

Published as:

**Author:** Ingham, Valerie

**Email:** [vingham@csu.edu.au](mailto:vingham@csu.edu.au)

**Year:** 2007

**Title:** Decisions on Fire

**Journal M/C - A Journal of Media and Culture**

**Volume:** 10

**Issue:** 3

**ISSN:** 1441-2616

**URL:** <http://journal.media-culture.org.au/0706/06-ingham.php>

**Abstract:** Decision making on the fireground is a complex activity reflected in the cultural image of fire in contemporary Western societies, the expertise of firefighters and the public demand for response to fire. The split second decisions that must be made by incident commanders on the fireground demonstrate that the dominant models of rational, logical argument and naturalistic decision making are incapable of dealing with this complexity. Twelve senior ranking Australian fire officers participated in the investigation from which I propose that fireground incident commanders are relying on aesthetic awareness and somatic responses, similar to those of an artist, and that due to the often ineffable nature of their responses these sources of information are usually unacknowledged. As a result I have developed my own theory of decision making on the fireground, termed 'Multimodal Decision Making', which is distinguished from formal rationality and informal sense-based rationality in that it approaches art, science and practice as a complex and irreducible whole.

# Decisions on Fire

Valerie Ingham

## Introduction

Decision making on the fireground is a complex activity reflected in the cultural image of fire in contemporary Western societies, the expertise of firefighters and the public demand for response to fire. The split second decisions that must be made by incident commanders on the fireground demonstrate that the dominant models of rational, logical argument and naturalistic decision making are incapable of dealing with this complexity. Twelve senior ranking Australian fire officers participated in the investigation from which I propose that fireground incident commanders are relying on aesthetic awareness and somatic responses, similar to those of an artist, and that due to the often ineffable nature of their responses these sources of information are usually unacknowledged. As a result I have developed my own theory of decision making on the fireground, termed 'Multimodal Decision Making', which is distinguished from formal rationality and informal sense-based rationality in that it approaches art, science and practice as a complex and irreducible whole.

## Fire - complex decision making

The complex reality of a fireground incident is not effectively explained by decision making models based on logic. These models understand decision making in terms of a rational choice between various options (Dowie) and tend to oversimplify decision making. Grouped together they are commonly described as 'traditional'. Recent research and the development of an alternative understanding, termed naturalistic decision making, has demonstrated that under the pressures of an emergency situation there is just not time enough to weight up alternatives (Flin, Salas, Strub and Martin; Klein). Naturalistic decision making draws on the cognitive sciences to explain how incident commanders make decisions when they are not using probability theory or rational logic (Montgomery, Lipshitz and Brehmer).

Although I appreciate various aspects of the naturalistic models of decision making (Cannon-Bowers and Salas; Flin and Arbuthnot; Zsombok and Klein), the problem for me is that the research has been conducted from a cognitive task analysis perspective where typically each decision has been broken down into its supposed constituent parts, analysed and then reassembled. I understand this process to be counterproductive to appreciating complex and interrelated decision making. I propose an alternative explanation which I call Multimodal Decision Making.

Multimodal Decision Making recognises that probability theory or rational logic does not adequately explain how incident commanders balance feelings of contradictory information in parallel, and by the very clash or strangeness of the juxtaposition, see a way forward. This is reasoning by similarity rather than calculation. I suggest that the mechanistic rational processes do not necessarily disappear, but that they are

**CSU Research Output**

<http://researchoutput.csu.edu.au><sub>2</sub>

assimilated into a dynamic, as opposed to inflexible and rigid, approach to decision making. The following excerpt from a country Inspector is provided to illustrate the role of aesthetic awareness and somatic perception in fireground decision making.

### *The Trembling Voice*

Early one morning a country Inspector is called out to a factory fire in a town, normally one hour's drive away. It takes him 40 minutes to drive to the fire, and on the way he busies himself receiving two updates from the communications centre and talking by radio to the first arriving officer at the incident. Nothing the first arriving officer said was unusual or alarming. What was alarming, said the Inspector, was the very slight tremor in the first arriving officer's voice. It contained a hint of fear.

...so I got the message from the first pump that was on the scene. I could hear in his voice that he was quivering, so I thought 'I am not too sure if he is comfortable, I'd better get him some help' so I rang up the communications centre, and I said 'Listen, I know you have got these two trucks coming from A., you've got the rural fire service', I said 'you need to send U. up now...I may have waited another 10 or 15 minutes before I said 'Ok you better get G. there' - it's only another 40km maybe, I said 'get them on the road as well.'

V – This is all while you are in the car?

