A new application of contextualist methodology in case research

Paper for presentation to:

ACSPRI Social Science Methodology Conference 2006

The University of Sydney, Sydney, Australia

10-13 December 2006

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Abstract

Contextualist methodology is the main focus of discussion in this paper, and its attributes as a rigorous approach to case study methodology are discussed. In a departure from the usual practice of applying this methodology to processes of organisational change, its efficacy in relation to cases of managerial decision making is demonstrated. The method is illustrated through references to a case study researched by the writer, the Moura Mine disaster of 1994. Reference to the case shows how a model of decision making processes was constructed as a tool to generalise the findings about behavioral decision making to other situations. The main aim of the paper is to present a convincing argument for this new area of application that will both extend the breadth and power of contextualist methodology and provide researchers with an additional tool for case study research.

Introduction

Davis (2000: 147) described the case study as 'the simplest and weakest of all experimental designs', since it 'suffers from all the major sources of invalidity' and is 'to be avoided if at all possible'. The underlying position of Davis and many besides is that case studies are merely descriptive, conclusions cannot be validated and the results may not be generalised. This position may resonate with those who privilege the quest for confirmatory evidence of pre-determined hypotheses under laboratory or quasi-experimental conditions, but is anathema to those who do not seek 'universal laws' to describe or explain social reality (Patton & Appelbaum, 2003). Seeking plausible explanations for complex and sometimes messy phenomena through an intensive examination of real-life scenarios suggests different research pathways. This does not have to mean a loss of research rigour: as distinguished researcher, Donald Campbell remarked (cited in Yin, 1994: ix):

> More and more I have come to the conclusion that the core of the scientific method is not experimentation per se but the strategy connoted by the phrase *plausible rival hypotheses* [that are presented] in extended networks of implications that (while never complete) are crucial to … scientific evaluation.'

For Campbell, the integrity of any research method can be judged according to how well alternative explanations of a phenomenon are examined and/or found to be irrelevant. Experimental studies supposedly eliminate the difficulty that would otherwise be posed by the presence of rival hypotheses by either randomly assigning objects of study to different treatment groups, or by controlling for the presence of confounding variables. This means that contextual factors are removed from the analysis to the extent possible. But this is not an option in case study research since context is all-important. The scientific rigour of case studies can be equal to that of experimental and quasi-experimental research designs, although tackling the matter of validation in different ways. For some commentators (Berg, 1998; Shaughnessy & Zechmeister, 1990) case studies open the way for discoveries, or reveal individual or social behaviours for the first time or in a new way. Although the results may not be relevant to categories of other people or capable of being judged for their statistical impact, they are valuable nonetheless for the insights they provide and their capacity to guide further research. Furthermore, every good case study can be generalised to similar individuals or groups to some degree. Yin (1994) and Patten and Appelbaum (2003) contrast the case study researcher's goal of expanding and generalising theories from a particular set of results with that of the experimental researcher who uses statistical results from representative samples to do a similar thing.

Yin (1994) acknowledges that good case studies are hard to do, and those that are good follow pre-specified design procedures and satisfy the requirements of scientific rigour. Contextualist methodology (Pettigrew, 1985) falls within the array of good case study research designs. This approach has been used by many researchers to investigate the dynamics of organisational change (e.g., Nelson & Dowling, 1998; Siti-Nabiha & Scapens, 2005). Its strength is in the rich description of the context in which the action in the case study is embedded. This provides a sound basis for findings that can be transferred through processes of analytic logic to other settings. As Patten and Appelbaum (2003: 65) asserted about good case studies generally: 'the generalisability is determined by the strength of the description of the context' such that 'a good descriptive or analytical language by means of which you can truly grasp the interaction between various parts of the system [so that] the possibilities to generalize … may be reasonably good'

Contextualist methodology is the main focus of discussion in this paper, and its attributes as a rigorous approach to case study methodology will be discussed below. In a new twist, however, this methodology will be applied to something other than processes of organisational change. In fact, the area of application is that of managerial decision making, which is of particular interest to the writer, who has adapted the methodology to explain cases of poor decision making that resulted in accidents or disasters. The logic of this adaptation will be discussed in this paper and one of the cases studies treated in this way will illustrate the method. The main aim is to present a convincing argument for this new area of application that will both extend the breadth and power of contextualist methodology and provide researchers with an additional tool for case study research.

