

FIRE NOTE

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OBSERVING TEAMWORK IN EMERGENCY MANAGEMENT

RESEARCH BACKGROUND

This research project has focused on understanding information flows and Incident Management Team Effectiveness. However, the principles and research approaches can be applied to a broad range of situations.

In any organisation or team the biggest influence on system performance is the human factor (Wilson, Burke, Priest, and Salas, 2005). Team dynamics and communication between groups or teams repeatedly arise as key features in breakdowns of coordination, near-misses and accidents (Mills and Stothard, 2000). How individuals and groups share knowledge will become increasingly critical in future in both team performance and in organisational/system performance (Stanton Baber, and Harris, 2008). In terms of emergency incident management, increased complexity comes from rising expectations from the community and other stakeholders for faster responsiveness; greater inter-dependencies between stakeholders (e.g. critical infrastructures) and from the applications of technology that change work practices.

Yet understanding what enables and inhibits teamwork and shared understanding can be difficult because of the complex tasks that may be involved in work that shifts dynamically and is fast-moving. Systematic observations can provide insight into what actually occurs rather than relying only on asking people after the event what they thought happened. It is also important that data collection during observation is not left to the whim of the observer, otherwise the data might focus on certain activities and overlook others. Having a systematic approach enhances reliability and validity (for more information go to <http://www.socialresearchmethods.net/>).



SUMMARY

This *Fire Note* aims to provide guidance for agencies wishing to conduct observations in fire and other emergency management contexts in a systematic manner, using the observations conducted of Incident Management Teamwork conducted within the Research Project D5 by way of an example.

Good observational methods are particularly important when evaluating teamwork and/or the impact of changes (e.g. introduction of new technologies or procedures) on individual, team and organisational (or system) performance. This *Fire Note* highlights some of the issues which can arise in this process and provides guidance that will help agencies to collect good data for reviewing and improving operations.

KEY DEFINITIONS

Taskwork: The technical aspects of team operations.

Teamwork: Interactions that are necessary to establish coordination among team members to achieve team goals.

Triangulation: Collecting data using different methods or at different data collection points to strengthen interpretations and validation (e.g., observing the same work activity over 3 different periods of time not just one).

STEPS IN USING A SYSTEMATIC METHOD OF OBSERVATION

Be focused on what the agency wants to find out.

Don't try to observe everything. What is the problem you are aiming to better understand through observation? What are you aiming to achieve? Think about what questions or problems need addressing. For example "What might hinder a Situation Unit Officer from receiving timely information from the

ABOUT THIS FIRE NOTE

Information Flow and Incident Management Team Effectiveness is part of Bushfire CRC Program D: Protection of People and Property.

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Operations function?” or “How do Incident Controllers and Deputy Incident Controllers share tasks to effectively perform their roles?”

The measures taken need to be connected to the goals/questions the agency wants addressed and should be important enough to warrant detailed attention. Understanding why you wish to conduct the observation will also help to determine the level of detail that will be required.

Start by immersion

If possible conduct informal observations first to get a feel for the work as well as the physical layout of the organisation or site being studied. This will help refine areas for observation and determine whether the focus requires the identification of individuals or not. For example, if the focus is on the social system then the agency is likely to want to identify who interacts with whom, but if the focus is on broad tasks or how many times a new technology is used it might not be necessary to identify users.

Define and model the behaviours sought to be observed

The preliminary observation period can be used to see if the behaviours targeted are relevant or if the focus needs to be refined. For example, see Table 1 (right) for the teamwork indicators used in the study. Try to draw a model of how the elements should connect together. This helps clarify thinking and enables focus on the key points of inter-connection between work units.

Determine what needs to be measured and how it will be done

Mills and Stothard (2000) suggest there are different methods for consideration:

- *Objective methods* (e.g. observational techniques using behavioural and task-load checklists).
- *Subjective methods* (e.g. surveys assessing individuals' perceptions of teamwork and taskwork characteristics).
- *Outcome measures* (e.g. measures of successful performance such as time taken to establish an Incident Control Centre).

Frequently a research study will use a number of different measures and seek to triangulate data (see *Key Definitions*, page 1). The important thing is to make sure the behaviours to be observed are explicitly defined beforehand. It is also important that the behavioural categories be exhaustive and mutually exclusive (i.e. a behaviour can only be coded in one category).

