Educating – Crisis

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ABSTRACT: *Crisis management* has become a recognised part of the overall management literature and there is a reasonable body of literature dealing directly with it, plus many writings on related matters such as disasters and catastrophes, both natural and human-made. In addition, there are publications on personal crisis situations and how one may deal with them, but in this paper, the author concentrates entirely on crisis management in industry and business. However, one may reason that the term *crisis management* is an oxymoron, which becomes somewhat apparent if examined via the commonly-recognised management tasks of planning, organising, leading and controlling. For example, although a manager may prepare plans how to deal with a crisis, no manager plans to have a crisis happen and similar reasoning may be applied to the other management tasks. The defined nature of a crisis, an unexpected event intruding into normal life, makes planning, etc, exceedingly difficult, for no matter how much preparation may be made for whatever situations can be imagined, the diabolic nature of crisis situations means an unexpected and interrupting event can occur. The above leads to why engineering students need and should be given crisis management instruction.

INTRODUCTION

We begin with a definition: *what is a crisis?* The answer depends what is taken as a source. The *Oxford Dictionary* gives:

> *Turning-point, especially of disease, moment of danger or suspense in politics, commerce, etc. (Latin, from Greek krisis, decision)* [1].

A definition that covers *commerce* has been given by Irvine and Miller: *A significant business disruption which results in extensive news media coverage and public scrutiny* [2].

Barton defines crisis more thoroughly in terms of the following six characteristic features:

- It is unexpected, that is, there is no background;
- Therefore no-one knows what to do;
- The people who must deal with it are already busy with *normal*, *everyday* matters;
- It is usually treated initially as *just something else to be done*;
- Therefore, it very often escalates through a time period from something that could be controlled to something well out of control;
- This escalation features the involvement of more than one organisation, which increases control difficulty [3].

Mitroff, a recognised guru in crisis understanding and crisis management, answered the question: *What is a crisis?* by stating (citing Perrow [4] for this):

> *There is no single, universally accepted, definition of a crisis, although there is general agreement that a crisis is an event that can destroy or affect an entire organisation* [5].

In a later work, Mitroff et al stated that *it is not possible to give a precise and general definition of a crisis* [6]. He went on to offer as a *guiding definition*, a crisis is *an event that affects or has the potential to affect the whole of an organisation*, and proceeded to distinguish between minor and major crises [6].

Rather than simply define crisis, Heath gave an example (the fire at Kings Cross Station, Sydney, Australia, in 1987) and extracted from that the following three elements:

- Little time in which to act (or respond);
- Missing or uncertain (unreliable) information;
- A threat to resources or people [7].

Heath stressed that although crises happen suddenly, they may have a trail of signals that become apparent in a post-event review. Of course, such hindsight is of no preventive value.

Has crisis management been recognised by management writers generally? A check through the indexes of some half-dozen well-known management texts has found only one reference, which defines a crisis problem and distinguishes it from no crisis:

> *A crisis problem is a serious difficulty requiring immediate action. An example is the discovery of a serious cash-flow deficiency with the potential to evolve into a serious loss* [8].

It can only be concluded that crisis management is such a specialised section of management that it has not been mentioned in most of the general literature. Indeed, the development of crisis management is very recent; the earliest reference found was dated from about 1975.

A COMMENT ON RELATED TOPICS

One may reasonably conclude, after thinking through this topic, that crisis is something to be avoided. Ideally, that is. But what leads to a crisis? That question has led the author to recognise a sequence beginning with *safety*, or more precisely the observation and exercising of safe working practices, which will minimise *risk*, a condition which can be managed, that is, controlled, to be within acceptable limits. However, if risk is not managed, controlled and minimised, then there is a higher probability that safe practices will be compromised and a *crisis* will occur. The irony of this is, of course, that even if risk is reduced to a low value, there is a similarly low-value probability that a crisis event may still occur.

This sequence of safety-risk-crisis has not been found spelled out in the literature, although there are many writers who deal with the above three items, many individually, some in pairs, but none found linking all three together. Having recognised that sequence, the author resolved to write about each. The first two were covered in two prior articles published in the *World Transactions on Engineering and Technology Education* [9][10].