All while I am in the car driving to the incident, I am building a mental picture of what's happening, and from hearing his voice, I felt that he was maybe not in control because of the quivering in it.

V – Did you know him well already?

Yeah I knew him sort of well enough... I could just tell, he sounded like he was in trouble...I felt once I arrived, he more or less - I could feel a weight come off his shoulders, 'You're here now, I don't have to deal with this anymore, its all yours.'

The Inspector deduced the incident was possibly more serious than the communications centre had so far anticipated. He organised backup appliances, and these decisions, maintained the Inspector, were prompted by the "quivering" in the officer's voice. On arrival he saw immediately that his call for backup was indeed necessary, because the fire was moving out of control with the possibility of spreading.

Although the Inspector in this incident was not physically present, he relied on his aesthetic awareness and somatic perception to inform his decision making. He would have been justified if he acted only on the basis of incoming communications, which were presented in scientifically measurable terms: "factory well alight, two appliances in attendance..." and so on; nothing out of the ordinary, a straightforward incident. In fact, what he responded to was not the information he received as a verbal message, but rather the slight tremor in the first arriving officer's voice. That is, the Inspector's aesthetic awareness and somatic perception informed his decision to call for backup, overriding the word-information contained in the verbal report.

## **Fire - complex cultural image**

Fire is a complex object in itself and in a threatening context, such as the engulfment of an inhabited building, creates a complex environment which in turn, for me as a researcher, requires a complex method of inquiry. As a result I have been obliged to draw on theories of art and art criticism as part of my own method of enquiry and I have adopted Eisner and Powell's application of aesthetics:

**CSU Research Output**

<http://researchoutput.csu.edu.au><sup>3</sup>

It may be that somatic forms of knowledge – the use of the physical body as a source of information – play an important role in enabling scientists to make judgements about alternative courses of action or directions to pursue. It might be that qualitative cues are difficult to articulate, indeed clues that may themselves be ineffable, are critical for doing productive scientific work (134).

That is, sometimes the physical body is used as a source of information, and sometimes it is difficult to express in words how this happens. The following incident illustrates the importance of somatic awareness in decision making from an Inspector's perspective.

### *A Smell of Petrol*

In this incident a country Inspector was called to a row of factory units. The smell of petrol had been happening on and off over a period of 18 months, but now in the toilet of one shop it had become unbearable. The Inspector set his crew to work with a device that detects levels of petrol in the air, that he called a 'sniffer'. When the 'sniffer' did not register a high value for petrol the Inspector considered the machine to be faulty and trusted his own sense of smell and that of his crew, over the 'sniffer'.

Decisions in this incident were informed by somatic response to the situation. In the *Smell of Petrol*, the Inspector considered his nose a more reliable source of information than a mechanised 'sniffer'.

### *Burning Ears*

Continuing the theme of mechanization and technology, personal protective equipment, one Inspector informed me, has become so effective that firefighters are able to move much deeper into a fire than ever before. The new technology comes with a price. Previously firefighters perceived the sensation of their ears burning to be a warning sign. This somatic response has now been effectively curtailed. Technology in the form of increasing personal protective equipment, complex communication systems and sophisticated firefighting equipment is usually understood as increasing the opportunity to prevent and control an incident. Perhaps an alternative perspective could be that increasingly sophisticated technology is replacing somatic response with dangerous implications?

Somatic awareness is developed within a cultural context. On the fireground, I understand the cultural context to *be* the image, as a fire is a moving, alive image demanding an immediate response. An arsonist may look for a fire to spiral out of control, enjoying the spectacle of an entire building being engulfed and spreading to the next office block. What is it that firefighters are looking for? What do they see? What directs their attention? Firefighters invariably see what they have been trained to see – smoke escaping from under the eaves, melting rubber between clip-lock walls, cracks in structural concrete, the colour and density of the smoke and so on. Their perception of signs, indicating their appreciation of the situation, and the way they perceive these signs – they look for them, gauge and measure their progress and act in response, are all intensified by time pressure and the imperative and means to do something. This is in sharp contrast to an arsonist or even the general public watching the fire's progress on the TV news.

The ability to comprehend and act on the visual is called aesthetics in the discipline of art criticism. I use the words 'aesthetic awareness' to mean the way an activity of perception is organised and informed to unspoken, but shared, principles for recognising fire features and characteristics; being able to share these principles helps with the building of an identity of expertise.

