Safety Culture: Its Importance in Future Risk Management

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1. Introduction

In a public statement following the inquiry into plans to build a new nuclear reactor at Sizewell, a British Government Minister discounted fears that the newly approved reactor could be affected by an incident of the kind experienced at Chernobyl because Britain had, he said, a better "safety culture" than the Russians (Walker, 1987:36). This comment drew upon the analysis made by the OECD Nuclear Agency(1987) of the implications of the Chernobyl release for Western countries. It refers to the social and cultural elements which contribute to safety, and which, if they are deficient may lead to major accidents. It also poses the problems of determining what precisely a safety culture is, and of how such a culture could be identified.

What is more, if these social and cultural elements are as important as the Chernobyl analysis suggests, it is not enough merely to identify a safety culture. We need to be able to identify what constitutes a good safety culture, what its characteristics are and how managers responsible for risk management can change and improve existing safety cultures. Only in this way can culture be used to improve safety and to reduce the hazards and costs arising from deficient safety provisions. This paper offers a preliminary discussion of these matters, at the start of a research programme which should provide fuller evidence on such topics.

2. Background

During the second half of the twentieth century, large-scale, technically based systems and enterprises have become firmly established, during what is sometimes called the 'second industrial revolution'. The growth of these major institutions has been associated with the successful application of the physical sciences to a wide range of technical problems. However, our increased ability to control and manipulate our physical environment has raised a number of fundamental issues about the safety and the social acceptability of our new technologies, reflected in publicly expressed concerns about defining levels of acceptable risk, and about asking "How safe is safe enough?". (See, e.g. Fischoff, Lichtenstein, Slovic, Derby and Keeney, 1981)

Much of the core agenda for the risk acceptability debate has been set by the response of the engineering community to the need to improve reliability in high technology systems. It has concentrated upon formal systems for appraising potential threats to the integrity of high-risk systems and upon the related development of the discipline of probabilistic risk assessment. The results of major risk assessments form increasingly importanc inputs to decision-making about facility siting and to debates about the definition of appropriate management and control procedures for risky installations.

A supplementary response to the problems posed by high risk activities concentrates upon the critical importance of analysing the range of social factors which may affect safety control or which may contribute to the onset of hazardous situations. All stages of the design, construction and use of any technological system are dependent upon human agency. Consequently the purely technical and environmental analyses suggested by traditional engineering education (Blockley, 1980) need to be supplemented by a socio-technical approach if the ill-structured problems posed by high-risk activities are to be addressed adequately. At this point, the work of social scientists becomes relevant to the establishment of acceptably safe technical installations.

Individuals, their groups and organizations, and ultimately the cultures developed and transmitted within such social settings, are all implicated in the design, construction, operation and monitoring of technological systems. The significance of social inputs for the generation of accidents and disasters has been noted by a growing number of analysts (Turner, 1978, Blockley, 1980, Perrow, 1984, Kletz, 1985), and the popular urge to attribute disastrous events to individual 'human error' is also gradually being replaced by a realisation that the human factors which undermine safe operations are of a more subtle kind. Typically they are complex, multi-faceted and rooted in the social, managerial and organizational properties of the particular socio-technical system concerned.(Pidgeon & Turner, 1986; Pidgeon, 1988; see also Reason, 1987)

The notion of a socio-technical system stresses the close interdependence at many levels between technical hardware and the social arrangements of the people involved with it. Both social and technical components interact with and change each other over time in complex and unforseen ways. For these reasons, it is not wise to confine inquiries about safety and accidents to narrowly technical considerations: serious account needs also to be taken of the social and organizational preconditions of failure. Major breakdowns of safety control invariably have multiple causes which are qualitatively diverse in character and and which are compounded with each other in complex interactive ways (Pidgeon, 1988). These multiple aspects of disaster causes were first discussed by Turner (1978): after analysing a wide range of accidents in the United Kingdom, he concluded that typically major accidents are preceded by an 'incubation period' which may extend for many years, during which a number of events accumulate in an manner which is unnoticed or misunderstood. This complex aggregation of interlinking events lays the groundwork for the subsequent failure. The model resulting from this work looks at the information-processing difficulties experienced by organizations and individuals trying to deal with uncertain and ill-defined safety problems, difficulties which are often compounded by technical malfunctions and operational errors. Typically the result is an unnoticed situation that runs counter to the accepted beliefs about hazards and to the safety norms and procedures prevailing at the time. (See also Reason's 1989 discussion of latent failures.) This situation is revealed eventually when a trigger event of some kind precipitates the disaster. The trigger itself might be a slightly abnormal operating condition or a final critical error, the straw which breaks the camel's back.

