

CHAPTER A.1

INTRODUCTION:

THE GOALS OF EVENT ANALYSIS

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1. SETTING THE SCENE

A natural response after an accident is to start looking for someone to blame, someone to pick up the pieces and someone to foot the bill for the damage and the victims. The headlines in the media the day after a disaster will almost certainly point the finger at human error, whether it be of the aircraft pilot, the manager or the operators of the chemical plant, or the captain of the ferry. We seem to attach a high priority to fixing responsibility and blame. By so doing we localise and encapsulate the events in a way which is understandable and manageable. Something or someone failed; if that can be tracked down and put right, we can all sleep soundly in our beds again.

A second natural response to dramatic and unexpected events, such as disasters, is to want to understand them; to delve into the details of how they could have happened and how people could have reacted as they did; to judge behaviour, whether as heroic, despicable or pitiable. Disasters make good reading and even better film and television; even minor accidents if well told, make stories which stay in the mind and fascinate like a good detective novel.

Usually later in time comes a third response to disasters. They are so terrible that they must never be allowed to happen again. We must learn from the events which led up to them; modify our behaviour, or that of those we have sought to blame; take precautions so that we are never confronted again with the same scenes of destruction.

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This feeling sometimes becomes linked closely to the exact events which have occurred, but sometimes extends further to encompass a wish to learn how to prevent all accidents of the same class or with the same technology. Ferry accidents since the Estonia, and before that the Herald of Free Enterprise and nuclear accidents since Chernobyl fall into that category.

These are the responses to major disasters which hit the headlines. The same type of reactions, albeit in less traumatic form, greet more minor accidents or near misses. Then there is often a fourth response, namely to breathe a sigh of relief that it was not worse and to try to forget about it as fast as possible, because it is an embarrassing reminder of one's fallibility and wrong decision making. Where this last response dominates, many valuable opportunities for learning go by the board.

This book is about all of these responses and how we can try to manage them. It is derived from a workshop held in the summer of 1995 at Bad Homburg under the auspices of the Werner-Reimers-Foundation and the Maison des Sciences de l'Homme. Researchers and managers from seven countries met to address the question of how to manage the stages of learning from disasters and from less dramatic accidental events and to answer questions such as:

- how data could be collected and analysed to derive the lessons;
- how and how far the different and conflicting objectives of judicial procedures and organisational learning could be reconciled.

The workshop focused on organisational learning, because it was felt that learning at the level of hardware and technological improvements, and even of the role and influencing of individual behaviour was relatively well understood and covered by texts such as van der Schaaf *et al.* (1991), if not always applied in practice. In contrast, the issues of organisational shortcomings have only emerged as a central focus in the last decade, and there are few if any proven techniques or management systems for coping with such issues. These issues may reach right up to the board of the company involved, and we are still learning how to draw conclusions about them from event analysis and how to ensure that the organisation learns and changes as a result of them. Equally there is the problem of learning at a societal level; how do we learn to regulate an industry better and to co-ordinate the activities of the many people and organisations responsible for safety in the complex systems which our transport networks, harbours, airports and super-highways have become? How can we react sensibly at that level? This means taking action which is necessary but also resisting taking ineffective or ridiculously expensive action in the heat of the emotions following the media coverage of a dramatic disaster.

The objectives of the workshop are set out in the next section, which reproduces the introductory statement which participants were asked to respond to in their papers and presentations.

The chapters which follow are based on those papers, supplemented by specially written chapters which provide a framework for the issues raised and draw conclusions from them. In the first section of the book a number of theoretical issues are raised concerning the purpose and structure of event analysis and the application of analysis techniques to draw conclusions about organisational shortcomings. The notion of cause as applied to the decisions of managers in organisations is inextricably bound up with the notion of responsibility, as delegated by the organisation, and as accepted by the manager or operator. Without a clear understanding of how we arrive at such causal attributions for managerial decisions and behaviour an epidemiology of organisational factors in accidents is not possible. This is one explanation for the lack of any general predictive model about what are "organisational factors" in accidents. So far we have usually only researched and discussed them post hoc, when we can trace the links in an event that has happened. We are still a long way from a theory of what is an "unsafe organisation", judged in advance of accidents. It is relatively easy to look back after an accident and say it happened because manager X decided to give priority to a new plant for production reasons, rather than the maintenance of old equipment. It is harder to say something about how we recognise, a priori, whether a given set of managerial priorities will result in more risk of accidents than another.

