

Experts' sensemaking during the 2003 SARS crisis

Iva Seto

Victoria University of Wellington
Iva.seto@vuw.ac.nz

David Johnstone

Victoria University of Wellington
David.johnstone@vuw.ac.nz

Jennifer Campbell-Meier

Victoria University of Wellington
Jennifer.campbell-meier@vuw.ac.nz

ABSTRACT

This paper depicts the real-time sensemaking of experts as they worked to combat the first emerging disease of the 21st century: Severe Acute Respiratory Syndrome (SARS). Newspaper data was analysed from the 2003 SARS crisis, with a Canadian perspective, to follow the process of solving the puzzle of this emerging disease. Retrospective sensemaking is a process that is triggered by the unexpected, which leads to actors gathering information (taking action) in order to consider possible interpretations for the unexpected event. Disease outbreaks serve as sensemaking triggers, and actors engage in retrospective sensemaking to find out the factors involved in how the outbreak happened. Prospective sensemaking (future-oriented) is employed when actors work together to plan how to combat the disease. The newspaper data demonstrate that retrospective and prospective sensemaking are tethered: to make plans to combat a disease, actors first require a collectively agreed upon understanding from which they can generate possibilities for a crisis response. This paper contributes to the field by providing concepts for long-duration crisis sensemaking, as the bulk of organisational research focuses on acute crises such as wildfires, or earthquakes.

Keywords

Crisis informatics, public health crisis, organizational learning, social sensemaking.

INTRODUCTION

In our highly connected and fast-paced modern world, crises occur and may escalate in severity in a very short amount of time. Crises are rare events, and may be compounded by ambiguity and complexity, with a requirement for rapid action to mitigate the magnitude of the event (Pearson and Clair, 1998). The event may have extreme consequences for the physical, psychological, and material resources of the population (Hannah, Uhl-Bien, Avolio, and Cavarretta, 2009).

The response to natural disasters (tsunamis, hurricanes, earthquakes), or human-caused disasters (power plant accidents, terrorist attacks) focuses on action within a 72 hour period (Ruback, Wells, and Maguire, 2013). A public health emergency (specifically that of emerging infectious diseases) requires a completely different type of response. Unlike natural disasters, by the time a public health emergency is declared, the virus may have spread and created a reservoir in the population, and it may take weeks, months, or even years to resolve the crisis. A disease outbreak would be a long-duration crisis as the focus on action is beyond the 72-hour period.

On March 10, 2018, the World Health Organization has added Disease X (the unknown emerging disease of the future) to their list of diseases that require urgent attention: "planning for an epidemic or a pandemic should not

be entirely focused on [a] particular disease or pathogen... While it may be easier psychologically to identify a clear single enemy and put a face to it, specifically targeting a very specific enemy can lead to solutions that are too focused, not flexible, and only work under limited conditions. This would be like buying underwear that you can only wear while riding a unicycle and juggling candles in Antarctica on a glacier next to penguins" (Lee, 2018). Preparing for a future unknown public health threat, caused by a novel organism, is of great importance – not only preparing for the response, but also understanding the processes that underpin it.

Organizations engage in sensemaking to respond to a crisis: they gather information, interpret that information, and decide on a course of action, which is then executed. This may result in further information that the organization utilizes for another cycle of sensemaking. Research in sensemaking has investigated acute crises such as wildfires (Weick, 1993), or pursuit of a suspected terrorist (Colville, Pye and Carter, 2013). Long-duration organizational sensemaking research has been conducted in a non-crisis setting, lasting several months (Maitlis, 2005). However, there is a clear gap in the literature around long-duration crisis (beyond 72-hours in crisis response mode) sensemaking.

This research seeks to address the research gap, by exploring long-duration crisis organizational sensemaking and developing concepts of the process, as well as exploring how it differs from acute crisis organizational sensemaking. The research question is: what are the acute and long-duration organizational sensemaking processes among experts (scientists, doctors, and other professionals that may be called upon to advise the government) during a public health crisis?

This paper presents data from a PhD project on sensemaking and learning through a public health crisis, focusing on the Severe Acute Respiratory Syndrome (SARS) epidemic in Canada as a case study. As this is a case study of one long-duration crisis event, there may be limited generalisability. However, this case provides an opportunity to illuminate how experts engaged in sensemaking in extraordinary circumstances – it is “unusually revelatory” and an “extreme exemplar” (Eisenhardt & Graebner, 2007). Newspaper data is used to track experts' sensemaking in real-time during the crisis duration. SARS in Canada was chosen due to the unique nature of an emerging disease: the first one in the age of global travel, and the first to represent the perils of that advancement.

LITERATURE REVIEW

Sensemaking

There is no universally agreed definition on what sensemaking is (Maitlis and Christianson, 2014). Instead, there are general agreements among scholars on sensemaking aspects, or the sensemaking perspective (Sandberg and Tsoukas, 2015), that it begins with the unexpected, and engages cycles of action and interpretation until sense is restored. Weick is the seminal researcher in organizational (social) sensemaking (Maitlis and Christianson, 2014).

Maitlis and Christianson (2014) define social sensemaking as:

“a process, prompted by violated expectations, that involves attending to and bracketing cues in the environment, creating intersubjective meaning through cycles of interpretation and action, and thereby enacting a more ordered environment from which further cues can be drawn” (Maitlis and Christianson, 2014, 67).