Contextualist methodology and managerial decision making

Pettigrew (1985) proposed a contextualist methodology for examining change processes in organisations, which simultaneously placed human action in its broader historical and organisational context and captured the time-based nature of processes as they unfolded. In his view, understanding complex cause and effect relationships required detailed attention to action sequences and acknowledgment of the multilayered nature of organisational systems. He emphasised the notions of embeddedness and interconnection of process and action across systems. Pettigrew's (1985) holistic approach to examining change through case study analysis encompassed content (the action focus of the change), the surrounding context and processes unfolding over time. Pettigrew acknowledged that change processes are complex and caused by factors that are neither linear nor singular (Siti-Nabiha & Scapens, 2005). These ideas were developed further by Dawson (2003; 1996; 1994) who added organisational politics and specific internal and external environmental variables.

Why is managerial decision making a suitable phenomenon for exploration using contextualist methodology? In contrast with depictions from the classical tradition, which is the dominant approach in the management literature (e.g. Harrison, 2000), decision making has also been viewed as highly dynamic in nature (Kerstholt & Raaijmakers, 1997; Ford et. al., 1989). This alternative explanatory framework views decision making as a process that is non-linear, and decision making environments as highly complex, ambiguous and constantly changing (Reason, 1997; Perrow, 1984). Within socio-technical systems frameworks, the complexity is partly due to the interaction of social and technical elements (Richardson, 1994). The social component operates according to biological and psychosocial laws, while the technical part operates according to physical and mechanical laws (Waddell, 2001). For decision making in hazardous situations where accidents or disasters are more likely (the particular focus for the cases studied by the writer), the additional systems frameworks offered by Fortune and Peters (1995) and Toft and Reynolds (1994) are particularly relevant. Hopefully, it is reasonably clear from this brief description that decision making from the writer's perspective is a process embedded in dynamic, multi-layered systems, a fundamental requirement for the application of contextualist methodology.

A second reason for using contextualist methodology is that it is suited to cases where processes of social construction are emphasised. Socio-technical systems, according to the frameworks mentioned above, are complex constructions that are designed, shaped and operated through human agency. People intervene in their surrounding systems by generating and communicating knowledge and information, forming judgments about what is happening in the 'here and now' and making choices about what to do next. They are highly responsive to a range of psychological, social and cultural influences (Dawson, 1996) that arise from the internal environment of the system and external conditions. The choice making is essentially what decision making entails and is highly responsive to sets of contextual influences.

To round out this brief justification for adapting contextualist methodology, we can add that the action sequence studied in each of the chosen cases is the series of decisions (or actions taken at identifiable choice points) that ultimately lead to an accident or disaster. In fact, the disaster is often the result of a series of poor choices that are linked over time, rather than one bad decision at a discrete moment in time. The research focus is squarely on the choice behaviour of the people who are within the system and have the power and/or delegation to act and make decisions. The aim of the analysis is therefore to understand the connections between what these human agents decide to do at critical choice points and the influences around them that impact on their choice behaviour. While the writer is particularly interested in situations of poor decision making, this is not a 'blame the victim' approach. The focus on the individual at the scene is not intended as a means of attributing responsibility due to negligence, ignorance or similar faults. On the contrary, the analysis is designed to bring choice behaviour into the foreground so that it can be understood in the context of broader factors and influences, many of which are well beyond the control of the individuals at the centre of the action.

The method also draws upon other theories about the causes of socio-technical accidents and disasters. According to Richardson (1994), a socio-technical system failure is typically caused by a 'low probability triggering event', which is often preceded by at least one ‘weak signal event’ that potentially could have provided some indication of a problem in the developmental stages. In many instances, problematic incidents are averted because weak signal events are recognized for what they are and remedial action is taken. Unfortunately, in a minority of cases the events are missed (and people may have more than one chance to avert an accident). Socio-technical systems frameworks (eg., Fortune & Peters, 1995) further acknowledge contributory causes due to latent system weaknesses that may have been present for weeks, months or even years. In the writer’s framework for case research, the weak signal events are depicted as either opportunities for the human agent to make choices (decisions) to remedy a problem or moments when opportunities to avert a problematic series of events are lost.