FROM THE LITERATURE

As remarked above, the management literature, in its general form, does not deal with crisis and/or its management. Crisis in management affairs, and crisis management as a management response to crisis, is a specialised area covered by a few select writers.

One who has attracted this author's attention is Meyer, not only by the ease of reading his output with examples and sensible reasoning, but also by the quaint title (although a careful skim through the book has not revealed to what Meyer was referring as hitting the fan) [11].

He has identified the biggest reason for reluctance in preparing for hard times: it is simply that management thinking is geared to success, that is, managers are conditioned to think positively. So when one of his nine types of business crisis occurs, there is usually no crisis management protocol or formula that can be opened up to tell the manager-in-trouble what to do. The result is essentially the same series of emotions a person experiences, as given by Kubler-Ross, when diagnosed with a life-threatening affliction: denial and isolation, anger, bargaining for time, depression and grief, finally acceptance (incidentally, this author confirms those emotions by having observed them).

Mitroff made the same point, with reference to the extent of complexity of today's systems and the extent of the coupling between systems [6]. Curiously, he did not mention the original use of these terms by Perrow, who dealt with them very thoroughly as complicating factors in today's enterprises, particularly those using innovative technology [5].

Referring specifically to hazardous industries (eg chemical and nuclear) Perrow argued that close *coupling*, such as absence of buffer capacity between production units, increased process hazards because it makes the operation of the process more sensitive to small variations of the operating conditions, particularly if the plant under consideration is continuous and operating close to maximum design output. This connection has been agreed, generally, by technologists.

Perrow also argued against *complexity*, the extent to which the integrity of one section of a production system depends upon the next, and the extent to which there are interactions between sections. His point was that complexity can promote the occurrence of human error, and other writers (eg Dorner, Ouchi and Wilkins, and Reason) have agreed that complex situations can increase the probability of mistakes occurring. However, technologists (eg Kletz and Roberts) have pointed out shortcomings in Perrow's arguments on this.

Whatever criticisms there may be, Perrow's arguments should be noted and understood by engineers, indeed, by all technical people, because coupling and complexity has tended to be part of what is used in industry, not only in those using hazardous processes, but much of industry generally. So many industrial processes and procedures are totally unforgiving and can hurt or kill the undefended person, which is why the delicatessen section of supermarkets insist that workers wear a steel mesh glove when using a meat-slicing machine.

Mitroff itemised 11 types of crisis, including some not mentioned by Meyer, such as criminal and loss of information, with up to nine sub-types, yielding a total of 54 [4]. In both works cited, he stressed that a crisis is usually, if not always, preceded by *signals*, indicators that something may happen. Other writers on crisis management agree there are early events, whether signal or *precursors*, another term used (for example, by Andriole [12]).

Signals, precursors or preconditions may be present in a system for a long time, having arisen from errors committed in the past and lying dormant. Reason has termed such errors as *latent*, buried in the system and waiting for an opportunity to play havoc [13]. What changes the latent error to a crisis is a *trigger event* that may be another error: an unsafe act within the organisation, an action from outside or possibly a management decision. There is general agreement that the trigger event which actually initiates the crisis is usually sudden, virtually instantaneous.

However, two factors can be seen that argue against claiming that a crisis itself is sudden in every case. These are:

- The origin of that trigger event is often buried in the past, perhaps several years before, perhaps the length of time taken to reach that management decision;
- The action that occurs after the trigger event can take some time to have full effect on the organisation involved.

Therefore, from a management viewpoint, the time of the escalation or development into the full-blown crisis-onset situation (generally overlapping the tentative response) is more significant than the usually rapid onset of the trigger event.

The essence of those few paragraphs above is that the *recognition* of signals or precursors gives time to stop the trigger from acting and time to damp down the crisis itself if it begins.

Unfortunately, latent errors and triggers are often ignored. Among the injury cases this author has investigated was one in which a child's hand was crushed in a machine. The latent error was allowing the mother (who worked in the factory) to bring the child with her during the school holidays, an error shared by the mother and management. The trigger, probably, was allowing the child to assist the mother at the machine.

