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Reflections on Enacted Sensemaking in the Bhopal Disaster

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ABSTRACT   An updated analysis of the Bhopal disaster suggests that problems of abduction, awareness, reliability, and certainty were more serious than was first thought. Expanded analysis shows that the tight coupling between cognition and action, normally associated with enacted sensemaking, broke down at Bhopal. The breakdowns included a low standard of plausibility, minimal doubt, infrequent updating of both mental models and current hunches, and mindless action. The modest enactment that did occur prolonged rather than shortened the crisis.

INTRODUCTION

Looking back from the year 2002 to the year 1984, Lapierre and Moro (2002) described the Bhopal methyl isocyanate (MIC) plant this way:

> An atmosphere of extreme depression prevailed for some time over the metal structures of the factory. Ever since the departure of the men who had given it its soul – Woomer, Dutta, Pareek, Ballal – morale had plummeted, discipline had lapsed, and worst of all, the safety culture had gone out the window. It was rare now for those handling toxic substances to wear their helmets, goggles, masks, boots, and gloves. It was even rarer for anyone to go spontaneously in the middle of the night to check the welding on the pipework. Eventually, and insidiously, the most dangerous of ideas had crept in, namely that nothing serious could happen in a factory when all the installations were turned off. As a result, plant workers preferred card games in the site canteen to tours of inspection around the dormant volcano. (Lapierre and Moro, 2002, pp. 279–80)

The awakening of that 'dormant volcano' was captured in Paul Shrivastava's (1987) thoughtful analysis of Bhopal. One sentence in his analysis seemed especially provocative: 'when a triggering event occurs, spontaneous reactions by different stakeholders

solve some of the immediate problems, but they also create new problems – thus prolonging the crisis and making it worse' (p. 24). The possibility that reactions create new problems (e.g. mentioned on p. 309 of Weick, 1988, hereinafter abbreviated as W88) can be recast in terms of the more general notion that cognition lies in the path of the action (W88, p. 307). An even more inclusive frame is one proposed by Hernes (2008) when he describes 'the mind grappling with complexity, then becoming part of that complexity. The mind establishes labels in order to understand what is going on, but then the labels become part of what is going on' (p. 149). Traditionally, sensemaking and categorization are seen as means to simplify rather than complicate. But, there are also times when, despite or because of that simplification, situations become less comprehensible, more interactively complex, and harder to control (Perrow, 1984). Bhopal seemed like just such a case and that's why I studied it 20 years ago. More recently, when the editor asked me to restudy that analysis and update my understanding of it,[1] the new experience was much like that described by T. S. Eliot:

> We shall not cease from exploration,
> And the end of all our exploring,
> Will be to arrive where we started,
> And know the place for the first time.
> (T. S. Eliot, 'Little Gidding', No. 4 of 'Four Quartets')

When I arrived back at the Bhopal article I didn't so much 'know the place' for the first time as I knew the knower and what guided his knowing for the first time. And that knowing was informed by explorations of sensemaking since 1988. When all of these strands came together they triggered reflections such as those that follow.

A CLOSER LOOK AT SENSEMAKING ON THE NIGHT OF 2–3 DECEMBER 1984

The control room at the MIC plant in Bhopal was something of a nightmare for sensemaking. The control board had 75 dials, many of which were not working. This meant that the operator had to go out and get information on site or do without the information (Lapierre and Moro, 2002, p. 277). 'Broken gauges made it hard for MIC operators to understand what was happening. In particular, the gauges that show pressure, temperature, and level for the MIC storage tanks had been malfunctioning for more than a year' (Hanna et al., 2005, p. 32). There were corroded lines, malfunctioning valves, faulty indicators, and missing control instruments (Chouhan, 2004, p. 21). Operators were trained to implement a model that was later modified without further training (Chouhan, 2004, p. 14). In short, 'anything could happen in this plant' (Chouhan, 2004, p. 6). If the plant condition is deteriorating, then there should be a greater likelihood that any apparent problem could be one of Barry Turner's 'decoy problems' (Turner and Pigeon, 1997, p. 42) that draws attention away from more serious problems elsewhere.