Using the Esso Longford gas explosion as an example, the immediate cause of the disaster was an explosion, whose immediate trigger was escaping gas from a pipe with a cold brittle fracture that came into contact with a flame. The cold brittle fracture was unusual and unexpected (low probability) but the events leading up to it were traceable to actions taken by plant operators on the day in response to emerging problems (weak signal events), along with earlier contributory causes (latent weaknesses) including poor maintenance, staff shortages, and lack of knowledge of how the system worked. Responses to weak signal events on the day were inadequate, or exacerbated the situation because the staff on duty did not comprehend the full implications of the situation with which they were dealing. Ultimately, the company was found responsible because it had allowed the latent conditions (e.g., deterioration due to lack of maintenance) to continue unchecked, thus leaving the operators unprepared to recognise the signs of a developing crisis and to deal with it satisfactorily as it unfolded on the morning of the explosion.

Overall then, socio-technical systems theory suggests several elements for the case study researcher to work with: a systems failure (immediate cause such as an explosion); a low probability triggering event; one or more weak signal events; and other latent conditions that may have been present for some time. In the adaptation of contextualist methodology developed by the writer, this theory is used to structure the data collection through the following steps:

1. Identify the low probability triggering event, and understand its technical elements
2. Working backwards in time, identify one or more weak signal events that relate to the ultimate triggering event
3. Identify the individuals who were present at the time of each weak signal event, or who were witnesses to the event
4. Identify the action taken (choices made) in relation to the event
5. Reconstruct the action in as much detail as possible: include the responses of each person to the event, their situation assessments, evaluations, communications, personal interactions, and other actions taken and follow-up activity
6. Construct explanations of the choices made in relation to each event and establish patterns of choice behaviour in the system.

In the writer's own program of case study research, these steps were drawn up in advance of the data collection for the first of the detailed case studies, which was the

Moura mine disaster occurring in Queensland during August 1994. The main sources of evidence for this case were the mining warden's report (Windridge, 1995) and transcripts from the 40 days of official hearings. What emerged from this first case was a general model that could be applied to other socio-technical systems disasters. The tri-level model, referred to in figure 1, is based on the Moura case and has three levels that are nested one within the other: the broader institutional context, the socio-technical organization and the immediate operational environment of the individual or human agent. The expectation would be that while each ensuing case would have its unique elements, most could be explained by referring to the various levels and factors in the general model.

Figure 1: Tri-level explanatory model factors

Level 1: the immediate operational environment Factor A - Mental models: Assumptions and knowledge Factor B - Ambiguity and uncertainty in the operational environment Factor C - Emotion and mood states *Level 2: Socio-technical organisation* Factor D – Technology Factor E – Interpersonal communication Factor F – Formal organisation *Level 3: Institutional context* Factor G – Strategic intent Factor H – Regulatory environment Factor I – Industry framework

In the next section some details of how the Moura case was constructed will be given as an illustration of the method. This will not be a full case narrative - a more complete description of events was given by Chapman (2006).

The Moura mine disaster: the method illustrated

The initial task for the case researcher was to understand the triggering event and its technical elements (step 1 above). This emerges from the case scenario below.

> Just before midnight on 7 August 1994 the first of two explosions ripped through an underground coal mine at Moura in outback Queensland. Twenty one miners were working there at the time. Ten managed to make their way through the dust and heat to the surface more than a mile away, but 11 did not. The dangerous conditions frustrated all attempts to enter the mine and rescue any survivors or recover the victims. The mine was later sealed. The cause of the initial explosion was never finally determined, but was most likely triggered when a pocket of burning coal came into contact with combustible methane gas in a section known as panel 512. In all, 28 panels had been mined and sealed before work commenced on panel 512 in November 1993. In the first stage known as the *advance*, the pattern of access roads and solid coal pillars to support the roof was laid out to the extremities of the panel. Then in late April 1994 extraction continued into the second stage known as the *retreat*. This involved the stripping of pillars in alternate rows and by cutting more deeply into the floor. The method used during the retreat was different from that of previous panels where the roof was allowed to collapse behind the continuous miner. This time enough roof supports were left for the mined goaf area to remain open. This innovative design achieved the highest rate of production of any panel at Moura No. 2, but had the unintended consequence of allowing loose coal to accumulate around the columns and under the floor ramps. There were also some localised roof falls during the retreat that might have concealed loose coal. The problem with loose coal is its potential exposure to oxygen in the air, which spontaneously starts a heating process. When very hot, the coal can trigger an explosion if combustible gases are present. After the tragedy, the questions began: Why did mine management fail to prevent the heating from occurring in the first place, to recognise the symptoms or to do something about it?