This author must confess to being unable to identify the reference he has seen to *psychological denial*, which refers to ignoring signals that may lead to a crisis. The classic example of psychological denial is how people living close downstream from a large dam may refuse to recognise the possibility of the dam bursting and flooding where they live. Psychological denial goes through the following four stages:

- Failure to anticipate what might eventuate by thinking about it;
- Failure to see the potential that exists;
- Failure to try to solve a problem that has been noticed;
- Failure to solve the problem.

All the references cited, except one, deal with disasters caused by human and/or industrial activity, and the management crisis behaviour that followed. Heath is the one exception; his work also covers some crises caused by natural disasters [7].

ILLUSTRATING CRISIS DEVELOPMENT

There have been plenty of major events in the last decades. Australian examples include the landslide at Thredbo, the National Bank losing millions, the fire at the Moomba plant that cut gas supply to Sydney, the explosion and fire at the Longford gas plant which cut gas supply to southern Victoria, and the Port Arthur shooting, just to name a few. However, there is no need to refer to a major disaster to illustrate crisis and here is a small example which adequately illustrates crisis development.

Several years ago, this author was requested to act as an expert witness giving an opinion on a case in which two workers (who operated a garbage collection truck) sued their employer (a city council located about 100 km from Sydney) [14]. The workers had been collecting garbage left in bins outside properties several kilometres from their base when they became extremely ill. They had to leave the vehicle and sit on the roadside and call for help while describing the odour from the truck that had affected them. Their office did act, by passing on the message to the local ambulance. The paramedics arrived, treated the men, confirmed that the truck could not be safely approached and called for the fire brigade. They arrived, assessed the situation and called for a HAZMAT team, who set up a portable shower system, donned full protective equipment, and emptied the truck onto the roadway.

They found some plastic bottles of pesticide that must have come from a bin or bins emptied into the truck. These bottles had been crushed by the compacting device and their contents had become mixed into the general garbage and produced the sickening odour. The final clean-up took several hours.

Such an event had never happened before and was hence certainly unexpected, which meant there was no standard procedure or protocol to cover the follow-up action, so no-one knew what should have been done. Those in the office who responded to the phone call were busy with their usual duties, so they had to divert attention and work out what action to take to deal with this extra job that had turned up.

Looking back through the two or three hours during that morning, the events quietly escalated from a normal garbage collection activity to employees being sick, then panic involving an ambulance, the fire brigade, HAZMAT, bringing a front-end loader to the site to put the spilled garbage back into the truck, and finally to litigation with the two workers suing the council for whatever after-effects they were able to claim from chemical exposure.

A small crisis? Yes, quite small, but containing all the features that can be found in any of the major events recorded.

WHY INCLUDE CRISIS MANAGEMENT IN ENGINEERING MANAGEMENT?

Most engineering faculties have in their curriculum some subject or subjects of a management nature. Crisis management is a specialised section of that overall topic, so it can be asked: is there a case for including crisis management in the engineering management subject? An answer comes from Stoner et al who quoted a diagram of five phases of growth many companies experience, each phase followed by a crisis [15]. The sequence is as follows:

- Growth through *creativity* followed by a crisis of *leadership*;
- Growth through *direction* followed by a crisis of *autonomy*;
- Growth through *delegation* followed by a crisis of *control*;
- Growth through *co-ordination* followed by a crisis of *red tape*;
- Growth through *collaboration* followed by a crisis of ?

Although the original diagram specifically stated *five* phases, the query provided at the end implies the probability of further crises. Perhaps the fifth would be stagnation followed by growth through takeover or buy-out.

A similar list has been given by Smith of seven causes of crisis in business [16]. These are growth, responsibility, control, antitrust, leadership, judgement and competition, all of which can occur in Australia with the exception of antitrust, as Australia does not have the American antitrust laws.

Engineering graduates and those students working while studying may enter an organisation that then goes through any of those growth stages leading into a crisis situation. The probability of that occurring depends on many factors, both inside and outside the organisation, but the author's experiences through some 50 years suggest that it is a very real possibility (reductions in the aircraft industry in the 1950s, LPG marketing changes around 1960, cash flow crises of two employers in the 1970s, the shrinkage of consulting work in the 1980s, hostile takeovers in the 1990s, and legislation changes which stopped a (quite legitimate) business activity around 2000).

