Learning from failures in emergency response: Two empirical studies

Sidney W. A. Dekker, PhD
Magnus Jonsén, MSc
Johan Bergström, MSc
Nicklas Dahlström, PhD

ABSTRACT
Recent high-visibility disasters have fueled public and political awareness of the importance of managing and mitigating their consequences effectively. In response, various countries have enacted legislation that demands the evaluation of emergency responses so that lessons for improvement can be learned. A series of field and experimental studies were conducted from 2005 to 2007 to assess the ability of first-responder organizations (eg, fire departments) to learn from failures that occurred during their emergency responses. The departments studied often lacked basic organizational requisites for effectively learning from failure (eg, mutual trust, participation, knowledge of possible learning mechanisms). Further, neither first-responder training, nor daily practice, seems supported by knowledge of generic competencies necessary for effective crisis management. This not only hampers coordination during a response, but also keeps its evaluation from using a language that could help organizations learn and improve.

Key words: learning, failure, emergency response, safety culture

INTRODUCTION
Recent high-visibility disasters have fueled public and political awareness of the importance of managing and mitigating consequences of disaster effectively. In response, various countries have enacted legislation that demands the evaluation of emergency responses so that lessons for improvement can be learned. First-responder organizations have a variety of ways to comply, ranging from self-evaluation sheets, checklists, documentation of debriefing sessions, to formal inquiries of the emergency response by a dedicated evaluation person or team. The requirement to assess emergency responses often comes on top of other stipulations, such as having to investigate the causes and sequence of events of the incident that triggered the response. As a result, the resources for, and the quality and extent of evaluating emergency responses varies. Checklists and self-evaluation sheets can risk joining a compliance paper-trail that leaves no meaningful footprint on the organization or its core mandate. Emergency response reports may get written with more enthusiasm and engagement then there is willingness, or time taken, to read the reports or implement and follow up on recommendations. It may be that first-responders have few effective ways of disseminating lessons learned beyond their own organization or even beyond the person or team involved.

It would seem that the ability to learn from failure in emergency response can be improved in obvious ways. One would be to enhance the technical mechanisms for collection and dissemination of data about a response (eg, computer-based collection and analysis or web-based publication). Other ways would be to assist team leaders during debriefings or to standardize the way in which analyses are conducted and written up (such as is done with aviation accidents according to rules from the United Nations' International Civil Aviation Organization). Yet, others would involve more formal requirements for the follow-up and
implementation of recommendations that come out of an evaluation. Such measures, however, have a chance of success if there is consideration of barriers to learning from emergency responses as well. Some of these barriers may be related to cultural predispositions and organizational relationships, whereas others could be the result of the focus of training and proficiency checking in first-responder work.

METHOD

A field study examined the emergency responses and evaluations of one rural and two urban fire departments in a European country during a period of 6 months. Through a combination of participant observation and targeted interviews, an inside-out view was assembled of what it means to learn from failure as first responder, and what some of the organizational constraints and opportunities for learning are. The data were analyzed using problem-oriented ethnography, which aims to understand people’s own perspectives on a particular aspect of their work through qualitative inquiry; in this case, in the form of participant observation, interviews, and documentary studies. A particular focus was trained on people’s ideas and activities around failures and learning. All departments studied were (in part because of regulatory requirements) working on implementing a learning process, ranging from self-rating scales to the appointment of a dedicated investigator. Data were initially categorized according to the organizational scale they belonged to—from the individual’s need to acquire new knowledge (a precondition for learning), to the internal work environment (team level), to the interest and respect for emergency response work from both the organization’s management and society around it. Findings within these levels were then further coded and resulted in a revision of the eventual categories that ended up cutting across them (see results and discussion): what targets for intervention were typically identified in learning activities, what amount of trust and participation existed between management and emergency workers (including the treatment of minority or lower-rank perspectives), the integration (or not) of a second opinion in learning, and the actual practices changed as lessons were implemented.

