THE ANALYSIS OF CAUSES AND EFFECTS OF A PHENOMENON BY MEANS OF THE "FISHBONE" DIAGRAM

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Abstract

The risk has been and will remain one of the main problems any company is put to trial during its activity, regardless of its type. Whether we are talking about a financial activity, a production activity, a management activity, etc ... the risk is a matter which should not be neglected. The motivation behind a detailed analysis of risks lies in the complexity and their multiple effects, in the need for security, in the desire for a safe development of the activity of the company, a development of safe and cost-effective projects, the implementation of performance and safe technologies etc.

Depending on the field of activity, the risk is dealt with in different ways. Whether we are talking about a transaction, a project, an organization, an asset, a monetary flow, the risk is composed of two elements: the probability of occurring of an event that could affect one of the units of analysis mentioned above and the effect that this has on the unit of analysis. Therefore, the manifestation of risk leads the analysis to a difficult situation to which the management of the organization is supposed to find viable solutions for surpassing.

In the specialized literature there many methods and techniques in managing the emergence and the manifestation of risks, and one of these is the fishbone technique.

Researches in the field have led to the gathering and analysis of items of information regarding this analytical tool. The results of the theoretical and practical research have resulted in a multitude of studies and research papers on such analysis tools that help improve understanding and identify the underlying causes of certajn problems.

The purpose of this article is to achieve a representation of the relationships between the possible effects and possible causes that can influence a process, a phenomenon, an action.

Keywords: *risk, fishbone diagram, management, benefits, analysis of the main cause*

Classification JEL: *G31*

1. Introduction and context of the study

The Ishikawa diagram or Fishbone diagram is a graphic representation, which helps the mental processing and organization of ideas, point of view and conclusions to be formulated in case of problems and the identification of their causes, and it may be used in any type of activity.

This chart also represents a tool that helps logical and systematic processesing of the causes and subcauses of certain problems or of certain effects that put their mark on a particular activity, regardless of its type.

Ishikawa diagrams (also called fishbone diagrams, herringbone diagrams, cause-and-effect diagrams, or Fishikawa) are causal diagrams created by Kaoru Ishikawa (1968) that show the causes of a specific event. Common uses of the Ishikawa diagram are product design and quality defect prevention to identify potential factors causing an overall effect. Each cause or reason for imperfection is a source of variation. Causes are usually grouped into major categories to identify these sources of variation. The categories typically include: [7]

People: Anyone involved with the process

Methods: How the process is performed and the specific requirements for doing it, such as policies, procedures, rules, regulations and laws

Machines: Any equipment, computers, tools, etc. required to accomplish the job

Materials: Raw materials, parts, pens, paper, etc. used to produce the final product

Measurements: Data generated from the process that are used to evaluate its quality

Environment: The conditions, such as location, time, temperature, and culture in which the process operates

The link between this article and the research in the field is particularly interrelated considering the many books, studies, articles, research papers written on the subject. Next, I will present some representative papers focusing on the analysis of the cause-effect diagram:

- „Managementul calităţii totale", Stanciu Ion, Ed. Pro Universitaria, București, 2008;
- „Total productivity management", David Sumanth, St. Lucie Press, USA, 1998;
- „Rapid strategic planning", Barksdale Susan, Lund Teri, USA, 2002;
- „Application Of Fishbone Diagram To Determine The Risk Of An Event With Multiple Causes", Ilie Gheorghe, Ciocoiu Carmen Nadia, Management, Research and Practice, vol.1, nr.1, 2010;
- „Dezvoltări actuale privind instrumentele clasice ale calităţii", Gheorghe Lucian Fulea, Marian Borzan, Marius Bulgaru, a XIII-a Conferinţă Naţională Multidisciplinară cu participare internaţională, Sebeş, 2013;
- „How to Use the Fishbone Tool for Root Cause Analysis", https://www.cms.gov/ medicare/provider-enrollment-and certification/qapi/downloads/fishbonerevised.pdf ;
- „Diagrama Cauză-Efect", https://www.accedio.ro/uploaded_img/accedio/ro/ Newsletter/ Diagrama_cauza_efect_Ishikawa.pdf.

