

# **Experience feedback in practice**

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This licentiate thesis consists of an introduction and the following essays:

Lindberg A-K., Hansson S. O. (2006) ”Evaluating the effectiveness of an investigation board for workplace accidents”, *Policy and Practice in Health and Safety*, 4 (1): 63-79

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Lindberg A-K., Hansson S. O., Rollenhagen C. (2008) ”Learning from Accidents – What More Do We Need to Know?”, submitted manuscript.

Lindberg A-K. (2008) “Learning from Experience in Municipal Environmental Inspection”, submitted manuscript.

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# Abstract

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The subject of this licentiate thesis is experience feedback from accidents and incidents. The thesis aims to contribute to an understanding of how the learning processes within organizations, companies and authorities could be improved.

*Essay I* (written together with Sven Ove Hansson) reports on an evaluation carried out in 2004 by the Swedish Work Environment Authority's Accident Investigation Board, called HAKO (Haverikommissionen). An important outcome of this evaluation shows that HAKO have not been able to manage the dissemination of their written reports, which is unfortunate, since the reports are thoroughly written.

*Essay II* (written with Sven Ove Hansson and Carl Rollenhagen) is an overview of the literature on learning from accidents and incidents. The focus in this essay is on literature that evaluates the effectiveness and usefulness of different methods in accident investigations. The conclusions drawn from this literature review are that the dissemination of results and knowledge from accident investigations must be improved, and experience feedback systems should be integrated into overall systems of risk management.

The starting point for *Essay III* was an empirical study conducted in 2005/2006. Twenty-eight supervision cases from eleven local Environment and Health Administrations in Sweden were examined. The overall goal of the study was to find out how, and to what extent, experience feedback occurs between different municipal authorities. Two major problems affecting experience feedback have been found; namely, that the inspectors do not have enough guidance on how to interpret the law, and that they would like more information on what happens to legal cases they have reported to public prosecutors and police.

**Keywords:** Experience feedback, accidents, incidents, accident investigations, CHAIN model, learning process.

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Eskilstuna

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Evaluating the effectiveness of an investigation board for workplace accidents.

*Policy and Practice in Health and Safety*, 4 (1): 63-79

### Essay II

Learning from Accidents – What More Do We Need to Know?

Submitted manuscript.

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Learning from experience in municipal environment inspection.

Submitted manuscript.



# **1. Introduction**

It has proven difficult to give the word “accident” a general definition as different disciplines tend to use different concepts. However, accidents do happen everywhere, and virtually all human activities pose hazards for human beings or the environment. Accidents and incidents are often costly and time-consuming. They can also be devastating for the individuals involved when the accident leads to physical or mental injuries or even death. Common to all accidents is that they are undesirable and obviously, we cannot avoid all of them. In order to reduce the number of accidents as far as possible, it is important to learn from previous mistakes and failings and to disseminate this knowledge to others. Experience feedback from accidents and incidents has become increasingly important for authorities, organizations, and companies. Also the number of published scientific papers on learning processes has increased.

The framework of this licentiate thesis is the study of how authorities, organizations, and companies could learn from the past concerning accidents, incidents, mishaps and near misses.

## **1.1 Aim and scope of the thesis**

The main purpose of this thesis is to contribute to our knowledge on how the learning processes in organizations, companies, and authorities could be improved. So far, this has been done in three essays. In the first essay, a model of accident investigation processes is presented and used in an empirical study, namely, an evaluation of an accident investigation board in the Swedish Work Environment Authority (SWEA). The second essay focuses on previous literature on experience feedback from accidents and incidents. It is an overview of the literature on learning from accidents and incidents with its focus on research that describes and evaluates procedures intended to promote such learning. The third essay is based on an empirical study of experience feedback in Swedish municipal environmental supervision cases, and investigates how the municipal Environment and Health Administrations handle accident and incident experiences in their work.

## **2. What is experience feedback?**

Much learning in society occurs spontaneously. For example, when my three-year-old daughter tries to ride her tricycle standing up but falls and hurts her knee, she changes her behaviour. Experience feedback in organizations is a more complex phenomenon (Kjellén 2000). According to Rollenhagen

(2003), investigation of accidents is an important element in a large class of safety strategies that can be named “experience feedback”, and the experience feedback is an element in a class that can be called safety strategies. The high complexity makes it impossible to foresee everything when designing technical safety systems, and Rollenhagen points out that we also have to learn from experience. The Swedish Centre for Lessons Learned from Incidents and Accidents (NCO) describe systematic learning from accidents as follows:

“Learning from accidents is to extract, put together and analyse, and also to communicate and bring back, knowledge on accidents and near-accidents, from discovery to course of event, damage, and cause to all who need this information. The purpose is to prevent the occurrence of similar events, to limit damage, and thereby improve safety at work.”<sup>1</sup>

Experience feedback should be seen as a process of events and measures, and I would like to start at the end of this process. The ultimate goal of experience feedback is the prevention of similar accidents from happening again. Essential for preventive work is the generation and dissemination of knowledge, and proper recommendations based on investigations of previous incidents. Experience feedback has a central role in management systems for the prevention of accidents.