Field study results suggested that the ability of first responders to reflect on their group’s performance after its management of an escalating situation should be tested more formally. It was particularly interesting to assess experimentally what generic competencies first-responder leaders take with them into action, and will rely on in the evaluation of their team’s performance (including its failures). A class of final year fire commander students was randomly divided into four groups of equal size. Two of these groups were offered a 2-day intensive training program for managing escalating situations, which involves a simulated passenger ship bridge where multiple threats have to be managed over a number of hours (rough seas, water penetration, onboard fire). Trainees were given roles typical of the bridge crew (Captain, Chief Officer, Chief Steward, Doctor, two Engineers). As part of the training program, their ability to handle escalating situations was evaluated and discussed extensively. A follow up during the class’s own field exercises was then conducted, in which senior students played the roles of their normal domain. Using the results of these exercises, the group of students who had received the training in generic competencies of emergency management was compared with the other half of the class.

RESULTS AND DISCUSSION

Whether on site, on the way back in the vehicle, or across the management conference table, one consistent field study finding was that people and groups reflect on their emergency response work. There appears to be no lack of motivation to adapt, improve, and guarantee success in future responses. Occasionally, changes are made based on these discussions too. The field studies did, however, expose some possible limitations on first-responders’ ability to extract and disseminate meaningful lessons from emergency work. These limitations were derived from qualitative interviews, observations, and our study of documentary data (such as incident reports and evaluation forms).
Human error as target for improvement

One response to failure during an emergency response was to cite “human error” by any other name (e.g., complacency, did not watch out, judgment failure, inadequate supervision, incompetent leadership). Such an error was often coupled to (or explained on the basis of) presumably enduring qualities of the person or commander involved. Blaming human error has a long tradition in safety-critical fields, but has been limited in helping organizations find sustainable countermeasures.\(^5\) For example, reprimanding, compensatory training or reminding individuals of applicable rules, routines, procedures or regulations were not seen as and asked to more stringently adhere to them. A longer-term implication of the idea that there is a human error problem is often to supply more technology (field study results showed recently added mobile communication and information technology). Although offering new capabilities, these solutions often had unanticipated side-effects, such as creating new work for commanders and their crew (e.g., managing the interface, remembering codes), and were in one large response reported to lead to communication clutter and data overload for those in command roles.

Field study results did reveal particular kinds of repertoires for discussing emergency response failures (with or without those involved). One such repertoire was defensive posturing, when commanders or fire-fighters appeared to feel that they or their assessments and actions are under unjust scrutiny or attack. One defenses that was observed was shooting the messenger, particularly by valorizing operational experience (“we know how to put out fires, who are they to question our judgment” or “we were there, you were not”). But there were contrast cases too. For example, during a debriefing, a commander began by addressing his own misjudgments (in this case about misplacement of one of the trucks) before asking the entire response team to reflect. This showed a humility, which indeed elicited a fruitful discussion and openness to share. However, such discussions typically remain limited to people’s own organizational group or level.

Trust and participation

Critical for the success of learning that involves the sharing of stories of failure is the existence of trust between the parties who disclose and who receive the story.\(^6\) In other operational worlds (e.g., aviation), such trust is engineered into the system in various ways.\(^9\) One is anonymity (not having to report a name or any other identification, only the substance of the story) or confidentiality (having any identifiers or names taken out of the story before it is sent on). This may not be feasible inside individual emergency organizations, because their often limited size will enable people to identify one another regardless of such precautions. But it could work on a regional or national scale. In those cases, having neutral outsiders gather, assess and synthesize could contribute to people's willingness to share stories of failure. Reporting outside the line organization (either into a local staff, or to a neutral outsider) is particularly helpful if people have concerns about those they work with (especially their superiors) or if they fear consequences for their own careers or work situations as a result of their reporting.\(^9\)

Trust may remove barriers for people to share and report stories. But trust is not enough to actually get people to share or report. Participation in change efforts is critical to motivate people to report and keep reporting.\(^10\) The management of a large urban fire station took away the idea-letterbox that they had earlier created to let operational personnel suggest improvements. Despite generating some solutions to local problems (e.g., mounting a first-aid kit in the top of the ladder truck), the system was taken away because it did not match bureaucratic accountability requirements for quality improvement inside the organization. Field study results suggested a halo-effect of relaying to firemen that their contributions to learning were not worthwhile, denting their motivation to participate in subsequent improvement or change. Similar actions, which were perceived as put-downs, included using the word “whining” to describe how local personnel considered certain improvements in their working conditions necessary.
In contradistinction, and consistent with the literature,6-10 organizations that were able to harness the knowledge and experience of those on the front-line of their safety-critical work in improvement efforts often had little trouble filling their reporting systems with meaningful stories and suggestions. This was evident in the smaller rural fire station, where trust seemed to be much less of a problem than in the urban settings studied. Ways in which they did this included having peers debrief operators and review with them their reports and improvement proposals, and sending feedback into the organization about what was accomplished as a result of those suggestions. It is said that, getting reports was not the same as learning from them. Documentation never doubled as learning. The field study showed the inklings of an effective reporting system succumbing to its own success: its ability to invite reports was overtaking the manpower and its analytic ingenuity and synthetic abilities for seeing larger patterns that could offer leverage for change. The only organizational answer there was to increase the resources spent on analyzing and synthesizing reported information, rather than to discourage reporting so as to slow the flow.