The second section of the book provides a range of case studies of methods and techniques for collecting and analysing data about events of different types and seriousness in order to learn organisational lessons from them. The advantages and disadvantages of the different approaches are discussed, as well as the considerable work which still has to be done in many cases to develop them into viable methods for widespread application.

The final section returns to the level of the generic problems of organisational and societal learning. It focuses particularly on the conflict between the openness required for the genuine analysis of where and what changes are necessary and the defensiveness engendered by the judicial search for blame and accountability associated with settling culpability and liability for compensation payment. Even where this conflict is not sharply imposed by the type of adversarial legal and social insurance system such as found in the USA, there is a strong tendency to defensiveness and secrecy among top managers who feel that event analysis may point a finger at their decisions and actions. The conclusions chapter assesses how far the workshop brought us in answering the questions posed at the start, and which directions for future work were emphasised.

2. THE CHALLENGE OF ORGANISATIONAL LEARNING

The challenge to the participants in the workshop was set out as follows.

"Companies, industries and regulatory authorities use event analysis to identify signals for initiating or guiding change in their safety management and regulatory systems. The learning may be necessary both within the life cycle phase where the accident occurs (e.g. lessons for maintenance planning from Piper Alpha) and for other life cycle phases (e.g. the implications of the Estonia ferry disaster for the design and certification of ships). These signals can be generated from a range of events, from in-depth analysis of single incidents, be they near misses or large scale disasters, to statistical analysis of patterns from multiple events, again ranging in outcome from recoverable errors to fatal accidents, disease or major environmental releases.

This analysis and learning process has generated models, tools and approaches about which there is some consensus for the first two "ages" of safety, which concentrated on technical and human failures respectively. For the third age, where the concern is with complex socio-technical and safety management systems, the developments are still in an early stage. They present difficulties because the organisational determinants being traced are usually further distant in time and space from the accident than is normally the case with technical and individual operator failures.

A second, often conflicting goal of event analysis, particularly of single large accidents, has been to fix liability, so that punishment can be meted out, or compensation claimed. This has been the goal of the legal and compensation systems and often of the media. In this area also a trend is discernible in public enquiries and legal cases to look further in time and space for the liable party than previously and increasingly to indict designers or top managers.

The trends related to the two types of goal for event analysis may be parallel, but the dynamics of the process of reporting and analysis, the requirements for their success and the ultimate goals appear to be very different, if not in conflict, in the two cases.

Underlying conceptual difficulties of event analysis include:

- the fundamental difference between casuistics and statistical proof,
- the danger of introducing new risks by making changes designed to eliminate one single dramatic accident
- the difficulty of defining and collecting information about exposure, normal/undeviated situations or "non-event" situations which can be compared with situations in which events have occurred, in order to draw responsible conclusions.

These issues are problematic even in tracing proximal technical and human causal factors. The problems are accentuated when trying to trace the chain of events further back to make the links with safety management or regulatory systems. An additional problem is to decide when to stop digging deeper and to be satisfied with the level of analysis reached.

The focus for the workshop will be the issues surrounding the linking of event analysis to safety management and regulatory systems in both learning and liability modes: event analysis in the third age. The above discussion gives rise to a number of questions which the symposium will try to address.

- What are the precise goals for event analysis in learning to evaluate and improve safety management and regulatory systems?
- To what extent are these goals compatible with goals arising from tracing corporate responsibility in the punishment and compensation systems?
- What models and techniques for event analysis are currently used or being developed to arrive at valid conclusions about safety management and regulatory systems? How do we validate models given the problem of making predictions, and our current reliance on ex-post-facto studies.
- What are the criteria and requirements for applying such models and techniques and what are they suitable for, in respect of:
 - type of events (near miss to serious consequences)?
 - single events vs. pattern recognition?
 - depth and variety of data about events?
 - data about exposure, c.q. non-accident situations in an organisational or regulatory sense?
- Is an epidemiology of organisational or regulatory failure possible?
- What distinguishes events which tell us to make fundamental changes in the safety management/regulatory system from those that tell us to try harder to implement the systems we have?
- How do we cope with the public demand to make rapid and significant organisational or regulatory changes following a major accident when the outcome of such changes may be highly uncertain in terms of both the direction (safety improvement vs. degradation through the upheavals of the change itself) and the extent (cost-benefit) of the effects?
- What are the implications of all of these issues for setting up and running event reporting and analysis systems within companies, industries and nations/economic communities?"

