

Ishikawa diagram essay



**ASSIGN
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DIAGRAM _____ A Written Report Presented to Prof.

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Ishikawa Diagram

1. Objectives of the Report

a. Discuss the uses of fishbone diagram;

b. Identify when to use the fishbone diagram;

c. Discuss the categories of causes;

d. Discuss the steps how to construct a fishbone diagram;

e. Provide an example of a cause & effect analysis using fishbone diagram

2. Historical Background

Dr. Kaoru Ishikawa, a Japanese quality control statistician, invented the fishbone diagram. He proposed it in the 1960s, he also pioneered quality management processes, and in the process became one of the founding fathers of modern management.

Ishikawa diagrams (also called fishbone diagrams, or herringbone diagrams, cause-and-effect diagrams or Fishikawa) are causal diagrams that show the causes of a certain event. The fishbone diagram is an analysis tool that provides a systematic way of looking at effects and the causes that create or contribute to those effects. Because of the function of the fishbone diagram, it may be referred to as a cause-and-effect diagram. Whatever name you choose, remember that the value of the fishbone diagram is to assist teams in categorizing the many potential causes of problems or issues in an orderly way and in identifying root causes.

The cause and effect diagram is used to explore all the potential or real causes (or inputs) that result in a single effect (or output). Causes are arranged according to their level of importance or detail, resulting in a depiction of relationships and hierarchy of events. This can help you search for root causes, identify areas where there may be problems, and compare the relative importance of different causes. The possible causes are presented at various levels of detail in connected branches, with the level of detail increasing as the branch goes outward, i. e. , an outer branch is a cause of the inner branch it is attached to.

Thus, the outermost branches usually indicate the root causes of the problem. The Ishikawa Diagram resembles a fishbone – it has a box (the ‘ fish head’) that contains the statement of the problem at one end of the diagram. From this box originates the main branch (the ‘ fish spine’) of the diagram. Sticking out of this main branch are major branches that categorize the causes according to their nature.

3. Common Uses Of Ishikawa Diagram

Common uses of the Ishikawa diagram are: 1. In product design and quality defect prevention, to identify potential factors causing an overall effect; 2.

Tool used for team brainstorming, when identifying possible causes for a problem, especially when a team's thinking tends to fall into ruts. 3. To get a holistic and logical representation of a problem broken down into a pictorial format. 4. To study all the possible reasons why a process is beginning to have difficulties, problems, or breakdowns 5. To study why a process is not performing efficiently or producing the desired results 4. Major Categories of Causes Causes in the diagram are often categorized, such as to the 8 M's, described below.

Cause-and-effect diagrams can reveal key relationships among various variables, and the possible causes provide additional insight into process behaviour. Causes can be derived from brainstorming sessions. These groups can then be labelled as categories of the fishbone. They will typically be one of the traditional categories mentioned above but may be something unique to the application in a specific case. Typical categories are: The 8 Ms (used in manufacturing) 1. Machine (technology) 2. Method (process) 3. Material (Includes Raw Material, Consumables and Information.) 4. Man Power (physical work)/Mind Power (brain work) . Measurement (Inspection) 6. Milieu/Mother Nature (Environment) 7. Management/Money Power 8. Maintenance The 8 Ps (used in service industry) 1. Product= Service 2. Price 3. Place 4. Promotion/Entertainment 5. People(key person) 6. Process 7. Physical Evidence 8. Productivity & Quality The 4 Ss (used in service industry) 1. Surroundings 2. Suppliers 3. Systems 4. Skills •People: Anyone involved with the process •Methods: How the process is performed and the

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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 ? Non-Service Process (Methods, Materials, People, Equipment, Measurement (Technique), Environment ? Service Process (Policy, Procedures, Plant, People) 5. Questions to be asked while building a Fishbone Diagram Man/Operator – Was the document properly interpreted? – Was the information properly circulated to all the functions? Did the recipient understand the information? – Was the proper training to perform the task administered to the person? – Was too much judgment required to perform the task? – Were guidelines for judgment available? – Did the environment influence the actions of the individual? – Are there distractions in the workplace? – Is fatigue a mitigating factor? – Is his work efficiency acceptable? – Is he responsible/accountable? – Is he qualified? – Is he experienced? – Is he medically fit and healthy? – How much experience does the individual have in performing this task? – can he carry out the operation without error?

