CLASSE 1.   **Ishikawa Diagram**

This diagram was developed by the Kaoru Ishikawa, a noted Japanese quality expert. Sometimes the diagram is called a cause-and-effect diagram or fishbone diagram because that is what is look like. This diagram is using to identify causes of a problems in processes and products. Variation in process output and other quality problems can occur for a variety of reasons, such a materials, machines, methods, people, and measurement. The goal of problem solving is to identify the causes of problems in order to correct them. It is a simple graphical method for presenting a chain of causes and effects and for sorting out causes and organizing relationship between variables.

The general structure of Ishikawa Diagrams shows in figure XX:
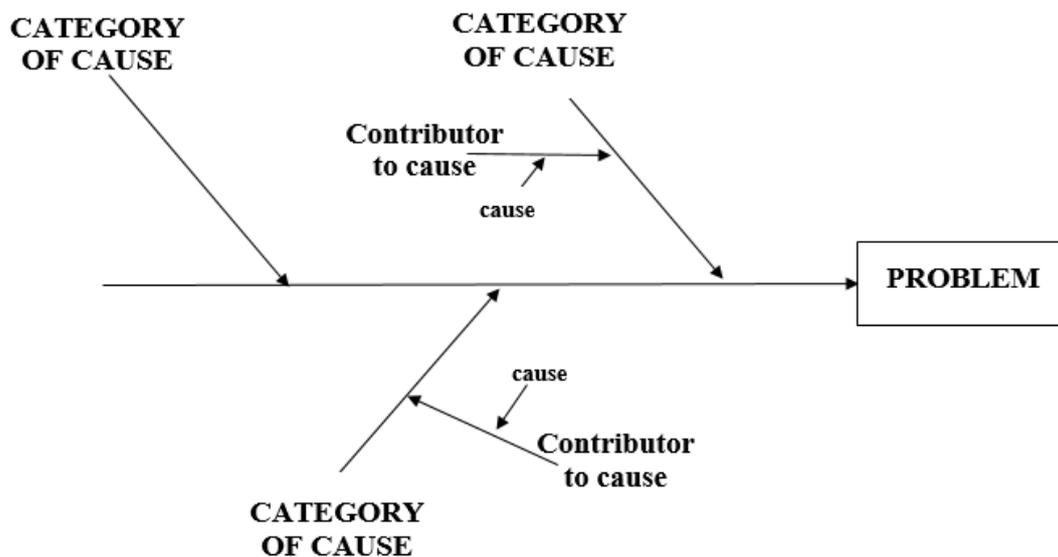

Figure XX. Idea of Ishikawa Diagram

Categories of causes are selected depending on the analysed problem. The most popular approach in analysing problems and errors in the process is the use of the 5M + E:

- **M**an Power (people who are involved with the process).
- **M**achines (equipment, computers, tools, etc. required to accomplish the job. All which is use during the process).
- **M**aterials (raw materials, parts, pens, paper, etc. used to produce the final product).

- **M**ethods (How the process is performed and the specific requirements for doing it, such as policies, procedures, rules, regulations and laws, for example related methods of decision-making, resource allocation).
- **M**anagement (planning, organizing, motivating, control and improvement in process).
- **E**nvironment (the conditions, such as location, time, temperature, and culture in which the process operates, closer and further environment of process).

Sometimes among the categories of the causes may be, for example: measurement (data generated from the process that are used to evaluate its quality), procedures, collaborators, suppliers, internal and external stakeholders and many other categories, which may influence the analysed issue. The most important is to try to find the cause of the deepest as possible. It shows figure 1.
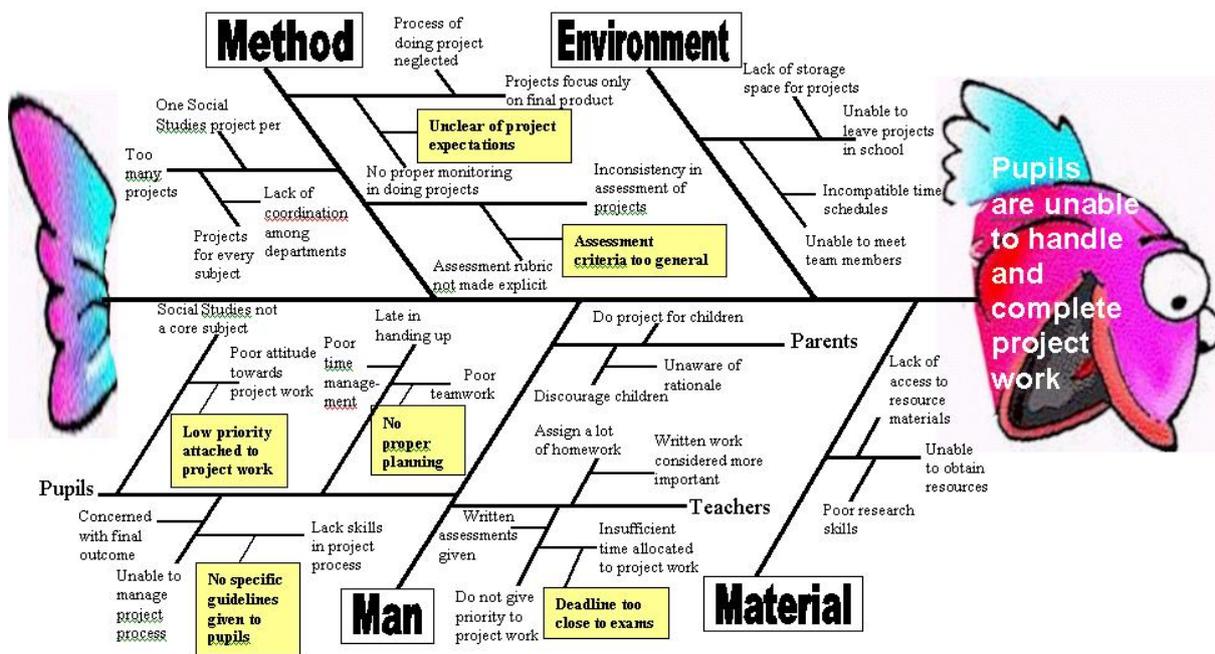