One way to conceptualize this combination of missing and misleading cues is to argue that Bhopal had a problem with abduction (e.g. Eco and Sebeok, 1988; Locke et al.,

2008; Patriotta, 2004). Operators found it difficult to generate plausible conjectures about the meaning of fragmentary evidence. The plant is in such poor overall condition that a cue or a symptom could mean anything. The problem is not so much alertness or sensing something out of the ordinary (e.g. an operator feels vibration when standing atop MIC Tank 610). Instead, because of the loss of expert operators and cutbacks in the length of training, the remaining operators worked with concepts that were largely ungrounded and empty. These empty concepts in turn meant that operators had little idea what to look for, what they saw, or what things meant.

It was this set of durable puzzles that formed the context for the pipe flushing operation on 2 December. This flushing was the triggering event that I started with (W88, p. 309). On the previous shift (Shift 2, which ran from 3:00 PM to 11:00 PM), a new worker was washing corrosion out of pipes located some distance from MIC Tanks 610, 611, and 619, all of which were close to full. He was being monitored by a new shift supervisor who had recently been given additional maintenance responsibilities (Hanna et al., 2005, p. 26). Before this change of responsibilities a maintenance supervisor would have instructed and supervised the operator who cleared the pipe. However, this maintenance position had been eliminated from Shifts 2 and 3 just a week before the accident. These maintenance responsibilities were added to those of the production supervisor of Shift 2. This person had been an MIC supervisor for only one month, having been transferred to the MIC unit from the battery production unit. He was not yet completely familiar with maintenance and operating procedures (Hanna et al., 2005, p. 32). Furthermore, when he was briefed by the production supervisor of Shift 1, there was no mention of the need to insert solid metal discs at end of each pipe before flushing to prevent water backup (Lapierre and Moro, 2002, p. 273).

As the flushing operation unfolded on Shift 2, some of the water was clearly backing up somewhere because it was coming out of only 3 of the 4 open drain cocks. At 10:30 PM, close to the end of Shift 2, the operator who started the flushing operation asked the supervisor if he should leave the water running. The supervisor said 'yes, the night shift will turn it off'. A note about ongoing flushing was made in the control room logbook. The water was eventually turned off by the 3rd shift at 12:15 AM, which is roughly 4 hours after it was turned on (Chouhan, 2004, p. 74). Without anyone realizing it, the water had been backing up into MIC Tank 610 where it was mixing with methyl isocyanate and building up both heat and pressure. This scenario of what happened was contested by Union Carbide who argued that a disgruntled worker had intentionally forced water into Tank 610. This 'sabotage theory' is discussed by Chouhan (2004, pp. 45–52) and D'Silva (2006).

When the 6 person operating crew for Shift 3 took over at 11:00 PM they had nothing much to do. 'Apart from Qureshi, Singh, and Varma, who were to continue the cleaning operation that the previous shift had started, the men had nothing to do because their production units had been stopped. They chatted about the plant's gloomy future, smoked bidis, chewed betel, and drank tea' (Lapierre and Moro, 2002, p. 278). About 11:30 PM one of the operators, Mohan Varma, said, 'Hey, can you smell it? I swear there's MIC in the air'. The others replied, 'There can't be any smell of MIC in a factory that's stopped. It's not MIC you can smell, it's Flytox [mosquito spray]' (Lapierre and

Moro, 2002, p. 280). One half hour later, however, people conceded that Varma was right because their eyes began to water and they too smelled the distinctive MIC odour that resembles boiled cabbage (Lapierre and Moro, 2002, p. 284).

During the tea break which started at 11:40 PM, operator Suman Dey came into the canteen from the control room and said, 'The pressure needle has shot up from 2 to 30 psig'. Hearing this, Supervisor Qureshi said, 'Suman, you're getting in a sweat about nothing! It is your dial that has gone mad' and continued with the tea break (Lapierre and Moro, 2002, p. 286).

After the tea break, two operators walked out to Tank 610 in order to compare the pressure reading at the tank with the unusually high reading in the control room. Both gauges gave the same high readings. Furthermore, the operators felt the throbbing that occurs when a liquid is boiling and turning into a gas. 'There's a lot of movement going on in there' (Lapierre and Moro, 2002, p. 291). The two spotted a leak 8 yards off the ground at a draincock where they also saw 'a bubble of brownish water surmounted by a small cloud' (Lapierre and Moro, 2002, p. 285). They reported all of this back to the shift supervisor.