The interactive complexity of events associated with large-scale accidents is discussed both by Turner (1978) and by Perrrow (1984). Their accounts suggest that disaster results from unanticipated and complex interactions between sets of contributory causes that would be unlikely, singly, to defeat established safety systems. Although the pattern in every individual case becomes all too clear with hindsight, the detection of such interactions in advance is difficult, given the typical ambiguity and complexity of large-scale contemporary socio-technical systems. The best that can be done at the moment is the identification of some broad patterns of preconditions which do recognisably occur and repeat themselves.

It is by no means easy to deal formally with the risks which are inherent in a given technical arrangement or installation. The documented difficulties of such technical risk assessment (See e.g. Blockley, 1980; Vlek and Stallen, 1980; Fischoff et al. 1981;) are thus further compounded when we examine risk management and safety control from a socio-technical perspective. Since formal risk assessments of a system can never provide more than a partial view of the hazards (Blockley, 1989), decisions about risk will almost certainly be in error. It is therefore very important to ensure that risk prediction is always complemented by strategies for the ongoing control of safety (Pidgeon et al. 1989). Careful exploration of the possibilities of designing safer organizations (Turner, 1989) offers one such strategy which is currently being pursued, and an attempt to discover the features which distinguish successful high-reliability organizations is another (La Porte,1982, 1987; Rochlin, 1986; Weick, 1987; Westrum, 1987). A third possibility is that of bringing much more assiduous attention to bear upon the manner in which a suitable safety culture can be prescribed and installed.

3. Culture

The term 'culture' is widely used in social science and many definitions of it are available to be applied in varying circumstances. For present purposes it is useful to regard culture as the collection of beliefs, norms, attitudes, roles and practices of a given group or organization. All understandings of culture require the investigation of meaning and systems of meaning together with the sensitive interpretation of the results of such inquiries. In its most general sense, culture refers to the array of systems of meaning through which given groups of people understand the world, whether the group concerned is a work-group, an industrial company or a whole society. Through their culturally related patterns of behaviour and their cultural beliefs, such groups of people specify those shared things which are most important to them, expounding in their acts and beliefs their understanding of their relationship to family, friends and community, to work and danger and to matters of life and death.

Against this background it is possible to regard the more specialised 'safety culture' as that specific set of beliefs, norms, attitudes, roles, and social and technical practices within an organization which is concerned with minimising exposure of employees, managers, customers, suppliers and members of the general public to conditions considered to be dangerous or injurious. The safety culture of an organization will never be purely social, but will always involve socio-technical matters, for if physical danger or injury is a matter of concern, this will always arise from systems which have both social and physical components.

We lack information about the constitution of existing 'safety cultures', apart from fragmentary discussions arising from particular industrial analyses carried out for other purposes (di Salvatore,1987) or from more general academic discussions (Rip, 1988). A number of analyses of dangerous occupations have demonstrated that workgroups among occupations such as

mining, high steel erection and deep sea fishing show high cohesion and self-sufficiency. Workers share the experience of danger and are wary about admitting into their group those who cannot control outward disturbance when confronted with danger. Fear is often denied in order to make behaviour within the group more predictable, and safety within the group is taken seriously according to the judgements of the group. Observations of outsiders on issues of safety and danger are taken much less seriously.(Haas, 1977; Fitzpatrick, 1980; Vaught and Smith, 1980; Rip, 1988). But such patterns of solidarity typically displayed in dangerous, masculine, manual occupational groups do not constitute a model for safety culture in today's technologically complex industrial operations. Indeed, the adoption of a machismo approach to the possibility of danger is the last thing to be encouraged in those managing an oil refinery, a chemical plant or a nuclear power station.

There are many accounts of what ought to be 'good practice' relating to safety: exhortations or recommendations built up from a mosaic of findings derived from earlier incidents. The clear technical lessons to be learned can normally be targetted accurately within the industry concerned, and within related industries using similar machines or techniques, although many industries are resistant to the establishment of effective industry-wide feedback procedures. The lessons to be learned from an examination of the social and administrative failings in particular incidents are potentially of equal importance to the technical lessons. However, when social and managerial issues are examined at all, recommendations relating to them tend to follow the same pattern of distribution as the technical ones, even though they are frequently of much wider potential application. Little attempt is made to generate wide-ranging cross-industrial versions of many of the particular recommended remedies for deficiencies observed, so that learning is circumscribed, applying to particular industrial plant or settings, even though social and administrative recommendations far outnumber technical recommendations in major accident inquiries.(Turner and Toft, 1988) Managerial recommendations also demonstrate a provisional quality, with ideas about good practice being constantly modified after previously unforeseen patterns of events lead to accident or hazard. Few, if any, of these patterns of good practice are based upon detailed investigations of safety-related attitudes and beliefs, such investigations having hardly ever been carried out. (But see Dawson et al. 1982, and Bryant and Neumann, 1988 for some contemporary exceptions.)

