

Aryana Project Management Conference

Tehran, Iran

March 2005

Use of Cause and Effect Diagram for Risk Management

Michael Stefanovic, P.Eng., PMP, MBA

Procept Associates Ltd.

www.procept.ca

1. Introduction

It was November 8, 2004 when I attended a dinner meeting that was organized by the local PMI chapter. The guest speaker was Dr. David Hillson, of “Risk Doctor and Partners.” The topic was “Use a Risk Breakdown Structure to Understand Your Risks” (<http://www.risk-doctor.com/>). I have listened to David before; he is an excellent speaker and he knows Risk Management. Again, his presentation was excellent and received a standing ovation from the capacity crowd.

During the question and answer period, I was prompted to ask David: “Has anyone tried to use a Cause and Effect Diagram for the same purpose of identifying project risks?” I do not remember David’s answer, but it was enough to encourage me to explore this idea further. I cannot pretend that this is an original idea; the PMBOK 2004 edition identifies Cause and Effect Diagram as a tool for Risk Identification process (ref. #1).

I entered “Cause and Effect Diagram, Risk Management” on Google and got 421,000 hits! Unfortunately, almost all talked about one or the other, but not both (at least the first 50 did not). Rather than spend hours fishing for the right article, I concluded that the purpose of the Cause and Effect Diagram is risk identification, even if this is not expressly stated by an article. Therefore, I decided to simply make this link (between the Cause and Effect Diagram, and Risk Management) more explicit. This, in conclusion, is the purpose of this presentation.

2. Risk Management Basics

Figure 1 summarizes the 6 Risk Management processes, according to the PMI’s Guide to the Project Management Body of Knowledge (ref. #1). For the purpose of this presentation, I think that this is adequate. However, if more information is required, I recommend reading Chapter 11 of the referenced book.

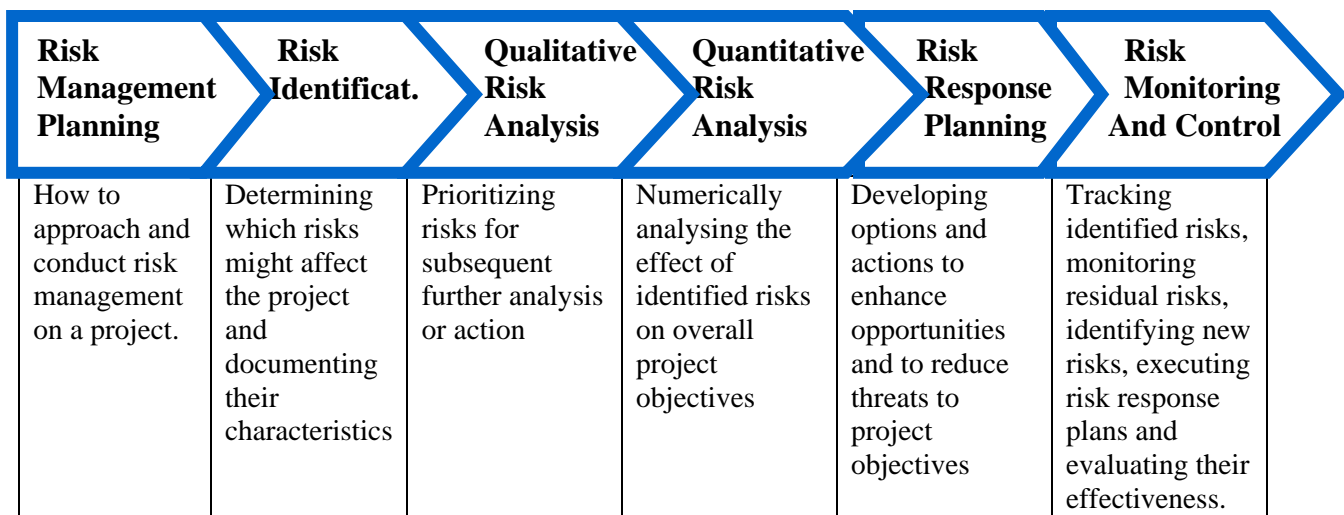


Figure 1 – Risk Management Processes

3. What is Cause and Effect Diagram?

The Cause and Effect Diagram (CAED) organizes and graphically represents the causes of a particular problem. It is also referred to as the Ishikawa Diagram, or Fishbone Diagram. Another definition is: “A graphic tool used to explore and display opinion about sources of variation in a process” (ref. #2).

CAED benefits are that it:

- Defines sources that contribute most to the problem;
- Defines interrelationships between these sources;
- Provides a basis for corrective, or preventive action.

3.1 History

In the 1960 s, Dr. Kaoru Ishikawa developed and started using the concept.

3.2 What Does it Look Like?

Figure 2 shows one example of a CAED.