In firefighting, as in other emergency service work, an aesthetic appreciation of the scene it is technically termed *situational awareness* (Banbury and Tremblay; Craig; Endsley and Garland) and sometimes colloquially known as *size-up*. This is when incident commanders appraise the fireground and on the basis of their judgement, make decisions involving, for example, the placement of personnel and resources, calling for backup and so on. It is at this stage that the expertise of the incident commander is foregrounded and I suggest that a linear approach to decision making does not fully explain the complexities involved when a small input or adjustment can lead to very dramatic consequences. In fact, a small input leading to dramatic consequences is likely to indicate a non-linear system (Lewin).

In a non-linear dynamic system, such as a fireground, some things may appear random, but they are known equations. Pink heralds a visual and non-linear approach, "(p)erhaps some of the problems we face when we write linear texts with words as our only tool can be resolved by thinking of anthropology and its representations as not solely verbal, but also visual and not simply linear but multilinear" (Pink 10).

With linear thinking there is a beginning and an end, which leads naturally to the supposition of cause and effect. This is because there is no looping back into the whole; it is as if there are many beginnings, leading to a fragmented sort of perception. Language shapes the way we perceive issues by virtue of the words we have to create our impressions with. Unfortunately English and Western languages in general are not equipped for a multimodal communication. We are, by the structure of our language, almost squeezed into the position of talking linearly in terms of cause and effect for understanding what is happening.

## **Fire - complex experience**

Creative decision making occurs when the person has a deep knowledge of the discipline. Great flashes of insight rarely come to the inexperienced mind. People who don't understand rhythm, melody and harmony will not be able to compose complex pieces of music. Creative and innovative decision making on the fireground will not be possible without prior experience regarding how various materials react on combustion, the structure of the organisational hierarchy, crew configurations and the nature of the fire being fought. There is beginner's luck of course, but this will not be a consistent approach to an otherwise fearful and dangerous situation, because knowing what to expect means feeling less danger and less fear, freeing up more energy to respond creatively. For example, consider a junior firefighter trembling in fear prior to their first incident, compared with an experienced firefighter who feels anticipation and exhilaration.

We live in a world of specialisation and expert opinion, even if there is a certain cynicism creeping in over what makes someone an expert. Taylorism has ultimately

**CSU Research Output**

<http://researchoutput.csu.edu.au>

produced people with high technical skills in one area and a lack of ability to see the whole picture (Konzelmann, Forrant and Wilkinson). As a counterbalance there is a current push towards multi-skilling and flattened hierarchies. For firefighting organisations this creates an interesting challenge. On the one hand there is a concentration on highly technical skill development which involves acknowledging the importance of team work; on the other, the demands of a time critical situation in which the imperative is to act quickly and decisively for the best possible outcome. Ultimate decision making responsibility lies with the incident commander who must be able to negotiate the complexity of the scene in its entirety, balancing competing demands rather than focusing solely on one aspect.

The ease with which incident commanders move through the decision making process, perceiving the situation, looking at the fire and sizing it up, is not reliant on eyesight alone. It involves their ability to adjust, reframe, and move through the incident without losing their bearings, no matter how or where they are physically situated in relation to the fire. Seeing does not involve only eyesight, it sums up the experience of becoming so familiar and integrated with the aspects of fire behaviour that expert incident commanders do not lose their bearings in the process of changing their physical location. Often they rely on incoming intelligence to develop a three dimensional perspective of the fireground. They have a 'multimodal' perspective, a holistic vista, because their sensory relationship with the fire is so thorough and extensive.

Just looking at the fire for the incident commander, is not just *looking* at the fire, it is an aesthetic experience in which there is a shared standard for recognising what is happening, if not what should be done to mitigate it. Participating in the knowledge of these standards, these ways of seeing, is recognised as part of the identity of the group member. Nelson (97), who specialised in visually reading the man-made environment, wrote "[w]e see what we are looking for, what we have been trained to see by habit or tradition." Firefighters are known and respected within their cultural context by their depth of understanding of these shared standards. These shared standards may or may not be a reflection of the ideal or organisationally endorsed standard operating guidelines. I suggest that a heightened situational awareness and consequent decision making may be a visible indication of contribution and inclusion within the cultural practices of firefighting. Thus seeing involves not only eyesight, but also being a part of a cultural context; for example interpreting individualised body movements and gestures.

Standard operating guidelines place rules and constraints on incident commanders. These guidelines provide a hierarchy of needs, and prescribe recommended approaches for various fireground contingencies. This does not mean that incident commanders are not creative. "Play and art without rules is uninteresting. Absolute liberty is boring" (Karlqvist 111). Within the context of the fireground, creative experience is deliberate as opposed to random. The creation of innovative approaches does not happen in a vacuum; rather it is the result of playing with the rules, stretching them, moving and testing them. It is essential to maintain common operating guidelines, or rules, because they form a stock body of common knowledge, but it is also essential to break the rules and play around with them. Karlqvist (112) writes "[m]astery reveals itself as breaking rules. The secret of creativity hinges on this insight, to know the right moment when you can go too far".