From this introduction to the story, it is possible to see that spontaneous combustion from coal that had begun to heat was a key trigger. The researcher needed to understand how this can happen in an underground coal mine and what is normally done to detect such hazards. The story continues …

> Miners could detect a heating in progress through two means. First there were sensory indicators including smells, hazes, vapour and heat. Because of the volume or air circulating through the mine, these could be fleeting or variable. Second, technical instruments were available to test for the presence of certain gases. Of these carbon monoxide (CO) was the most important as it is produced when coal burns. At Moura gas samples were automatically collected from points in the mine, analysed, and reported on monitoring systems at ground level. Instruments measured both the quantity of air flowing through (air velocity) and its quality (concentrations of various gases). If a preset level of CO was breached, visual and auditory alarms would sound and the computer screen would change colour. Management staff underground could also take instant readings of CO in parts per million (ppm) with their portable gas readers. Prior to the 1980s, CO concentration in ppm was the recommended indicator that a heating might be in progress. This was later revised in the standard text reference to 'CO make' (volume of gas in litres per minute, or lpm, taking both CO concentration and air velocity into account). *Levels above 10 lpm were reckoned to be a cause for concern, while 20 lpm indicated that a heating was likely.* To estimate CO make, the miner needed to take the reading on his portable monitor and make some calculations taking air velocity into account. This was practicable only when back on the surface. Technical instruments available at Moura were advanced for the industry. But at the official inquiry, it became apparent that each person using them had different knowledge and ideas about what the various readings signified.

From there, a search of the evidence revealed several instances in the hours, days and months before when signs of a possible heating were detected – the weak signal events (step 2 above). This synopsis provides a glimpse of what these events were like in the six or seven weeks prior to the disaster:

> Early signs of a possible heating were detected on 17 June. Production was stopped by deputy Robinson and better ventilation to the area was arranged. Later checks suggested that the problem was solved. Then, on 24 June Robinson noticed "a strong benzene-type smell" in the same area of the mine. He put this in his shift report and later claimed that he had told management. Possibly because it was a Friday afternoon and the volume of paperwork was considerable, the contents of the report were overlooked up the line. A month later acting ventilation officer Bryon reported an elevated CO level from a reading on his portable monitor. Management arranged a repeat reading, and this time the CO level was lower. They assumed that Bryon had made a mistake, but through the engineer, Abrahamse, instigated intense monitoring of gas levels. CO make remained around 15 lpm for some days but after the monitoring returned to normal, CO then rose very steadily to about 19 lpm two days before the explosion. On 2 August the preset level of CO for triggering the alarm was raised, suggesting that by then, high background levels were accepted as normal. The final phase began when observations of heat, smells and unusual air flows on 5 and 6 August apparently led several managers to suspect a heating in its early stages.

Steps 3, 4 and 5 of the method of analysis require that the researcher identifies key decision makers and other witnesses to the events. The idea is for the case researcher to glean as much richness from the situation as possible. Moura is a complex case, so only one example of this aspect of the method is illustrated in narrative form below. This particular set of events happened within days of the disaster. Out of context, the full gist of what is going on here will not be clear to the reader, but a sense of the ambiguity, confusion and uncertainty will be evident.

> On Friday afternoon, 5 August at about 3pm, a relieving deputy Mick Caddell began his inspection of the panel with another miner. Squires (the undermanager in charge of the shift) had told him to check for an increase in CO over previous shifts. Caddell's first reading was 8 ppm, and a bit further along near the waste, he noticed a strong tar smell. His companion detected a similar thing. The CO reading there was 10 ppm. Caddell had *a concern that something might be going on in the goaf* - it reminded him of the burning smell after the explosion at Moura No. 4. How could he ever forget it? He phoned Squires with his report. *Better to seal the panel as soon as possible*, he told Squires, rather than wait till Sunday when it was planned. Squires said he would talk to Mason (the manager) but to *keep an eye on it* in the meantime. A few hours later when above ground Caddell mentioned the situation to Newton, the incoming shift supervisor. He also wrote his observations in his shift report and handed it Squires. Squires knew Caddell well - he'd been a member of his shift many times and was a union rep. But he saw Caddell as inexperienced - he wasn't familiar with panel 512 or the smells from the grease drums. If he was really concerned he would have been jumping up and down like he did when talking union business - Caddell wasn't afraid of undermanagers and was not beyond a bit of yelling and gesticulation to draw their attention to matters that worried him. But just to be sure, Squires entered the mine and walked some way into the panel, noticing that the air was migrating towards the waste. Feeling a little uneasy about this he spoke to Mason when he arrived at the mine a bit later on, suggesting that they bring the sealing forward. Mason replied that he could see no reason to do so.