It is reasonable to conclude, therefore, that an engineering student or graduate is likely to meet at least one of those many possible situations during his/her working life. Hence, including at least a brief description of crisis management in a more general management subject, illustrating how to recognise its approach, how to prepare for it and how to cope after it happens, will help students (or graduates) to meet the demands of such a situation. They may not be in a position that requires them to respond, in a corporate sense, by actually managing the crisis, but they will be better able to survive personally. In the extreme, the lesson given by rats that desert a ship that will sink may be appropriate – the rats are smart enough to survive.

Mitroff et al have given another reason why engineers need to understand crisis management, based on the extent of the complexity of the systems today's engineers have to deal with, and the extent of the coupling between systems, as discussed above [6].

CRISIS MANAGEMENT IN A MANAGEMENT SUBJECT FOR ENGINEERS

Through four semesters in 1988 and 1989, students in a subject titled *Engineering Management* were given serial assignments in a 10-week series. This has been reported elsewhere in detail with a summary presented here of the process and results [17][18].

Each assignment was a case study in the form of a short story covering events in a factory that were designed principally to supplement the week's lecture material by presenting the student with decision problems to be answered *as if you (the student) were in the position of the character who has to make the decision*.

The general scheme of each week's case-assignment was that the case contained three *levels* of a decision-making problem. The first was a technical engineering problem of relatively trivial value in this context. The second level was an *obvious* yet *local* management problem, which students were required to solve, or at least resolve, as it related to the week's lecture topic. The third level was some other management-related feature of the factory or the company as a whole.

However, buried in the narrative of each case assignment, there was either a dangerous occurrence (a potential for an accident) or a minor accident (causing either property damage or personnel injury), with nothing in the text to draw students' attention to the event. There were two series of assignments; the first had only minor accidents and dangerous occurrences, while the second, following on chronologically from the first, continued those events and ended with a fatality.

The hypothesis leading to performing this experiment (which had been given ethics approval) was that management will ignore dangerous occurrences and minor accidents in favour of concentrating on the immediate management issues present.

The author realised there were two potential faults in the experiment. One was using students as *managers*, which depended on their ability to imagine themselves acting as the managers in the narrative would; the other was the use of a simulation and not a real situation. The first was partially overcome by the students, all part-time with some supervisory work experience, and hence practical experience in management. However, nothing could be done to compensate for the second.

So what happened? Although the evidence is not what lawyers would call *the best evidence*, there were results that tended to agree with the hypothesis.

This double series were used in spring 1988 and autumn 1989, as well as in autumn and spring of 1991. On both occasions, the results were similar to the pattern that had appeared in any other semester with a small number of students commenting on the technical element. Most of them faithfully worked through the second level (the local problem for the week) and ignored all aspects of the third level, while a small number noticed and commented on the third level.

When the first series was first used, with a dangerous occurrence or minor accident happening each week, 14 students in a class of 35 foresaw the possibility of something serious, but only two analysed the accidents carefully, made decisions concerning them and predicted a consequence. One student stated very plainly that someone was going to get killed if the management (in the narrative) did not tighten up procedures.

When the second series, which ended with a fatality, was first used, only 25 out of 55 reacted to the fatality, the majority of the class answered the *local management problem* only.

Similar results came from the second use of the double series. At the end of each semester's lectures, after having used each series, the series content was reviewed. The majority of each class was rather embarrassed by discovering how they had ignored such an important problem (the exceptions, of course, were the few who had responded to the accidents and dangerous occurrences; they looked smug), and there seemed to be general agreement that *we've learned something from this*.

The conclusion from the experiment was that management people focus on what has to be done *today* and will ignore the signals of an impending crisis. Indeed, the results appeared to indicate that managers may even ignore a serious event, such as a fatality, until (the real-world follow-up) the media gets hold of what has happened.

A PROPOSED CRISIS MANAGEMENT SUB-SUBJECT FOR ENGINEERS

Having reached this stage in outlining what crisis and crisis management is all about, and in recognition that this article is to be an education item, the author suggests how a one-lecture subject could be formed, to be fitted into whatever *Engineering Management* subject an institution might have.