Social sensemaking occurs within the spaces between people, and is carried out in conversations, where “collective sense is generated in an ongoing, iterative manner, as actors shape each other's meanings in repeated cycles of sensemaking” (Maitlis and Christianson, 2014, p. 95). Researchers who focus on sensemaking in the spaces between actors are not all necessarily in agreement on whether sensemaking is retrospective (which is the classical view of sensemaking) (Maitlis, 2005; Maitlis and Lawrence, 2007; Weick, 1995), creating meaning from an event in the past, or prospective, where actors generate multiple possibilities of the future, such as in strategy or planning research (Gephart et al., 2011; Gioia and Chittipeddi, 1991; Kaplan and Orlikowski, 2013).

Sensemaking in crisis and non-crisis situations

Concepts from the sensemaking literature draw from research in both crisis and ‘normal’ settings. This is because the “big picture” process is considered to be the same regardless of the urgency of the situation:

“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 ... 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” (Weick, 2010).

This literature review will focus on concepts from Weickian sensemaking, as Weick has examined many acute crises with a social sensemaking perspective. As Weickian sensemaking can be applied to both crisis and 'normal' settings, they may also be relevant to long-duration crisis social sensemaking; these concepts are reviewed in order to provide a foundation for this research.

Sensemaking process

Trigger: Frames and cues

Sensemaking is triggered when current experience (cues) does not match expectations (frames). Cues are units of meaningful information that are drawn from the environment, and can appear in any medium, such as words, visuals, sensation, etc. (Weick, 1995). Weick does not specifically define cues, but rather uses a variety of metaphors and examples.

There is a strong body of literature in management research on frames and framing; it stems from the cognitive stream, where a frame is defined as "a knowledge structure that directs and guides information processing" (Cornelissen and Werner, 2014). Orlikowski is one of the first researchers to study frames that are socially constructed in her well-cited paper on technological frames (Orlikowski and Gash, 1994). Their paper looks at existing socially-constructed frames, with a focus on technology. The technological frame is defined as: "A collectively constructed set of assumptions, knowledge and expectations regarding a technology and its uses and applications in organizations" (Cornelissen and Werner, 2014). Development of frames is a process, and when successful may result in a stabilized frame (Azad and Faraj, 2008).

While frames are "past moments of socialization", cues are "present moments of experience" (Weick, 1995, p. 111). Triggers for sensemaking start when cues do not match existing frames. However, the gap between frames and cues in itself do not necessarily trigger sensemaking. Sensemaking commences when the magnitude of the gap, and the perceived importance, is great enough to cause individuals or groups to be attentive, question and assess the situation, and decide what to do next (Billings, Milburn, and Schaalman, 1980; Maitlis and Christianson, 2014).

Bracketing

Triggering the sensemaking process involves the social acknowledgement of cues that merit collective attention and further investigation. Bracketing is creating an initial sense of the interrupted situation, through extracting cues (units of meaningful information) from the environment. Weick (1995) explains bracketing as a first step in discovery, that people set breaks in the stream of time, and impose labels or categories on the portion set apart. Bracketing is the first step to bring collective attention to the gap, the issue at hand.

Creating meaning: Relating Cues to frames

Following bracketing, an iterative cycle of meaning creation is entered, comprised of enaction and interpretation. A key element of Weickian sensemaking is enactment; that is, to make sense of the situation, people take action based on "preconceptions" (Weick, 1988), some initial assumptions about the situation. Cues (information) are generated from the action taken; actors interpret and understand the cues through social discourse: they talk about it.

Weick explains that constructing a relationship between frames and cues is creating meaning (Weick, 1995). At a trauma center, patient care teams co-create meaning, an understanding of the patient's situation: "The way we cope with [mysteriously deteriorating patients] is to consult with our colleagues; to vocalize more freely about what we think about the possibilities; to consult at the highest level of the organization with those who might have more experience, or might have seen cases or something like it before" (Faraj and Xiao, 2006, p. 1165). The specialists at the trauma center converse about the situation (patient) bracketed, and consider possibilities for the diagnosis (matching cues and potential frames in interpretation stage). They must determine a course of treatment in real-time as well as balance the tension of choosing the optimal course of action and the need to act as quickly as possible. In considering possibilities, actors also then weigh the most plausible frame.

Assessing plausibility of meaning created

Weick suggests that plausibility is "a good story" (Weick, 1995, p. 61). It includes elements of coherence, reasonableness, and is socially acceptable and credible. In short, reaching consensus on plausibility is socially negotiated and agreed upon, and is itself a process.

Trigger de-activated (output)

When the group has collectively agreed that the meaning created is plausible and "good enough", then they move to produce the output. The output of the sensemaking process restores the 'gap' between current

experience (cues) and expectations (frames) initially noticed in the triggering stage; as Azad and Faraj (2008) explain, the process of (coherent) sensemaking leads to a stabilized frame, which then ends the process. For example, Maitlis (2005) followed three British orchestras over several years, and depicted many sensemaking processes, one of which was the negotiation of the new season's program (stabilized frame).

Prospective Sensemaking

Weick has been criticized for not conceptualizing anticipation in the sensemaking perspective (Sandberg and Tsoukas, 2015). They discuss this issue as troublesome because an inherent aspect of a practitioner is the ability to anticipate the consequences of actions from experience. Future-oriented sensemaking is defined as: "sensemaking that seeks to construct intersubjective meanings, images, and schemes in conversation where these meanings and interpretations create or project images of future objects and phenomena" (Gephart et al., 2011). Weick presents future-oriented sensemaking in the 'future perfect tense' where the actor chooses his desired outcome, and from that perspective looks backwards in time to where he is in the present, to plot the way forward to reach the desired destination. This is different from prospective sensemaking where actors generate multiple possibilities from the standpoint of the present.