Develop a behaviour classification system and determine parameters

Be selective to avoid being overwhelmed by data. For teamwork interaction the researchers used a variety of sources (see for example Wilson et.al., 2005; Stanton, Barber, and

Table 1: Examples of behavioural indicators of teamwork

Supporting Behaviour Offering and requesting assistance in an effective manner both within and across teams	
PA	Offering or Providing Assistance “Can I give you a hand with that?” “I can do that if you like”
RA	Receiving Assistance “Thanks buddy – that’s great”
Mo	Monitoring “Have you done it yet?”
Fle	Flexibility The ability and willingness to adapt performance strategies quickly and appropriately to changing task demands “Instead of... we could...”
Information Exchange Involves passing relevant data to team members who need it, in a timely manner. Includes transmitting and receiving	
REQ	Receiving – requesting information/ or assistance “Can you get ... follow up...”
Communications climate The ability to enable team members to communicate their observations, concerns, suggestions and requests in a clear and direct manner without becoming hostile and defensive	
Tea	Team feedback Team members communicate/are invited to communicate their observations, concerns, suggestions and requests in a clear and direct and assertive manner “We’re all in this together – if you want to raise any concern then speak up...”
Bou	Team boundary crossing and integration Members ensure others are involved in the information loop “Can you make sure you’re talking to resources and let them know...”
BA	Banter/joking/sarcasm
Other	
NS	Non task related statements

Harris, 2008). Behaviour parameters involve deciding what aspect of the behaviour is of interest. For example, how often a behaviour occurs; how much time is spent in a behaviour; how long a bout of behaviour lasts and what sequences are important (Mills and Stothard, 2000).

Develop the data collection approach

A variety of approaches can be used. In this study researchers used video-based recording as well as audio-recording of individuals undertaking particular roles. These methods served different purposes. The video was used to record how team-members used a particular space; how many times they used shared resources (e.g. whiteboard displays) and who they interacted with. The audio recording was

used to record what was said and was coded for indicators of communication and teamwork interaction. For example, ‘RA’ is code for ‘requesting assistance’ (see Table 1: Examples of behavioural indicators of teamwork).

Develop a code and data sheet checklist

Sometimes it is helpful to include a code sheet (as seen in Table 1) which eases observation. This can accompany a checklist of behaviours which can be used during the observation. Ensure you understand how the data you are observing or recording will help you understand the issue or the question you are seeking to answer. Work out the level of detail you need to understand the issue at – if it is time, is it minutes or seconds that are important.

END USER STATEMENT

“Developing quality research methods is critically important in high reliability organisations such as fire and emergency services. In particular, it is necessary to understand the impact of changes on the workforce and this can only be done by using a scientific, observable approach. This method will help agencies undertake their own workplace evaluations, which will in turn contribute to enhanced operational effectiveness.”

– Superintendent Andrew Short AFSM
Director, School of Fire and Rescue
Service Training
Queensland Fire and Rescue Service

Observe ethically

Despite good intentions, data collected through observation can sometimes be misused. There are a variety of strategies for ensuring this does not occur included in the Human Research Ethics Handbook available at: <http://www.nhmrc.gov.au/publications>

In this study the researchers thought about the following risks to participants and introduced the strategies detailed below to mitigate those risks:

- Participants may have been at legal risk if poor performance was observed and this subsequently led to an adverse outcome. Therefore the date and time of the observation were not included in data collection. The researchers also obtained approval to destroy the video-tape once the type of collaboration and team-based practices in evidence had been coded, and to ensure this occurred within 30 days.
- Participants might have felt unnecessary stress if they felt scrutinised or coerced into taking part. Researchers included an information sheet explaining what would be done with the data and how confidentiality would be protected, and asked participants to advise if they wanted the observation to cease, at which point the researchers would immediately cease observation. This occurred once during the study.
- Participants' professional standing could have been harmed if they were observed making a mistake and management learned of this mistake. The researchers advised management that access would not be provided to any raw data, that only de-identified and collated data would be reported and that only a sample of data observed would be included in the study.



- ▲ If using video or audio, look for devices that have hard disk drives so it is possible to record for the full duration of the observation and to download the digital files for import into software programs. However, be prepared to allocate a large part of a computer's memory to storage. .



- ▲ Researchers will need to decide how long the sampling period will be. A rule of thumb is to observe 30-60 minutes of high-tempo operations and 2-3 hours in a slower tempo, per observation. .

Recording using video

If using video or audio, look for devices that have hard disk drives so it is possible to record for the full duration of the observation and to download the digital files for import into software programs. However, be prepared to allocate a large part of a computer's memory to storage. In this study each 30-minute video file took 2 gigabytes of memory. It is, however, possible to considerably reduce the size of the video file by saving the file with a lower resolution (e.g. to fit a video file on an MP3 player). The decision on whether to reduce the file size will depend on the purpose of the video.

Observing people movement and/or use of technologies

If the way in which personnel use a facility is of interest, it is possible to make up a schematic diagram of the space and track how people move through it. In this study

researchers took photographs of the facility and also measured its dimensions. They then superimposed a map-grid (e.g., A1; B2 etc) over a diagram of the layout of the room and used this to record movement and physical interaction with other functional units and items such as computers and maps.

