in the project team and are a

collaborative way to share and access relevant information for project development quickly and easily. The topics created in the forum are broken down and divided by themes, and sorted from most current to oldest.

In addition to these tools, a project manager can also use 5W2H (What, When, Where, Who, Why, How much), Plan, Do, Check, Act (PDCA), Key Performance Indicators (KPI), among others. The 5W2H allows you to **design** action plans for greater control over tasks and deadlines, and help structure the schedule. PDCA ensures continuous process improvement through 4 actions: plan, do, check, and act. The KPI measures the status of demands, designing analyses between what was planned and what was accomplished.

PROJECT MANAGEMENT SOFTWARE

Delegating, monitoring, and evaluating the execution of activities, as well as getting an overview of the project progress, is very difficult without the aid of a computational project management tool. Defining the requirements for a Project Management Information System (PMIS) software is essential to guiding the selection process due to the number of alternatives available in the market.

PMIS software supports project managers by providing project control information, as well as allowing managers to create task lists simply and to prioritize them. This allows everyone involved in the project to help with problem solving and to track the progress of each task and the progress of the project goals. PMIS graphically shows how well the team is doing and how well members are doing with each project task. PMIS also analyzes estimated and executed costs, scarce resource consumption and expected and accomplished **schedule.** It makes available documents related to tasks completion of each task. Other capabilities of PMIS software include defining, sequencing, and monitoring project phases and activities, utilizing completion milestones, resource allocation, facilitating team communication, and scheduling events to check overall project progress.

Activity 1: With your group or partner, identify the vocabulary from above and come up with a definition and its part of speech (noun, verb, adjective) without using a dictionary.

1. Project: _____
   _____
2. Management: _____
   _____

3. Delay: _____
   _____
4. Efficiency: _____
   _____
5. Task: _____
   _____
6. Tool: _____
   _____
7. Assist: _____
   _____
8. Deadline: _____
   _____
9. Collaborative: _____
   _____
10. Design: _____
    _____
11. Schedule: _____
    _____
12. Measure: _____
    _____

Activity 2: Complete the sentences with the words from the vocabulary list above.

a) The company is working on a new _____ for their most sold machine. The current one is out dated.
b) The Industrial Engineer has a few _____ to finish up until the end of the month.
c) The employees have a very busy _____ in November, which is the best-selling month of the company.
d) The intern asked for help because he realized he would not meet the _____ if he kept working by himself.
e) They had to _____ the machine a couple of times in order to make sure it would fit in the box.
f) The _____ department had an important meeting to redefine the team's goals.
g) The implementation of the new _____ brought positive changes to the company.

Grammar review:

Describing places with There + BE + Noun.

STRUCTURE
Singular Form
Affirmative statement: There + BE + Noun.
There is a chain on the workbench.
There's[1] a hammer next to the machine. (there is = there's)
Negative statement: There + BE + NOT + Noun.
There is not an electric drill on the shelf.
There isn't a weld machine in this factory. (there is not = there isn't)
Plural Form
Affirmative statement: There + BE + Noun.
There are some goggles in the backpack.
There're some ear plugs on the floor. (there are = there're)
Negative statement: There + BE + NOT + Noun.
There are not any pliers in the toolbox.
There aren't any work gloves in the stock. (there are not = there aren't)

[1] In English, a contraction is combines two words, usually a noun or pronoun and a verb using an apostrophe. In this case, it combines the word *there* and the *verb BE* (is, are, was, were, be, being, been).

Fun Fact:

5S Lean Manufacturing is one of the tools that helps us create the discipline culture, identify problems, and generate opportunities for improvement. The purpose of 5S, as well as some other lean tools, is to reduce waste in resources and workspace in order to increase operational efficiency. The practice of 5S provides improvement of personal and professional quality of life. The 5S concept is based on the Japanese words for the five senses whose initials form the name of the tool.

i. **Seiri (Sort)** means using materials, tools, equipment, and data with balance, and common sense. Where the disposal or relocation of all that is considered unnecessary for the accomplishment of the activities is

performed. Seiri's application results are comprised of space savings, ease of cleaning and maintenance, and cost savings.

ii. **Seiton (Set in Order)** is a sense of organization which can be interpreted as the importance of having everything available so it can be accessed and used immediately. Everything must be very close to the place of use and each object must have its specific location. Seiton's application results are comprised of time saving and easy tool placement.