The case study: SARS 2003, with a Canadian perspective.

The following information is extracted from the WHO (2006) report.

SARS was the first emerging disease of the 21st century, spread internationally with the speed of air travel. Retrospectively identified as the first SARS case, a man becomes ill in China on Nov 16, 2002 and infects a handful of his relatives. The virus spreads, and by early January, authorities in China note the outbreak. On January 23, 2003, an official statement is released about 'atypical pneumonia' by a Chinese regional authority. By early February, the WHO in China and its international surveillance network pick up information about an unusual epidemic of fatal pneumonia-like illness.

Over the next few weeks, there is a flurry of activity between Chinese authorities and the WHO, with the former being uncooperative in opening their borders for a public health investigation.

The following information in this section is extracted from the SARS commission (Campbell, 2006).

At the Metropole hotel in Hong Kong, a sick doctor from China only stayed one night (February 21); but transmitted the virus to at least 17 people. They travelled to many other countries: Canada, USA, Australia, Hong Kong, Singapore, the Philippines, and Vietnam. The Canadians flew back to Ontario and British Columbia, provinces on opposite sides of the country. The index case (first person infected) in Ontario began an event that affected hundreds of people and caused national hysteria in early and mid-2003.

In Toronto, on March 7, 2003 a man carrying SARS (he caught it from his mother, who had stayed at the Metropole hotel in Hong Kong) was brought in to hospital. He transmitted SARS to several other people, including hospital staff. From March 13-25, several people became ill, and it was noticed to be similar to outbreaks in South East Asia.

A provincial emergency was declared, March 25-26, 2003, and the Provincial Operations Centre (POC) was formed. For over six weeks this team of key decision makers were in crisis response mode, until mid-May when the crisis was declared over. However, SARS was lurking beneath the surface, and in late May, SARS II was declared as another outbreak occurred. Finally, on July 5, 2003, the WHO announced that the global SARS outbreak was contained.

RESEARCH METHODOLOGY

Data collection

Two Canadian newspapers were chosen for this analysis: The Globe and Mail (TGAM) and the Toronto Star (TS). Canada is one of the countries that experienced an epidemic of SARS, and an assumption is that Canadian newspapers would carry detailed and in-depth coverage of the SARS crisis, both nationally and internationally. In January 2016, both newspapers were searched for SARS-relevant articles throughout the crisis period in Canada (March 24 to July 5, 2003). 1552 articles were downloaded for TGAM, and 1647 for TS.

Criteria for inclusion/exclusion (I/E) were developed and applied to screening the 3199 articles (Table 1). The focus was on retaining articles that covered the science or public health aspect of SARS that are Canadian, or

relevant to Canada, not the economic, societal or reputational cost. Articles on pharmaceuticals or molecular science for therapy of SARS patients are also excluded as this research is focusing on the sensemaking of an outbreak, and controlling transmission. The final number of articles for analysis were 399, with a total of 722 pages, single-spaced.

Table 1. Inclusion/ Exclusion Criteria

Include	Exclude
Full articles	Articles that are not relevant to SARS, or only mention SARS, but it is not the main topic
Primary topic of SARS	
Canadian response (or relevant to)	Political, societal, or economic impact of SARS
Letters to editor that are written by experts (doctors, epidemiologists, etc)	Drug therapy for SARS

Data analysis

A grounded theory analysis approach was chosen, due to the lack of prior research on long-duration crisis sensemaking. While Weick's sensemaking concepts provide a foundation, it is unclear what role they play, and/or if there are additional concepts, and relationship(s) between these concepts, in long-duration crisis sensemaking. This approach is also suitable for detailed process data from multiple sources and formats. Charmaz's method (2014) of analysis was followed, which has three levels of coding – initial, focused, and theoretical.

The researcher first immersed herself in the 722 pages of data, and read each line. Then, initial coding commenced, where the articles were split into columns, with the text in the left column and the right column used for coding. Charmaz (2014) explains the researcher stays close to the data, and attempts to see what is emerging from the data by using words that reflect action. The coding was short and precise.

The next step is focused coding; these codes are the more frequent or significant of the initial codes. These codes are applied to “sift, sort, synthesize, and analyze large amounts of data” (Charmaz, 2014, pg. 138). The decision on what was significant was based on what patterns were arising that were directly relevant to the research question. Coding is a long and iterative process with codes often changing until the story fits the data, and vice versa.

The final step in analysis is theoretical coding, or theory development. This takes the focused codes to the next level of abstraction. The level and balance of application of previous knowledge (from the literature review) and emergence from the data is ambiguous (Charmaz, 2014). Theory development will be the next stage of this PhD project, once all the sources of data (including interviews and reports) have been analyzed and integrated. This paper present concepts arising from focused coding.

