LEARNING FROM ACCIDENTS

Experience feedback in practice

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STOCKHOLM 2010
This doctoral thesis consists of an introduction and the following essays:


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

IV Lindberg A-K., Hansson S.O. “Accident prevention through experience feedback from the rescue services. A study of incident reports in Sweden”, submitted manuscript.


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ABSTRACT


Experience feedback from accidents is important for preventive work in companies, authorities and other organisations. This thesis focused on experience feedback from accidents that take place in everyday life, in our neighbourhoods, in our workplaces, in our schools, in traffic and transportation.

Essay I 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. 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.

Essay II is based on an evaluation of the investigation board for workplace accidents (HAKO) that was carried out on commission of the Swedish Work Environment Authority. It was concluded that the accident reports published by HAKO had a high qualitative level but the dissemination of results from the investigations was weak.

Essay III investigates twenty-eight supervision cases from eleven Swedish local Environment and Health Administrations. The overall goal of the study was to find out how, and to what extent, experience feedback occurs in Swedish municipalities. Two major problems relevant for the 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 that they have handed over to the public prosecutors and the police.

Essay IV is a document study of incident reports from two municipal fire and rescue services. The overall purpose of this study was to investigate if information from the rescue services could be used to improve experience feedback in sectors where it is weak or non-existent. In the 1120 incident reports that were studied, we found 217 proposals for improvement but these proposals were not used for experience feedback. It is concluded that
the reports contain valuable information but this information is not used to prevent future accidents.

**Essay V** investigates experience feedback in Swedish authorities working with accident prevention. The essay is based on two interview studies. In the first study, 21 Swedish authorities participated, and several of these authorities seem to have a functioning experience feedback despite the lack of systematic routines and methods. Yet, only four of the 21 authorities actually handle the whole experience feedback process. These four have at least one common denominator; they have an experience feedback that is turning more inwards than outwards. The second study was a follow-up study of some of the results from the first study, concerning the dissemination of results from experience feedback.

**Keywords**: Experience feedback, learning from accidents, incidents, near-accidents, CHAIN model, communication, dissemination.
ACKNOWLEDGEMENTS

First and foremost, I am very grateful to my supervisor, Sven Ove Hansson who also is co-author on three of the essays. Without his support this thesis would not have come about. Thanks to my assistant supervisor Christina Rudén who’s comments especially on essay III have been valuable. I would like to thank Jan Schyllander at the Swedish Civil Contingencies Agency (MSB) who helped me with this and that during the years, and Thomas Gell at MSB for your useful comments, especially on the experience feedback definition. I am very thankful to all the participating interviewees who devoted time and patience to answer all my questions. Thanks also to Carl Rollenhagen for valuable comments and reliable information.

Very special thanks goes to the following persons: Misse Wester, I appreciate the stimulating and interesting co-work with essay V but I am mostly thankful to you because you always seem to believe in me and challenge me just when I need it the most. I will always be grateful for all the time and effort you spent on me and my work. Linda Schenk, our chitchats about this and that, and all our analyses of the mystery of life have made my days more fun and interesting. You have encouraged me to continue when I wanted to give up, and you have told me what to do when I was in doubt. I am really grateful for that. Sofia Norlander, a special thank to you for all our lunches during which we shared both happiness and sorrow, and for making me feel welcome when I arrived in KTH. Many thanks to the risk and safety seminar group; you rock!

I would also like to take the opportunity to direct a special thanks to Emma and Robin who have listened to me complaining and shared the ups and downs in my works during the years. You are the best friends a girl can have!

To the rest of my wonderful friends (you know who you are); thank you for forcing me to forget about my work and just have fun from time to time!

Last, but of course not least, my deepest gratitude to my wonderful little family; Jonas, Emilia and My. You always make me smile and you are the compass that I need to keep on the right track. Together we are the best team ever!

This work has been financially supported by the Swedish Civil Contingencies Agency, the Swedish Environmental Protection Agency, and
the Swedish Work Environment Authority. Their support is gratefully acknowledged.

Stockholm
November 2010

Anna-Karin Lindberg
To Emilia, My, Alex, Lowe and Enzo
1. INTRODUCTION

Experience feedback from accidents has become increasingly important for authorities, organisations, and companies. The variety of accidents is wide but what is certain is that accidents happen everywhere: in our homes, in our workplaces, when we ride our bike to the gym, on football grounds and tennis courts, in boats, cars, trains, buses, etc. An accident can be caused by human activities or by natural disasters such as floods, tsunamis, earthquakes. Human activities pose hazards for human beings and/or the environment and the ecosystems. What seems to be the common feature for all accidents is that they are unwanted and that we cannot avoid them all. Examples of everyday accidents can for instance be when a grandmother breaks her hip when she slips and falls from a three-step ladder when changing curtains in her living room, or when a family driving their car home from a birthday party collides with an elk and the mother dies in the ambulance before arriving to the hospital, or when a young slalom skier accidentally falls and gets a concussion. These are three different examples of types of accidents happening everyday, two of them with minor physical injuries and one with a fatal outcome. Of course, accidents can also include a great number of people. Examples of such accidents are the catastrophe when the cruise ferry M/S Estonia sank in 1994 on its way from Tallinn to Stockholm where 852 people died, or the railway accident in Halle in Belgium in 2010 which led to at least 18 fatalities, or when the Air France Airbus 330-200 with 228 persons onboard plunged into the Atlantic in 2009 and was never found again. However, not all accidents end up with harmed or killed persons; some accidents have negative effects on the environment and others have only economic consequences. Irrespective of the consequences, one thing is clear; no simple answer seems to be available to the question of how experiences from unwanted events and conditions could best be used to prevent accidents (Kjellén, 2000). We cannot avoid all accidents, but we ought to try. In general, accidents are unwanted and often in one way or another personal tragedies. When accidents are put in a larger perspective in order to prevent new ones from happening at least one interesting question arises; is there anything we can learn from the accident in order to prevent it from happening again in the future?

Much learning in society occurs spontaneously. When you kick your foot in a kitchen chair for the second time the same day you will probably
make some kind of change, for example move the chair or put on slippers. Learning through trial and error is often an efficient way for individuals but is most often not possible in large organisations. Learning from accidents and incidents in organisations and companies is a more complex process.

1.1 Aim and scope

The main aim of this doctoral thesis is to enhance our understanding of how experience feedback processes function in practice. This thesis is limited to examining organisations working with accident prevention, and to present ideas on how these processes could be improved. Four empirical studies have been conducted. Three different areas have been studied, namely workplace health and safety, environmental supervision, and fire and rescue services. These areas were chosen because they cover wide sectors of society concerning accident prevention. Various authorities’, and to some extent other organisations, practical ability and accomplishment of experience feedback was studied. The concept ‘experience feedback’ is used to describe the process of learning from accidents and incidents.

The choice to study workplace accident investigations (essay II) was based on the fact that workplace accidents happen within several sectors and is a rather common phenomenon. For example, in 2005 to 2009 147 376 persons were injured in workplace accidents in Sweden, 320 with fatal outcome.¹ Most workplace accidents that happen are simple and seldom result in serious injuries (Jørgensen, 2011). Although, 80 percent of all accidents that lead to medical care in Sweden happen in our homes and on our spare time (Stark Ekman, 2008) and some of these accidents end up in an intervention by the rescue services. In 2009, the municipal rescue services in Sweden carried through 93 000 rescue operations (Lundqvist and Malmqvist, 2010). Hence, they are called to the scene of many different types of accidents and therefore receive information about several types of accidents (essay IV). The municipal environmental supervision was judged as interesting in an experience feedback context because it covers sectors with high potential for accidents and disasters with great impact, but also minor accidents with crucial effects on the environment (essay III). The study of authorities (essay V) was carried out because many of the participating persons in the other studies had thoughts and

¹ Swedish Work Environment Authority: www.av.se 2010-10-07
ideas about the authorities work with experience feedback. Essay V is a survey of how the Swedish authorities’ work with accident prevention and experience feedback.