The main objective of this research is to present and describe the fishbone or cause-effect diagram as one of the most important analytical tools that leads to the identification of the main and secondary causes that have caused problems and about to affect the smooth running of an activity.

Regarding the contribution of research to the development of theory and economic practice, I believe that by writing this article I will expand the field of analysis on the fishbone diagram, creating an funtional environment for debates and discussions on the subject. The frequency with which this theme appears in specialized papers has led me to think that this chart is one of the tools of analysis used by a company's management to illustrate the main and secondary causes of a particular symptom.

2.Materials and methods

In justifying the theoretical basis of this article I started from the theoretical presentation of the fishbone diagram, a presentation that is meant to indicate its meaning and its role in the management of a company. In economic theory and practice there is a wealth of possibilities to address and analyze this theme, so my approach and analysis module complements and develops current and past studies that have addressed this subject.

The materials used consist of a set of specialized works publised in different books, various articles and online sources. The methodology used in this article demonstrates its own vision in terms of describing the scientific approach and it is based in particular on a qualitative research that will help understand the topic approapched and highlight the main issues addressed. The basis of this article is a fundamental research - the activity developped mainly ij order to acquire new knowledge about phenomena and processes, in formulating and verifying hypotheses, conceptual models and theories.

3.Theoretical aspects of the Fishbone diagram

In analyzing and solving problems in a particular activity there is always a point of interest for the management of a company. The solving of this issue will represents a challenge for team members, and one can be easily employ with one of the methods of analysis for complex problems based on several interrelated causes, namely the Fishbone diagram.

This is a graphic representation of the multiple and systematic relationships between a fixed target and the related causes (factors). In the specialized literature, it is also known as the Ishikawa diagram (or "fish skeleton" diagram – named by its graphic layout). [6]

The Fishbone diagram is a tool of analysis that characterizes a given procedure. It is also called "Ishikawa diagram", since it was developed by Kaoru Ishikawa and it is also called "fishbone diagram", because it resembles the skeleton of a fish. This diagram illustrates the main and secondary causes of a particular side effect (symptom). We constitute a group, through the process of brainstorming and we use it to identify root causes of a problem. This explains why the instrument is also referred to as cause-effect chart. In a typical chart of this kind, the problem to be solved is noted under the category "head of the fish" and there are several causes categorized along the "fish bones". Additional causes can be added as new ramifications.[8]

4.Using the Fishbone diagram

The cause-effect chart (the Fishbone Diagram) is a method for the analysis of complex problems that present several interrelated causes. One of the key aspects of this technique is the use of cause-effect chart. Because of the way it looks, this diagram technique is also called Fishbone Diagram (or Ishikawa Diagram). The method uses a combination of visual representation (branches) and brainstorming techniques for obtaining the causes. For building a fishbone chart we use arrows or branches: [2]

-primary branch: represents the effect;

-major branch: corresponds to the major cause;

-minor branch: corresponds to the causative and more detalied factors.

The steps in building a Fishbone diagram: [2]

1. The identification of the problem.

2. The description of the problem on the right side of the chart. This may be the problem itself or a symptom, but at this stage no one can know for sure.

3. We draw a horizontal line directed towards the box describing the problem. This arrow will serve as backbone. This is the starting pooint in identifying and grouping the major and minor causes.

4. We identify potential causes are we group them into categories. The major categories are: people, processes, materials, equipment, environment, etc. The main categories are identified by means of the brainstorming technique, trying to list them all. During the graphic representation on the diagram we must take care to save enough space between categories in order to later add individual causes. Each of these major categories will be explored in detail.

5. We continue the brainstorming activity on the causes by means of the detailed analysis for each main category identified. We write the detailed cause on a slanting line connected to the main category.

Basically, the Fishbone technique is a very succesful technique in that it does not involve the use of statistical methods, the visual representation is simple, human-readable, it values a series of elements and causes that characterize a particular situation, it helps to identify some possible causes of variation and allows for the determination of the fundamental cause, it encourages the

participation of the members of the group to problem solving, and last but not least it represents an easy and simple technique to find solutions for improvement.