Figure 1. Example of Ishikawa Diagram [1]

On this diagram were use only four of categories of causes because only this was connected with analysing problem.

To solve problems using the Ishikawa diagram is used brainstorming techniques. With brainstorming no criticism is permitted and people are encouraged to generate a large number of ideas.

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[1] Adapted from http://www.raganuga.com/2014/fishbone-ishikawa-diagram/

The main advantages of this diagram are:

- Creating the diagram itself is an enlightening, instructive process.
- Such diagrams focus a group, thereby reducing irrelevant discussion.
- Such diagrams separate causes from symptoms and force the issue of data collection.
- Such diagrams can be used with any problem.

Exercises to do:

1. Find a problem for the process which you described in the previous exercise, for example: quality control results are bad, decorations on porcelain is of a different colour.
2. Draw a Ishikawa diagram for this problem. Use 5M+E categories of causes. For example:
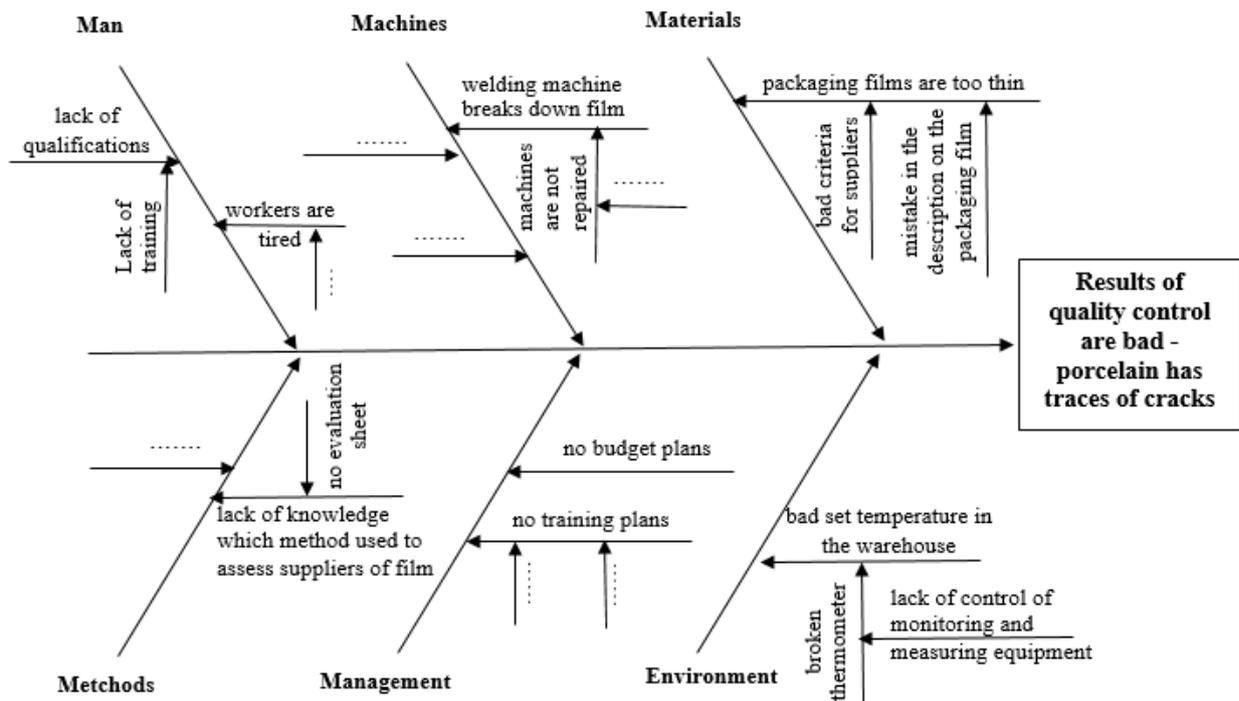
3. **How do you think, all the causes are equally important ?**