1.2 Some definitions

Definitions in general have a tendency to be too limited, too wide or just too complicated (Hansson, 2010). It is difficult to give the word ‘accident’ one single definition. A more thorough overview of definitions such as accident, injury, risk and safety, etc. can be found in All et al. (2006). Different organisations have different needs which are reflected in the definitions they use. One example of how the concept of an ‘accident’ has been defined in peer-reviewed literature is: “Accident is defined as any incident that caused harm. Incidents is an event where harm could have resulted but did not, due to one or more barriers or system defences not failing” (Kinnersley and Roelen, 2007, p. 33). Kjellén defines industrial accidents as: “/…/ unwanted events that cause losses to the individual, the company and the society as a whole” (Kjellén, 2000, preface). Perrow discusses the concept, and gives his view of a formal definition: “An accident is a failure in a subsystem, or the system as a whole, that damages more than one unit and in doing so disrupts the ongoing or future output of the system” (Perrow, 1999, p. 66). The concept is defined in Oxford English Dictionary as: “Anything that happens without foresight or expectation; an unusual event, which proceeds from some unknown cause, or is an unusual effect of a known cause; a casualty, a contingency” (Oxford English Dictionary, online version). The Swedish Transport Administration (former Swedish Rail Administration) defines an accident as: “A serious accident is an accident in which at least one person is killed or injured and in need of medical care for more than 24 hours, or damaged railway vehicle, railway infrastructure or other property to an estimated value of at least 1.4 million SKr” (Interview with Erik Lindberg, June 26th 2009). There is also a judicial aspect of the discussion on definitions. Some of the participating authorities in essay V primarily use a formulation from the law.

As a concept, the word ‘accident’ can be complicated also for other reasons than that it is difficult to define. One perspective has its foundation in the ‘injury’ concept instead of accident. In this perspective the notion is that the accident concept is misleading and that it makes one think of
something random and unpredictable. The ‘injury’ concept is said to be preferable to the ‘accident’ concept because the latter is claimed to be associated with a belief in fate and an idea that such events are not predictable or preventable (Andersson, 2003; Andersson, 2007).

However, in this thesis ‘accident’ will be used, and a definition of the concept that is appropriate here is that an accident is a sudden, unintended and unforeseen event or series of events that results in one or more specified undesirable consequences (Krausmann and Mushtaq, 2006). The consequences are for example one or more persons being injured or killed, economic or environmental damages, or damages to important public functions. The accidents in focus in this thesis have been organized using Rasmussen’s accident categories: (1) Frequent, but small-scale accidents, (2) Medium size, infrequent accidents, and (3) Very rare, large-scale accidents. According to this categorization, the focus in this thesis has not been on large-scale accidents, but rather on small-scale and medium size accidents. Rasmussen (1997) thought of small-scale accidents as occupational accidents but in this thesis the category includes all frequent but smaller accidents. The consequences of a small-scale accident are perhaps not as devastating as those of a large-scale accident. It is rather the quantity of small-scale accidents that makes them interesting to study from an experience feedback point of view. Small-scale accidents are potential good learning sources. Examples of medium size accidents are train collisions, aircraft accidents, etc. Medium size accidents do not happen as frequently as small-scale accidents, they are not everyday accidents but they occur from time to time. It is a reasonable assumption that the small-scale accidents might be precursors of medium size accidents, and from an experience feedback point of view it might be effective to study them together with the overall aim to prevent accidents. Large-scale accidents are for example accidents involving nuclear power. The time between accidents of this extent is long and the procedures around them are often very special.

Also incidents and near-accidents are important for experience feedback processes in order to prevent full-blown accidents in the future. They occur more frequently than adverse events and provide a larger sample from which to learn (Tamuz et al., 2011). These concepts are tightly connected to the accident concept. An incident can for instance be

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2 The ‘unforeseeable’ is in some respect somewhat problematic since there are accidents and incidents that are foreseeable, maybe not in time but as a phenomenon.
explained as something unexpected or unwanted that has the potential to cause harm (this is loosely based on Cooke and Rohleder, 2006) or as Perrow defines it as: “An incident involves damage that is limited to parts or a unit, whether the failure disrupts the system or not” (Perrow, 1999). A near-accident is an accident or incident that could have happened but never did. There are several authors who claim that there is a relationship between the number of near-accidents, minor incidents, and major accidents (Bird and Germain, 1966; Tye, 1976; Heinrich, 1980, cf. Jones et al., 1999).

The definition of experience feedback used in this thesis is that it is the process of identifying, extracting, collecting, and analysing information and knowledge on accidents, incidents and near-accidents, including detection of event, description of the course of event, its consequences and causes, and the subsequent dissemination and communication of this information to all parties that could benefit from it. The aim is to prevent the occurrence of similar events, to limit damage, and thereby improve safety. Experience feedback refers to the learning process that starts after an accident, incident, or a near-accident since the learning process need not be initiated only by accidents; it can also be triggered by incidents, near-accidents, and even positive examples of accident prevention. A positive event that triggers an experience feedback process can for instance be cross-sectoral learning, i.e. when an organisation working in one area learns from another organisation working in another area how this organisation prevents accidents, incidents and near-accidents. This should also include learning from positive examples.

2. PREVIOUS RESEARCH

Experience feedback is a process consisting of events and measures, and one goal is to prevent future accidents from happening (Sweedler, 1995). There are several different components that are important for a properly functioning experience feedback process and this section is a review of previous research in the subject. The literature findings are organized according to the steps in the CHAIN model (see more in section 4.1.1) to cover the main and most important aspects of the process. The review will start with a few words about learning.
Learning starts at an individual level and a learning organisation is based on the learning process of individuals (Wang and Ahmed, 2003). The differences between individual and organisational learning is pointed out in the literature (Wang and Ahmed, 2003; Small, 2006; Lukic et al, 2010; Wahlström, 2011). The relationship between organisational learning and learning organisations is also discussed in the literature (Tsang, 1997; Popper and Lipshitz, 2004; Edmondson and Moingeon, 2004). Still, the terms are sometimes used synonymously which will be the case in this literature overview (Berson, 2006).