When the supervisor heard this he ran out to the tank and saw an erupting column of gas. In what can only be described as a cosmology episode (Weick, 1993), he murmured, 'It's not true' (Lapierre and Moro, 2002, p. 292). What was 'not true' was that 'a terrifying, uncontrollable, cataclysmic exothermic reaction of methyl isocyanate' had exploded in an MIC production facility that had been shut down 6 weeks earlier. Since there were no operations and only inert storage, it was inconceivable that anything significant could be happening (Lapierre and Moro, 2002, p. 293).

ENACTED SENSEMAKING: THE BASIC ARGUMENT (IN RETROSPECT)

'Crisis' is the very first word in the Bhopal article: 'Crises are characterized by low probability/high consequence events that threaten the most fundamental goals of an organization' (W88, p. 305). I go on to say that 'actions devoted to sensemaking play a central role in the genesis of crises and therefore need to be understood if we are to manage and prevent crises' (W88, p. 308). Thus, my focus is on 'the adequacy of the sensemaking process directed at a crisis' (W88, p. 305) and how context affects that adequacy. Maitlis (2005) importantly focuses on sensemaking under non-crisis conditions.

Organizational factors such as loose coupling, diverse goals, and distributed cognition can impede efforts to make credible sense of the unexpected. When sense is elusive or easily normalized, events accumulate and develop into larger, more serious problems (Roux-Dufort, 2007). Thus, difficulties with sensemaking, are what mediate potentially dangerous outcomes. And organizational forms increase or mitigate many of these difficulties. It is true that Bhopal had all kind of safety problems, procedure problems, and technology problems that can have direct and dangerous effects on outcomes apart from sensemaking (e.g. closed valves that leak). The majority of these can be managed by alert, aware operators if detected early. But early management of these problems is dependent on mental models that are consensually valid, experience-based, and

informed by activity that clarifies puzzling cognitions. Restrictions on the content of the models or on meaningful interaction to update models allow small problems to grow larger and interact in complex, incomprehensible ways (Perrow, 1984). As problems worsen the effects of organizational factors on sensemaking tend to be magnified. As Pat Lagadec (1993, p. 54) put it, 'The ability to deal with a crisis situation is largely dependent on the structures that have been developed before chaos arrives. The event can in some ways be considered as an abrupt and brutal audit: at a moment's notice, everything that was left unprepared becomes a complex problem, and every weakness comes rushing to the forefront.'

Brutal audits are a harsh reminder that safe functioning is not bankable (Schulman, 1993). For example, the MIC plant bought its own fire truck to deal with emergency situations. However, when a dangerous fire broke out and audited the plant's emergency response, the truck was up on jacks and the rear wheels had been removed (Chouhan, 2004, p. 17). Just because operators held the operations together yesterday does not mean that they will be able to hold them together today. Coordination, communication, and trust need to be rebuilt every day.

The basic argument in the Bhopal paper was framed at the micro-level of analysis where individual agency, social psychology, and dyadic interaction constrain the argument. For example, although I mention crews and teams in the preceding paragraph I do not always walk that talk. On page 306 (W88) I start a sentence this way: 'Imagine that *the* control room operator faces a gas leak' (emphasis added). The sentence does not say 'imagine that the operating "team" faces a leak'. There is an ambivalent stance in some of my work regarding the costs and benefits of interpersonal sensemaking. That ambivalence is summarized in one of Robert Irwin's favourite maxims: 'seeing is forgetting the name of the thing seen' (Weschler, 1982, p. 180). The naming that transforms originary seeing into consensual seeing is done to introduce order into social life. For example, the eye irritation and faint odour experienced at 11:30 PM was labelled as Flytox odour and consensually dismissed using a category that was familiar to everyone (i.e. common spray for mosquito control used in plant). That category accomplished consensual order but came to mean something independent of its origins. It is this potential for meanings to become divorced from their origins that predisposes to failures of inference and escalation of crises.