Decide on the sampling approach

What kind of sampling supports the measures, behaviours and parameters to be obtained? You need to decide how much you want to record because it will impact on analysis time. For example, by using video in this study researchers were able to engage in *continuous sampling*, in which all occurrences of behaviour were recorded within slices of work activity collected over selected periods. The slices included low-tempo periods and high-tempo periods as well as the transition between them. However, using continuous

sampling and video was very time-consuming and resource-hungry. For example, one hour of video took approximately 10 hours to code and one hour of audio between 3 and 4 hours to transcribe and then a further 3-4 hours to code.

There are other sampling approaches that can also be used. They include:

- **Ad Libitum sampling:** observers record everything they can see happening in field notes
- **Scan sampling:** time-sampling-based systems where behaviours are observed at a particular interval (e.g. every five minutes the observer notes what the target is doing). This type of approach is best supported by a developed checklist.
- **Zero-one sampling:** where every instance of a particular behaviour is simply counted.

Decide on the sampling duration

It is also necessary to decide how long the sampling period will be. Mills and Stothard (2000) suggest that a rule of thumb is to observe 30-60 minutes of high-tempo operations and 2-3 hours in a slower tempo, per observation. It is important not to make the period so long that the observer becomes fatigued.

Take a small sample and analyse it ASAP

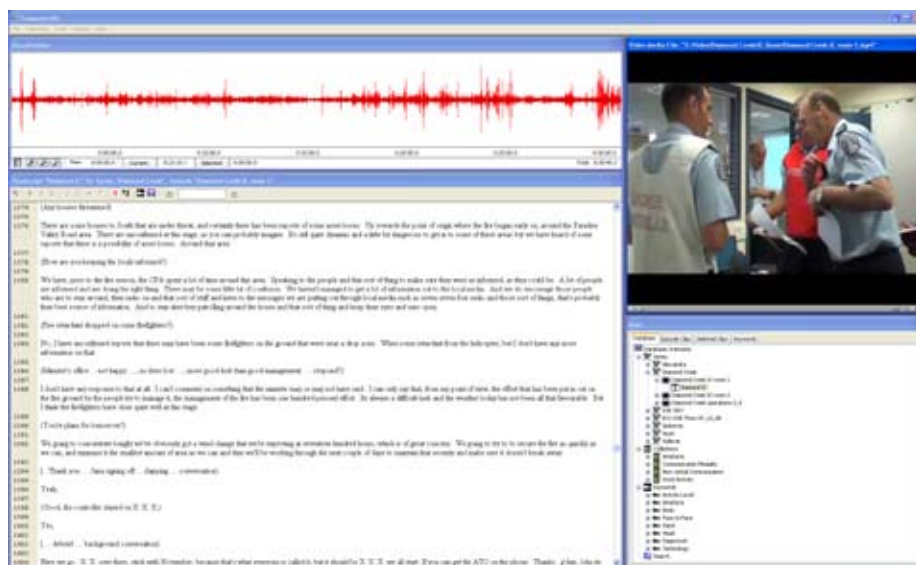
Doing a “pilot” study will help test the approach and to refine the behavioural indicators and the checklist, if one has been developed. This is important in enabling validation of the approach.

Try to use multiple observers and check for inter-observer agreement

If two observers watch the same exercise and rate the same behaviours as occurring then there can be confidence that the observation method is being conducted systematically. There are calculators to help determine inter-observer reliability at <http://www.med-ed-online.org/rating/reliability.html>

Decide how you wish to analyse the data

This might be as simple as using an Excel



- ▲ There are many purpose-built software programs for video-based observational studies.

spreadsheet or, if using video, a purpose-built software program. This study used one called Transana, but there are others (NVIVO; NOLDUS). As this area is growing there will be more in the future and an Internet search on video-based observer tools would be important before starting the study. For analysis of talk from the audio files the researchers used NVIVO.

Share your insights

Conferences such as AFAC and the Knowledge Web: <http://knowledgeweb.afac.com.au> offer excellent opportunities for doing so.

FUTURE DIRECTIONS

Systematic observation methodologies will be an important plank in the future to assess and better understand the impact of changes in work organisation if maximum benefits of those changes are to be obtained.

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- Stanton, N.A., Baber, C., & Harris, D. (2008) *Modelling command and control: Event analysis of systemic teamwork*, Aldershot UK: Ashgate
- Wilson, K. A., Burke, C. S., Priest, H. A., & Salas, E. (2005). Promoting health care safety through training high reliability teams. *Quality and Safety in Health Care*, 14, 303-309

FURTHER READING

- Subjective workload measure: <http://humansystems.arc.nasa.gov/groups/TLX/>
- Inter-observer (inter-rater) reliability: http://en.wikipedia.org/wiki/Inter-rater_reliability
- Social Research methods for evaluation: <http://www.socialresearchmethods.net/>
- Teamwork and high reliability organising in fire: <http://www.wildfirelessons.net/ICS.aspx>

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AFAC is the peak representative body for fire, emergency services and land management agencies in the Australasia region. It was established in 1993 and has 26 full and 10 affiliate members.