Individual learning has a significant impact on concepts and practices of organisational learning and the application of learning at an organisational level was primarily described as the combined effect of individual learning, training and development (Wang and Ahmed, 2003). Researchers often take different positions concerning individual and organisational learning. Some compare organisational learning with individual learning while others see the two approaches as two distinct processes (Popper and Lipshitz, 2004). However, there seems to be a tendency among researchers to agree that individual learning is necessary for organisational learning to occur. Essential is that members from all levels in an organisation learn to ensure success of the organisation and avoid extinction (Weldy and Gillis, 2010). Independently of what position one might take, it is important to consider who is involved in learning and how the process of learning works, is the learning focused on individuals accessing shared information, or is it groups of individuals sharing knowledge (Lukic et al., 2010). Popper and Lipshitz (2004) state that information processing is carried out at different systemic levels by different structures and that organisational learning involves an additional phase – dissemination. Argyris (1999) asserts that organisations learn through individuals acting as agents for them, and it is the agents who produce the behaviour that leads to learning. A relevant question when discussing these matters is how learning takes place outside individuals (Popper and Lipshitz, 2004) and how the individual and organisational learning is affecting experience feedback. It seems to be a reasonable assumption that the learning process in experience feedback is a central aspect. Learning from experiences in everyday life often occurs spontaneously but experience feedback in organisations is a more complex phenomenon (Kjellén, 2000). The learning organisation as a concept is most often attributed to Peter Senge who talks about the identification both of characteristics of organisational culture and climate that help
develop a learning culture (Senge, 2006; Dymock and McCarthy, 2006) but exactly what Senge means with the concept ‘learning organisation’ is perhaps not that easy to determine. Örtenblad (2007) examined how Senge is interpreted in the literature, and presents twelve different interpretations of his concept. It is concluded that the concept is rather vague, and that there is a sort of faithfulness to Senge’s text which prevent people from questioning it (Örtenblad, 2007). Edmondson and Moingeon (2004) define organisational learning as: “/…/ a process in which an organization’s members actively use data to guide behaviour in such a way as to promote the ongoing adaptation of the organization” (Edmondson and Moingeon, 2004, p. 28). With respect to organisational learning it is important to consider who is involved in the learning and what the process of learning will be (Lukic et al., 2010). Even though learning starts from individuals, it does not necessarily have to lead to an organisational learning. It is a task for a learning organisation to integrate individual learning into organisational learning (Wang and Ahmed, 2003). An organisational culture has to do with shared values, beliefs and attitudes that members of an organisation have towards different matters (Wahlström, 2011). The distinction between single-loop and double-loop learning is commonly referred to in discussions on learning from accidents (Argyris, 1999). A double-loop requires that the organisation changes its guiding principles, and/or the values for how to perform the industrial activity as a result of the accident (Jacobsson et al., 2010). There is also criticism towards the notion of a learning organisation. It has for instance been said to merely be a management tool for controlling workers or defined as a subtle way to shape workers’ beliefs, values and behaviour (Dymock and McCarthy, 2006).

The aspects that are relevant for learning organisations also affect experience feedback. An experience feedback process after an accident does for example not only take place in one organisation, and there are differences between how the process works in practice in different areas, i.e. when talking about experience feedback, the learning process most often involves several organisations. For instance, the differences in the extent to which accidents and incidents are reported affect the learning process. A reporting system or reporting routines are needed for the experience feedback process because if not the right accidents and incidents are being reported, learning will not be as effective as it should. It is well-known how the reporting is organized, and how it differs between different sectors etc. and that the quality of reporting differs between
countries and between different types of industries (Kjellén, 2000; Cox et al., 2006). There are also large differences in the extent to which accidents and incidents are reported, and some might say that an organisation’s ability to develop an efficient reporting system depends on its ability to deal with blame and punishment (Cox et al., 2006). Shame and blame are often stressed as the major reasons for not reporting incidents, but there are also other culturally-based reasons for not reporting (Sanne, 2008). Accident reporting systems are used differently in different organisations (Barach and Small, 2000), for instance there are differences between high-reliability organisations and health care (Bagian, 2006). As pointed out by Kjellén (2000) accident reporting is also influenced by the size of the particular business, its resources and the kind of technology being used.

Even if the accident reporting systems are working properly, not all accidents can be investigated and many organisations responsible for accident investigations need to make a selection of which accidents to investigate. To make a good selection one must have a properly functioning selection procedure, i.e. a selection method or a systematic routine. Yet, this is not a reality today, at least not in Swedish authorities (essay V) and not much has been written about the selection routines for investigation of accidents and incidents in the literature.

The investigation is often seen in the literature as the centrepiece of the experience feedback process. There are many proposals in the literature on experience feedback of how to perform accident investigations (e.g. Kletz, 1993; Baxter, 1995; Rozental, 2002; Celik et al., 2010; Prentkovskis et al., 2010, and more) and it is quite popular to write about accident investigation methods (Kjellén, 2000; Rollenhagen, 2003; Hollnagel, 2004; Sklet, 2004; Katsakiori et al., 2008; Le Coze, 2008; Rollenhagen et al., 2010 and others). However, for a functioning experience feedback it is not enough just to carry through an investigation. It also needs to contain data and information that could be useful for accident preventive purposes, and an accident investigation report should be written. This report needs to give recommendations and conclusions on how to prevent similar accidents from happening again.

It is not possible for others to learn from the conclusions and recommendations in the accident investigation report if not this is disseminated. The importance of an efficient dissemination of investigation reports and lessons learned from accidents and incidents have been discussed by several authors (Johnson, 2002; Amoore and Ingram, 2002; Johnson and Holloway, 2003; Krausmann and Mushtaq, 2010; Cambraia et
al., 2010, and more). Lessons learned should be disseminated as widely as possible and should involve all stakeholders (Krausmann and Mushtaq, 2010).

It is crucial that what is disseminated also is implemented (Sweedler, 1995; Johnson and Holloway, 2003; Hasle et al., 2009 and more). The accident investigation process has not come to an end until preventive measures have been implemented (Johnson and Holloway, 2003).

3. RESEARCH QUESTIONS AND METHODS

In section 3.1 a general summary of the important research questions used in the interview studies (essays II-V) will be presented. Section 3.2 will give the reader a short theoretical review of research methods and how the methods have been used in the thesis.

3.1 Research questions

The research questions used in the interview studies in the essays are focused on practical experience feedback in an overall perspective. The questions take their point of departure in the CHAIN model (see more in section 4.1.1) and are a mix of open-ended and closed. Here a summary of important questions that have been used in the studies follows:

1. What definitions for concepts such as accident, incident etc. are used?
2. What kind of and how many accidents and incidents occur in the organisation?
3. Is there an established plan or method for actions to be taken after accidents, and if so, how is this plan designed?
4. How does reporting of accidents work in practice?
5. Is a selection of what accidents to investigate made, and in that case are there any special methods for the selection?
6. How is the accident investigation carried out?
7. To what extent are experiences and knowledge from accidents and accident investigations disseminated?
8. What methods are used to disseminate experiences? Is the dissemination of experiences an active process?
9. What channels for dissemination of experiences and knowledge are being used? Does the information reach the right recipient?
10. What is the procedure for follow-up of experiences and knowledge?
11. How is cooperation with other involved parties carried out? What systematic methods, routines etc. are used for cooperation and coordination?
12. Is learning from accidents evaluated? If so, in what way?
13. Does the organisation have systems in order to retain knowledge and experiences in the organisation even in times of employee turnover? If so, how are these systems designed?
14. How do the rules and regulations that regulate and control the experience feedback process work in practice?
15. Does experience feedback have a low or a high priority in the organisation?

Not all of the research questions have been used in all studies. However, these questions show how the experience feedback process can be designed.

3.2 Research methods

It is often said that qualitative and quantitative methods are each other’s opposites. A division between qualitative and quantitative methods is perhaps self-evident. Still, qualitative and quantitative data can be collected within the same study (Brannen, 1992; Bryman, 1997; Patton, 2002; Eliasson, 2006; Esaiasson et al., 2007). Qualitative findings may be presented alone or in combination with quantitative data. On the simplest level, a combination can be made in a questionnaire or interview that entails both fixed-choice (closed) questions and open-ended questions (Patton, 2002). Another difference that should be mentioned is that a quantitative approach gives the researcher the opportunity to take an outsider’s approach, and to describe and explain an outcome of a study. On the contrary, qualitative studies tend to value nearness to the problem studied, a sort of inside perspective (Olsson and Sörensen, 2007). Both approaches are methodological aimed at finding causes and effects. The quantitative approach emphasizes the use of statistics (for instance
questionnaires) while the qualitative approach rather accentuates ‘softer’ methods such as interviews, conversations, pictures, observations, etc. (Boolsen, 2007). The choice of method is really about choosing a tool that most likely can bring out the information that can be used to answer the researcher’s questions (Eliasson, 2006). It is possible, and perhaps likely, that a question receives different answers depending on the method used, but it is also important to remember that the results might be different also within the same method (Bryman, 1997).