Baron and Misovich (1999) argue that sensemaking 'starts' with knowledge by acquaintance that is acquired through active exploration. Active exploration involves bottoms-up, stimulus-driven, on-line cognitive processing through action. Labelling those perceptions plays a secondary role. But if people want to share their cognitive structures, those structures have to take on a particular form. As social complexity increases, people shift from perceptually-based knowing to categorically-based knowing in the interest of coordination (see also Maitlis and Sonenshein, 2010). Now they develop knowledge by description rather than knowledge by acquaintance, their cognitive processing becomes schema-driven (i.e. concept-driven) rather than stimulus-driven, and they go beyond the information given and assign a handful of their direct perceptions to types, categories, stereotypes, and schemas (Tsoukas, 2005). This transformation can be treated as a representative anecdote for ways in which organization can impede sensemaking and heighten danger.

SENSEMAKING IS A SELECTIVE VOCABULARY

Language is a central issue in sensemaking.

> Men seek for vocabularies that will be faithful *reflections* of reality. To this end, they must develop vocabularies that are *selections* of reality. And any selection of reality must, in certain circumstances, function as a *deflection* of reality. Insofar as the vocabulary meets the needs of reflection, we can say that it has the necessary scope . . . [A procedure to develop such a vocabulary] involves the search for a 'representative anecdote', to be used as a form in conformity with which the vocabulary is constructed. (Burke, 1945/1969, p. 59)

The 1988 discussion of enacted sensemaking at Bhopal reflects a small portion of the disaster but deflects much more of it. The selection of the pipe flushing as a reflection of the Bhopal disaster, and its description using the vocabulary of enacted sensemaking, is an attempt to tie a representative time period in the disaster to six concepts: self-fulfilling prophecy, social information processing, retrospective sensemaking, commitment, capacity, and expectations (W88, p. 307).

A similar argument about language that ties data to concepts is found in Kurt Lewin's style of theorizing. 'Any description should be two-faced, looking simultaneously to the world of data and to that of concepts' (Cartwright, 1959, p. 13). Adequate description represents. But, depending on how well that representation links to a system of concepts, the description also explains. Three items are involved: conceptual system, description of observation, data. The relationship among these three is often imbalanced in one of two directions. 'Mere description' can occur when the language refers mainly to data but not to a system of concepts. Mere abstractions have the reverse problem, too much abstraction, too little data.

The title of the 1988 paper, 'Enacted sensemaking in crisis situations', suggests that it is both a crisis paper and a sensemaking paper. As a crisis becomes more severe, sensemaking intensifies, which normally lessens the crisis severity, which then reduces the sensemaking. Phrased in that form, crisis sensemaking at Bhopal is not all that different from sensemaking that occurs in response to breaches in everyday life. The sequences are similar but the intensities are different. There is an interruption, followed by moments of thought, action to clarify the thinking, and recovery. John Dewey puts it this way:

> In every waking moment, the complete balance of the organism and its environment is constantly interfered with and as constantly restored . . . Life is interruptions and recoveries . . . At these moments of a shifting of activity, conscious feeling and thought arise and are accentuated. (Dewey, 1922/2002, pp. 178–9)

The conceptual language of enacted sensemaking gathers data into interruptions, actions, and recoveries, but it also gathers it into the activity of thinking. We return to John Dewey to summarize this extension. Writing in 1931 during the height of the Great Depression, Dewey made the following observation: 'We are living in a period of

depression. The intellectual function of trouble is to lead men to think. The depression is a small price to pay if it induces us to think about the cause of the disorder, confusion, and insecurity which are outstanding traits of our social life' (McDermott, 1981, p. 397). Notwithstanding the relevance of Dewey's comment for the current economic context in 2009, this observation also has relevance for the topics of enacted sensemaking, crises, and Bhopal. To think about disorder, confusion, and insecurity is to engage in the early stages of sensemaking. Trouble is an occasion for thinking, whether it be thinking by a control room operator or by scholars analysing how operators cope with trouble. The troubled thinker 'observes, discriminates, generalizes, classifies, looks for causes, traces analogies and makes hypotheses' (James, 1996, p. 15). Thus, a vocabulary of sensemaking might start with these basics:

Disorder + confusion + insecurity = trouble.
Trouble + thinking = sensemaking.
Probing for plausible stories that explain trouble = enacted sensemaking.