Not offering a second opinion

In many cases, the evaluation of emergency responses amounted to people grading their own work. Managers found this to be quite useful, as it forced their personnel to reflect on their work in a way that demanded few other organizational resources. But limits showed up where there were fears that negative self-grading would hamper one’s organizational stature or career prospects. On many self-assessment sheets, individuals filled in “no comment,” rather than reflecting on (and grading) their own performance. “No comment” of course meant no learning, which shows the limits of self-grading and reflection. Various ways to introduce a second opinion were discussed with stakeholders. For example, others from outside the team or even organization could be asked to look at and assess the evaluations and ask the kinds of questions that can only be asked if one is not part of the culture that takes its particular practices for granted, as normal, unquestionable. This did not have to be more formalized than rotating individuals through different departments or across organizations so that they could bring a fresh look or independent perspective onto something that insiders may no longer see as either problematic or open for change. Effecting change as an outsider, however, is never easy,8 as credibility or buy in may be lacking. One outsider-opinion form that can perhaps force changes is independent safety investigation. This is institutionalized in other operational worlds (eg, aviation) and can generate a greater depth of failure analysis (though also not automatically an easier acceptance and implementation of any recommendations generated).

Fine-tuning the margins of existing practice

Closely related to the issue of second opinions was that much of the observed learning seemed to take place at the margins of existing practices. Routines were amended slightly (eg, decisions on placement of a ladder truck), but the substance of existing practices was hardly ever challenged (eg, sending a ladder truck to a traffic accident, dispatching a commander plus four fire-fighters to every call, prioritizing the sending in of firefighters over attacking a fire from outside) even if they are insensitive to subtle variations in context, or based on obsolete assumptions about operational work or long-since disappeared technologies. Critically, questioning the very basis for some of the operational work that groups engage in when responding to disaster seemed more difficult than making fringe adjustments. This could be another opportunity for routine independent investigations of emergency responses. Their independence, however, (and thereby ability to look at established practice from a fresh viewpoint) would need to be balanced by a credibility in the eyes of the recipients of the conclusions and recommendations. This can be done only if the independent investigation integrates a sufficient level of (local) technical expertise (which in turn can challenge its independence; its ability to withstand inculcation and then taking particular practices or factors for granted).

No language for generic emergency management competencies

Perhaps a rather fundamental barrier to learning was the lack of an awareness of, and language for,
generic competencies for emergency management. This lack first became apparent in debriefings or other performance evaluations that were observed in the field studies. Such general competencies are generally assumed to include information management (sorting, prioritizing), leadership, and communication (flexibility, building up shared mental models), proactive strategies and analysis (explicit goal statements), and assessment of any intervention effects and revision of plans. None of these notions were explicitly taken up in how groups talked about their performance after an emergency response, even though failures that occurred could often be linked to such cognitive and coordinative problems.

This motivated a further investigation on whether there is evidence of an awareness of such competencies in senior student-commanders. During the first simulated emergency, onboard the simulated passenger ship-bridge, trainee-commanders behaved like groups whose professional indoctrination or life does not revolve around emergency response. They displayed a quick glide into “normal operations” (not preparing for anything unusual or unexpected) even though it was clearly stated that they were to perform a crisis-management exercise with a simulation method and that they should make no assumptions about the condition of the ship. There were no efforts at proactivity, no explicit goal formulations, an inability to sort through escalating information flows, few attempts at process discussions with the emergency management team, no strategies for distributed decision making, and no flexibility in role execution.