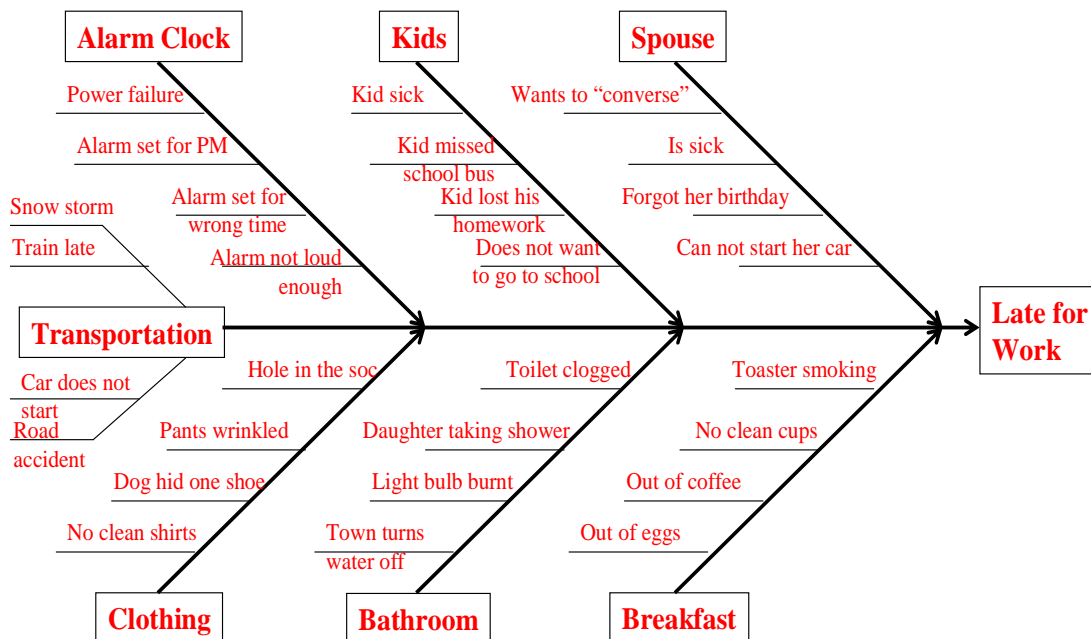


Figure 2 – Cause and Effect Diagram

3.3 *How is CAED Used?*

1. Start with the problem that is being analyzed on the right side of the diagram (e.g. “Late For Work”);
2. List the possible causes of that problem at the end of each primary branch (e.g. “Breakfast”). These are given conditions about which there is nothing we can do (i.e. breakfast is taken before leaving for work);
3. Add secondary branches with risk events within the cause area (e.g. “toaster smoking”);
4. Add tertiary branches: more detailed risk events that have as effect the risk event on the secondary branch (e.g. full of crumbs, or wiring insulation too old);
5. Continue developing new, more detailed risk events until you have reached the level of detail where risk events are specific, measurable and controllable.

This process can be performed by project team brainstorming, by using affinity diagrams, or other facilitative risk identification tools.

Once completed, this process will provide a list of risk events that need to be addressed if the probability of the problem occurrence is to be mitigated.

4. Use For Risk Management

4.1 *Risk Identification*

The process outlined under 3.3 above illustrates how a CAED can be used for risk event identification.

4.2 *Another Form of Risk breakdown Structure*

CAED has all the advantages of a Risk Breakdown Structure, which are that it:

- Facilitates risk identification;
- Provides project risk categories;
- Provides a template from past projects for the risk identification process;
- Provides a structure for risk assessment;
- Facilitates evaluation of the alternatives;

Figure 3 shows an example of a Risk breakdown Structure (ref. #5).