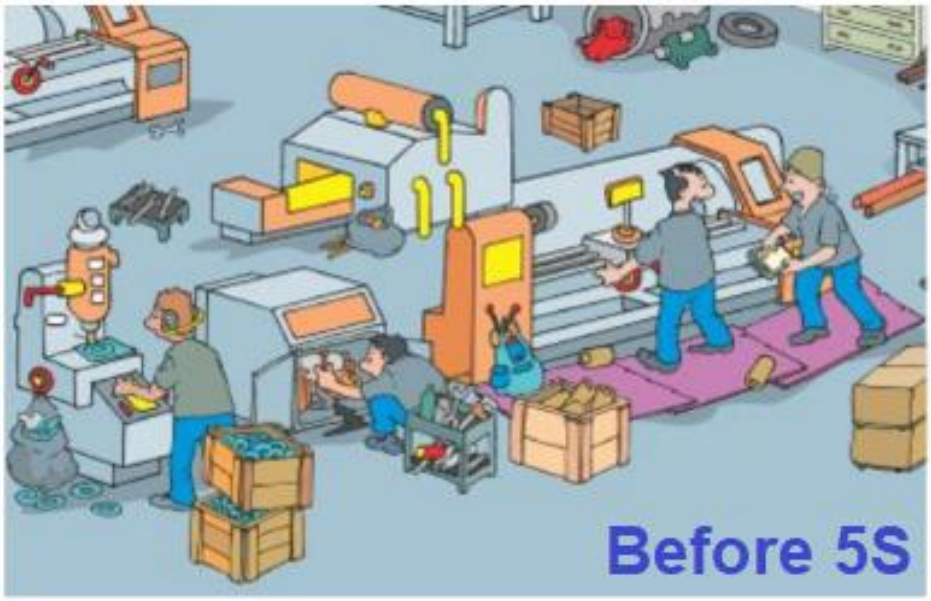
iii. **Seiso (Shine)** defines the importance of eliminating dirt, debris or unnecessary objects. The sense of cleanliness can go beyond the physical aspect, including the personal relationship where a work environment is preserved where transparency, honesty, and respect prevail. Seiso's application results are comprised of the reduction of the possibility of accidents and better conservation of tools and equipment.

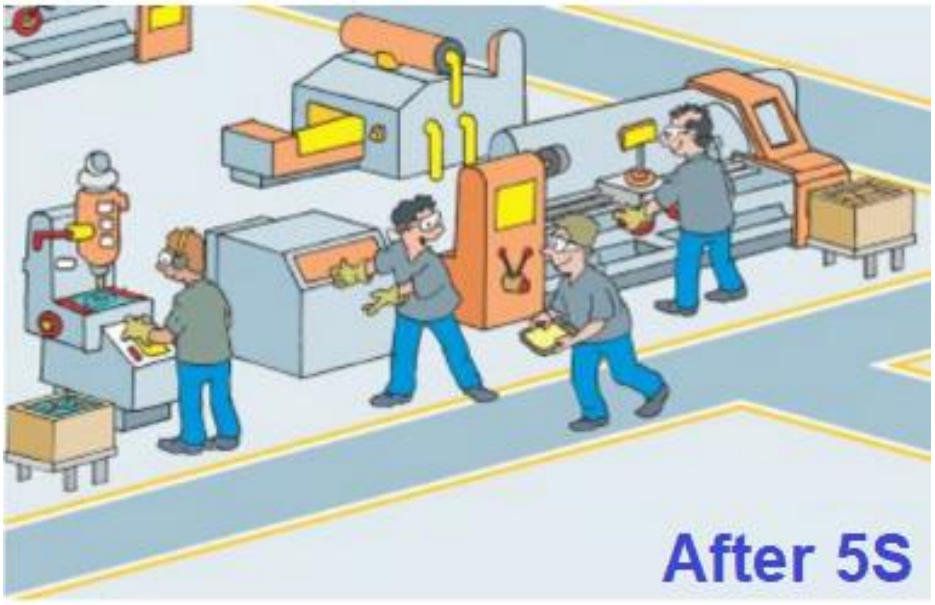
iv. **Seiketsu (Standardize)** is the standardization of color patterns, shapes, lighting, location, and plates. As it also encompasses facilities such as bathrooms, cafeterias, and workrooms and helps to identify problems that affect the health of employees such as ergonomic furniture, lighting, and ventilation. Seiketsu's application results are comprised of easy location and identification of objects and tools and improvement of common areas.