CRISIS SENSEMAKING IS AHISTORICAL

One of the objections to the use of crises as representative anecdotes of sensemaking (e.g. Grenada invasion, Tenerife airport disaster, Mann Gulch wildfire blowup, Moira mine disaster, Bristol Royal Infirmary, Columbia space shuttle) is that when one 'focuses on limited settings in timespace, he can concentrate his analysis on relatively few factors that he can observe have a bearing on organization in that limited time space' (Hernes, 2008, p. 124). In other words, if you watch a compact, specific, short event then you can grasp most of it with relatively few factors. Under the assumptions that most organizational events are overdetermined and complex, organizational sensemaking during crises is not representative. This issue is important and investigators need to make their peace with it. One way to achieve that peace is by Kurt Lewin's concept of 'contemporaneous causation'.

The concept of 'contemporaneous causation' (also known as ahistorical or systematic causation) states that 'neither past nor future psychological facts but only the present situation can influence present events. This thesis is a direct consequence of the principle that only what exists concretely can have effects. Since neither the past nor the future exists at the present moment it cannot have effects at the present' (Lewin, 1936, pp. 34–6). Dorwin Cartwright's (1959, pp. 10–21) summary of Lewin's thinking sheds additional light on the concept:

An individual's behavior is oriented to both the future and the past *as they exist for him at any given time*. He remembers, for example, that he failed at some undertaking in the past and expects to succeed when he tries the next time. The principle of contemporaneity asserts that both the 'expectation' and the 'memory' exist at the moment they exert their influence on behavior and that the exertion of such an influence demonstrates neither causation from the future nor from the past. (Cartwright, 1959, pp. 19–20; emphasis in original).

If investigators focus on limited timespace settings this could mean that relatively few factors 'have a bearing on organization in that limited time space'. But, it could also mean that many more factors are included if an investigator adopts the principle of contemporaneity. '(F)ield theorists are content, in attempting to account for the occurrence of a concrete event, to describe the "here and now" and to show how the occurrence of the event is required by the nature of the situation. Asked to account for "why" an individual does something at a particular time, the field theorist describes the situation in which the individual exists at that time' (Cartwright, 1959, p. 19). In other words, from the standpoint of contemporaneous causation, all the factors are there in each period of crisis sensemaking (Deutsch, 1954, p. 186). The trick is to describe those moments using language that connects data with conceptual networks. The Bhopal disaster therefore can be understood as a site where the language of enacted sensemaking is developed and applied in order to see whether it is useful (Reich, 2008). Useful here means whether it preserves a representative abridgement of the event and connects that representative selection to explanatory concepts.

In the Bhopal paper enacted sensemaking is treated as a link between the events in the disaster and the concepts of self-fulfilling prophecies, retrospective sensemaking, commitment, and social information processing (W88, p. 306). What is noteworthy is that retrospective sensemaking is just one part of the conceptual system of enactment in 1988, whereas in 1995 (Weick, 1995) it seems more central in the descriptive language. In 1995, enactment is now just one of seven properties of sensemaking, the other six being social context, identity, retrospect, reliance on cues, ongoing experience, and updated plausibility (summarized by the acronym SIR COPE). These seven now serve a different purpose, namely, they represent the situation that is present at moments of sensemaking. When operators at Bhopal flush corroded pipes, spot a leak, experience eye irritation, talk to their supervisor, tap gauges, and flee for their lives, their realities at those moments of sensemaking are mixtures of SIR COPE. That language converts the data into a description that links those data back to conceptual systems that are built around belief and action (Weick, 1995, pp. 133–68). A description that uses the language of SIR COPE allows the analyst to retain part of the psychological reality of working at 11:30 PM on a humid December night in a deteriorating Union Carbide chemical plant and to explain the data using concepts. As the runaway chemical reaction unfolded there was little communication among the six people on the crew (social context). There was also resignation to a low status position in a neglected plant (identity), unease that what had been occurring that evening was not right (retrospect), malfunctioning gauges (cues), continuous rumbling sounds that got louder and odours that got stronger (ongoing), explanations of the odours as insect spray (plausibility), and little immediate action other than a tea break to follow-up on the cues (enactment).