Investigations of accidents should take into account different methods of preventive work. When creating investigation systems, the whole process should be thought through. This includes how to handle data, how to disseminate information, and how to take care of questions concerning competence etc. (Rollenhagen 2003).

How the experience feedback process works in practice varies between different areas. For example, there are large differences in the extent to which accidents and incidents are reported. The ability of organisations to develop an efficient reporting system depends on its ability to deal with blame and punishment (Cox et al. 2006). As Kjellén (2000) points out, it is also influenced by the size of the particular business, its resources, and the kind of technology being used.

It is common that accident investigations end up in databases. Examples of databases are the Major Accident Reporting System (MARS) administered by the European Commission, the German Zentrale Melde- und Auswertestelle für Störfälle und Störungen in verfahrenstechnischen Anlagen

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<sup>1</sup> Swedish Rescue Services Agency: [www.srv.se/nco](http://www.srv.se/nco) Downloaded 2006-06-01. (Translation from Swedish by Sven Ove Hansson and Anna-Karin Lindberg.)

(ZEMA), the Major Hazard Incidents Data Service (MHIDAS), and the Aircraft Accident Statistics and Knowledge (AASK) database. Kletz (2002) reports that databases have been used less than expected, and that they appear not to have been used as tools for general learning as intended. Instead, they have been used only as sources to refer to after awareness of a hazard has already come to light. Rollenhagen (2003) points out the importance of having a well thought-out strategy throughout the investigation process of what collected data will be used for when developing systems for experience feedback.

Much of the previous literature on experience feedback consists of proposals on how to perform accident investigations. A successful accident investigation should, for instance, be performed by independent investigators (Baxter 1995), be conducted as soon as possible after the accident (Rozental 2002), give recommendations how to prevent similar accidents (Rozental 2002), and result in written reports (Kletz 1993). Various investigation methods and models have been proposed, for instance in Kjellén (2000), Rollenhagen (2003), Hollnagel (2004), and Sklet (2004).

Four types of studies are important for the development of evidence-based accident investigation practices, and, thereby, also for a properly working experience feedback system, namely (1) studies of the effects and the efficiency of different accident investigation methods; (2) studies of the dissemination of conclusions from accident investigation; (3) follow-up studies of the extent to which accident investigation reports give rise to actual preventive measures; and (4) studies of the integration of experience feedback systems into overall systems of risk management.

In summary, experience feedback is a process intended to reduce and avoid future accidents. What components should be part of good experience feedback can be discussed, but the investigation and dissemination processes are always essential. Without a properly working investigation process, there will be no material for the learning process to work with, and the feedback does not have the desired effect unless the information and knowledge from the investigation process is disseminated. An example of a learning process for accidents and incidents is presented below in section 3.1.

### 3. Main results

So far, there are two main outcomes of this research. These are the CHAIN model and a set of quality criteria for a good learning process.

#### 3.1 The CHAIN model

The CHAIN model was developed because a more comprehensive approach to accident investigation was needed. The intention was to create a model that was open enough for use in several different areas of the learning process but still consisted of the necessary components for a whole accident investigation procedure. The model was first used in an evaluation of the Swedish Work Environment Authority's Accident Investigation Board, as reported in essay I. The model has also been used in essay II, where the findings from the literature review were systematized through the stages in the model.

Simplicity was an important criterion when developing the model as it needed to be applicable in several different sectors yet still describe the investigation process in a functional way.

The CHAIN model consists of a *chain* of *accident investigation* steps. The first step is the reporting of accidents and incidents to investigation boards or others with investigation responsibilities. The second step is the selection of accidents and incidents that are worth in-depth special investigation. The third step is the investigation process, and this is also the centrepiece of the process. The fourth step is the dissemination of results to those affected, and finally, the fifth step, is the implementation of preventive measures in places where similar accidents may occur.