In view of our lack of detailed information about cultural beliefs and behaviour relating to danger and safety, it is instructive to look in a little more detail at the way in which the OECD Nuclear Energy Agency (1987) itself made use of its reference to safety culture in its report on the implications of Chernobyl noted above. After a number of general and unspecified references to "the underlying quality of the nuclear safety culture in the USSR" (OECD, 1987:9) and to the significance of the "so-called human element" in producing the "extremely improbable combination of violation of instructions and operating rules" (29-30) which constituted the prime cause of the incident, the review of the consequences of this incident for Western plants emphasises (30-32):

* "operator qualifications", including the need for refresher courses, for training on simulators and for feedback on accidents or near-misses;

* "operator working environment", stressing the importance of the role of the safety engineer, as well as a number of ergonomic factors in instrument displays;

* "control of the operators" by inspection, by monitoring of log books and by analysis of incidents; and

* "help to the operators in an emergency" based upon exercises and an emergency plan.

Supporting this list of strictures directed at operators, there should be:

* "strict administrative control" of building and operation, with reporting-back and consideration of deviations from what has been specified. (32)

* "Administrative controls" should be technically accurate, complete, understood and enforced, in order to ensure safe operations. These control should be reinforced by further training, contingency planning, and management attention and diligence.(55) A series of procedures for operation and testing, for unusual operations and for bypassing safety systems is listed (56ff.), with controls to check that they are adequate and to ensure that they are followed.

Finally, since it was recognised that "attitudes to safety" were in some way defective in Chernobyl, having permitted a "loss of vigilance", it is advised that improved knowledge of safety system design and operation, together with training in operating experience may help to improve such attitudes, although it is felt that "attitudes cannot be regulated."

These counsels are sensible in that they not only point to issues of major and proper concern to those managing nuclear installations, but also set them out in a form which might be worth considering by managers of any other major technical plant (although not explicitly circulated to such managers). However, the view which they present of 'safety culture' is a very impoverished one. The social aspects of the socio-technical systems concerned are looked at very much from the point of view of a technical manager or an engineer. The notion of safety culture is reduced, on the one hand, to sets of administrative procedures for training, emergency plans and so on, and on the other, to individual attitudes to safety and danger which, it is thought, "cannot be regulated". There is no indication of the crucial importance which shared attitudes and beliefs might play in determining how employees in an industrial setting come to consider matters of safety precautions and the enforcement of rules, along with all other aspects of their working life. It is perhaps indicative of this view that although 'safety culture' is given such a central place in the analysis, it is not explained in any general sense and nor is it included in the Glossary of Terms published at the end of the report.

4. Modelling Safety Culture.

How, then, might we go about specifying a model of a positive safety culture? At a very general level, we can think of such a culture as one which promotes among those who participate in it a shared attitude of care for the consequences of their actions, an attitude which would cover both a concern for material consequences and a solicitude about possible effects on people.(Turner:1989a)

To explore more specifically the requirements of a good safety culture, we might suggest the following:

First, at the senior management level, we would hope to find a strong emphasis given to safety as part of a broad strategy of risk control (Coletta, 1988). This would recognise the high priority which safety matters might demand as balanced against other needs: needs for quality, low costs, speed or quantity of output. Coupled with this would be a realistic view of the short-term and

long-term hazards entailed by the organization's activities, with staff and resources to provide good quality advice on such matters. What is to be avoided is the cultural pattern of behaviour which has been called 'groupthink' (Janis, 1972), a precarious pattern in which those in powerful positions use influence to reinforce their own points of view, even when these are mistaken, and to stifle criticism. This can lead to a self-reinforcing inflexibility, as realistic feedback becomes more and more difficult to acquire.

For similar reasons, as the high-reliability researchers have emphasised, it is desirable to foster a climate which takes a positive attitude towards criticisms, comments and feedback arising from lower levels of an organization, or from outside it. Rather than rejecting such views as 'foolish interruptions' made by the 'ill-informed', their content might be reviewed for novel insights into organizational operation. The recent extension of workers' quality circles in Japan to safety matters takes such an approach. Workers in the hyari-hatto programme do not only discuss safety procedures both generally and in relation to particular novel tasks. They also report back to their groups on the incidence of 'near-misses' which they encounter (hiyari); and on the occasions during their work when they experience a sense of danger (hatto). These reports serve as preliminaries to reviews of the actions which might make such occasions less frequent (Kitagawa, 1989).

