Course Learning Outcomes for Unit IV

Upon completion of this unit, students should be able to:

3. Apply accident investigation techniques to realistic case study scenarios.
   3.1 Develop an events and causal factors analysis chart.

4. Evaluate analytical processes commonly used in accident investigations.

Reading Assignment

Chapter 6:
The Analytical Process

Chapter 7:
Events and Causal Factors Analysis


In order to access the resource below, you must first log into the myCSU Student Portal and access the Business Continuity & Disaster Recovery Reference Center database within the CSU Online Library.


Unit Lesson

Imagine that you are a part of an investigation team that has completed the gathering of evidence related to an accident. You have witness interviews; photographs and diagrams of the scene; and mountains of paper that represent policies, procedures, and training. How do you make sense of all of this information? In the previous unit, we said that accident investigation is a three step process—gain knowledge, analyze the knowledge, and develop corrective actions. Gathering evidence is a part of the gaining knowledge step, helping us understand what happened. However, the evidence by itself does not get us very far. We need to organize it in some fashion so that we can move from what happened to why it happened. An events and causal factors (ECF) chart is a good first step in making the transition to analysis.

Much like accident investigation itself, creating the ECF chart is a sequential process. The first step is to define the accident sequence. Once the sequence of events is known, we look for conditions that are related to each event. At this point, we are not identifying causal factors but, rather, are simply relating conditions to events. Once all events and conditions are charted, we can use any additional evidence to validate all of the facts. The sequence can be changed, and conditions can be added or deleted as the evidence is further examined. Only when the chart is completed and verified can we begin to analyze conditions to determine causal factors.

Now, it may be helpful to look at an example of an accident sequence. Here is what we know:

On January 2, 2016, at 5:34 a.m., Sam, the night maintenance technician, noticed a leak in the water pipe in the valve department. The valve had been leaking for four months, but because a maintenance request had not been submitted, the problem was not fixed. Sam was about to clock out at 5:40 a.m. and decided to leave a note for Mary, the first shift technician, to mop up the area. At 5:53 a.m., an air horn was sounded for everyone to respond to an area. As workers arrived, they noted that Bob (another employee) was lying in a

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pool of water. It was very obvious to everyone that Bob’s leg was broken. An ambulance was called, and, at 6:00 a.m., Bob was transported to the hospital. During the investigation, it was learned that Sam had noted the water but decided not to clean the area immediately. Sam left a note at the desk at 5:41 a.m. and departed the area. Mary was supposed to clock in at 5:40 a.m., but she called her supervisor, Tom, at 5:33 a.m.; she was unable to talk to him, so she left a message that she would be arriving at 6:00 a.m. since she was running late. Tom, the supervisor, also called at 5:33 a.m., and he left a message for Mary, saying that he was running 15 minutes late. Mary, who arrived at 5:53 a.m., heard the alert horns and responded to the accident.

First, we chart the known events. Note that the two phone calls are charted as events occurring simultaneously. We could also chart some events that did not occur, such as Sam not cleaning up the spill (Oakley, 2012). There could also be assumed events, such as Bob slipping in the water and falling. The level of detail is up to the investigator, but you may find that more detail results in fewer missed causes.

To see an example of an ECF timeline of events chart for this incident, click here.

The next step is to add conditions that are applicable to the events. Once these are charted, causal factors begin to emerge. At first glance, we can see that the failure of the night maintenance technician to clean up the spill was a likely causal factor. It certainly was a factor, and without the chart, we might be tempted to identify it as the sole cause.

To see an example of an ECF events and conditions chart for this incident, click here.

Within a safety program, authority implies control and would reflect the ability to provide direction, apply discipline, and allocate resources. Responsibility implies that something has been assigned or tasked, and the expectation is that you will complete it. Accountability is the application of consequences (good or bad) for actions taken or not taken under the assigned responsibility (Manuele, 2014). It is helpful to think of causal factors in terms of accountability. According to Oakley (2012), the four levels of accountability are as follows:

- Worker or equipment level: The failure to clean up the spill and not posting a wet floor sign certainly fall within the responsibility of the night maintenance worker.
- Supervisor level: The communication failures between the supervisor and the other employees involved deserve more investigation, as do the supervisor’s policies on turnovers from one shift to the next.
- Management level: Upper management should be held accountable for allowing the leak to remain uncorrected for four months. Some of this responsibility may be shared with the supervisor.
- Corporate level: The safety culture of an organization that allows leaks to go unrepaired and has not established clear policies for safety management needs further investigation.

The chart can also reveal good things. The time between the response team being called and the transportation to the medical facility was only seven minutes. Effective emergency response can be a significant contributor in reducing the overall severity of an accident (Oakley, 2012).

You can see that our investigation does not end with the completion of the chart since additional avenues to explore have been identified. Still, we did finally turn the corner from the what to the why. In our example, we developed the chart after the evidence was gathered, but in a real world investigation, the chart can, and should, be started as soon as any facts are known about the accident. Expect the ECF chart to change as new facts and information are uncovered. The order of events may change, as well as the significance of the conditions. Do not spend all of your time making the chart pretty until the investigation is complete and you are ready to include it in a final report. Choose substance over style.

An events and causal factors chart is a basic building block of accident analysis. We cannot determine why something happened until we are certain we know what happened and the sequence in which it happened. In the next two units, we will examine additional techniques that can be used to identify more of those elusive why factors.
References


Suggested Reading

If you are interested in learning more about the events and causal factors analysis, review the PowerPoint at the link below. It is an in-depth presentation with great information about this subject.


This website discusses events and causal factors charting. This is a skill that we will be using in several unit assignments, and this may be a helpful resource for more information on the topic.