This model truly represents a chain in the sense that the whole process fails if one of its steps or links is weak or missing. The whole chain is necessary for the learning process to be effective. (See figure 1.)

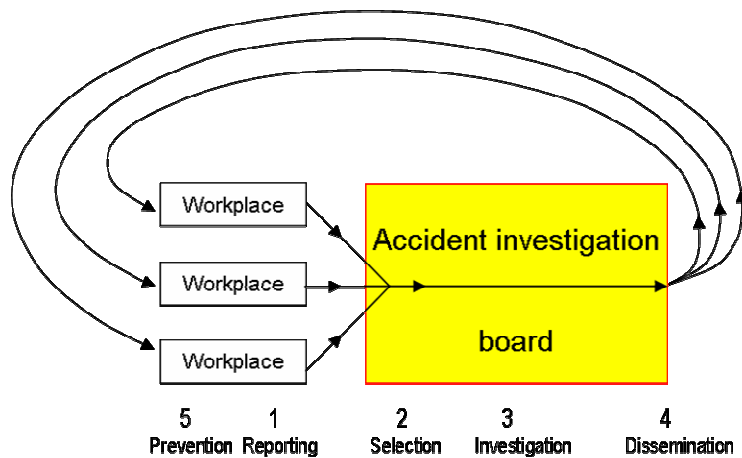


Figure 1. The CHAIN model of accident investigation and prevention.

### 3.2 Quality criteria for the learning process

With the purpose of improving the methods used in learning from accidents and experience feedback, six quality criteria have been developed. The criteria are: reporting system for accidents and incidents, selection methodology, investigation methodology, dissemination of results, preventive measures, and evaluation. The purpose, when developing these criteria was to find the key content in the learning process after an accident or incident, and make the criteria as wide and clear as possible. Hopefully this will mean that the criteria are useful in different sectors and in different investigations. Below, preliminary versions of these criteria are reported. The criteria will probably be improved later on in the research.

#### (1) Reporting system for accidents and incidents

A reporting system for accidents and incidents is needed. This should specify who is responsible for reporting an incident, what should be reported, how this should be done, and who the recipient of the report will be.

#### (2) Selection methodology

An appropriate and well-functioning methodology for selecting accidents and incidents for further investigation is necessary, since not all accidents and incidents can, or should, be investigated.

### **(3) Investigation methodology**

A carefully thought-out methodology for investigation work is needed. It should specify who is responsible for the investigation, what competences the investigation team requires, and how they should perform the investigation. It is essential that investigations reveal underlying causal factors. The Man, Technology and Organisation perspective (MTO) is useful in this context (Rollenhagen 2003).

### **(4) Dissemination of results**

Routines for dissemination of conclusions, proposals, and recommendations from an investigation are important, so that its results reach those who can make use of them. The results should be disseminated and routines for availability in the future are needed.

### **(5) Preventive measures**

Results from investigations should be used in preventive work in order to avoid similar accidents and incidents from recurring.

### **(6) Evaluation**

A well functioning evaluation system should incorporate mechanisms for its own improvement. Evaluation studies of the effects of different methodologies and organizational structures are needed.

These six criteria for the attainment of a good learning process can be used as a checklist in accident or incident investigations.

## **4. Preview of Essays I-III**

***Essay I.*** The first article, “Evaluating the effectiveness of an investigation board for workplace accidents” was written in collaboration with Professor Sven Ove Hansson. The essay is based on an evaluation carried out by the authors on the commission of the Swedish administrative authority for workplace health and safety, the Swedish Work Environment Authority (SWEA). SWEA initiated an accident investigation board called HAKO (Haverikommissionen) which began working as an operative unit under SWEA’s management in 2001. The purpose of the board was to tighten up SWEA’s accident investigations and make them more efficient. HAKO was also expected to produce a deeper and broader understanding of what causes occupational accidents and to disseminate this

information, both internally and externally. The board performed careful investigations of a very limited number of accidents. HAKO was evaluated in 2004 (Hansson and Lindberg 2004), and essay I summarizes the conclusions from this evaluation. The board's work is described in the essay, and some previous relevant research is examined. The theoretical point of departure for this essay has been the CHAIN model, which was developed because a more comprehensive and coherent approach to accident investigations was needed than could be found in the existing literature. The model has been thoroughly described and used to analyse the investigations of HAKO.

The main conclusion of the analysis was that the dissemination of accident reports is the weakest link in HAKO's work. This is unfortunate, since HAKO has managed to establish a high qualitative level in their investigations of workplace accidents that should set a standard for such investigations in general. The HAKO reports are thoroughly written, and it is possible for a layperson to read and learn from the reports. Still, if the reports are not effectively disseminated, it does not matter how good their quality is.