RESULTS

Four cases of sensemaking are presented in this paper; one case of acute sensemaking, and three cases of long-duration sensemaking. The three long-duration cases are robustly covered in the newspapers, and provide substantial data for analysis. The acute sensemaking case chosen is an outbreak, and also relates to the group of experts that are being studied in the wider PhD project. For this project, acute sensemaking is defined in the same time period as acute crises, such as floods, wildfires, and industrial incidents: 72 hours (Ruback, Wells, and Maguire, 2013). For SARS, once the potential of transmission is known, officials work as quickly as possible to identify, and quarantine people who might have been exposed. While the quarantine period is 10 days, the enactment and interpretation processes are immediate to limit the potential of transmission. Long-duration sensemaking refers to the sensemaking processes that are beyond the 72-hour time frame. All of the

data analyzed and depicted are from articles in TGAM and TS, from March 24 to July 5, 2003.¹

Outbreak sensemaking follows the Weickian retrospective sensemaking process; an unexpected event has happened, and people take action to find out information in order to understand and take further action to address that event. Figure 1 depicts a potential outbreak. Dr. M discovers she has a fever (triggering sensemaking), and immediately enters the hospital. At this time, people are only considered to be infectious when they are symptomatic; to be on the safe side, the officials decide to interview people who spent time with Dr. M within a 24-hour window before Dr. M's onset of fever (this is the initial gathering of information – the bracketing stage). As soon as possible, these people need to be identified and quarantined, to limit the extent of potential transmission. The plausibility of the interpretation will be assessed once those people who were quarantined (and all those others who came in contact with Dr. M) become ill or not – if the disease has not been transmitted, then the sensemaking cycle is complete. If new cases have arisen, another sensemaking cycle is entered, to ensure every person that may have come in contact with the person who is ill, is quarantined as well.

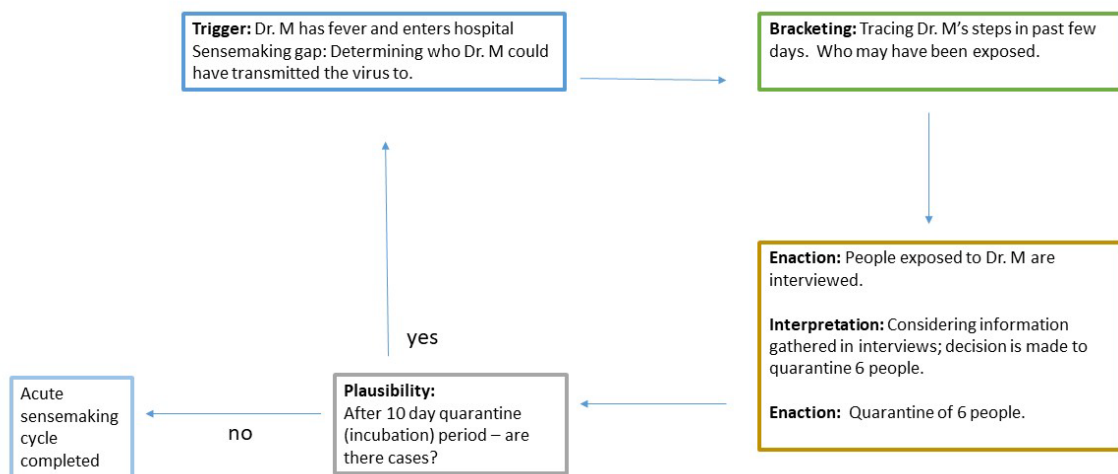


Figure 1. Acute sensemaking process of SARS case: Dr. M

Newspaper data does not allow for fine-grained sensemaking analysis for long-duration processes; however, it does allow for the mapping of frames over time. For long-duration sensemaking cycles, the evolution of frames will be mapped for the following sensemaking processes: the cause of SARS (figure 2), how SARS is transmitted (figure 3), and when it is transmitted (figure 4). In these figures, possibilities are shown in dashed boxes, with the color being stronger the more certain experts are. Solid boxes express certainty.

Around the world, scientists work together to hunt down the organism that is causing SARS. In the beginning, there are two contenders – a metapneumovirus or a coronavirus (Figure 2).

¹ For a list of all of the articles, please contact the first author as they are not cited in this paper (due to the page limit).

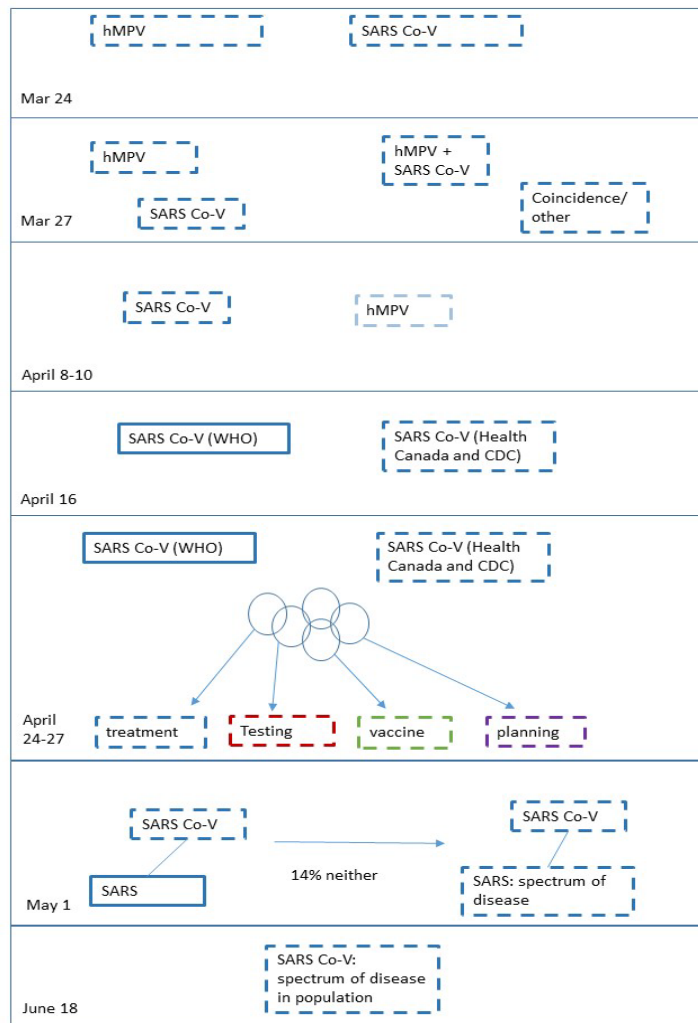


Figure 2. The cause of SARS.