The lecture should begin by pointing out that crises may be purely personal, then there can be natural crises (storms, bushfires, earthquakes) and industrial (human-made) crises, which may cause personal crises. A few examples of each category can be found very easily, emphasising the engineering component behind the causes of the industrial ones and the engineering input into recovery from natural ones.

Then one can move to the crisis management aspect. There seems to be little in the literature spelling out the content of a lecture, the nearest to such an outline is by Mitroff et al, who give what is described as the form of an ideal crisis management manual [4]. This contains the following sections:

- Scenarios – crisis types, eg likely versus worst case;
- Criteria – required to initiate a response;
- Signals – early warnings of an imminent crisis;
- Containment – how to prevent the damage spreading;
- Recovery – overcoming the immediate effects;
- Post-crisis – an audit of the causes and lessons learned;
- Stakeholders – those involved and affected.

There is the need to have a Crisis Management Team, and for the Team to have meetings and be trained. This Team should contain the smallest number needed to cope with a crisis, with the recommended participants coming from these departments: legal, security, human resources, health and safety, quality

assurance or operations, and corporate communications or public affairs. Here one must disagree with Mitroff et al because their Team contains no technical/engineering people, except any who might be included under *operations*. The author considers that an industrial crisis, the essence of this reference, should have a technical/engineering person in such a Team.

However, apart from that, Mitroff et al do give the basis of presenting a lecture on crisis management. The only addition that one would like to see would be a heading titled *Response*, which comes before *Containment*. Rapid response to the sudden onset of a crisis may save a person from injury, or even death, as reported to this author by a country lawyer; a young worker at a local abattoir was accidentally stabbed in the heart by a fellow-worker and was clinically dead within minutes. Fortunately, the abattoir management was able to call an ambulance immediately and the worker was revived for transfer to a hospital. Emphasising the importance of rapid response, he died again in the ambulance, was revived again, and died on the operating table while being repaired. The report concluded with information that the person had fully, finally, recovered and returned to work.

As an example of the sort of simple readiness and awareness features that should be incorporated, the author recalls one factory where he was employed that required the security guard to keep a record of how many people were on the site at any time. The reason was that the factory had an evacuation procedure with an emergency meeting place outside the gate. The reason for the numbers-in was so that the numbers-out could be counted, giving a figure for the number of bodies that might have to be found; a somewhat macabre thought, but sensible.

Heath does not present, as concisely as the above, the content of a two-to-three-hour lecture in his truly monumental work [7]. A few points come out; first, his crisis management modules, which are as follows:

- Reduction – by risk management;
- Readiness – awareness, training, test and exercise;
- Response – impact analysis, plans and audit;
- Recovery – impact analysis, plans and audit.

In a later chapter, he added *Resilience* with the following details:

- Stage 1 – reduce the number of crisis situations;
- Stage 2 – determine the warning and alert systems;
- Stage 3 – train the Crisis Management Team;
- Stage 4 – spread the developed skills into the community.

There is sufficient in a section on crisis management specifically, and in the text generally, to assemble material for a lecture, but it would require extracting notes intensively; Heath's book goes so deeply into so many areas.

An Australian writer has covered much the same ground, but with an additional important point: risks (all around us and recognisable) are distinct from threats (which may develop from those risks) [19]. However, threats may develop in ways other than from recognised risks, and therefore with no preparation.

All the above references stress the best ways of dealing with the media, a difficult task under any conditions, at its worst when a crisis eventuates. This author recalls a chlorine gas leak from a site where he worked in the early 1970s; the word was spread by residents across the street, and within an hour, reporters were driving in past the security guard at the gate to demand interviews. That was a particularly difficult confrontation for someone with purely engineering experience at that time, and this situation emphasises the need for engineering students to be prepared for such a situation.

HOW TO DEAL EFFECTIVELY WITH A CRISIS

Having been through all the above, one can turn full-circle back to beyond crisis management and, indeed, before that, to how, really, to cope with a crisis situation. The answer is very simple: do not have a crisis and avoid its happening.