AWARENESS NOT ALERTNESS IS THE REAL STRUGGLE

Five years after the Bhopal paper was published, Karlene Roberts and I (Weick and Roberts, 1993) studied operations on the flight deck of an aircraft carrier. We summarized those operations as a 'struggle for alertness'. That continuing struggle involved efforts to perform reliably and to spot and fix small anomalies that might produce large

negative consequences. These efforts were more or less effective depending on the heedfulness with which people envisioned their work as contributions to a system and subordinated their interests to those of the system they envisioned. The Bhopal analysis, which is focused on such things as triggering events and missed signals, seems to be a clear instance of a struggle that was lost. However, a problem in both analyses is that alertness is sometimes treated as synonymous with awareness. That conceptual confounding blurs two different contributors to sensemaking and the crisis.

'Alertness' is an effort to notice something that is out of place, unusual, or unexpected. 'Awareness' is an effort to generate conjectures about what that anomaly might mean. In the terminology of Baron and Misovich alertness is stimulus-driven, awareness is schema-driven. Alertness and awareness are instances of the more general categories of perception and conception and the relations between them (James, 1996, ch. 4–6). One way to depict this more general relationship is by means of Kant's observation that 'Perception without conception is blind; conception without perception is empty' (Blumer, 1969, p. 168). Crisis sensemaking can make the crisis worse either when significant cues go unnoticed because there are no concepts to select them (problem of blindness) or when the concepts that people deploy have no connection with particulars (problem of emptiness). Empty concepts are a problem when designer logic steeped in abstractions dominates (Perin, 2005). Blind perceptions are a problem when logics of practice steeped in details dominate. Crises worsen because of senseless details or meaningless conjectures. While operators at Bhopal lost alertness, they did so because their repertoire of responses, including analytic concepts, was too small, too tentative, and too ungrounded to select and explain their perceptions (e.g. nothing happens in a plant that is shut down). The problem was twofold. Inadequate concepts based on limited training and experience produced meaningless conjectures. And undifferentiated perception without any figureground structure to suggest significance was blind and essentially no perception at all.

If we re-examine alertness at Bhopal from the standpoint of more recent work, we see an expanded set of phenomena. For example, a newer interpretation of crisis sensemaking at Bhopal would highlight the morale, emotional tone, and energy associated with plant operations (e.g. Barsade and Gibson, 2007; Mills, 2003; Maitlis and Sonenshein, 2010). My discussion of Bhopal in 1988 was basically cool and cognitive. The only affect mentioned was that of the shift superintendent who arrived at the scene on his bike and 'panic'd' (W88, p. 312). This imbalance between cognition and affect in my explanation gives too little weight to an ongoing mood of pessimism. 'The plant didn't seem to have a future and a lot of skilled people became depressed and left as a result' (W88, p. 313). I thought this downward trajectory reduced the response repertoire available to operators. With a restricted response repertoire, operators cannot afford to see much trouble because they have no way to deal with it. With a fuller repertoire, people can afford to see more discrepancies because they can do something about each of them (Westrum, 1993). But there is a different way to interpret these data. Barbara Fredrickson (2009) found that positive emotions broaden the range of what people see and think. Thus, one could argue that alertness and awareness were limited at Bhopal (W88, p. 311), possibly due to a limited skill repertoire that reduced capabilities for control or possibly as a consequence of negative emotions.

A different expansion would be embedding the Bhopal incident in the literature on high reliability organizations (e.g. Roberts, 1990). I was surprised to see that five principles of organizing for high reliability (Weick et al., 1999) were implicit in the Bhopal analysis but conspicuous because of their absence in Bhopal's practices themselves. *Preoccupation with failure* is almost moot in a 'system' that already is failing in multiple ways. Nevertheless, operators have some sense of what is expected in a flawed system. Departures from those expectations need to be given prompt, close attention, not put on hold until after a tea break. *Reluctance to simplify* is absent because of cost-cutting, loss of experience, and simplified instructions to newer crew members. *Sensitivity to operations* is at the centre of the Bhopal story as illustrated by the pipe flushing operation. Sensitivity 'to detect and correct anomalies' (p. 313) is achieved when more people are in constant touch with the system. *Commitment to resilience* is somewhat of a puzzle at Bhopal. It is amazing that this system continued to function at all given its environment of dust, humidity, unpredictable fluctuations in voltage, and inoperative gauges. Continued functioning is a testament that operators were able to make do and recover from modest setbacks. But these efforts at recovery represent less of a 'commitment' than a necessity. Commitment to resilience would be more evident had there been more attention to learning, training, and varied experience, all of which increase resilience. Finally, *deference to expertise* is low at Bhopal and is replaced by deference to authority (e.g. see Ayres and Rohatgi, 1987, p. 30). At the lower levels of the hierarchy, where people know the technology and where their eyes begin to burn from the escaping gas, there is not much latitude to take action. And no one higher up pays much attention to their symptoms and observations. This fills out the model mentioned earlier wherein practices of organizing affect the credibility of sensemaking which affects containment of and recovery from the unexpected.