On March 24 (Figure 2), newspapers report evidence of two types of organisms – human metapneumovirus (hMPV) and a coronavirus (SARS Co-V). Scientists around the world are trying to make sense of the puzzle (Figure 2: March 27); they are not sure if either is the culprit, or if they work together, or if it is just a coincidence and there is another organism. By early April (Figure 2: April 8-10), as reported in the *Lancet* and *New England Journal of Medicine*, experts state that evidence supports that SARS Co-V is the SARS causing organism. They are cautiously optimistic of this. However, in Canada, only 60% of SARS patients test positive for SARS Co-V.

A week later, the WHO declares a consensus among their experts (Figure 2: April 16) that SARS is caused by a coronavirus – SARS Co-V. However, there is continuing doubt in Canada – the national lab is not finding SARS Co-V in all SARS patients.

As the weeks pass, Health Canada and CDC are not completely certain SARS is caused by the coronavirus due to evidence (Figure 2: April 24-27). Even though they are not certain it is the coronavirus, experts are using that frame to engage in prospective sensemaking (depicted as overlapping circles) in planning, treatment, testing, and developing vaccines, because the stakes are too high to not take action.

By May 1 (Figure 2), experts find that 14% of the people under investigation for SARS tested positive for the coronavirus, yet are neither probable nor suspect cases. These people do not display the clinical symptoms associated with SARS – meaning there could be people with mild cases of SARS that are not being recognized by the authorities. This leads to changing the understanding of SARS, and redefining the definition of SARS, that it is a disease that is expressed in a spectrum (Figure 2: June 18).

For the third case of sensemaking process, the mode of SARS transmission is discussed (Figure 3).

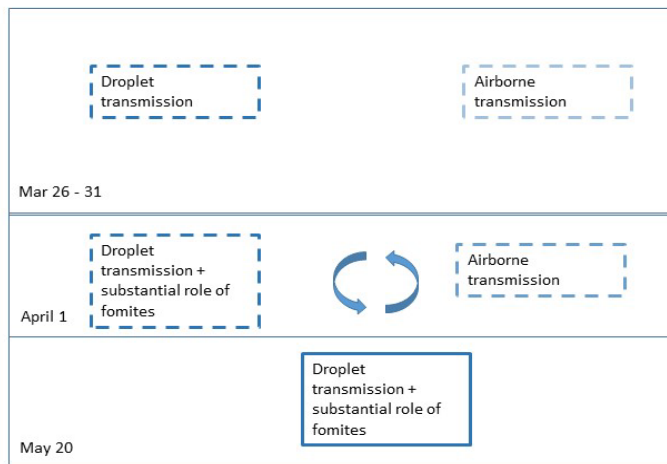


Figure 3. How SARS is transmitted.

Dr. Heymann of the World Health Organization states there is no evidence of the disease being airborne – they have analysed thousands of passengers travelling with SARS infected people, who did not become ill (Figure 3: March 26). They would be concerned if they find cases that did not involve close proximity with someone symptomatic. However, the CDC are considering the possibility of airborne transmission (Figure 3: March 30).

On April 1 (Figure 3), in Hong Kong, several hundred people became ill with SARS who all live in the same building. Experts in Hong Kong are considering if the transmission is airborne. Dr. Low in Canada says the data shows that 99% of cases are through close contact via respiratory droplets, and he suggests the role of fomites (surfaces where the organism survives).

With several weeks of data, by May 20 (Figure 3), the WHO presents analysis of 35 flights with people showing symptoms of SARS: proximity is a big part of the transmission. It is confirmed to be droplet transmission.

The fourth case of sensemaking process will focus on whether transmission occurs when the person is asymptomatic or has symptoms of the disease. From early in the SARS crisis, the disease was thought to be transmitted only when the person is symptomatic (Figure 4). We see that as the SARS crisis unfolds, the definition of 'symptomatic' becomes a spectrum rather than a binary, as scientists learn that even people who have mild forms of the disease may not even know they are carrying it and are potentially infectious.