Analyzing the stages of the Fishbone diagram we draw the conclusion that it can be easily applied to general issues that can arise in all branches of an organization. For example, it can be applied to solving problems such as the decrease of profit, the decrease of market shares, the loss of suppliers, the loss of contracts, etc.

The categories involved within a Fishbone diagram are: people involved in the process; methods of written policies, procedures, laws, rules applied throughout the process; cars represented by equipment, computers; consumable materials; measuring data quality; the internal and external environment.

The Fishbone diagram can be used when we want to: [8]

-deter somebody's attention to a particular problem.

- draw the team's attention to the causes (G) and not the symptoms.

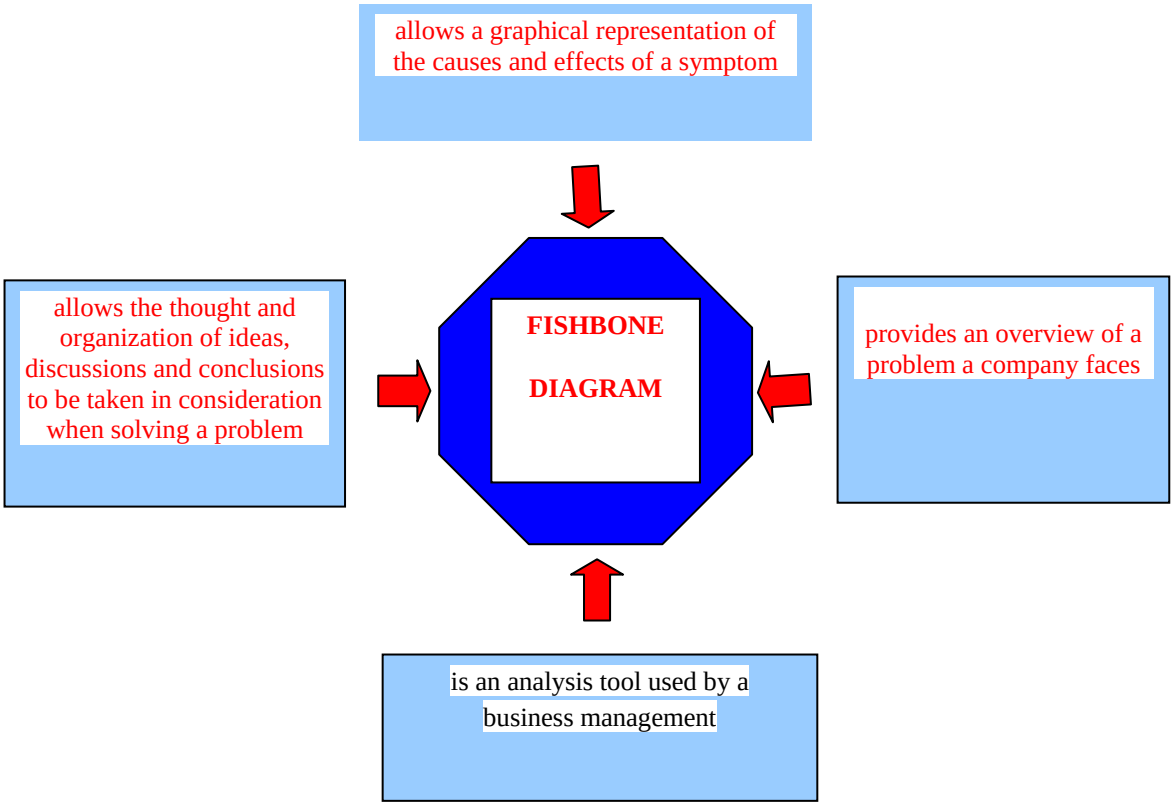
- graphically present the various theories about the causes (G) that could be at the root of a problem.

-we emphasis the links between the various factors that affect a problem.

-discover important links between different variables and possible causes (G).

- better understand how this process works

The synthetic cause-effect diagram allows:



Scheme no.1
Synthesis of the Fishbone diagram
Source: personal creation

Taken into consideration the aspects above, the fishbone diagram can be applied in many areas of activity.