To update the Bhopal article is to shift away from a singular focus on alertness towards a broader focus on awareness, concepts, and prototypes as crucial inputs for sensemaking. Kathleen Sutcliffe and I, following the work of Ellen Langer (1989), highlighted awareness in our description of mindfulness as 'a rich awareness of discriminatory detail. By that we mean that when people act, they are aware of context, of ways in which details differ (in other words they discriminate among details), and of deviations from their expectations' (Weick and Sutcliffe, 2007, p. 32). Deviations from expectations are issues of alertness. The sense people are able to make of these deviations depends on their awareness of context, actions, and perceived differences among details.

COGNITION AND ACTION ARE INSEPARABLE

If trouble compels one to think as well as act, then the phrase 'enacted sensemaking' preserves that interplay. This interplay is evident in two assumptions associated with American pragmatism:

(1) 'The world people inhabit is one they had a hand in making. And it, in turn shapes their behavior. They then remake it.'
(2) 'Meaning and consciousness emerge from behavior. An object's meaning resides not in the object itself but in the behavior directed toward it.' (Reynolds, 2003, p. 45)

Pragmatist William James fleshes out these assumptions:

> I, for my part, cannot escape the consideration, forced upon me at every turn, that the knower is not simply a mirror floating with no foot-hold anywhere, and passively reflecting an order that he comes upon and finds simply existing. The knower is an actor, and co-efficient of the truth on one side, whilst on the other he registers the truth which he helps to create. Mental interests, hypotheses, postulates, so far as they are bases for human action – action which to a great extent transforms the world – help to *make* the truth which they declare. (James, 1992, p. 908)

A central assumption in the Bhopal analysis is that people think by acting (e.g. W88, p. 305) which is why their efforts to develop a sense of what is happening are described as sense*making*. It is these efforts that can escalate or defuse a crisis. Acting without thought is blind, thought without action is empty. Swift cycling between thought and action is preserved if we say that people think *while* acting (e.g. W88, p. 307). Hernes (2008) puts it this way: 'We notice things as we act, and the sense made of what was noticed forms a basis for what is done next' (p. 131).

When action is inherent in sensemaking, the context of that action can shape thinking. Any context that makes an action public, irrevocable, and volitional also makes that action hard to undo and shapes thinking towards interpretations that justify the act (e.g. Weick and Sutcliffe, 2003). Diane Vaughan (1999) makes a related point when she says, 'individuals make the problematic nonproblematic by formulating a definition of the situation that makes sense of it in cultural terms, so that in their view their action is acceptable and non-deviant prior to an act' (pp. 280–1). For example, the sense made of actions at Bhopal (e.g. we keep things secret because we do not want to alarm people) justifies past actions and guides future actions (e.g. the siren that warned citizens of a gas escape was turned off after 5 minutes even though gas continued to escape; W88, pp. 310–11).

The general point is that whenever activity is salient, it may become frozen by attributions and justifications, and therefore become a constraint on sensemaking. To understand enacted sensemaking, an investigator needs to assess at least two things: (1) the malleability of the setting (how readily can actions change it); and (2) the extent to which the setting locks people in to what they did and provides a limited set of acceptable reasons for why they did what they did and why they should keep doing it.

Given the potential tenacity of sense made in the service of justification, newer work on doubt assumes considerable importance (e.g. Locke et al., 2008; Perin, 2005, p. 213 on doubt and discovery). Enacting doubt during a crisis may sound counter-productive since there is a premium on answers and confident intervention. Doubt should undermine coping. But, if choice activates self-justification and confirmation bias, if people are prone to focus on the safest interpretation (Perrow, 1984) and best case scenario (Cerulo, 2006; Clarke, 2001), and if comprehension of an idea leads to initial acceptance rather than rejection of that idea (Gilbert, 1991), then the enactment of doubt is crucial in order to expose wishful interpretations.