The research questions listed in section 3.1 can be answered by using a mix of qualitative and quantitative methods. Hence, the most appropriate method when studying experience feedback depends on the specific questions in focus. The research questions used in this thesis are not so much focused on theoretical matters as on practical ones. Qualitative interviews were therefore a good way to get information about how it works in practice. Document studies were most suitable when studying experience feedback in workplace health and safety (study of investigation reports), environmental supervision (study of supervision cases), and fire and rescue services (study of incident reports). Table 2 gives an overview of the actual methods used in the essays of this thesis. How these methods were used will more explicitly be presented in section 3.2.1 and 3.2.2.

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<tr>
<th>Essays</th>
<th>Qualitative</th>
<th>Quantitative</th>
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<td></td>
<td>Interviews</td>
<td>Document studies</td>
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<td>Essay 5</td>
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Table 1. Methods used in the studies in the thesis.
3.2.1 Qualitative methods

Interviews

Interviewing people is a way to find out things we cannot directly observe or read about. An interview allows us to enter into another person’s perspective, and the interview situation should always be entered with the assumption that the perspective of others is meaningful, knowable, and possible to make explicit. An advantage with the interview method is that it is flexible. A major disadvantage is that the transcription of interviews and the analysis of transcripts are very time-consuming (Bryman, 2008). The main purpose of the method is to find out what is in and on someone else’s mind and to gather their stories (Patton, 2002). The interviews carried out in the studies in this thesis were semi-structured. In a semi-structured interview the researcher has a list of questions or fairly specific topics to be covered, which often is called an interview guide. The questions asked must not follow an exactly outlined path and questions that are not included in the interview guide may be asked. Still, all questions in the interview guide should be asked in all interviews in a similar way. A characteristic feature is that the semi-structured interview is flexible and that the emphasis must be on how the interviewees frame and understand issues and events (Bryman, 2008). In this thesis, interviews have been an important part of essay II, III, and V (two interviews were made also for essay IV but only used as background material), and were all conducted with a semi-structured approach with open-ended questions. The interview data in the studies has been analysed using inductive thematic analysis, which implies discovering patterns, themes and categories in one’s data (Patton, 2002). In the analysis the collected data is structured in themes, and in an inductive thematic analysis the collected data is structured with starting point in the data itself, in contrast to a deductive thematic analysis which has its foundation in theory. An inductive analysis can be combined with a deductive approach. It is not always possible for the researcher to have a clear and not preconceived understanding since he or she could have been influenced by earlier similar studies etc. and it is not always feasible or not even necessary to start over again unbiased. That is why it is possible to combine these two approaches in order to raise the validity (Hayes, 2000; Langemar, 2008) and since the steps in the CHAIN model (see more in section 4.1.1) had a prominent role when developing the interview guides, it has of course coloured my pre-understanding.
According to Langemar (2008) it is feasible to combine inductive and deductive themes. This means that in the first search for patterns or themes were the links in the CHAIN apparent, but were put aside in the latter readings in order to give life to new themes. The interview processes and analyses has been categorised in the following order:

General preparations:
1. Developing a semi-structured interview guide with open-ended question.
2. Establishing contact with potential interviewees. These persons were asked to participate, and if the answer was positive, time and date was decided for the interview.
3. Interview questions or main points for the interview were sent out to the interviewees.

The interview procedure:
4. The interview occasion. Most interviews were made by telephone since the interviewees were spread all over Sweden and telephone interviews are less time-consuming. It was judged that possible differences between face-to-face interviews and telephone interviews were small (Bryman, 2008). All interviews were audio-recorded. The interviewees were informed that their interviews could be published.

The analysis preparation procedure:
5. The interview material was transcribed from the audio-recording as soon as possible after the interview. An edited version of the transcription was sent out to the interviewees and they were given the opportunity to make clarifying changes in the text. The adjusted text was used in the analysis.
6. The method used was inductive thematic analysis which implies discovering patterns, themes and categories in ones data (Patton, 2002). The transcribed text was thoroughly read several times at least by two persons and sorted into keywords. The keywords emerged into themes and the themes were sorted in categories. After several thorough readings, the final themes were ready for use.

In essay II three interview sets were carried through (six members of the HAKO expert group, three members of the HAKO secretariat, eight district inspectors, and seven persons working with workplace health and
safety in external organisations that had been involved in a HAKO investigation). The themes in the interview sets were slightly different from each other depending on the interviewees. The transcribed interviews were coded under these themes and this sorted text was used in the further analyses.

<table>
<thead>
<tr>
<th>Expert group:</th>
<th>District inspectors:</th>
<th>HAKO secretariat:</th>
<th>External organisations:</th>
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<tbody>
<tr>
<td>• Possibility to prioritize HAKO</td>
<td>• Possibility to prioritize HAKO</td>
<td>• Starting up an investigation (reporting, selection etc.)</td>
<td>• Knowledge about HAKO</td>
</tr>
<tr>
<td>• Follow-up of recommendations</td>
<td>• Need for improvement</td>
<td>• Aim and ambition with the reports</td>
<td>• Reading a report</td>
</tr>
<tr>
<td>• Competence and education</td>
<td>• Time to finish a report</td>
<td>• Time taken for the reports</td>
<td>• Contact with HAKO</td>
</tr>
<tr>
<td>• Co-operation and contacts</td>
<td>• Competence and accessibility</td>
<td>• Communication plans</td>
<td>• Need for improvement</td>
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<td>• Dissemination of reports and recommendations</td>
<td>• Dissemination of reports</td>
<td>• Quality of reports</td>
<td></td>
</tr>
<tr>
<td>• Need for improvement</td>
<td></td>
<td>• Dissemination</td>
<td></td>
</tr>
</tbody>
</table>

In essay III a structured interview was conducted with a senior representative of each of the eleven participating municipalities. They were asked general questions as well as questions about their environmental supervision cases. Thematic analysis was used to analyse the general questions.

**Municipal supervision inspectors:**
- Resources and lack of time
- Co-operation
- Judicial issues
- Collaboration and contact with public prosecutors
- Organisational issues concerning experience feedback
- Need for improvement concerning experience feedback

*Continued on next page*
Interpreting the law
Dissemination of knowledge

Essay V is based on interviews with 21 Swedish authorities working with accident prevention. Two of the authorities choose to answer the questions in writing. The identified themes for the analysis were:

**Swedish authorities, study 1:**
- Organisation
- Definition of ‘accident’ concept
- Reporting of accidents and incidents
- Selection of what to investigate
- Investigation of accidents and incidents
- Methodology for investigation
- Dissemination
- Co-operation
- Follow-up
- Evaluation of the processes
- Weaknesses and strengths concerning experience feedback

**Swedish authorities, study 2:**
- Learning from positive examples
- Informal networks
- Media
- Communication or information

**Document studies**
The data in a document study can consist of excerpts, quotations, or entire passages from organisational, clinical or program records; memoranda and correspondence, official publications and reports; personal diaries; and open-ended written responses to questionnaires and surveys (Patton, 2002). This method aims at finding the essential content in a material through reading parts of the text, the entire text and the context in which the different parts of the text are included. Some blocks in a text might be more important than others. An essential benefit is that when necessary a text can be deeply penetrated to find underlying information that can only be found through intense reading of the text (Esaiasson et al., 2007). The fact that the documents are already available for the researcher to work on
can sometimes make it less time-consuming than to start by collecting interviews. On the other hand, the search for relevant documents is often a frustrating and a very protracted process and once they are collected, considerable interpretative skills are required to uncover the material (Bryman, 2008). A further problem with the methods is that important routines and decisions in an organisation may not be written down, or the documents may not have been kept or made available to the researcher.