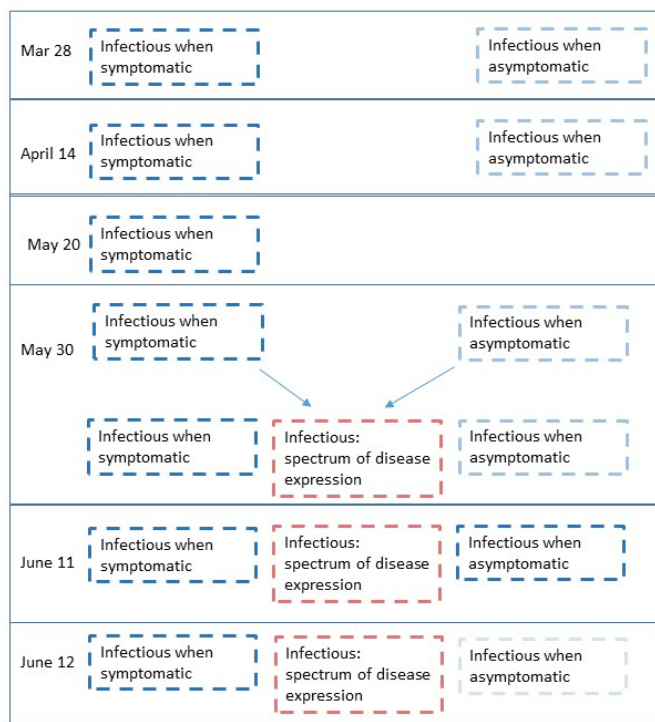


Figure 4. Infectious when asymptomatic or only when symptomatic

In late March, the experts are working on the assumption that people are infectious only when symptomatic, and the “chances of spreading the illness before your symptoms show up is low” Dr. Singh from Canada (Figure 4: March 28).

A few weeks later, there is some concern, as Dr. Maguire, a member of the WHO team, says there is some evidence suggesting people can transmit before they are symptomatic (Figure 4: April 14). Although, the great majority of cases stem from someone who is ill and infectious.

In mid-May, there is certainty expressed by the WHO that people are only infectious when symptomatic. The WHO analysed data of 35 flights where people who were ill and symptomatic travelled: SARS is not contagious unless symptoms are showing, experts say (Figure 4: May 20).

When the second wave of SARS hit, there was renewed concern about asymptomatic transmission. An expert in Toronto said that there were some people who had mild cases of the disease – some displayed no symptoms – but carry the virus and may be able to transmit to others. Furthermore, experts had debated over some people that were exposed at the epicentre of SARS, and should have become infected, but declared no symptoms, and were deemed not SARS cases (and thus were neither quarantined nor tracked) (Figure 4: May 30).

A potential case of asymptomatic transmission occurred in early June. A man from North Carolina visited a patient at Baycrest (Toronto) who days later developed SARS; the man also developed SARS in the States. If this was true, then it would be the first case of asymptomatic transmission (Figure 4: June 11). However, a day later, experts discovered the patient's wife at Baycrest had been symptomatic and coughing while the man from NC was visiting (Figure 4: June 12).

DISCUSSION

Acute and long-duration sensemaking

Acute crisis sensemaking has been studied widely, with Weick being the seminal researcher in this field (Maitlis and Christianson, 2014). In an epidemic, the crisis is the possibility of widespread transmission of a disease; therefore, each outbreak represents an acute crisis as it holds the potential for widespread transmission, unless action is taken to contain the threat. As acute crisis sensemaking has been extensively studied, the contribution of this PhD project will be towards understanding and illuminating long-duration crisis sensemaking, and comparing and contrasting it to acute sensemaking. For this paper, long-duration sensemaking is defined as being more than 72 hours in length; however, as the PhD research project progresses, the definition may become richer and more complex, and may include characteristics that are unique to long-duration sensemaking in addition to its length. With newspaper data, there is not enough data to analyze and characterize long-duration sensemaking with depth, as it requires detailed process data. However, this type of data does allow for the identification of the triggers of long-duration sensemaking, and the frames developed over time.

Frames and certainty

Information is required to assist decision-makers in public health crisis response; the decisions include the scale of response, and the selection and targeting of measures to reduce transmission, as well as for direct protection (Lipsitch et al., 2011). In the cases presented in this paper, scientists are working together to find answers to the cause of SARS, and how and when it is transmitted, in order to help decision-makers in crisis response. However, in responding to infectious diseases, decisions must be made early in the outbreak when the threat is relatively small but there is not much available information.

From the cases, we see that it takes time, it is a process for scientists and experts to find out information and test ideas before there can be greater certainty in frames. Yet, this is counterbalanced with an urgency to take action to limit potential transmission. In these cases, there is a relationship, a tension, between retrospective and prospective sensemaking, an urgency to understand what has happened in order to plan for the response. A trade-off is made between “comparatively small, but nearly certain harm that an intervention may cause (such as rare adverse events from large-scale vaccination...) and the uncertain probability of much greater harm from a widespread outbreak” (Lipsitch et. al., 2009, pg. 112).

Relationship between retrospective and prospective sensemaking: tethering of frames

This relationship is seen in Figure 2 in the case of the evolution of what scientists believe are causing the SARS virus. In that sensemaking stream, even though the WHO officially declared the coronavirus (SARS Co-V) to be the cause of SARS, there is data that does not support that conclusion. Specifically in Canada, there were only 60% of SARS patients that tested positive for the virus, and that number continued to drop – and even more bizarrely – they found that 14% of people who were not ill with SARS tested positive for the virus. Even

with the uncertainty regarding SARS Co-V, there was immense pressure to take action, and scientists and leaders in crisis response moved forward in planning and strategizing how to combat the SARS epidemic with the assumption SARS Co-V causes the disease. We see this tethering of frames, because the frames of treatment, testing, vaccine development, and planning, are all tethered on the assumption that SARS is caused by SARS Co-V. It would be a significant loss of effort, time, and resources if a vaccine and treatment were developed but scientists finally found the “real” culprit of SARS to be the metapneumovirus. This is an example of tethered frames that have a big risk – the alternative is to do nothing until scientists are “certain” the cause is SARS Co-V.