That is a very obvious statement, bringing up the question: how does one avoid a crisis?

The answer comes from the concept of signals or precursors, which usually (though, as admitted above, not always) precede a crisis. If those indicators can be recognised, then the crisis condition can be avoided by shifting attention and correcting the situation before the crisis actually occurs.

Here is an illustration of a fictional nature, but based on a combination of conditions that make the scenario sufficient to demonstrate what can occur and be done. (This scenario has been set up with the intended complexity to strengthen the possible opportunity for a crisis and its impact, with both those factors buried in the complexity).

Let us consider a small company, which has operated successfully for (say) several decades by having leased land from a much larger organisation, the *owner* of the land. The small company is *owned* by a small number of shareholders, whose income has been generated by the company building on the land and leasing out the buildings. Through all that time, the company has been managed by non-shareholder directors, who have an income from their positions and who have full knowledge of the leasing agreement for the land; however, those details have never been revealed to the shareholders. The managers and shareholders are aware that the deal with the larger organisation was that after a set time, the land would return to the landowner with the buildings, which, of course, by now are getting older and some are becoming in need of repair. That set time is now only a few years away.

Over the last 10 (say) years, there has been soft rumblings from the landowner related to the condition of the buildings – nothing very specific, just recognition that some expenses could be involved in repairs, updating and so on, all supported by inspection reports. That led to a vague question floating around: will the company have to have that work carried out before handing over the land and buildings? So far, no-one could answer that. However, this seems to have faded into semi-obscurity through the last couple of years and not been mentioned for that length of time.

Now, let us consider that the directors/managers of the small company have expressed their desire to retire from active duties, so they approach the shareholders with a suggestion they (the shareholders) might like to take over the directors' positions and hence the task of actually managing the company. The benefit to the directors, of course, is that they can retire to golf and other relaxing activities, and the benefit to the shareholders is they can have a closer relationship to the

actual company's operations. One may well imagine that the shareholders would be delighted by this opportunity and are tempted to accept the change as described. This is so inviting that it is an offer too good to refuse and the first thought must be: *go for it!*

But hold it: what about this question of repairs to the buildings? What is the latest from the landowner? Has anything come from them recently, anything which would explain why the directors want to get out at this time? And why are the directors prepared to give up some of their income, which would shift from them to the newly appointed directors? Using the concept in Meyer's reference, is something about to hit the fan?

In this scenario, one can go no further than point out those questions which should be asked (particularly the fourth one), and the possible results of asking versus not asking. If not-asking leads to straightforward acceptance, then there is a possibility of a financial crisis with the landowner invoking some clause buried in the lease contract so that the small firm must repair the buildings before handover.

If the questions are asked, then depending on what answers are received, the shareholders might refuse to take over the director positions. Or they might accept, given certain conditions that need to be agreed upon. Or else there may be other solutions that satisfy all the parties. Any of those choices can avert a crisis. But if the questions are not asked, then the shareholders may be lurching into a crisis situation.

The important steps in avoiding a crisis are as follows:

- Look for signals that something may be hidden, something left undisclosed, in the information provided;
- Seek more information by asking questions one way or another;
- Base decisions on the total information gathered;
- If the choice finally requires some risk-taking, then follow appropriate risk-minimising processes.

Entering a *managed crisis* with eyes wide open can be worked out, but falling blindly into an unexpected crisis will usually swallow and digest those involved.

By the way, the precursors in this case are the directors not informing the shareholders of the land-leasing conditions and then the directors announcing that they want to retire. The trigger causing the crisis to eventuate would be the shareholders accepting the change.

SUMMARY AND CONCLUSION

By now, there is, at least 30 years of crisis management literature on which to draw information on what can happen and how crises may be confronted, not overcome, but handled in ways that reduce their possibly serious impact.

It must be admitted that the author's experiences with employment crises are, unfortunately, a single sample from a population of one, which reduces their statistical significance.

Nevertheless, the number experienced does at least strongly suggest that engineers can meet such situations.

It is recommended, therefore, that adequate coverage of crisis management should be included in the management subject already part of most engineering curricula, not as a separate subject, but as a topic within the general subject.

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