

Causal Models which Drive the Quality of Incident Investigations

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Introduction

Human Reliability Associates were commissioned by the Health & Safety Executive to carry out a survey of current industry practise in incident investigation, given the proposed new duty to investigate. This article outlines how the model of accident causation that an organisation or individual holds can have an impact on the overall quality of an investigation. Two approaches to incident investigation based on causal models at opposite ends of a spectrum are discussed and illustrated with case studies.

Traditional Approach

The '*traditional*' approach to incident investigation, almost exclusively focuses on the individual or behavioural contribution to an incident and largely ignores, or downgrades, other potential contributory factors. The emphasis in this type of investigation is on the person or persons involved, identifying their contribution to the incident and highlighting only those immediate causes that are obviously and unambiguously implicated. Once these conditions are satisfied, the investigation is typically seen as complete. Underlying causes, such as poor procedures, inadequate equipment, that may have influenced behaviour or led to unsafe conditions are rarely formally identified and captured in this type of investigation.

There are a number of fundamental problems with this approach. These include: a tendency to focus on 'what' and 'how' rather than 'why' the incident occurred, to restrict the investigation to a limited set of causes, to focus prevention on disciplinary or procedural approaches and to assign responsibility and blame to those most immediately involved. Lastly, this approach tends to lead to short term, and ultimately ineffective, interventions since the underlying conditions that may create vulnerability to a wider range of incidents remain un-addressed. The traditional approach is illustrated in Case study 1.

Case Study 1 (A Traditional Approach)

Narrative

The prescribed method for cleaning the interior of the manufacturing machine was to open the lid and hose out any debris. The system was protected by an interlock device that automatically switched off the power when the lid was open. It was common practice amongst the workforce to use magnets to override this mechanism. The operator involved in this incident had used a magnet to override the interlock and was cleaning out some debris when the machine cycled and severed his finger.

Process

The investigator was a part time H&S Manager, this meant that the incident investigation competed for priority with a range of other tasks. He estimated that he had spent a day and a half on the investigation.

There was no formal procedure for accident investigation and the RIDDOR form provided the only investigation structure. The injured party was visited the day after the incident to obtain an admission of culpability.

Conclusions and actions taken

The investigator concluded that workers should be trained in the tasks they carry out and more importantly they should sign for the training they undertake. This signing would show that the workers know the 'correct' way of doing their tasks.

The investigation recommended that all staff should be reminded of how to conduct the task and that frequent checks should be made for the use of magnets. These were to be confiscated when found.

In this example, the investigator seeks to place blame rather than to understand what had occurred. The use of magnets as a method for circumventing guarding was well known but the investigation had made no attempt to address why this practice was commonplace and how it might be stopped.

Systems Approach

By contrast, the '*system-based*' approach to incident investigation, tries to understand the full range of factors that contribute to an incident. Organisations that advocate a system-based approach will typically be more open-minded about the causes of unsafe behaviour, recognising that individuals often work in circumstances that promote the likelihood of such behaviour. The approach recognizes that individuals all have intrinsic error vulnerabilities and hence under certain conditions, even experienced, well-motivated individuals may be involved in incidents.

In this approach incidents are seen as not just arising from a single cause, but from a combination of conditions. Immediate triggers or causes of an incident, such as the failure to follow a procedure or the use of the wrong equipment, are identified, and then the underlying causes of these conditions are addressed. These underlying causes are typically characterised as the organisational and management policies (system factors) that create the preconditions for accidents.

Organisations that identify both immediate and underlying causes of an incident are also tackling the conditions that could lead to future incidents. They employ a more rigorous and thorough approach to investigation. Therefore, system-based approaches to incident investigation are generally acknowledged to represent current best practice. Case study 2 is an example of a system approach to incident investigation.

Case Study 2 (A Systems Approach)

Narrative

The incident occurred when an engineering technician was attaching a bolt to a flywheel. The procedure for this process had been developed to an industry standard. This task required a great deal of force to be applied to the wrench. As the technician applied the required force, the bar snapped, propelling the technician two or three feet through the air injuring his back.