Document studies have been carried out in essays II, III, and IV. The document material has been scrutinized by at least two persons.

In essay II, all 15 accident investigation reports from the Swedish Work Environment Authority’s accident investigation board were studied and analysed. The investigation reports was analysed using the boards own investigation criteria which were: (1) Course of events, (2) Graphical representation, (3a) Underlying causes – organisation, (3b) Underlying causes – people, (4) Direct causes – organisation, (5) Underlying causes – technology, (6) Direct causes – technology, (7) Legal failure analysis, and (8) Conclusions and recommendations. The results from this analysis were categorized by the use of the CHAIN model (see more in section 4.1.1).

In essay III, inspection reports from eleven Swedish environmental supervision offices were studied and analysed. The information in the inspection reports was sorted under categories (the categories were created as the themes in an inductive/deductive thematic analysis. When information was missing in an inspection report, follow-up interviews with involved personnel were conducted as well as follow-up studies of relevant documentation. The material was analysed with starting point in the CHAIN model (section 4.1.1). The categories were:

<table>
<thead>
<tr>
<th>Inspection report categories:</th>
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</thead>
<tbody>
<tr>
<td>Case summary</td>
</tr>
<tr>
<td>Reporting (of cases to the environment administration)</td>
</tr>
<tr>
<td>Duration of investigation process</td>
</tr>
<tr>
<td>Legislation</td>
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<tr>
<td>Involved companies and authorities</td>
</tr>
<tr>
<td>Preparation work before inspection</td>
</tr>
<tr>
<td>Inspection routines</td>
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<tr>
<td>Realization of inspection</td>
</tr>
<tr>
<td>Documentation methods</td>
</tr>
<tr>
<td>Proof securing at inspection</td>
</tr>
<tr>
<td>Dissemination of information (to mass media, other authorities, and others)</td>
</tr>
</tbody>
</table>

Continued on next page
• Dissemination routines
• Collaboration with other authorities
• Allocation of responsibility of general experience feedback
• Measures taken by the company
• Measures taken by the administration
• Follow-up of the case
• Results from the case
• Changes on account of the case
• Experiences from the case

In essay IV all incident reports (1120 reports) from two municipal rescue services from one year were studied and analysed. All incident reports were thoroughly read and databases were created containing information from all the studied reports. A thorough categorization of the accidents and incidents was made mainly based on the rescue service’s own categories, such as fire in building, traffic accident, false alarm, outlet of dangerous substance, etc. The file number, incident category, basic information about the incident and all the information provided under the heading “Suggestions for improvement” was registered in the database. The information in the database was categorized under the following categories: Incident report number, type of errand, damage on property or person, accident cause, description of the accident, the rescue operation, evolution of the rescue operation, and need for improvement. The primary analysis of the information in the databases was discussed with one senior staff member from each of the rescue services in order to scrutinize and clarify important issues found in the reports. Three questions were used as a point of departure for these discussions: (1) What kind of experience feedback related issues can be found in the category? (2) Who should have information about improvement suggestions? (3) Are there channels and resources in the municipality to disseminate information and knowledge to other concerned parties? Their comments were taken into account in the analysis of the material.

Scientific literature

Almost all science starts with a thorough study of previous documentation in the research field of interest. This literature study helps the researcher to formulate a research question, find out what is missing in the present field of research interest, choose definitions of concepts, and apply or improve
the methods that have been used in previous studies. The scientific literature has, of course, been important in all the five essays in this thesis but one was completely based on literature (essay I) and provides a research overview. This paper was based on literature identified through a thorough search in Science Citation Index with the following search words: accident, incident, prevention, lessons learned, and near misses. This search was carried out in the years 2005 to 2007 and it was restricted to publications in English. Additional searches have been done mostly in 2008 and 2009.

3.2.2 Quantitative methods

Questionnaires

A questionnaire, or a self-completion questionnaire which is a term often used in social science, is a method that invites or forces the respondents to answer by themselves since there are no interviewer to ask the questions. The respondents must read and answer the questions on their own (Bryman, 2008). The contact between the researcher and the persons participating in a questionnaire study are most often sporadic or non-existent. This distance between the researcher and the subjects can be seen as an advantage (Olsson and Sörensen, 2007). For example, questionnaires are most often anonymous which gives the participants the opportunity to answer the questions more honestly, even if the answer may not be as thorough as it could have been in a qualitative interview. There is also a risk for unintentional leading questions but still, a questionnaire has the advantage that it provides the researcher with extensive data, it is time-saving and many people can be reached in a cost-efficient manner. In some cases it may be easier for the participants to answer emotional or in other ways sensitive questions in a questionnaire.

One study containing a self-completion questionnaire with ten multiple-choice questions was conducted (essay II). It was possible to write comments after each question. It was distributed to all heads and deputy heads of inspection districts and to a random selection of inspectors at the Swedish Work Environment Authority. 130 persons received this questionnaire. The response rate was 78 per cent (102 of 130) which is a 4 on a sliding scale from 1 to 5 where 1 is not acceptable and 5 is excellent (Mangione, 1995, cf. Bryman 2008). The software survey program Opinio
was used to administer the survey (and for the analysis). The reason why a survey was used in this study was because the aim of the study was to investigate perceptions and opinions about the investigation board among a representative selection of the personnel and their superiors. In this study anonymity was judged to be extra important.

**Content analysis**

Content analysis seeks to quantify content in terms of predetermined categories in a systematic and replicable manner (Bryman, 2008). Such an analysis can result in a report of how frequently different categories in a material occur (Esaiasson et al., 2007). As a method, it is very transparent, flexible and can be applied to a variety of different sources of information. The coding scheme and sampling procedures clearly can be set out so that replications and follow-up studies are feasible. It is applicable to many different forms of unstructured information, such as transcripts of semi- and unstructured interviews and even qualitative case studies of organisations. Hence, a disadvantage is that a content analysis can only be as representative and as informative as the documents analysed. A content analysis is firmly rooted in a quantitative research strategy in that the aim is to produce quantitative accounts of a raw material in terms of specified categories (Bryman, 2008). Counting phenomenon or phenomena of interest in the results is one of its benefits. Simply, by using a computer program or by hand, count the occurrence of a certain category or tendency in a material (Esaiasson et al., 2007). Counting of interesting phenomena in documents by hand was used in essays III, IV, and V. Perhaps the method has been most central in essay IV. The categorizations and the information sorted in the categories based on the incident reports (more thoroughly described in section 3.2.1) and the improvement suggestions has been counted.

In the other essays the method was used more as a support than as a main tool. The documents (interviews, incident report forms, authority documents) studied were sorted into different categories and these categories were counted. The sorted and counted material gave a very good overview of the material, and from this some general conclusions could be drawn.
Official statistics

Central authorities are required to keep a running record of their areas of activity, and these records form the official statistics. There are many advantages connected to the use of such data, one being that the data is already collected. Using official statistics can be a good opportunity to employ high-quality data sets that are based on large and reasonably representative samples (Bryman, 2008). However, there is a risk involved when using such data. The researcher should use data that he or she has good reasons to trust and always remember that statistics not is infallible just because it is official. Official statistics have been used as a complementary source for information in essay II, III, IV, and V.

4. RESULTS AND RECOMMENDATIONS

Section 4.1 summarizes the main results from the essays. In section 4.2 recommendations from the essays will be presented.