**Essay II.** The second essay, "Learning from Accidents – What More Do We Need to Know?" was written together with Professors Sven Ove Hansson and Carl Rollenhagen. This essay is an overview of the literature on learning from accidents and incidents. The literature is categorised in this essay according to the elements within the CHAIN model, that is, into literature on reporting, selection, investigation, dissemination and prevention. The focus is on literature that evaluates the usefulness of different methods of accident investigation.

A lot has been written on the *reporting* of accidents and incidents, and this literature indicates that there are large differences between different hazards; for example, road traffic and aviation are subject to extensive experience feedback, whereas accidents in homes and arising from leisure activities are seldom investigated. Accidents are often reported in databases, and several of these databases are well described in the literature.

The results from the literature search on *selection* of accidents and incidents for investigation shows a need for more studies to determine whether selection processes are adequate. Studies are needed that compare actual selection processes against carefully constructed adequacy criteria.

Much has been written about the *investigation* process; however, most of the literature consists of proposals for how investigations should be performed, and what methods should be used. Different models and methods for accident investigation have also been a focus in the literature. No studies

were found that systematically evaluated and compared accident investigation methods, or performed empirical evaluations comparing different approaches to the learning process.

Only a small number of studies were found on the *dissemination* of results from accident investigations. An organisation that does seem to put much effort into dissemination is the U.S. National Transport Safety Board (NTSB).

An accident investigation process is not complete until its recommendations have been implemented for the future safety of the system to be protected. The *prevention* step in the CHAIN is therefore very important. Still, only a few studies have been found of the effects of accident investigations on the implementation of actual preventative measures.

In conclusion, important topics for future studies of experience feedback are proposed. The following four topics are given the highest priority:

- The efficiency of different accident investigation methods.
- The dissemination of conclusions from accident investigation.
- The effects of accident investigation reports on the implementation of preventive measures.
- The integration of experience feedback systems into overall systems of risk management.

***Essay III.*** “Learning from experience in municipal environment inspection” is the third essay. It was based on an empirical study carried out in 2005/2006 with financial support from the Swedish Environmental Protection Agency. Twenty-eight cases from local Environment and Health Administrations in eleven municipalities in Sweden were studied. The idea behind the study was that the experiences gained from one municipal Environment and Health Administration could also be useful in other, similar, Administrations. The main purpose of the study was to find out how, and to what extent experiences are exchanged between different municipal authorities. A further purpose was to identify what kind of unfulfilled needs the inspectors may have for such communications.

The essay consists of a description of how the Swedish municipal supervision system works, a brief exposition of the supervision cases, an analysis of the case studies, and a report from interviews with inspectors. Finally, some conclusions were presented. Two major problems affecting experience feedback are discussed in the essay. Firstly, the inspectors lack any guidance on how to interpret the law, and what to demand of the inspected companies. They also want more information about what happens to the legal cases they report to public prosecutors and the police. One possible means of achieving this would be for local authorities to receive information in the same way as the injured party in a criminal case.

## 5. Continued research

This licentiate thesis has received partial financial support from the Swedish Rescue Services Agency as part of a larger project on experience feedback. The next step in the project will be an analysis of accident and incident reporting within the Swedish local rescue services. The local rescue services are an ideal platform for studying experience feedback, since it is likely to be the organization with (at least potentially) the most knowledge on the whole spectrum of accidents in Sweden. Irrespective of the cause of an accident, whether due to a natural disaster or human activities, the local rescue services at the municipal level (there are more than 200 local rescue services in Sweden) have to deal with it. Their main tasks are to reduce damage caused by accidents and to prevent accidents. In this sub-project, I have studied over 1100 reports from two municipal local rescue services. The reports have been thoroughly read, divided into categories, and analysed. I will conduct follow-ups based on the recommendations in the reports. For example, if a local service recommends higher railings on a bridge following a suicide attempt, I will contact the Swedish Road Administration (the responsible authority in this case), to find out if they have received these recommendations, and if so, what has been done.

In the next step, I will study how Swedish authorities handle experience feedback in their different domains of responsibility. This will be achieved through interviews with representatives of these authorities.

Finally, a special study of areas with weak learning processes will be conducted. Central topics will be establishing why the learning process does not work in some areas, what other countries have done in these areas, and what has been written in the international research literature on how to strengthen the learning process. Methodology and organisational requirements for a strengthening of the learning process will be discussed.

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