Fluidity of frames and frame identity

One of the remarkable aspects of the SARS crisis was the fluidity of frames. They kept changing; at one point a frame was solid and experts were certain in it, then an event occurred that caused doubt, and loss of certainty in the frame. For example, the definition of SARS itself changed far into the crisis. Scientists were at a loss to explain why 14% of people test positive for SARS Co-V when they are neither probable nor suspected cases (figure 2). Then scientists were using abduction - the ability to “generate plausible conjectures about the meaning of fragmentary evidence” (Weick, 2010), that they were able to consider that SARS was expressed in a spectrum in the population, from mild to severe. Some people who had very mild cases of SARS, possibly were not aware they had the disease.

In the long-duration sensemaking cases, the frame development started with an assumption that the frame definitions would be solid, for example, that the transmission was droplet, contact, or airborne and the data gathered should elucidate which one it is. However, scientists found that it is droplet transmission, with a substantial role of fomites and manual aerosolization that provided confounding data, which had suggested airborne transmission (figure 3). There seems to also be an assumption that the frames are solid, and also, in general, discrete. This is seen in the consideration of the possibilities of frames, for example, that people are either infectious when they are asymptomatic or not (figure 4). Scientists later found that the definition of asymptomatic or symptomatic falls into a spectrum of disease expression. Rather than a discrete binary (asymptomatic or symptomatic transmission), the structure of the frame's substance shifts, to being a spectrum. This suggests a higher-order of sensemaking, that not only does an emerging disease cause high intensities of sensemaking, but may also cause scientists to question paradigms of scientific knowledge, such as how Weick described ‘cosmology episodes’ (Weick, 1993) where actors are faced with such overwhelming cues that do not match any existing frames that some are at loss to be able to engage in sensemaking. SARS was an unrelenting crisis event with multiple confounding sensemaking cycles.

Multiplicity and complexity of concurrent sensemaking

All of the cases presented in this paper happened concurrently; while they can be separated and diagrammed, they also co-exist through time with many experts ‘overlapping’ and considering multiple problems at the same time. As acute sensemaking takes place, frames are generated and exist in social collective spaces, for experts and scientists to use as working frames, to inform concurrent streams of sensemaking.

There can be significant benefit from greater experience and frames to draw from – a wider “response repertoire”. Christianson et al. (2009) define “response repertoires”: “the stock of routines, habits, and roles that have been experienced, as well as the capability to recombine portions of the stock in novel ways. We emphasize that response repertoires include both realized and latent potential... for much of the stock remains outside awareness and is taken for granted until moments of interruption and attempts at recovery call attention to it or require actions that draw upon it” (846-7). For situations where cues do not match existing frames, the most relevant frame(s) may be retrieved, and adapted to the situation (Maitlis and Sonenshein, 2010).

Furthermore, as actors gain experience of cycles of sensemaking, they may become more familiar and adept with the process, which has been observed in organizational learning from rare events (Christianson et al., 2009). With more experience as practitioners develop a greater collection in their library of frames, and may develop the tacit ability or “capacity” to sense weak cues that could eventually develop into crises. That is, with more experience (and becoming ‘experts’), there is a greater likelihood of sensing weak cues and stopping a crisis before it starts, or at least mitigating the effect. The greater the number and variation of frames to draw on, the more likely the ability of the actors to sense an impending crisis earlier.

Next steps

In this paper, one subset of data for a PhD project was analyzed and presented: the newspaper data for the 2003 SARS crisis. Next steps in this project are to complete data collection of interviews, and then analyze and integrate that data, with document, reports, and newspaper data. Interesting concepts have arisen from the newspaper data analysis, such as frame tethering, and the relationship between retrospective and prospective processes in long-duration sensemaking, and these will be further explored with all sets of data with the aim to

build a conceptual framework for long-duration crisis sensemaking.

LIMITATIONS

Data were extracted from two Canadian newspapers. Newspaper data alone cannot provide the fine-grained detail for sensemaking process research. This will be addressed in the next steps.

CONCLUSION

In this paper, newspaper data from the 2003 SARS crisis was examined. This data has depicted some interesting concepts, and potential relationships between the substantial knowledge of acute crisis sensemaking and the nascent research on long-duration crisis sensemaking. This paper's contribution to research is in illuminating that in long-duration crisis sensemaking, frames can be tethered, and providing insight on the way in which these tethered frames evolve over the period of the crisis. In terms of contribution to practice, a greater understanding of tethering of frames may lead to reflecting on current long duration crisis response planning, and how tethered frame evolution may affect the process of response. There is a need to explore long-duration sensemaking further, and the evolution of frames, particularly the retrospective and prospective sensemaking processes between frames, within a public health crisis context.

ACKNOWLEDGMENTS

During the presentation of the PhD research proposal, suggestions were made to improve the design. One of the suggestions was to review newspaper media of that time period, which has enhanced the robustness of the PhD project.