The areas in which the diagram is applied are various, for example: [6]

-identifying the reasons for not complying with the quality of compliance;

- the causes of the decrease in sales volumes and profit rates;

- the complaints of the number of complaints with unfavorable effect on the company image;

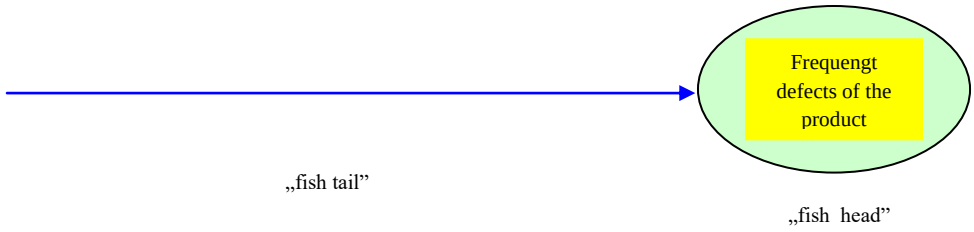
-determining relationships between the properties of a commodity.

5.Identify the causes of a problem using the Fishbone diagram

As mentioned above, the Fishbone diagram or cause-effect diagram is an analytical tool that helps identify the causes of a problem, namely the modification of a process or phenomenon. It aims at presenting and identifying schematically the primary and secondary causes that have led to the appearance of symptoms. Subsequently, these causes are analyzed and removed.

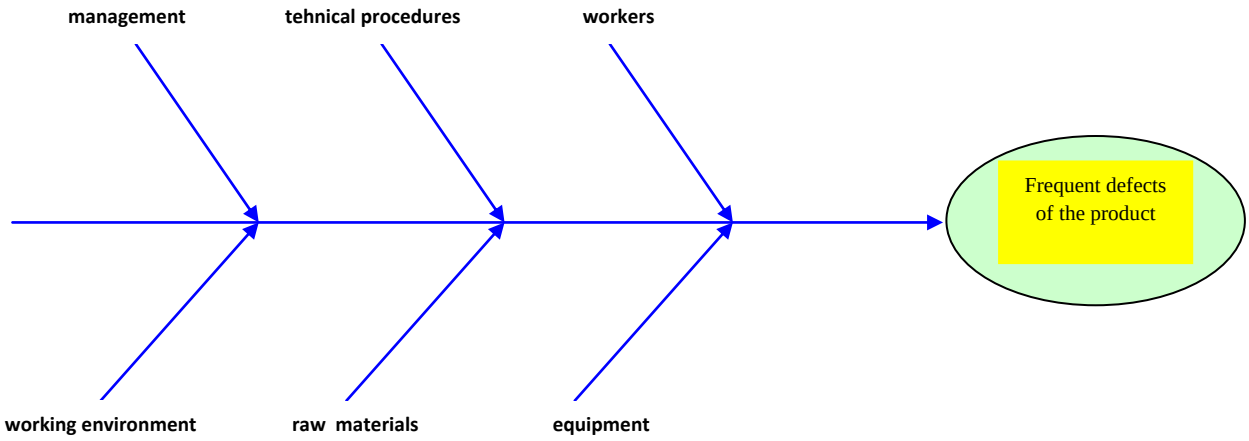
The starting point in drawing up this diagram is to identify the problem and the effect produced by this problem. Thus, the problem will be the head of the fish, and the spine will be represented by the causes that have led to the problem.

As an example, I took as a defect problem frequent in the process of producing a product.