4.1 Summary of results from the essays

There are differences between reporting systems in different sectors and in different countries (Kjellén, 2000; Cox et al., 2006). This has been pointed out in the literature review presented in essay I, and it was also visible in essay V, since the reporting of accidents in Swedish authorities only in a few cases is based on legal requirements but in most cases built on a voluntary ground. Reporting is only partly relevant in municipal environmental supervision (essay III). Their work is often built on scheduled inspections even if anyone who discovers a violation against the Environmental Code can report this to a municipal environmental supervision administration. The operative work carried through by the municipal rescue services often start when someone is reporting something to SOS Alarm (essay IV).³

It does not seem to be a problem or contested issue for the participating authorities in the thesis to select what accidents and incidents

³ A company owned by the Swedish Government and the Swedish Association of Local Authorities and Regions which administrates the Swedish emergency number, 112.
to investigate. Some of them have the possibility to investigate all accidents but most of them have to make a selection. The results from essay II-V revealed that none of the participating authorities seem to have a problem with the selection even if systematic routines do not always exist. However, clear and distinct criteria for the selection process could be useful in order to increase the chances that the ‘right’ accidents and incidents are chosen from an experience feedback point of view.

Essay V showed that seven of the 21 Swedish authorities studied regularly investigate individual accidents. Four of these authorities use one or several special investigation methods, two do not have a special method and one of the authorities did not answer the question.

An important result from essay II and essay V is the importance of an engaged and interested staff for a well-functioning experience feedback. It is also essential for the staff to have functioning collaborations, both within and between organisations, in formal and informal networks. For example, the results of essay III show that municipal inspectors do not get enough feedback from the legal cases they have reported to the public prosecutors and therefore they cannot learn which cases should be reported and how such cases best should be prepared. A previous Swedish study of eleven authorities showed that there is a lack of cross-sectoral collaborations concerning development work on safety issues (Harms-Ringdahl and Ohlsson, 1995). An example from one of the essays where a closer collaboration was pointed out as useful is essay III. Networks and co-operation groups are also extremely important for the dissemination process, which has been identified as the weakest link in the chain in all of the essays. In experience feedback the central aim is to prevent accidents, and towards that aim knowledge and information about how to prevent accidents need to be disseminated to those who can make a difference. Follow-up of the experience feedback work is also essential in order to find out if recommendations and taken measures have had the desired result.

4.1.1 CHAIN model

Practical experience feedback could use a model, a sort of tool to use in practical work, and such a model was developed within the scope of this thesis. This model was first introduced in an evaluation of the Swedish Work Environment Authority. It has been explicitly used in essay I-III, and more implicitly in essay V. (For a more extensive description of the CHAIN model, see essay I, II or III.) An important criterion when
developing an experience feedback model for practical use focused on accident or incident investigation was that it had to be applicable in several different sectors but still describe the investigation process in a functional way. The CHAIN model is built by links in a chain (see figure 1) and it consists of a chain of accident investigation steps. The first step is the reporting of accidents and incidents to the responsible party. The second step is the selection of accidents and incidents in need of a special investigation. The third step is the investigation process that is the centrepiece of this process. The fourth step is the dissemination of experiences and results from the investigation to those affected. Finally, the fifth step is the implementation of preventive measures in places where similar accidents may occur. Evaluation and follow-up of the whole process was not an explicit part of the CHAIN model from the beginning but it should be an important part of experience feedback and it should be included continuously in the whole process. Each step of the CHAIN could in fact carry through evaluation and follow-up in order to improve and make the process as effective as possible.

The CHAIN model is very comprehensive which is also one of its benefits. There are other similar models described in the literature. The steps in the CHAIN model have some resemblance with the steps in a process of learning lessons from accidents in MARS database system (Major Accident Reporting System). These steps normally include: (1) Data collection and reporting, (2) Analysis, (3) Decisions, (4) Implementation, (5) Control/check, and (6) Evaluation and act. These steps form a loop, a ‘learning loop’ that could be applied to several levels (Jacobsson et al., 2010). Lundberg et al. (2009) propose a nine stage set for accident investigation that investigators often encounter in one way or the other: The nine stages are: (1) Initiation of an investigation, (2) Planning, (3) Data collection, (4) Representation, (5) Analysis of the accident/incident, (6) Recommendations, (7) Documentation/ writing the report, (8) Decisions about actions and implementation of remedial actions, and (9) Follow-up activities. The core message in these nine stages has similarities with the CHAIN but it does not explicitly describe the dissemination procedure, even though it is implied in the follow-up stage. Krausmann and Mushtaq (2006) present a six step methodology: (1) Investigation of accidents and disasters, (2) Reporting of accidents and disasters, (3) Data collection, (4) Data analysis, (5) Generation of lessons learned, and (6) Implementation of lessons learned. This methodology has its focus on accidents in connection to the MARS database for major accidents and the NEDIES knowledge
base for natural accidents. The latter two methodologies (Lundberg et al., 2009 and Krausmann and Mushtaq, 2006) contain more details than the CHAIN model but a strength of using the CHAIN model for analysis is that the image of a chain emphasizes that the whole process fails if one step or link is weak or missing. All links must work properly; otherwise, the whole chain will fail. An alternative possibility would be to present the links in a closed-loop. However, it is more important that all the steps in the CHAIN need to work properly for the experience feedback process to run smoothly. Evaluation and follow-up is essential and this needs to be done continuously throughout the whole process. The areas studied in this thesis are of various types and the accidents and incidents that were related to the areas studied were also different. The CHAIN model was developed because a model that could be applied to many different areas and possible to use in different accident categories was needed. Characteristic for the CHAIN is its focus on the practical performance of experience feedback.

![CHAIN model](image)

Figure 1. The CHAIN model is built by five links in a chain.

This model can be criticized for being simple but its advantage is that it can be used in different organizations. It is easy to remember the stages and the fact that they all are connected.

### 4.1.2 Quality criteria

Another aim of this thesis was to develop quality criteria for a practical experience feedback process. Within the scope of the thesis, seven quality criteria for the experience feedback process were developed using the CHAIN model as a point of departure. Good quality when it comes to experience feedback should refer to efficiency in preventing future
accidents from happening and reducing negative consequences of accidents that we cannot avoid. Such a demand for quality is essential but it is more useful to make the demand more explicit. The quality demand has therefore been divided into subcategories in the shape of quality criteria which should be easier to use in practice. One goal when developing these criteria was to find the key content in the learning process steps after an accident or incident, and to make the criteria as wide but still as clear as possible. The purpose was to create criteria that would be useful in different sectors and in several different investigations. The criteria are:

(1) Reporting system for accidents and incidents

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

(2) Selection methodology

A well-functioning and suitable 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.

(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. This should be a communicative procedure, not merely an informative one. It is important that information, knowledge and experiences are received and that the recipient knows what to do with the message.
(5) Preventive measures

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

(6) Evaluation and follow-up

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

(7) Co-operation

A properly functioning collaboration between involved parties is needed. Forums, formal or informal, for the exchange of experiences are needed.

These quality criteria can be used as tools to organize the process surrounding the practical work with experience feedback. An authority or other organisation can use the criteria to make follow-up studies of their own work in order to find possible flaws.

4.2 Recommendations

Important recommendations from the essays will be presented in this section. The recommendations were chosen because they are general and practically oriented, and therefore could be valuable for different authorities and organisations. Yet, one of the recommendations is directed towards the municipal rescue services, but this recommendation was judged to be a good example of the need to avoid looking at recipients as one uniform group.

Recommendations

- Accident investigations should be timely and a date when the investigation should be finished must be set. It is not always possible to set up a time schedule, but still, it should be an overall aim to make the investigations as effective as possible in order to raise their credibility. It is also important to send out the investigation reports as quickly as possible with recommendations on how to prevent similar accidents from happening again.