Machines – Was the correct tool/tooling used? – Does it meet production requirements? – Does it meet process capabilities? – Are files saved with the correct extension to the correct location? – Is the equipment affected by the environment? – Is the equipment being properly maintained (i. e. , daily/weekly/monthly preventative maintenance schedule) – Does the

software or hardware need to be updated? – Does the equipment or software have the features to support our needs/usage? – Was the machine properly maintained? – Was the machine properly programmed? – Is the tooling/fixtures adequate for the job? Does the machine have an adequate guard? – Was the equipment used within its capabilities and limitations? – Are all controls including emergency stop button clearly labelled and/or color coded or size differentiated? – Is the equipment the right application for the given job? Measurement – Does the gauge have a valid calibration date? – Was the proper gauge used to measure the part, process, chemical, compound, etc.? – Was a gauge capability study ever performed? – Do measurements vary significantly from operator to operator? – Do operators have a tough time using the prescribed gauge? Is the gauge fixturing adequate? – Does the gauge have proper measurement resolution? – Did the environment influence the measurements taken? Material (Includes Raw Material, Consumables and Information) – Is all needed information available and accurate? – Can information be verified or cross-checked? – Has any information changed recently / do we have a way of keeping the information up to date? – What happens if we don't have all of the information we need? – Is a Material Safety Data Sheet (MSDS) readily available? – Was the material properly tested? – Was the material substituted? Is the supplier's process defined and controlled? – Was the raw material defective? – Was the raw material the wrong type for the job? – Were quality requirements adequate for the part's function? – Was the material contaminated? – Was the material handled properly (stored, dispensed, used & disposed)? Method – Was the canister, barrel, etc. labelled properly? – Were the workers trained properly in the procedure? – Was the testing performed statistically

significant? – Was data tested for true root cause? – How many “ if necessary” and “ approximately” phrases are found in this process? Was this a process generated by an Integrated Product Development (IPD) Team? – Did the IPD Team employ Design for Environmental (DFE) principles? – Has a capability study ever been performed for this process? – Is the process under Statistical Process Control (SPC)? – Are the work instructions clearly written? – Are mistake-proofing devices/techniques employed? – Are the work instructions complete? – Is the work standard upgraded and to current revision? – Is the tooling adequately designed and controlled? – Is handling/packaging adequately specified? – Was the process changed? Was the design changed? – Are the lighting and ventilation adequate? – Was a process Failure Modes Effects Analysis (FMEA) ever performed? – Was adequate sampling done? – Are features of the process critical to safety clearly spelled out to the Operator? Environment – Is the process affected by temperature changes over the course of a day? – Is the process affected by humidity, vibration, noise, lighting, etc.? – Does the process run in a controlled environment? – Are associates distracted by noise, uncomfortable temperatures, fluorescent lighting, etc.?

Management – Is management involvement seen? – Inattention to task – Task hazards not guarded properly – Other (horseplay, inattention....) – Stress demands – Lack of Process – Training or education lacking – Poor employee involvement – Poor recognition of hazard – Previously identified hazards were not eliminated

6. Criticism In a discussion of the nature of a cause it is customary to distinguish between necessary and sufficient conditions for the occurrence of an event. A necessary condition for the

occurrence of a specified event is a circumstance in whose absence the event cannot occur.

A sufficient condition for the occurrence of an event is a circumstance in whose presence the event must occur. Ishikawa diagrams have been criticized for failing to make the distinction between necessary conditions and sufficient conditions. It seems that Ishikawa was not even aware of this distinction.

7. When to use a Fishbone Diagram

1. Analyze – brainstorm possible causes
2. “ Improve” Phase – create list of failure modes

8. How to solve a problem with a Fishbone Diagram

Materials needed: flipchart or whiteboard, marking pens.

Steps:

1. Identify the problem. Write down the exact problem you face in detail.

Where appropriate identify who is involved, what the problem is, and when and where it occurs. Write the problem in a box on the right hand side of a large sheet of paper. Draw a line across the paper horizontally from the box. This arrangement, looking like the head and spine of a fish, gives you space to develop ideas.

2. Work out the major factors involved. Next identify the factors that may contribute to the problem. Draw lines off the spine for each factor, and label it. These may be people involved with the problem, systems, equipment, materials, external forces, etc.

Try to draw out as many possible factors as possible. If you are trying to solve the problem as part of a group, then this may be a good time for some brainstorming. Using the ‘ Fish bone’ analogy, the factors you find can be thought of as the bones of the fish.

3. Identify possible causes. For each of the factors you considered in stage 2, brainstorm possible causes of the

problem that may be related to the factor. Show these as smaller lines coming off the 'bones' of the fish. Where a cause is large or complex, then it may be best to break it down into sub-causes. Show these as lines coming off each cause line. . Analyse your diagram. By this stage you should have a diagram showing all the possible causes of your problem. Depending on the complexity and importance of the problem, you can now investigate the most likely causes further. This may involve setting up investigations, carrying out surveys, etc. These will be designed to test whether your assessments are correct.

9. Fish Bone Diagram Example a. Parts of the Diagram b. Analyze the causes why an employee is late for work

References
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