**CSU Research Output**

<http://researchoutput.csu.edu.au><sub>6</sub>

There are experts who are trained to be mechanical, and there are experts, such as the incident commanders I interviewed, who integrate and sometimes override the mechanical list of rules. Multimodal Decision Making is not primarily about an objective representation of the 'truth', but rather the unpredictable and complex conditions which incident commanders must negotiate.

## Conclusion

When dealing with a complex and dynamic system, cause and effect are not sufficient explanation for what is happening. Instead of linear progression we are looking at a feedback or circular system, in which a small act may produce a larger reaction. Decision making on the fireground is a complex and difficult activity. Its complexity stems from the uncertain variables, the immediate threat to life and property, the safety of the crew, trapped victims, observing public, the perceptions reported by the media and the statutory obligations that motivate firefighters to their tasks are intricately interwoven. This melting pot of variable contingencies creates a complex working environment which I suggest is negotiated by a little acknowledged ability to integrate somatic and aesthetic awareness into decision making in time critical situations.

When dealing with a complex and dynamic system, cause and effect are not sufficient explanation for what is happening. Instead of linear progression we are looking at a feedback or circular system, in which a small act may produce a larger reaction. Decision making on the fireground is a complex and difficult activity. Its complexity stems from uncertain variables which include the immediate threat to life and property, the safety of the crew, trapped victims, and observing public, the perceptions reported by the media and the statutory obligations that motivate firefighters to their tasks, all of which are intricately interwoven. This melting pot of variable contingencies creates a complex working environment which I suggest is negotiated by a little acknowledged ability to integrate somatic and aesthetic awareness into decision making in time critical situations.

## References

- Banbury, Simon, and Sebastian Tremblay, eds. *A Cognitive Approach to Situational Awareness: Theory and Application*. Hampshire, England: Ashgate, 2004.
- Cannon-Bowers, Janis, and Eduardo Salas. *Making Decisions Under Stress*. Washington: American Psychological Association, 1998.
- Craig, Peter. *Situational Awareness: Controlling Pilot Error*. New York: McGraw-Hill, 2001.
- Dowie, Jack. "Clinical Decision Analysis: Background and Introduction." Eds. H. Llewellyn & A. Hopkins. *Analysing How We Reach Clinical Decisions*. London Royal College of Physicians, 1993.
- Eisner, Elliot, & Kimberly Powell. "Art in Science?" *Curriculum Inquiry*, 32.2 (2002):131-159.
- Endsley, Mica, and Daniel Garland, Eds. *Situational Awareness Analysis and Measurement*. New Jersey and London: Lawrence Erlbaum Associates, 2000.

CSU Research Output

<http://researchoutput.csu.edu.au><sup>7</sup>

- Flin, Rhona, and Kevin Arbuthnot. *Incident Command: Tales From the Hot Seat*. England: Ashgate, 2002.
- Flin, Rhona, Eduardo Salas, M. Strub, and L. Martin, Eds. *Decision Making Under Stress*. England: Ashgate, 1997.
- Karlqvist, Aka. "Creativity, Some Historical Footnotes from Art and Science." Ake Andersson and Nihls-Eric Sahlin, Eds. *The Complexity of Creativity*. Dordrecht, Boston and London: Kluwer Academic Publishers, 1997.
- Klein, Gary. *Sources of power*. Massachusetts: Massachusetts Institute of Technology, 1998.
- Konzelmann, Suzanne, Robert Forrant and Frank Wilkinson. Work systems, corporate strategies and global markets: creative shop floors or 'a barge mentality'? *Industrial Relations Journal*, 35(3) 2004.
- Lewin, Roger. *Complexity: Life at the Edge of Chaos*. 2nd ed. Chicago: University of Chicago Press, 1999.
- Montgomery, Henry, and Raanan Lipshitz, and Berndt Brehmer, Eds. *How Professionals Make Decisions*. New Jersey: Lawrence Erlbaum Associates, Inc, 2005.
- Nelson, George. *How to See: A Guide to Reading our Manmade Environment*. Boston & Toronto: Little, Brown and Company, 1977.
- Pink, Sarah. "Introduction: Situating Visual Research." Eds. Sarah Pink, Laszlo Kurti and Ana Isabel Afonso *Working Images*. New York: Routledge, 2004.
- Zsombok, Caroline, and Gary Klein. *Naturalistic Decision Making*. New Jersey: Lawrence Erlbaum Associates, 1997.