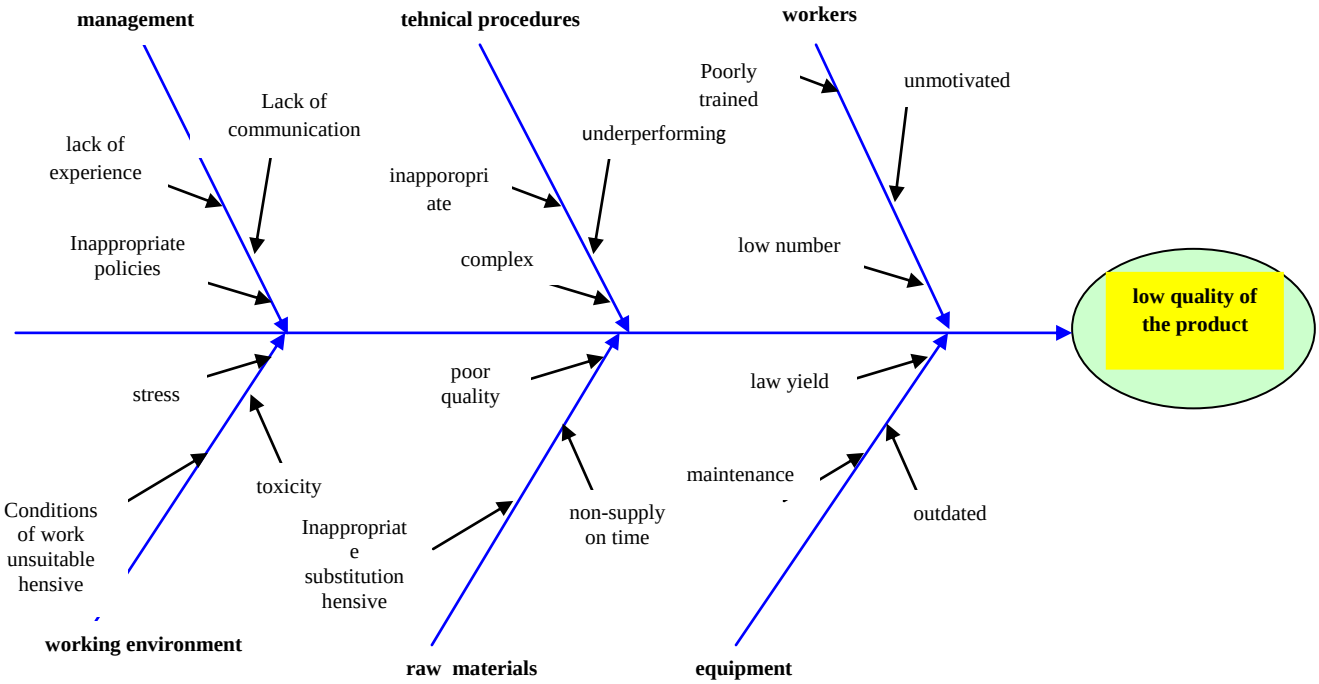
Scheme no.2
The graphical representation of the problem to be solved
Sourse: personal creatin

Once the problem has been identified, the main causes of the problem will be identified by discussing and analyzing the deficiencies of the work carried out. After identification, the identified causes will be inserted into the fish tail.



Scheme nr.3
The graphical representation of the main causes that led to the problem
Sourse: personal creatin

After identifying the main causes that have led to a problem, we will identify the underlying causes of each major cause. In this sense, brainstorming will be used. By using the brainstorming method during the process of identifying the causes of the problem, participants concentrate more easily and at the same time they are motivated, facilitating the assessment of possible causes according to their level of importance in the chart hierarchy.



Scheme no.4
Graphic representation of the Fishbone diagram
Sourse:personal creation

After the Fisbone diagram, we will analyze the main and secondary causes as well as the sub-cases, and in these analyzes we can use statistical, analytical methods, etc.

After discussions, opinions, suggestions, the company's management will make the decisions to resolve the problem they are confronted with.

6. Conclusions

The Fishbone technique is a simple technique by means of which the problem to be solved is written in the "fish head", and afterwards the causes are specified along the "fish bones" and they are divided into categories. This quality instrument has three important features: [9]

- it is a graphical representation of the factors that may contribute to the phenomenon or the effect being examined;

-the relationships between possible causal factors are clearly indicated. A causal factor may occur in several parts of the chart;

-the relations are generally qualitative and hypothetical. A cause-effect diagram is usually a preparatory stage in developing the data necessary for the empirical determination of causality.

The benefits of this technique are the following: it allows exploring different categories of cause, encourages creativity through brainstorming, provides a graphical representation of the problem and of the potential categories of cause. [2]

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