The range and complexity of these questions indicates what a complex area this is. No one workshop or book can answer them all. What is collected here is a good representation of the state of the art on a range of the issues. To introduce it we need to look more closely first at the question of the objectives of event analysis.

3. ORGANISATIONAL LEARNING VS. JUDICIAL ACTION

A theme which runs through the book is the issue of the objectives which we are trying to meet through event analysis. Our concentration will be upon organisational learning. This is an activity which is directed to the future; what can be done better from now on, so that the past does not repeat itself, but also that the chance of other types of accident in the future are reduced. In this perspective, the event is only interesting for so far it has predictive value and in so far as its details can inform future choices. This is, however, a relatively new perspective on accidents and disasters. The more traditional one has been directed towards understanding in detail what went wrong, so that responsibility for it could be allocated to some person or organisation, who could then be punished or made to pay for the damage done. That is an orientation to the past, in which concern for the future may be limited to securing the future of the victims and making it as comfortable as possible.

The traditional approach to event analysis is strongly associated, therefore, with judicial proceedings, with fixing blame and with a search for the one correct description of what the course of events was which led to the disaster or accident. It is epitomised in the primary objective of the public enquiries which are a feature of the British response to disaster, in the prosecutions by government inspectorates or judiciary for breaches of statutory duty or for criminal negligence, and in the claims before a judge for compensatory, or even punitive damages for the victims of the accident.

The objective here is to find at least one party who can be found to have broken a law or duty of care. If more than one such party is found, the process must apportion the blame in some way so that the share of the punishment or the costs of compensation can be allocated among them. Implicit in such an approach is the idea that we can define a certain standard of behaviour of individuals or corporations which may be expected and required by society in order to protect its citizens against injury and damage. We may call this a standard of (responsible) care. Such norms of behaviour are laid down in explicit statutes governing specific industries or activities, and/or in the general duties of care which form part of the civil law which governs what the customer may expect from the supplier of goods and services, the employee from the employer, and one citizen from the behaviour of another.

The purpose of the investigation after an accident or disaster, in this paradigm, is to unearth points in the chain of events leading to the damage at which this duty of care was breached. Any person who knowingly causes such a breach is certainly a blameworthy party. However, even breaches which are made unknowingly are increasingly seen as culpable, if they are committed by people who we consider should have taken the time and effort to find out the consequences of their actions.

This punitive orientation to the investigation gives it both its direction and the rules for how far it goes. It is directed at uncovering the truth; something which is seen as objective and of which there is only one version, though what that version is may be disputed. It stops when the culpable actions are found and does not bother to dig deeper to find out why they were carried out.

In the past culpable actions were uncovered mainly close to the accident in time and space, in the behaviour of workers or operators. A trend in the judicial reports of disaster investigations in the last two decades has, however, been the tendency to point the finger of blame further up the organisational hierarchy. The trend is particularly clear in the series of reports of government investigations and public enquiries in the United Kingdom since the enquiry into the explosion at Nypro, Flixborough in 1974. These enquiries did not accept that the discovery of breaches of safety rules by people low down in the company hierarchy were a suitable place to end their investigation and analysis. Sharp criticism was levelled at management all the way up the chain to the boardroom, who were seen as responsible for allowing the actions there to occur or persist. A notable case was the capsizing of the ferry Herald of Free Enterprise in 1987. Although the private prosecution for corporate manslaughter against the ferry company failed, it sent clear signals to corporations that organisational failures could be the subject of much more severe judicial action than earlier. This trend is but a visible manifestation of a judicial process that has been going on for much longer in the prosecution of companies for breaches of safety laws. The advent of framework legislation in many industrialised countries from the early 1970s, in which safety policy and safety management systems were for the first time explicitly required by law, has accelerated the concern of judicial processes with fixing the blame on higher management levels.

This judicial focus is often associated with a rather wider objective, which can be called the public's right to know. What has led up to an event of such a dramatic nature is a matter of general concern to many people, both those directly involved and those observing from afar. That right to know may lead to a desire to trace the circumstances of the accident further and deeper than would occur if the only concern were fixing liability. The focus is still, however on uncovering the truth, the whole truth and nothing but the truth.

Built into the judicial approach is a threat for those at whom the finger may finally point. They will have to pay, either as a punishment, or to compensate others, and their reputation and future business or employment prospects will be damaged. There is a natural tendency for anyone faced with such a prospect to be unforthcoming, to limit themselves to statements which do not damage their position, to put the best gloss on their description of events and to act defensively under questioning. Event investigation and analysis in this paradigm becomes an adversarial activity, which shares many of the traits of the detective work for criminal investigations.