Process

The investigation process followed an international company standard. The incident was investigated by a team comprising:

- The H&S Manager (as the investigation co-ordinator)
- The Injured Party (to provide information on the incident and work processes)
- The Supervisor (to provide information on the work process)
- The Assistant Director (to act as an impartial observer)

The team established a timeline of events from the start of the technician's shift up to the incident. They developed a cause and effect tree where all potential contributory factors were discussed and their likelihood of occurrence assessed. Recommendations were made to reduce the likelihood of this event happening again. These actions were assigned to individuals and dates for their completion were set. Once the H&S Manager had completed his report it was disseminated to senior management, H&S committee and H&S managers at relevant sites.

Conclusions and actions taken

The conclusions of this investigation were firstly, that the tool was not suited to the pressures that were applied to it during the task. Secondly, that the quality control systems of the equipment supplier were not sufficient.

The investigation automatically triggered a review of the relevant risk assessments. In addition, all branded tools were identified and replaced with those of another supplier. All tools that are used for high torque applications were reviewed for suitability.

Organisations adopting the traditional approach would have probably stopped at identifying the cause of the incident as the wrench snapping. In this company, an investigation team was convened and various tools and techniques were employed, which enabled many possible reasons for the incident to be considered before the final conclusions were reached.

Factors Influencing Causal Model Used

The approaches outlined in the case studies above are characteristic of the two ends of a continuum (see Figure 1). Few companies explicitly state or represent a causal model within their written documentation or company policy. However, the overall impression gained from the survey was that a spectrum of approaches exist, with the majority of companies operating closer to the traditional end of this continuum rather than using a system-based approach.

The two factors found to influence the causal model adopted during a specific investigation were: the attitude and values of the individual conducting the investigation and the company investigation process and procedures. In addition, the company culture and training and education in accident investigation principles and techniques will have an underlying influence (see Figure 1).

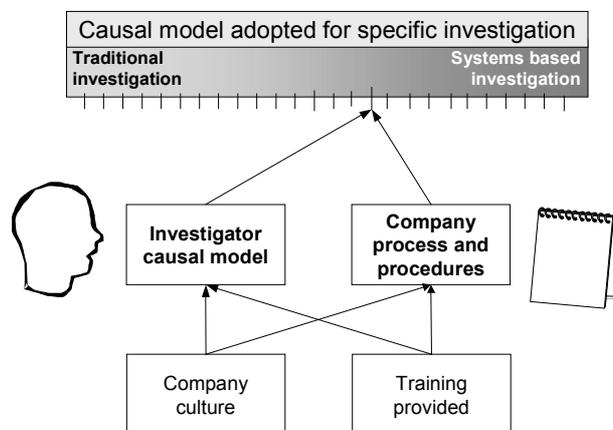


Figure 1 Factors influencing causal model used during accident investigation

The survey showed that, whatever the support or structure available within an organisation, the individual driving the investigation has a large influence over both the way an investigation is conducted and its outcome. For example, it is entirely possible for an investigator working within a company that has little or no structure, to carry out a system-based investigation. Conversely, it is also feasible that an investigator working within a company that has a structured, system-based approach could undermine this by conducting the investigation based on their own more traditional perspective. Therefore, the values and attitudes held by the lead investigator can help or hinder an investigation.

In practice, the strength of an individual's influence will usually be moderated by the robustness of the processes and procedures that support the investigation process. Having a structured process to support incident investigation aids the consistency of the process. Structure helps ensure that the right questions are asked to identify immediate and underlying causes, improves the likelihood of recommendations being acted upon, improves the chance that their effectiveness will be monitored and that the lessons learnt will be captured by the organisation for future reference. Whilst it is possible for an individual to achieve all of this without such support, one would expect it to be less likely and to occur with less consistency.

Summary

In order to make the new duty to investigate a benefit for industry, there are two obvious areas that need to be carefully addressed. Firstly, raising the level of awareness and understanding of system-based accident models, and their value. Secondly, there is the need for practical support, in terms of usable systems and documentation, to encourage the application of such models. These areas will need to be carefully addressed by the Health & Safety Executive to ensure a new duty to investigate will be a profitable exercise for reducing future incidents.