Even though the students’ generic competences for crisis and fire management were indistinguishable from those who did not spend the past year being educated as fire commanders, they responded well to the 2-day training program. The two groups that underwent the training program in handling escalating crisis performed much better in their subsequent field exercises than the other half of the course. Roles were better defined, including those of team leader and moderator. Not all decisions were taken in consensus (nor was that judged necessary), decisions got clearly executed and followed up, and there was a modicum of explicit goals that the team strived for. See Table 1 for an overview of the groups’ performances at the field exercises.

Interestingly, discourse about their performance both during and after the field exercises, became more articulated in the groups who had gone through the training program in generic competencies, and it focused on the social and interactive aspects of team performance—those aspects that alone can carry success or failure in managing an escalating situation. See Table 2 for an overview of the different groups’ comments at the debriefing sessions, held after the field exercises.

For all trainee-commanders, this was the first time that the social and interactive aspects of performance were taken up explicitly at all, their training having otherwise focused on technical competencies and operative competencies on a rule-based level. Scenario methodology similar to the one deployed in the study described here can, in different ways, be

<table>
<thead>
<tr>
<th>Table 1. The different groups’ performance recorded during the field exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Groups that underwent the training program in handling escalating crisis before the field exercises</strong></td>
</tr>
<tr>
<td>Indistinct roles at high information flow</td>
</tr>
<tr>
<td>Showed proactive tendencies</td>
</tr>
<tr>
<td>Not all decisions taken in consensus</td>
</tr>
<tr>
<td>Clear team-leader and team-moderator</td>
</tr>
<tr>
<td>Tasks were performed</td>
</tr>
<tr>
<td>Some explicit goals</td>
</tr>
</tbody>
</table>
used in all phases of civil protection and disaster prevention (mitigation, preparedness, response, recovery, reconstruction). Previous work has shown how scenarios for training emergency response can be used for a variety of teaching objectives, such as acting in the absence of critical data, as well as practicing various decision making competencies under conditions of information overload and scarce resources, something confirmed in other fields such as medicine, and by the study reported here.

CONCLUSIONS AND RECOMMENDATIONS

Learning from failures that occur during an emergency response cannot be improved by narrow organizational or technical solutions alone. Better mechanisms for reporting and disseminating information can work successfully only if founded on organizational trust and participation in improvement processes. Also, learning from failures during an emergency response requires a particular language that not only limits psychological defensiveness, but is capable of bringing out the social and interactive aspects of team performance that are critical to the success or failure in managing an escalating situation. Based on the empirical work described in this article, the following can be concluded and recommend:

- There could be a need to evaluate emergency response training curricula, particularly those for commander training, to see to what extent they integrate the teaching of human factors issues that are of great importance for the success of emergency responses (eg, communication, coordination, situation awareness, delegation, information management, creation of a safety culture). In addition, such curricula could include an early focus on what organizational learning is, and how to promote it.

- The development of general competencies for emergency management such as information management, group interaction, leadership, and decision making could be supported by putting trainee-commanders in contexts other than those where they can rely on rehearsed roles and over-learned routines. Evidence from the work reported here suggests that occasionally setting practitioners outside their normal context may accelerate the development of awareness and discourse around generic skills for handling escalating situations.

- An earlier integration of the training programs of those who will be working at different levels in the emergency response organization’s hierarchy (eg, commanders versus firefighters) could promote the kind of understanding, trust, and openness that is necessary for organizational learning later on.

- Documenting an emergency response by whatever means (formal report, checklists, self-assessment sheets) is not the
equivalent of learning from that response. There is a strong need for resource investment in organizations’ analytic and synthetic capabilities so that such documentation can be transformed into lessons-to-be learned and disseminated as such.

- Trust is important if organizations wish to remove communication barriers so that people can share and report stories of failure. Getting people to report requires enhancing people’s participation in the learning process. Showing and institutionalizing interest in and respect for ideas that come up from operational personnel on how to improve the quality of the processes they work with everyday can be a fruitful way forward.

- The institutionalization of a second opinion during learning from emergency response failures, varying from rotating one’s own personnel to delegating investigations of emergency responses to an external, independent organization, could be an ingredient in questioning and improving practices and routines that may otherwise remain taken for granted.

Sidney W. A. Dekker, PhD, School of Aviation, Lund University, TFHS, SE – 260 70, Ljungbyhed, Sweden.

Magnus Jonsén, MSc, School of Aviation, Lund University, TFHS, SE – 260 70, Ljungbyhed, Sweden.

REFERENCES