An example of this line of argument is Eric-Hans Kramer's (2007) provocative discussion entitled 'Organizing Doubt'. He presents a detailed framework, grounded in

rhetoric, evolution, and sensemaking, to understand the often senseless world of Dutch armed forces assigned to peacekeeping operations in the former Yugoslavia. These units faced the problem of not understanding the conflicts well beforehand (no one did) and the problem of not knowing what they would encounter on patrols (e.g. shootings, mines, aggressive local population, road blocks, witnessed atrocities, deplorable living conditions, everyday accidents, people who did not seem to be in need at all). Two assumptions lie at the core of Kramer's analysis:

(1) 'If the environment is dynamically complex it is impossible to know and understand everything in advance, therefore you need to be able to doubt your existing insights.' (p. 17)
(2) 'If the ability to doubt is of crucial importance for organizations dealing with dynamic complexity, organizations need to organize their ability to doubt . . . (A) spirit of contradiction should be organized.' (pp. 17–18)

To organize doubt is to engage in meaningful argumentation. Matters of controversy are deliberately sought and discussed (Kramer, 2007, p. 134). Kramer shows that doubt becomes organized when sense-*discrediting* occurs alongside sensemaking. Discrediting is tough because the real problem in most systems is that they are not open to the unknown. 'Real openness implies that a system is open to information that it has never thought of before. For this reason, *action* is an important informer for systems . . . If presented with the unknown, systems can be confronted with circumstances in which they need to act before they think. New experiences are therefore the source for discrediting' (Kramer, 2007, pp. 74–5).

A final issue that has become clearer since the Bhopal paper is that enactments are seldom as clear as I presume. John Law (2004), for example, argues that the best we can do is 'situated enactments and partial connections' (p. 155). In other words, enactments tend to be vague and indefinite (p. 14). My presumption has been that thinking and sensemaking are muddled until action resolves the muddle. That's too simple. If enactment is hesitant, fumbling, or transient, that can misdirect sense or render everything inexplicable (Goffman, 1974, p. 30).

CONCLUSION

If we wanted a single image to describe the complexities and uncertainties at Bhopal, we could borrow from Pat Lagadec and call Bhopal either a kaleidoscope or a situation of 'un-ness'. The situation at Bhopal resembles a kaleidoscope in the sense that 'if you touch the smallest element in it, the entire structure is altered. Consequently, the crisis resists attempts to simplify it. It requires strategic judgment more than predefined tactical responses' (Lagadec, 1993, p. xxvii). The situation at Bhopal is also one of 'un-ness', a word coined by Uriel Rosenthal, to depict a situation that is unexpected, unscheduled, unprecedented, and almost unmanageable, where 'the line between opportunities for brilliant success and crushing defeat is very thin' (Lagadec, 1993, p. xxix).

Trouble begets thinking. That thinking can be described as sensemaking, a description that allows both the analyst and the practitioner to link crisis details (Roux-Dufort, 2007)

with conceptual systems. Other descriptions capture different data and connect with different clusters of concepts. The test regarding the value of any description is a pragmatic one. Does the description improve coping as well as conceptualizing? Regardless of how one defines it, trouble contains Dewey's basics of interruption and recovery. In the case of Bhopal the interruptions as well as the recoveries are drawn out which makes the role of cognition, action, and sensemaking more visible.

When they deal with ambiguity, interdependent people search for meaning, settle for plausibility, and move on. The operating crew at Bhopal search for the meaning of the smell of boiled cabbage, plausibly label it as the odour of mosquito spray, and move on to drink tea. This represents sensemaking with a low bar for plausibility put in place by crude concepts, coarse-grained perception, and experience within a deteriorating plant. A deteriorating production facility blunts sensemaking tools and encourages simple explanations which mask accumulating problems. Bhopal teaches us that each step in this chain can raise the low probability of a high consequence event to tragic levels.

NOTE

[1] These comments are not intended as a review of the literatures on sensemaking, crises, or Bhopal. Instead, they are personal reflections on an earlier piece of work.

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