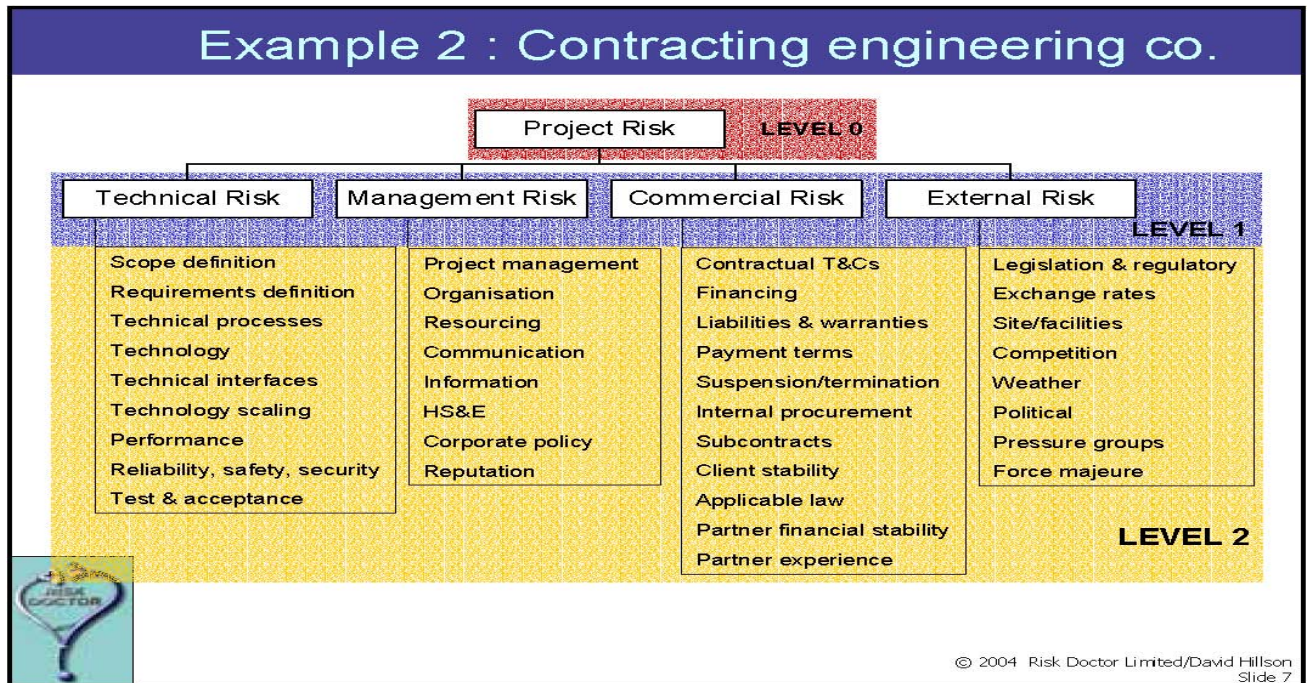


Figure 3 – Example of a Risk Breakdown Structure (Ref. #5)

4.3 Provides a Hierarchy of Risks

As explained in 3.3, risk events are organized hierarchically. A risk event at one level of detail becomes an effect (impact) of a more detailed risk event. For instance, the three top level risk events of any project are:

- Project ends late;
- Project budget is overrun;
- The product that the project delivered does not work.

Everyone knows that for any decently sized project, these risk events are not adequately specific, measurable, or controllable to be practical. However, they are an example of the first level of detail below an even higher level: “Project Fails.”

Using CAED as a risk hierarchical structure would lead us to define causes (e.g. “Breakfast”) as the first level of risk event detail. In such case, we should give it a risk event characteristic (e.g. “Breakfast Late”).

4.4 Evaluate Competing Proposals

The process for using CAED for evaluating competing proposals can be summarized as follows:

1. Construct Risk Cause and Effect Diagram for each proposal;
2. Assess probability and impact for risk events at the ends of branches;
3. Multiply probability with impact for each risk event (Expected Monetary Value);

4. Add all expected monetary values for each proposal;
5. Rank proposals in order of risk expected monetary values.

4.5 *Prioritize Competing Projects*

A very similar process to the one explained in 4.4 can be used for prioritizing between competing projects:

1. Construct Risk Cause and Effect Diagram for each project;
2. Assess probability and impact for risk events at the ends of branches;
3. Multiply probability with impact for each risk event (Expected Monetary Value);
4. Add all expected monetary values for each project;
5. Rank projects in order of risk expected monetary values.

4.6 *Organize Risk Historical Database*

CAED can be used effectively for organizing a risk historical database storage and retrieval system. It can:

1. Group projects by type;
2. Create risk causes categories;
3. Store risk factors information by cause;
4. Retrieve risk information only from applicable causes for a new project.

4.7 *Risk Management Reporting*

Similar to any other reporting strategy, risk management reports are structured to provide summary reports to senior management and detailed reports to middle management. The CAED hierarchy of risks can be used to summarize, or detail risk management reports.

5. **Conclusion**

A Cause and Effect Diagram can be effective in:

- Risk identification;
- Replacing Risk Breakdown Structure where advantageous;
- Hierarchically organizing risk events;
- Evaluating competing proposals on the basis of their risk levels;
- Prioritizing competing projects on the basis of their risk levels;
- Organizing a risk historical data base;
- Risk management reporting.

References:

1. A Guide to the Project Management Body of Knowledge, Project Management Institute, 3rd edition, 2004
2. <http://mot.vuse.vanderbilt.edu/mt322/Ishikawa.htm>
3. <http://www.jiscinfonet.ac.uk/InfoKits/risk-management/ishikawa>
4. http://www.westfallteam.com/Cause&Effect_Diagrams.pdf
5. <http://www.risk-doctor.com/>