REFERENCES

- Azad, B., and Faraj, S. (2008). Making e-Government systems workable: Exploring the evolution of frames. *The Journal of Strategic Information Systems*, 17, 2, 75-98.
- Bechky, B. A., and Okhuysen, G. A. (2011). Expecting the unexpected? How SWAT officers and film crews handle surprises. *Academy of Management Journal*, 54, 2, 239-261.
- Billings, R. S., Milburn, T. W., and Schaalman, M. L. (1980). A Model of Crisis Perception: A Theoretical and Empirical Analysis. *Administrative Science Quarterly*, 25, 2, 300-316.
- Campbell, A. (2006). *SARS Commission: Spring of Fear*. Toronto: Publications Ontario.
- Christianson, M. K., Farkas, M. T., Sutcliffe, K. M., and Weick, K. E. (2009). Learning through rare events: Significant interruptions at the Baltimore & Ohio Railroad Museum. *Organization Science*, 20, 5, 846-860.
- Colville, I., Brown, A. D., and Pye, A. (2012). Simplexity: Sensemaking, organizing and storytelling for our time. *Human Relations*, 65, 1, 5-15.
- Colville, I., Pye, A., and Carter, M. (2013). Organizing to counter terrorism: Sensemaking amidst dynamic complexity. *Human Relations*, 66, 9, 1201-1223.
- Cornelissen, J. P., and Werner, M. D. (2014). Putting framing in perspective: A review of framing and frame analysis across the management and organizational literature. *The Academy of Management Annals*, 8, 1, 181-235.
- Dunbar, R. L., and Garud, R. (2009). Distributed knowledge and indeterminate meaning: The case of the Columbia shuttle flight. *Organization Studies*, 30, 4, 397-421.
- Eisenhardt, K., & Graebner, M. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25.
- Faraj, S., and Xiao, Y. (2006). Coordination in fast-response organizations. *Management science*, 52, 8, 1155-1169.
- Gephart, R. P., Jr., Topal, C., and Zhang, Z. (2011). Future-oriented Sensemaking: Temporalities and Institutional Legitimation. In T. M. Hernes, S. (Ed.), *Process, Sensemaking, and Organizing*: Oxford University Press.
- Gioia, D. A., and Chittipeddi, K. (1991). Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal*, 12, 6, 433-448.
- Gioia, D. A., Corley, K. G., and Fabbri, T. (2002). Revising the past (while thinking in the future perfect tense). *Journal of Organizational Change Management*, 15, 6, 622.
- Hannah, S. T., Uhl-Bien, M., Avolio, B. J., and Cavarretta, F. L. (2009). A framework for examining leadership in extreme contexts. *The Leadership Quarterly*, 20, 6, 897-919.

- Kaplan, S., and Orlikowski, W. J. (2013). Temporal Work in Strategy Making. *Organization Science*, 24, 4, 965-995.
- Lee, B. Y. (2018, March 19) Disease X is what may become the biggest infectious threat to our world. *Forbes*. Retrieved from <https://www.forbes.com/sites/brucelee/2018/03/10/disease-x-is-what-may-become-the-biggest-infectious-threat-to-our-world/#69cadaf02cd7>.
- Lipsitch, M., Riley, S., Cauchemez, S., Ghani, A. C., and Ferguson, N. M. (2009). Managing and reducing uncertainty in an emerging influenza pandemic. *New England Journal of Medicine*, 361, 2, 112-115.
- Lipsitch, M., Finelli, L., Heffernan, R. T., Leung, G. M., and Redd, S.C. for the H1N1 Surveillance Group. (2011). Improving the evidence base for decision making during a pandemic: the example of 2009 influenza A/H1N1. *Biosecurity and bioterrorism: biodefense strategy, practice, and science*, 9, 2, 89-115.
- Maitlis, S. (2005). The Social Processes of Organizational Sensemaking. *Academy of Management Journal*, 48, 1, 21-49.
- Maitlis, S., and Christianson, M. (2014). Sensemaking in Organizations: Taking Stock and Moving Forward. *The Academy of Management Annals*, 8, 1, 57-125.
- Maitlis, S., and Lawrence, T. B. (2007). Triggers and enablers of sensegiving in organizations. *Academy of management Journal*, 50, 1, 57-84.
- Maitlis, S., and Sonenshein, S. (2010). Sensemaking in Crisis and Change: Inspiration and Insights From Weick (1988). *Journal of Management Studies*, 47, 3, 551-580.
- Orlikowski, W. J., and Gash, D. (1994). Technological Frames: Making sense of information technology in organizations. *ACM Transactions on Information Systems*, 12, 2, 174-207.
- Pearson, C. M., and Clair, J. A. (1998). Reframing Crisis Management. *The Academy of Management Review*, 23, 1, 59-76.
- Ruback, J., Wells, A. S., and Maguire, B. J. (2013). Methods of Planning and Response Coordination. In R. Bissell (Ed.), *Preparedness and Response for Catastrophic Disasters*. Boca Raton, FL: Taylor & Francis.
- Sandberg, J., and Tsoukas, H. (2015). Making sense of the sensemaking perspective: Its constituents, limitations, and opportunities for further development. *Journal of Organizational Behavior*, 36, S1, S6-S32.
- Weick, K. E. (1988). Enacted sensemaking in crisis situations. *Journal of management studies*, 25, 4, 305-317.
- Weick, K. E. (1993). The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster. *Administrative Science Quarterly*, 38, 4, 628-652.
- Weick, K. E. (1995). *Sensemaking in Organizations*: Sage.
- Weick, K.E. (1996). Prepare your organization to fight fires. *Harvard Business Review*, 74, 3, 143-48.
- Weick, K. E. (2010). Reflections on enacted sensemaking in the Bhopal disaster. *Journal of Management Studies*, 47, 3, 537-550.
- WHO. (2006). *SARS: how a global epidemic was stopped*. Geneva, Switzerland: WHO Press.