v. **Shitsuke (Sustain)** This sense is composed of the ethical and moral standards of each individual in which they do what needs to be done even when there is generally no vigilance from their leadership. Shitsuke concepts may extend into personal life demonstrating their full involvement. Shitsuke's application results are comprised of better quality, productivity and safety at work, and improvement in human relations.

For further information, access the article about 5S Lean Manufacturing on the Creative Safety Supply website: https://www.creativesafetysupply.com

Activity 3: With your partner or group, create eight (8) sentences, four (4) in the singular form and four (4) in the plural form describing the differences in the same workplace after the application of the 5S Lean Manufacturing tool.





Source: Soluções criativas em comunicação (https://www.5s.com.br)

1. _____
_____
2. _____
_____

3. _____
_____
4. _____
_____
5. _____
_____
6. _____
_____
7. _____
_____
8. _____
_____

Speaking:

After getting familiar with Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis, ask the students to apply the SWOT tool to their own lives. The goal for this activity is to describe the strengths, weaknesses, opportunities, and threats in their professional path. Students should be organized in a donut arrangement to practice this activity.

Fun Fact:

The engineering tool called SWOT Analysis stands for the words Strengths, Weaknesses, Opportunities and Threats. SWOT Analysis is a tool used for environmental analysis, being the basis of management and strategic planning in a company or institution. The tool collects important data that characterizes the internal and external environment of an organization. The internal being described as Strengths and Weaknesses and the external as Opportunities and Threats. Due to its simplicity it can be used for any kind of scenario analysis, from setting up a blog to managing a multinational company.

For further information, access the article about SWOT Analysis on Investopedia website: https://www.investopedia.com/terms/s/swot.asp

SWOT ANALYSIS	
STRENGHTS	WEAKNESSES
What do you do well? Define your abilities. What special resources can you draw on? What do people see as your strenghts?	What can you improve? Where do you have fewer resources than others? What are your challenges? What do people see as your weaknesses?
OPPORTUNITIES	THREATS
What opportunities are open to you? What trends could you take advantage of? How can you turn your strengths into opportunities?	What threats could harm you? What are your competitors doing? What threats do your weaknesses expose you to?

Writing/Composition:

The Engineering Tool called STAR stands for Situation, Task, Action, and Result. STAR is applied in everyday problems in a factory. Being a visual tool, it facilitates the process of finding a solution for problems. The *Situation* is the context in which the problem occurred. The *Task* is the challenge to be overcome. The *Action* is the set of strategies which will be used by the team to solve the current problem. The *Result* is the outcome from the team's action.

Considering the situation given below, imagine you are a member of a team in factory **X**. You are in charge of coming up with a task and action for the most recent problem they had. Describe the task, the action and the result(s) the company had due to your hard work.

Situation
I was a retail data analyst at factory X. The company was going through a difficult time and needed to reach its sales target, which had not been reached in the past 7 months.

Task

Action

Result

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