From even this partial glimpse of events, it should be obvious that the decision makers (the management group) were failing to respond to the weak signal events (various signs of a heating in progress). The task of the researcher in relation to step 6 of the method is to explain why, based on the evidence gathered. During this stage of the data analysis the tri-level model from Figure 1 was constructed. In contextualist research the descriptions are rich and detailed, and the process of theorizing from them is time consuming. The model includes 'formal organisation' that encompasses communication processes (just one of nine factors). Here is an extract concerning this factor to show how details from the case can be collated to provide a partial explanation of what went wrong (with a fuller account possible from a presentation of the complete model) :

> Formal communication channels were restrictive and lacking in openness. Comprehensive information was meant to flow up the line though shift reports. However, protocols were such that when unusual incidents were successfully dealt with locally, top management was not necessarily informed, and no one was in a position to bring together 'a series of apparently disconnected but vital pieces of information (Windridge, 1996: 49)'. This became very evident when the Inquiry revealed that site manager Schaus (Mason's boss) had been aware of only one of the 11 incidences of hazes and smells that were reported from 17 June. Some of the gaps in knowledge were also due to absences on leave and in the case of Robertson's shift report of 24 June mentioning a "strong benzene-type smell", a simple oversight had occurred.

Conclusions

In the past, contextualist methodology has been applied to situations of organisational change only. In this paper a new application, to processes of behavioural decision making, was introduced and illustrated by reference to a case researched by the writer, that of the Moura Mine disaster. One tangible product of this application is a new, tri-level model of decision making, pointing to the many influences in effect prior to the incident, and providing an explanation of why the actors in that unfolding drama failed to respond adequately to the myriad of indicators of a disaster in the making. The paper has suggested that there are two ways to present the case – in narrative form, as illustrated by the extracts in this paper, and through an analysis of events in relation to the nine factors in the tri-level model. The case narrative is particularly useful if an explanation of the particular disaster is required. The tri-level model has the additional potential benefit of providing a framework for exploring and analyzing other decision making failures. Ultimately, the efficacy of the method that resulted in these outcomes depends on the extent to which it provides a valid explanation of the phenomenon under study. We should therefore ask: Has this adaptation of contextualist methodology produced a plausible explanation of the case?; and can the tri-level model be generalized to other settings?

The writer suggests that the answer to each question is 'yes'. The construction of the narrative was based on a set of steps derived from socio-technical systems theory, and draws on theorists who have studied past accidents and disasters. Theoretically, its basis is sound. The tri-level model is a platform for generalising the model to other situations, but only to those where socio-technical systems frameworks apply, and decision making is construed as socially constructed within a particular context (and this is not the position of classical theorists). So yes, the model can be generalized, but care should be taken to ensure that the theoretical paradigm underlying the study is appropriate: in other words, the model can be used in some settings, but not all. This is not a weakness in comparison with positivist methodologies that seek universal solutions. Rather, it merely suggests that different research paradigms are suited to different research puzzles.

Could contextualist methodology be applied to other processes, besides change and decision making? Of course, as long as time-based processes are involved. A researcher could, for example, study an unfolding conflict. Taking the particular approach in this paper, the researcher might begin with a flash point, a point of conflict escalation, and trace back through time to the events and contextual influences leading to it. By understanding events to that point it might be possible to predict future developments, and plan interventions to disrupt future destructive patterns.

Whatever the research question might be, case researchers have, perhaps, a new tool to advance case study research and application. In any applications of the methodology, the data collection and analysis needs to be guided by a clearly articulated theoretical framework (in this case socio-technical systems and related theory), focusing on a specific content or focus (in this case choice making behaviour), and an action or time-based flow of events (in this case a series of 'weak signal events' prior to a disaster). Ultimately, the findings can be generalised to other settings with similar parameters. In fact, subsequent case studies can be a partial validation of the original, should similar explanatory factors be found. Confidence in the plausibility of the case explanations is supported through the completeness of the rich descriptions provided, transparency of the steps in the methodology and thoroughness in considering alternative explanations.

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