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Personnel working with accident investigations and accident prevention need education about this. Time and resources have to be spent on humans working in the learning processes. A database or a systematic method for investigation is useless if no one knows how to use it and has an interest in using it. A general accident investigation education is needed. Such an education might affect the whole experience feedback process, for example because it might bring an opportunity for the participants to meet over the boundaries, and offer a common understanding of accidents and prevention. An example of a basic course for accident investigators is organized by Karlstad University. The target group for this course is primarily new and inexperienced accident investigators. This course will start in Sweden in 2011.

All accident investigation reports need clear addressees, i.e. persons or organisations responsible for implementation of recommendations etc. One way is to add a communication plan to every accident investigation report. Communication plans should make the dissemination of results and knowledge easier and more effective.

Suitable recipients of information from the rescue service’s incident reports need to be identified. Such recipients can be sorted into two major categories: (1) local recipients such as local companies and landlords and the local municipal authorities, and (2) non-local recipients such as companies producing a faulty device and national authorities responsible for regulation and oversight in various areas. The information in the rescue service’s incident reports needs to be disseminated to persons and organisations that are in a position to use it to prevent future accidents or reduce their consequences. The number of possible recipients is large. Dividing them into two categories might make the dissemination process easier and checkboxes for the more common recipients may facilitate the filling in of the forms.

When disseminating results from accident investigations it has to be clarified if the method used is based on information or communication. There is nothing wrong with information, but it is important to remember that communication is something else. Is information enough or is communication, which includes some sort of dialogue, necessary when disseminating results and knowledge from an accident investigation? This needs to be clarified in all organisations working with experience feedback.

Dissemination of experiences, knowledge and results should take place in proper forums. The recipients of knowledge and results from accident investigations must be met in the right forums. Only publishing accident investigation reports on a website is most often not enough. The dissemination needs to be more actively oriented, for example by publishing information in trade journals, organising seminars, public deliberations or stakeholder conferences, etc.

It is important to learn not only from accidents but also from successes in preventive work. There is much to learn also from positive example of how different organisations carry out accident prevention.
5. FINAL CONCLUSIONS AND LOOKING TOWARDS THE FUTURE

Much research on experience feedback is focused on accidents in the process industry and the transport sector. To conclude this thesis I would like to emphasize the importance of learning from the past also when it comes to everyday accidents such as when a child falls from a climbing-frame on a playground, or a man falls overboard from his small fishing boat, or an old lady slips on the street outside her house. Such small-scale, everyday accidents have been the starting point for the experience feedback process central in this thesis. Two interesting questions that have come up during the work with this thesis are: Who is responsible for the investigation and learning from accidents? Is it even a reasonable effort to try to prevent all accidents? An answer to the first question concerning responsibility is that there is almost always an authority (local, regional or central) with some responsibility (implicitly or explicitly) for the prevention of future accidents. The authorities often lack the power to carry out practical preventive measures, but they could still have one important task when it comes to prevention of accidents which would be to follow the development in their area of responsibility and, when needed, propose improvements. Experience feedback can provide authorities with tools to do this. An answer to the latter question should be yes, we ought to try to avoid all accidents. Accidents are a reality in our society and our overall aim should be to avoid accidents. This is of course not possible to carry out as accidents will always occur. But if we do not try to protect ourselves and our surrounding from all accidents, another question emerges: where should we draw the line, i.e. what accidents should we try to avoid or how many accidents are acceptable?

It should be possible to prevent an accident without having to first suffer one. There are previous positive examples of how accidents were prevented and therefore only became near-accidents. Near-accidents should also be starting points for experience feedback and information from them should therefore be disseminated. This leads us back to the common denominator in all of the essays in this thesis; the need for an improved dissemination process of experiences, knowledge and results from accidents, incidents and near-accidents. The dissemination process did not work satisfactorily in any of the three areas studied in detail in this thesis, namely the Swedish Work Environment Authority's investigation
board, Swedish municipal environment supervision, or the local rescue services. Why does the dissemination procedure not work? There may be four major reasons for this:

- Indistinctly allocated responsibility.
- Lack of resources; both financially and in terms of personnel.
- Recipients are not susceptible, i.e. the recipients do not have the skills needed to receive what is disseminated.
- Organisations do not have a memory.

It needs to be clarified who is responsible for the dissemination process. Organisations working with accident prevention in governmental authorities, local municipalities, companies, etc. need to have at least one appointed person who is responsible for disseminating knowledge and experiences from accidents and accident investigations. These persons need to have a personal interest in questions relating to experience feedback and perhaps also some sort of special education. As was mentioned in section 4.2, an education for accident investigators is about to start in Sweden in 2011 and it will hopefully match this need.

The disseminated message needs to be taken care of by a recipient with suitable skills and an interest in making use of the information (recommendations, etc.) in their organisation. In other words, the actors that receive the information must be susceptible to the message that is disseminated. Both time and money ought to be devoted to experience feedback issues, and since organisations have no memory (Kletz, 2002), systems are needed to retain knowledge and experiences in the organisation in times of staff turnover. Yet, these systems have to rely on individuals in the organisation. Individual learning is necessary for the organisational learning to occur and learning starts at an individual level, but it is essential to remember that people have flaws in their memory capacity.

It has become clear that the dissemination is the most troublesome link. This affects the whole process, especially prevention but also reporting, since dissemination can function as a form of feedback to those who report accidents and incidents. Without a well functioning investigation process, there will be no material for a learning process, and feedback will not have the desired effect. Dissemination should not only be a matter of handing over information, it should be combined with a communication process. Communication is more than just sending out information; it implies a dialogue, an exchange of ideas and opinions.
between two or more parties. Publishing information on a website or giving information to a newspaper does not qualify as communication.

The process of learning from accidents needs a more proactive approach. Rasmussen and Svedung’s (2000) definition of the concept is useful. They define proactive as something that is prior to an accident. Proactive thinking takes place before an accident and experience feedback starts when an accident already happened so at first sight this thought may seem contradictory. Still, a proactive approach should be a part of experience feedback because there is always a “before” potential future accidents and as was stated in section 4.1.2, the quality demand is to prevent accidents or reduce consequences after an accident. It might be easier to look back and discover what ought to have been done than it is to notice and deal with risks in advance (Jørgensen, 2011) but a preventive philosophy should be included in experience feedback with future accidents in mind.

Some areas concerning experience feedback are in need of further research, one example is the investigation of differences between reporting systems in different sectors and in different countries. A comparison of reporting systems in various countries would be interesting and could stimulate renewed thoughts in existing systems. There are also differences in the quality of initial reports, i.e. the forms that are used to report accidents and incidents, and also in the promptness with which they are delivered. Research is also needed to learn more about the selection of accidents for investigation. Even though much has been written about different investigation methods, the efficiency of the methods is in need of more systematic studies. Accident databases are common objects of research but more studies are needed on how they are used in practice. There is also a need for more research on how and to what extent conclusions from accident investigations are disseminated, and on the actual effects that accident investigation reports have on preventive measures. The integration of experience feedback systems into overall systems of risk management is an important area for future research and evaluation studies are needed to provide evidence-based information about the effects of various methodologies and organisational structures for accident investigation on the future prevalence of accidents.

It would also be interesting to look closer into whether or not there is somebody with a moral responsibility or a moral obligation concerning experience feedback. Kletz concludes that if someone has information which could be used to prevent accidents, then this someone has a moral
duty to pass the information on to other people (Kletz, 2008). Interesting questions to ask in this context are: Do we have an obligation to pass information about how to prevent accidents on to other people? Who has this obligation? Is it individuals or organisations? What does this obligation embrace and how far does this obligation go? What is the recipients’ responsibility with respect to the communicated message?

One of the things that unite accidents such as those mentioned in the introduction (car crash, elderly lady falling from a ladder and a skiing accident) with major accidents (train and aircraft accidents, etc.) and large-scale accidents (nuclear power plant melt-down, etc.) is the need for an experience feedback process in order to learn from and prevent future accidents. There are things to learn from all accidents in one way or the other, but it is not always possible to foresee exactly what.