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We have called this judicial approach the traditional one, not only because of its long history in law, but also because the natural feelings of guilt, fear and anger engendered by accident and disaster encourage people to respond in that mode, even when they are not standing before a judge.

If we contrast the traditional, judicial approach with the one we take in this book, the standpoint of *organisational learning*, the objectives of event analysis are very different. Our objective is to profit from the events which have taken place in order to prevent them occurring again. They are valuable and valued opportunities for learning, which must be sought out and cherished if the organisation is not to become rigid and complacent. We do not mean here that accidents are or should be valued in prospect; we do not want accidents to happen so that we can learn. What we do mean is that they should be valued in retrospect; maximum use should be made of them, so that the victims will not have suffered in vain. To gain that maximum value we need to use them not only to learn about how to prevent that same accident happening again, but about how to prevent as many other accidents as possible. With this perspective, it is not only the exact sequence of events which actually occurred which is important, since that may have been of such low probability that it is unlikely ever to occur again in the same way, even if nothing is changed. The accident is an opportunity to learn what the gaps and shortcomings were in the way the organisation managed and will manage the process or technology in which the accident occurred. From this point of view, the objective truth of what took place is of relatively minor importance. It was only one possible sequence of events, which breached the defences of the safety management system. Limiting learning to controlling just one sequence is a waste of investigative resources. It is better to try to examine the whole safety management system to uncover as many other sequences as possible, which could have led to the same or other serious consequences. From the point of view of learning, culpable breaches of rules or a duty of care are also only way-stations on the road to a full understanding of the lessons. It is necessary and interesting to uncover why the breaches occurred and how they could have escaped being noticed and corrected. If such deeper analysis shows that the rule which was broken was not a sensible or achievable rule given the circumstances of the organisation, no measure of blame will produce change; either the rule needs to change, or the circumstances which condition its breach must be modified.

The learning paradigm therefore has a completely different feel to it compared to the judicial. It is a mutual search for opportunities for improvement. As such it also does not need to wait for actual disasters. There is much to be said for paying equal attention to near-misses, which elicit far less emotions to muddy the investigative waters, and which have the added advantage that they got stopped in time, before damage was severe; that gives us an opportunity to investigate the recovery mechanisms which caught it in time (van der Schaaf *et al.*, 1991), so that we can see if they can be strengthened even more.

When we apply the learning paradigm to organisational learning we are looking at what *all* levels of the organisation can and should learn. Accident investigations have often, in the past, stopped at the events close to the accident, which usually concern only the behaviour of the hardware and of the operators/workforce directly concerned with carrying out the activity. The questions could always have been posed as to why the management system failed to manage the behaviour of the hardware and individuals, but often they were not. Supervisors and managers have avoided asking them by hiding behind such explanations as "accident proneness" and "wilful disregard for rules". These explanations implied that, as managers, they had no influence over the behaviour of the workforce in relation to safety. Such an attitude is no longer accepted in mature safety management systems. The question as to why the supervisors and line or senior managers did not anticipate and control the unsafe actions of their subordinates has now moved to centre stage.

Organisational learning requires that event analysis traces the causal factors and determinants of an event both further back into the past than before, and further up the chain of management control. At each step it needs to ask whether those responsible for hardware, people, rules and procedures, communication and organisational structures had taken suitable decisions to select, prepare, instruct, supervise, monitor and improve them. Such questions lead into the heart of the safety management system, as well as uncovering generic failures which may lead to other weaknesses in safety, which could lead to very different accidents or disasters. They can also lead over the boundaries of the company into the organisations of suppliers, contractors, designers and regulators. Organisational learning therefore opens out events in both time and space and poses many questions concerning the availability of information and the collaboration of many parties. It is particularly vulnerable to the defensive attitudes which come from a fixation on the judicial mode of operation. Perhaps it is a sign of a mature and responsible industry or society that it can draw organisational learning from its accidents.

4. CONCLUSION

This chapter has summarised two contrasting sets of objectives for event analysis, one leading to an adversarial inquisition to find the truth, the other leading to a co-operative effort to learn and improve. Equipped with this discussion of the objectives of event analysis, particularly at the level of organisational factors, we move in the next chapter to a consideration of the structure of an event analysis system, its inputs, processing tools and outputs.