Awareness is needed, of course of the importance of communicating safety relevant information at all levels in the organization: an organizational culture needs to be sought which permits such communication flows in spite of the almost universal disruptions and distortions of information by bottlenecks, by personal antagonisms and by office politics. 'Total communication' does not offer an answer, for this merely leads to information overload and excessive noise. Instead some stable pattern of trade-off between too little and too much information must be sought.

As the OECD Nuclear Energy Agency comments suggest, a good safety culture would promote the operation of appropriate, realistic and workable rules relating to hazards, to safety and to the control of potentially damaging energy sources. These rules, however, need to be supported and endorsed throughout the organization, for concern with safety needs to be 'representative' of organization members, not imposed in a punitive manner by one group on another (Gouldner, 1954). Only in this way is it possible to move towards a state in which the recognition of the necessity and the desirability of the rules provides a motivation to conform to them in spirit as well as according to the letter. The communal gathering of 'intelligence' and the creative assessment of this intelligence can then be applied to issues of safety management.

If the members of an organization, both work-force and management, are to apply themselves in this way, it is clear that personnel need to be well-trained and appropriately educated. They need to have an appreciation of the possible sources of disruption to their normal work, and of the possible consequences of unsafe acts, to be aware of unusual responses from equipment and of unusual actions by members of the organization or by 'strangers' (Turner, 1978) arriving from outside.

In considering how such patterns of operation might be extended, it is also worth examining the organizational design and development literature to consider how the design of a safe organization might be tackled. The work of Cherns (1976, 1987) and Davis (1982) has been considered as a starting point for such a task, applying their socio-technical approach to orgnization design to the requirements of a safe organization (Turner, 1989). Much more work remains to be done, however, in locating useful insights in this literature and transferring them to the risk management problem.

In sum, four very general characteristics may be tentatively advanced as prelimiary features of a corporate safety culture. These are the establishment of an organizational response of care about the consequences of actions and policies; a commitment to this response at all levels, especially the most senior, together with an avoidance of groupthink; provision to practitioners of feedback from incidents; and the existence of comprehensive and institutionalised norms and rules for handling safety problems supported in a 'representative' rather than a punitive fashion. All of these features, but especially the final one need to be reinforced by the generation of an appropriate accompanying set of beliefs and assumptions which constitute a corporate attitude towards safety.

5. Conclusions; with a Caveat about Culture.

During the past decade, many managers have been preoccupied with issues of corporate culture, following the linking of particular styles of corporate culture with 'excellence' in performance (Peters and Waterman, 1982). As a result of intensive research and discussion on this topic during this period, we are now much more aware that, while an appropriate corporate culture is crucial to good performance in most industrial situations, such cultures are both more subtle and more resistant to manipulation than many had at first assumed.(Pondy et al., 1983; Turner, 1986; 1989b). This is not to say, as did the OECD Nuclear Energy Agency, that "attitudes cannot be regulated", but rather to indicate the difficulty of acheiving such regulation by imposition from the upper levels of an organization.

The excesses of the 'corporate culture' movement need to be avoided in the new look at issues of 'safety culture' which, during the coming decade, must form an essential component in risk management within our concentrated and high-energy using industries. It needs to be recognised that culture is not a simple 'thing' that can be 'bolted on' to an organization, nor a simple set of practices which can be implemented on a Monday morning after a weekend course. There is often a well founded resistance at the lower levels of any organization to the latest fads and fashions which are imposed from above (International Herald Tribune, 1989) so that there is a danger that 'safety culture', like 'corporate culture' may be seen as something which only requires lip service, until this current enthusiasm has been replaced by another.

If an effective safety culture is to be put in place to counter the alarms and concerns which have prompted this series of World Bank Workshops, it needs to be recognised that there is a difference between a managerial or a corporate outlook and the patterns of practices, beliefs, and attitudes which constitute 'culture-in-work' for most industrial employees. To influence this 'culture-in-work', it is necessary to take it seriously, to recognise its subtleties and its complexities, and to acknowledge that its roots are far from superficial. Assumptions and traditions about work and safety which are seen as 'natural' and 'taken-for-granted' can only be understood if they are seen as components of wider sets of beliefs which offer a world-view on matters of work and leisure, safety, danger and injury, life and death. If risk management is to proceed successfully in the future, if it is to respond adequately to unease about potential technological disasters, the nature and sources of those beliefs and assumptions which make up 'culture-in-work' must be taken tackled in a manner which avoids superficiality. Only then will it be possible to gain the willing cooperation of workgroups at all levels in support of the implementation of those patterns of best practice which may be selected from existing organizations or demonstrated by current research.

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