Finally, I would like to highlight learning from positive events and permanently add this to my experience feedback definition. If it is an accident, incident, a near-accident, or a positive event that starts the experience feedback process should not be important. What is important is that we do not stop trying to prevent accidents from happening, and from this perspective it would be a waste if we did not take advantage of the past in order to improve the future.

6. PREVIEW OF ESSAYS I-V

In this section, I will summarise the contents of essays I-V. All papers in this thesis have either been published in international peer reviewed journals or are under consideration for publication in such journals. The order of the essays is based on the order when the projects started. The work with essay I has been ongoing between the years 2006-2009 and has served as a basis for the other essays.

*Essay I.* “Learning from Accidents – What More Do We Need to Know” was written in collaboration with Professors Sven Ove Hansson and Carl Rollenhagen. The essay is an overview of the literature on learning from accidents and incidents. The CHAIN model has been used in this essay as a tool to categorise the findings; reporting, selection, investigation, dissemination
and prevention. The focus is on literature that evaluates the usefulness of different methods of accident investigation.

Much has been written on the reporting of accidents and incidents. Accidents are often reported in databases and several of these databases are well described in the research literature. However, the literature indicates that there are large differences between different sectors and industries in the prevalence of reporting from accidents and incidents.

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 evaluate actual selection processes against carefully constructed adequacy criteria.

It is easy to find literature on the investigation process. Still, most of the literature consists of proposals for how investigations should be performed and the methods that should be used. Different models and methods for accident investigation have also been a focus in the literature. No studies could be found that contain systematic evaluations and comparisons of accident investigation methods with respect to their efficiency in identifying measures to be taken to avoid future accidents or empirical and comparative evaluations of different approaches to the learning process.

There are only a small number of studies found on dissemination of results from accident investigations. An accident investigation process is not complete until its recommendations have been implemented for the future safety of the system to be protected. Therefore the prevention step in the CHAIN is very important. However, only a few studies have been found on the effects of accident investigations on the implementation of actual preventive measures.

Important topics for future studies of experience feedback are proposed, and 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 II.** “Evaluating the effectiveness of an investigation board for workplace accidents” was written together with Professor Sven Ove Hansson. This essay is the result of an evaluation carried out by the authors on the commission of the Swedish Work Environment Authority (SWEA).
In 2001, SWEA initiated an accident investigation board called HAKO (Haverikommissionen) with the purpose to improve SWEA’s accident investigations and make them more efficient. Another important purpose with HAKO’s work was that they should produce a deeper and broader understanding of what causes occupational accidents and disseminate this information, both internally and externally. The theoretical base for this essay was the CHAIN model and the results from the study were compared to the model which led to the conclusions that the board has been successful in establishing a high qualitative standard for investigating workplace accidents but that the investigation process should be speeded up if the board’s reports are to realise their full potential. The analysis and evaluation of HAKO showed that dissemination is the weakest link, and a follow-up system is needed. This is unfortunate because HAKO managed to establish a high qualitative level in their investigations of workplace accidents that should set a standard for such investigations in general. The reports are thoroughly written and thought through but despite their quality the reports had limited impact since they were not disseminated effectively enough. HAKO has since been closed down.

More details are available in a report in Swedish (Hansson and Lindberg, 2004).

**Essay III.** The third essay, “Learning from experience in municipal environment inspection” is based on an empirical study carried out in 2005/2006 with financial support from the Swedish Environmental Protection Agency. Twenty-six environmental supervision cases from eleven municipal Environment and Health Administrations in Sweden were studied. Additional structured interviews were made with a senior representative in each of the eleven municipalities. Follow-up interviews with involved companies, authorities or other organisations were made when needed. The purpose with the study was to investigate how and to what extent experience feedback and other exchange of experiences take place among municipal environmental authorities. To identify unfulfilled demands of such communication was also important. The Swedish municipal supervision system is described in the essay, and a brief exposition is made of the supervision cases. These cases are analysed. The interviews conducted with supervision inspectors are summarized. There are two major problems affecting experience feedback discussed in the essay. (1) The inspectors need more guidance on how to interpret the law and what to demand of the inspected companies. (2) The inspectors want
more information about what happens to the legal cases they report to public prosecutors and the police. Overall, they expressed a need for more co-operations with other agencies dealing with similar issues. Central authorities could take a more active role in guidance and experience feedback. It is also concluded that it is important to learn also from incidents and near misses.

More details are available in a report in Swedish (Lindberg, 2006).

**Essay IV.** The main aim of this essay, “Accident prevention through experience feedback from the rescue services. A study of incident reports in Sweden”, written together with Sven Ove Hansson was to investigate if information from municipal fire and rescue services could be used to improve experience feedback in sectors where it is at present weak or non-existent. The study encompasses 1120 incident reports from two local Swedish rescue services. These reports contained 217 proposals for improvement but these were not much used for experience feedback. Two important questions are answered in the essay: (1) if the information obtained by the rescue services in their normal operations potentially can contribute to a more efficient and comprehensive experience feedback system, and if so, (2) what measures are needed to realize this potential. The conclusion is that incident report forms contain valuable information that can be used to prevent future accidents, although the reports are not currently used systematically for that purpose. The crucial action needed is to disseminate information already available in the incident reports to persons and organisations who are in a position to use it to prevent future accidents or reduce their consequences. This is not a surprising answer since previous research shows that lacking or insufficient dissemination is a common problem in experience feedback. A first step in dissemination should be to identify suitable recipients for the information. We found that there are two major categories of suitable recipients: (1) local recipients such as local companies and landlords and the local (municipal) authorities, and (2) non-local recipients such as companies producing a faulty device and national authorities responsible for regulation and oversight in various areas. In this essay it was proposed that two further items should be added to the incident report form, namely “Local recipients of proposals” and “Other recipients of proposals”. The use of checkboxes for the most common recipients could facilitate the filling in of the forms.

More details are available in a report in Swedish (Lindberg, 2009).
**Essay V.** The fifth essay, “Investigating experience feedback in Swedish authorities”, was written in collaboration with Misse Wester. Two interview studies are reported. In the first study 21 Swedish authorities involved in accident prevention in different sectors were interviewed about their practical experience feedback work. The second interview study was conducted with seven of the participating authorities from the first study and had its focus on practical communication procedures, how authorities communicate results, knowledge and experiences within their own organisation, and to other authorities and external parties.

One result was that the participating authorities reported that in practice they have a functioning experience feedback, despite lack of systematic routines and methods. Nevertheless, only four of the 21 participating authorities handle the whole experience feedback process. These four authorities have a common denominator: they have an experience feedback that is turning more inwards than outwards. All the participating authorities need to improve and systematize the dissemination of experiences, knowledge and results. It is claimed that an improved dissemination can have a positive effect on other procedures such as the reporting of accidents. It is also concluded that it is an almost impossible task to agree on one definition of the term ‘accident’. Still, it is striking that there is no agreement on the term among the participating authorities, and the implications of this lacking definition need to be addressed.

Another important conclusion was that the learning process has to be more proactively oriented, and a crucial factor is the need for interested and engaged personnel. A joint education for accident investigators is recommended. Potential recipients of experiences, knowledge and results have to be met on proper arenas and in the right forums. It is also important to remember to discuss the positive examples from the work of accident investigations and experience feedback.

More details are available in a report in Swedish (Lindberg, 2010).
REFERENCES


The Swedish Civil Contingencies Agency (Former Swedish Rescue Services Agency): [www.srv.se/nco](http://www.srv.se/nco) Downloaded 2006-06-01.


